

Nesting behaviour of the South Philippine Dwarf Kingfisher *Ceyx mindanensis*

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South Philippine Dwarf Kingfisher *Ceyx mindanensis* is a poorly known, small forest kingfisher, endemic to the Philippine islands of Mindanao and Basilan. We describe here observations of the sites, habitats and structure of five nests of this species and accompanying feeding behaviour. Nests were holes excavated in a bank or in arboreal termitaria. Food brought to the nest was largely earthworms and small lizards, but also other invertebrates.

INTRODUCTION

The South Philippine Dwarf Kingfisher *Ceyx mindanensis* is a small forest kingfisher, endemic to the islands of Mindanao and Basilan. It is a poorly known species, reported to be dependent on lowland forest and as such is classified as Vulnerable (BirdLife International 2017). Until recently it was considered conspecific with its close relative in the northern Philippines, *C. melanurus* (including the form *samarensis*), but was split by del Hoyo & Collar (2014). Nothing has been published concerning the nesting or breeding behaviour of these species, or indeed any other of the Philippine populations of small *Ceyx* or *Alcedo* kingfishers; nor is there any published information on the diet or habits of *C. mindanensis* (Fry *et al.* 1992, Kennedy *et al.* 2000)). Here we report nest site discoveries between 2007 and 2017 and data on feeding behaviour.

NEST SITES DISCOVERED

Paper Industries Corporation of the Philippines (PICOP)

In April 2007, April 2008 and February 2010 a nesting site was found and monitored by RH in the former PICOP logging concession, Surigao del Sur province, eastern Mindanao, 27 km north-west of Bislig (8.30°N 126.14°E). The site (280 m) was towards the edge of a block of residual forest about 6×6 km in extent. The nesting location was in a moderately steep, earthen area of a predominantly limestone bank at the side of a logging road that cut through primary dipterocarp forest; it was about 2 m above the road surface. Banks cut for the road were probably the only potential nesting site in the area, which otherwise consisted entirely of limestone. The surrounding area comprised steep, forested hills and ridges separated by steep-sided gullies. Tree height in the immediate nest area was estimated at a maximum of 20 m, but trees on the surrounding ridges and valley bottoms reached 30 m. The same hole was used in 2007 and 2008 but a different hole, about 20 cm away, was excavated in 2010.

On 16 and 18 April 2007 two birds were present and actively excavating the nest hole. The following year, on 5 April 2008, two birds were present and watched by RH for a period of two hours as they brought food to nestlings, which could be heard calling inside the hole. During this time there were seven visits by the adults. Two prey items brought were identified as skink species and one appeared to be a large earthworm; the others could not be identified.

Two years later, on 27 February 2010, an adult was seen by RH excavating a nest hole 20 cm away from the previous one. No further observations were made.

Cagayan de Oro

During 2015–2017 four different nests were discovered in heavily degraded forest within the boundaries of Cagayan de Oro city,

Misamis Oriental province, on the coast of north-central Mindanao. All the nests were located within 10–150 m of human habitations and close to gullies that drained the forest floor.

Mapawa Nature Park: two nests were found at Mapawa Nature Park, about 2,500 ha of very open secondary forest at 400–500 m (8.45°N 124.70°E), located a few km south-east of the city. The first nest, discovered in June 2015, was located in an active arboreal termitarium. It was 2 m above ground level, on a culm of a bamboo clump near a steep-sided gully. Unfortunately, this nest was destroyed by trespassers before observations could be made.

The second Mapawa nest was found on 23 May 2016, 8 km from the 2015 nest, after a pair was seen perched together. This nest was also in an arboreal termitarium, 3 m above ground level, attached to the trunk of an evergreen *Dillenia* tree in a gully surrounded by trees and shrubs; the forest floor was moderately covered with leaf-litter. The pair took turns to enter the hole, and debris was observed coming from it, suggesting that a cavity was being prepared. The nest was revisited on 27 May, and again five weeks later, on 6 and 7 July, when NKB constructed a hide and, in two watches each of 5–6 hours, recorded feeding activity. Food brought to the nest on 6 July comprised a skink (09h15), skink (11h00), skink (11h15), cricket (12h36), skink (13h33), skink (13h47), larger skink (14h44), gecko (15h17) and skink (15h26); and on 7 July a skink (07h07), skink (07h24), invertebrate (08h36), skink (10h23), cricket (10h30), skink (11h18), skink (11h34) and cricket (11h40).

Alwana Village: the other two nests were located in an area adjoining Alwana village and industrial park, 3 km to the north of Mapawa in 100 ha of open secondary forest dominated by grassy clearings, shrubs and bamboo (as at Mapawa), with a few remnant trees 20–30 m high. The site (8.47°N 124.70°E) at about 70 m is contiguous with the ridges that comprise the Malasag Forest Reserve (largely owned by the Philippine government) to the south and is about 2 km from the coast. Both nests were found on 7 August 2017 and were also in arboreal termitaria, but at opposite sides and at the outer edges of the same large bamboo stand, which was 14 m in diameter. The termitaria were 3.2 m and 1.6 m above ground, attached to live Spiny Bamboo *Bambusa blumeana* culms. The nest holes were excavated in the lower portion of each mound with a horizontal tunnel leading to the nest cavity. The higher termitarium was occupied by red ants, but it was not determined if termites were also present; this nest could not be observed without disturbance, so no details were recorded. When first found, the lower nest (Plate 1) could be seen to contain two eggs. On 10 August 2017, a hide was constructed 10 m from the entrance to this nest. Observations were made by MDL between 05h00 and 18h00 on each of 21 consecutive days until fledging, all day on nine days but on average six hours per day. Images and video were taken for documentation and later study. On three occasions it was confirmed that one of the pair roosted overnight high in the bamboo, invisible from the hide.

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Plate 1. Adult South Philippine Dwarf Kingfisher *Ceyx mindanensis* leaving its nest in an arboreal termitarium attached to a live Spiny Bamboo *Bambusa blumeana* culm, Alwana Village, Cagayan de Oro, Misamis Oriental province, Mindanao, Philippines, 31 August 2017.

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Plate 3. Adult bird entering its nest, Alwana Village, 29 August 2017.

Typically, during the first two weeks, the parents would leave the nestling (the other egg not having hatched) 3–4 times a day on no fixed schedule, for no more than one hour. In the third and final week, they left the nest for as long as three hours, although one adult always acted as sentinel on one of four perches above and in front of the nest entrance.

The parents perched as low as 20 cm from the ground on fallen bamboo poles, bamboo branches and vines, relatively openly, and would stay on the same perch for as long as five minutes, surveying the ground for prey. On occasion they would perch high up among the bamboo where they could be heard but not seen. The great majority of prey items were earthworms (Plate 2), which were seen taken one to five times per day. The parent birds were never seen carrying any food items in their bills when returning to the nest to feed the nestling; in at least one case a prey item was swallowed, but the bird then flew directly to the nest. Consequently we presume that the chick was fed with regurgitated food. On at least three occasions prey was found in moist, decaying leaf-litter or dug from the ground. The earthworms were cut up and shaken free of soil on a fallen bamboo culm 5–14 m away from the nest. Small skinks (5) and spiders (2) were also seen to be caught but were thrashed a few times to stun them, then swallowed whole.

On returning to the nest, both birds would stop for 5–45 seconds on one of five sentinel perches, located 5–10 m from the nest



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Plate 2. Adult bird with an earthworm which it hunted on the forest floor 10 m from its nest. It swallowed the earthworm whole before flying back to its nest. Alwana Village, 25 August 2017.

entrance. The birds entered the nest by darting in without stopping at the external opening (Plate 3). Often, the tip of their tail was visible for a split second before it completely disappeared from sight.

On 8 September 2017, more than a week after fledging and with no activity around the nest observed, the two nests were inspected and measured. The nest studied was found to have one unhatched egg, which was photographed and measured. It was plain, glossy white, and almost spherical, measuring 17.5×14.0 mm. The dimensions of this termitarium were 53×39×29 cm (height×width×depth). The entrance to the nest was 8 cm in diameter leading to a 3 cm diameter, 25 cm long tunnel opening out to a nest space of 8×10×9 cm. The dimensions of the second termitarium were 89×80×69 cm with a nest entrance of 7 cm diameter, and a tunnel which was also 3 cm diameter and 25 cm long. The nest cavity was similar in size at 8×9×9 cm.

DESCRIPTION OF THE CALL

The call is a rasping, flat-toned, insect-like *tsrrrrrt*, lasting about 0.25 seconds and given singly or 2–5 times in succession at two- to five-second intervals. On occasions a similar but slightly higher-pitched call was heard. A recording is archived at: <https://www.xeno-canto.org/431292>; a video of a calling, perched bird is available at: <https://www.hbw.com/ibc/species/south-philippine-dwarf-kingfisher-ceyx-mindanensis>.

DISCUSSION

Kingfishers are cavity-nesters (Fry *et al.* 1992), typically excavating nest holes in earth banks or termitaria. Sixteen species are now considered to be resident in the Philippines (del Hoyo & Collar 2014) of which the nests of only three have been documented in the country—Stork-billed *Pelargopsis capensis*, Brown-breasted *Halcyon gularis* and Collared *Todirhamphus chloris*; all of these have, at least on occasion, used termitaria (Kennedy *et al.* 2000). Two other species, Ruddy Kingfisher *H. coromanda* and Oriental Dwarf Kingfisher *Ceyx erithaca*, are known to use earth banks and termitaria extralimitally (Woodall 2001). Del Hoyo *et al.* (2018) give brief reports of the Philippine endemic Northern Indigo-banded Kingfisher *C. cyanopectus* and Southern Silvery Kingfisher *C. argentatus* nesting in stream or river banks, but with no details. However, the nesting of small kingfishers in termitaria (*Ceyx* sp.,

Alcedo sp.) has never previously been reported in the Philippines to our knowledge. Such a dearth of breeding information is typical for the Oriental Region (Noske 2017).

In the Cagayan de Oro area there is little seasonal variation in maximum daytime temperatures (29–33°C) or hours of sunshine (6–8h/day). However, average monthly rainfall varies from 74 mm in April (typically 7 wet days) to 254 mm in June (19 wet days) (<https://weather-and-climate.com/average-monthly-Rainfall-Temperature-Sunshine,cagayan-de-oro-mindanao-ph>). It seems possible that the onset of the rainy season is the trigger for breeding in this area and more breeding records of *C. mindanensis* will help elucidate this.

The species is not considered common but it is unclear what limits its distribution. At PICOP the ground in the nesting area is predominantly limestone, so it is possible that suitable nesting sites such as earth banks are limited—hence the nest-site fidelity. However, it is not known whether there were arboreal termitaria in that area. More research is needed on the distribution and availability of these termitaria as nest-sites for kingfishers and other bird species such as Guaiabero *Bolbopsittacus lunulatus* (Rosell *et al.* 2007) to ascertain whether their availability is a limiting factor for the breeding of these species.

Kennedy *et al.* (2000) made no mention of the species's diet. Del Hoyo *et al.* (2018) state insects and larvae and small crabs as food of *C. melanurus*, although with no reference given, while for *C. mindanensis* they simply state 'No known differences from *C. melanurus*'. At one of the Alwana nests most of the food taken appears to have been earthworms, supplemented with small lizards, spiders and other invertebrates. At the Mapawa nest in 2016, the main prey items, at least latterly, were skinks and invertebrates. Prey items appear to be varied and probably influenced by local availability more than preference. Specialised prey requirements do not appear to be a limiting factor in the distribution of this species, but more research is needed. Limited food resources at other times of year and/or predation may prove to be more significant.

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