

## Sharpbill *Oxyruncus cristatus frater* nesting ecology in Costa Rica

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Describimos el primer nido de *Oxyruncus cristatus frater*. Incluimos una descripción de los pichones, así como observaciones del comportamiento y asistencia del adulto al nido. El nido es muy similar al descrito para la sub-especie nominal *O. c. cristatus*, de Brasil. La hembra es la única que atiende al nido y el tiempo que dura atendiendo a los pichones tiende a disminuir conforme estos crecen. Los pichones fueron alimentados casi exclusivamente con frutos arilados, los cuáles eran regurgitados por la madre dentro de la boca de los mismos.

The Sharpbill *Oxyruncus cristatus* has a wide but extremely patchy distribution extending from northern Costa Rica south to north-east Argentina. It inhabits mid-elevation humid forests on the east slope of the Andes, in the Guianan Shield, even more locally south of the Amazon in Brazil, and the Atlantic Forest of southern Brazil to north-east Argentina<sup>7</sup>. In Costa Rica *O. c. frater* occurs from the Cordillera de Guanacaste south along the foothills of the Caribbean slope to Veraguas in western Panama, with only a few scattered records from the Pacific slope, where the southern limit is Veraguas, Panama<sup>4,6,8</sup>.

Despite its comparatively wide range, relatively little is known about the species' ecology and behaviour. Stiles & Whitney<sup>9</sup> described singing behaviour and the social system of *O. c. frater* in Costa Rica, but other than this, and two possible copulation events, no data on this subspecies' breeding ecology have been published. The previously published information on nesting by Sharpbill concerns two nests found in Brazil, one in the Serra do Tingua<sup>1</sup>, and another at Itatiaia National Park<sup>5</sup>, both in Rio de Janeiro state, although a nest has also been found in Venezuela<sup>2</sup>. These observations involved the nominate subspecies and *O. c. phelpsi*

or *O. c. hypoglaucus*, depending on taxonomy, respectively. Ortega<sup>4</sup> provided a brief description of the nest we studied; however, he was unable to examine the nest in detail because it was still active. Our objective here is to provide a detailed description of the nest, which we collected once it had been abandoned, and to compare this with the other nests from Brazil<sup>1,5</sup>. We also describe the chicks' diet and plumage, and the behaviour of the adult and chicks, including the abandonment of the nest by the fledglings, based on systematic observations.

### Study area and Methods

The nest was discovered during the rainy season, on 3 June 2008, at Tapantí National Park, Cartago province, on the Caribbean slope of Costa Rica (09°45'N 83°46'W; 1,280 m)<sup>3</sup>. By the time observations commenced the two chicks were small, and had down on their backs. Habitat in the environs consists of Premontane Tropical Rainforest, and the area surrounding the nest comprised old second growth surrounded by primary forest. The nest was visited six times between 13 and 25 June, at 07h00–11h00. During each visit we recorded the time spent by the single adult (presumably the female) attending



Figure 1. Sharpbill *Oxyruncus cristatus* nest collected in Tapantí National Park, Costa Rica (Luis Sandoval)



Figure 2. Fledgling Sharpbill *Oxyruncus cristatus* immediately after leaving the nest for the first time, Tapantí National Park, Costa Rica, 25 June 2008 (Esteban Biamonte)

the nest (feeding, cleaning or brooding) and the time that it was absent, presumably foraging. We recorded parental care, nestling behaviour and their development. We collected regurgitated or fallen fruits and seed samples on the ground below the nest for identification and estimation of diet. Also we collected a sample of the tree species where the nest was built for identification. We measured the height of the nest from the ground, and subsequently we collected it (after abandonment); it was deposited at the Museo de Zoología, Universidad de Costa Rica, San José.

## Results

### Nest description

The nest (Fig. 1) was constructed in the fork of a horizontal branch, in a *Wercklea insignis* (Malvaceae) tree c.8 m above ground, i.e. much lower than the nests in Brazil, which were at c.29 m<sup>1</sup> and c.10 m<sup>5</sup>, respectively. Our measurement of nest height differs from that of Ortega<sup>3</sup> due to methodology, whilst his identification of the tree was incorrect. The three-way fork supporting the nest was on the edge of the tree, and its large leaves shaded the nest. The nest's egg cup measured 65.3 × 65.0 mm, whilst the outside cup was 89.3 × 88.4 mm, with a height of 32.3 mm, making this nest wider and taller than that described by Brooke *et al.*<sup>1</sup>. The nest was a simple cup, constructed of interlaced Mimosaceae leaf petioles, similar to the Brazilian nest<sup>1</sup>. The inner cup was lined with fungus mycelium (*Marasnius crinsiqui*: Marasniaceae), which was not recorded in the previous nest. The outside walls were covered by liverworts *Papillaria deppei* (Meteoriaceae) and mistletoe (Loranthaceae) seeds that sprouted over the liverworts. It was common to see other seeds on the side of the nest, probably having been regurgitated by the chicks. We found no traces of saliva as described by Brooke *et al.*<sup>1</sup> or Sick<sup>5</sup>, and given the small amounts of saliva produced by birds, we doubt that the material used in the Brazilian nests was this substance.

### Nest attendance and exit strategy

The female spent on average (±SD) 10.16 (±5.34) minutes attending the nest ( $n=15$ ) and 35.75 (±16.65) minutes away from it ( $n=11$ ). She spent more time on the nest during the first days of observation than when the nestlings were about to leave. On day 1 the female spent a mean 20 minutes away from the nest, but 12 days later the female was absent on average 50 minutes. Brooke *et al.*<sup>1</sup> observed a similar pattern for nest attendance.

We observed the female exit the nest 11 times. She would jump from the nest and dive towards the ground without flapping the wings until c.1 m

above it, whereupon she started flying low above the ground through the vegetation for an unknown distance (as the bird was soon lost to sight). This behaviour, which was repeated systematically, is more inconspicuous than departing via the forest canopy or subcanopy. Possibly, aerial predators such as hawks or canopy-dwellers like squirrels and monkeys represent important predators of this species during the nesting period, and the exiting behaviour described might be a strategy to reduce the risk of the nest's discovery.

### Feeding behaviour and diet

The female never arrived directly to the nest to feed the two chicks; instead perching on nearby branches, c.10–30 cm away, where she would remain for c.10 seconds to one minute, meticulously checking her surroundings by slowly moving the head, before finally going to the nest. Here, the bird fed the chicks from the nest's rim or on a branch outside the nest, by regurgitating fruits. The chicks remained quiet and largely still during this procedure. We collected five different fruit species fed to the chicks, most of which are arillate: a *Coupania* sp. (Sapindaceae), *Dieffembachia* sp. (Araceae), *Sapium* sp. (Euphorbiaceae), an unknown Fabaceae fruit, and the berries of a *Cavendishia* sp. (Ericaceae). Fruits were the only food item we observed being fed to the chicks.

### Cleaning behaviour

After each feeding, the female always cleaned the chicks and the nest. Each chick would raise the cloaca to defecate and the female picked up the droppings in her bill and swallowed them. This behaviour was consistently observed at every visit. The female also checked the nest interior for droppings, swallowing any that were found. Such behaviour is presumably designed to make the nest less noticeable to predators (e.g. White-nosed Coati *Nasua narica* and Grey Fox *Urocyon cinereoargenteus*), by ensuring that droppings do not accumulate in the vicinity. Also, by removing seeds from the nest, this should reduce bacteria and fungus.

### Description of the chicks

On 13 June the two chicks were covered in white down, although patches of skin were exposed (especially around the face, which was naked) and their eyes were closed. Their bills were shorter than in adults and were overall paler pink with a dark tip, although they still possessed the diagnostic sharp-pointed shape. By 21 June, the chicks' eyes were fully open. The down plumage was dense but already being displaced by contour feathers on the head, chest and back, especially in the case of the oldest chick. The flight feathers were also starting to grow (measuring up to c.5 mm), with dark quills

no larger than 3 mm on the oldest chick's rump. The wing-coverts were well developed and showed the distinctive yellow marks of adult Sharpbills.

On 25 June, the oldest chick was perched outside the nest (Fig 2). Except for its short tail (c.2 cm), short remiges (c.3–5 cm) and a very small amount of down between the wing-coverts, its plumage was fully developed, although the underparts and mantle were paler than in adults. The head was heavily streaked, with dark and clear grey markings, paler than the adult. Around the eyes, due to the relative lack of feathering there was the impression of a pale eye-ring that extended with a droop at the rear. The younger chick had more down feathers, a shorter tail (c.1 cm) and remiges (c.2–5 cm), and was noticeably smaller.

#### **Abandonment of the nest**

On 25 June the chicks left the nest shortly after two Swallow-tailed Kites *Elanoides forficatus* flew low over the nest. During this, we noted that the kites were unaware of the nest but that the chicks tracked the raptors' movements. The kites then commenced to circle around a fruiting tree close to the nest (c.15 m away), and just a couple of minutes later they overflew the nesting tree, with one bird even touching the branches where the nest was placed, which seemed to alarm the chicks into departing. Although we did not observe this, the chicks were subsequently found close to the ground c.6–8 m from the nest, where they remained quiet and partially hidden by the vegetation. However, once the female reappeared they started to make small movements and vocalise using calls similar to the adults' but higher pitched and shorter. The oldest chick was observed to become very active and was soon able to fly up to at least 25 m, but the other chick remained largely inactive and was not observed to fly.

#### **Discussion**

The nest of *O. c. frater* is similar to that of the nominate subspecies<sup>1,5</sup>. As at the nests in Brazil, it seems that only the female Sharpbill participates in the nesting process. The time spent by the female at the nest decreased as the chicks developed. From our observations, the main diet of the chicks is arillate fruits. Based on nest placement, the systematic way in which the female departed the nest and the chicks' response to overhead raptors, we consider that aerial predators are important evolutionary pressures on nesting behaviour. On the other hand, the constant cleaning of the nest by the female presumably serves to reduce nest predation by ground predators, and to minimise bacterial and fungal infections.

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