Observations at a nest of Crested Eagle *Morphnus guianensis* in the southern Gran Sabana, Venezuela

Crested Eagle *Morphnus guianensis* is a low-density, Near Threatened, resident of forested areas of Middle and South America that is known in Venezuela from three specimens and a few other records, most recently from the llanos in 2006[12], from Junglaven, Amazonas, in December 2006 (G. M. Kirwan *in litt*. 2012), and five observations by AC in the region of El Paují, Bolívar, since June 2008[2]. The latter involved both pale- and barred-phase birds. AC has also seen Harpy Eagle *Harpia harpyja* twice nearby[2] (c.1 and 3 km from the Crested Eagle sightings). This and a report by G. M. Kirwan (*in litt*. 2012) of nests of both species seen in the early 2000s within 1 km of each other in the Serra dos Carajás, Pará, Brazil, provide additional evidence of their sympatry[5,11], although Thiollay observed that their territories did not overlap in two study areas in French Guiana[9]. Nesting in Venezuela, in 1981, was reported in Hilty[6], and there are breeding data for Brazil (north of Manaus) in 1984[1], for Guatemala in 1995[10] and Peru in 2002[7].

On 1 April 2011, we heard several long, high-pitched, unfamiliar whistles emanating from forest canopy close to the El Paují–Santa Elena dirt road in the southern Gran Sabana, Bolívar, near a ridge in the río Surucún basin (in the headwaters of the río Caroní). On searching, we discovered a pair of Crested Eagles, close to a very large nest in the main fork, at canopy level, of an emergent tree. Annual rainfall[3] in this region is 2,000–2,250 mm and the Surucún supports largely intact primary forest of c.400 km^2. The nest site is on a gentle slope, c.20 m lower and 220 m from the ridge at 990 m elevation, along which is the road carrying 30–60 vehicles per day. A logging trail passes below the nest tree and has been used recently. To avoid drawing the attention of hunters to the nest and because detailed breeding data are available[1,10], we elected to sporadically monitor the nest from the ground, despite the inherent limitations. We opened a separate path to our main observation location and did not meet anyone during our visits to the nest, thereby fulfilling one of our principal objectives, to avoid jeopardising the breeding attempt.

Figure 1. Female Crested Eagle *Morphnus guianensis*, 30 June 2011; note white crest feathers tipped black, and absence of barbules basally on the main crest feather; tail barring is pale greyish brown above and white below (Anthony Crease)

Figure 2. Female Crested Eagle *Morphnus guianensis* on nest, 30 June 2011 (Anthony Crease)

The nest tree, a *Balizia pedicellaris* (Fabaceae), has compound leaves mostly at its extremities, so that the tree is open with unusually 'clean' branches, providing easy access for a large raptor, and is a well-lit location. The trunk, of 1.05-m diameter near ground level, rises vertically to the primary fork c.23 m above ground, where the nest is located. Here, the tree separates into several large, widely spread, crooked branches, with upper foliage 12–15 m above the nest.

Figure 3. Unfledged young Crested Eagle *Morphnus guianensis*, c.105 days of age, 30 August 2011 (Anthony Crease)

Figure 4. Juvenile Crested Eagle *Morphnus guianensis* in nest tree post-fledging, c.133 days old, 27 September 2007 (Anthony Crease)

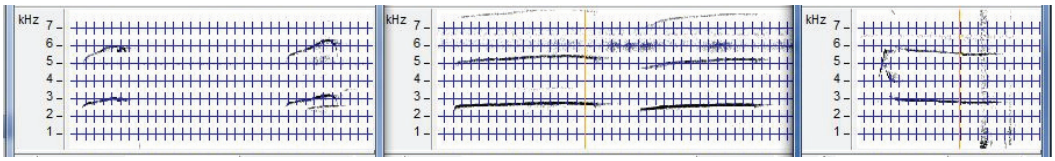
Most trees around the nest have crowns below c.24 m with a more open area and lower growth c.70 m to the north-west, and an old treefall c.40 m to the south. The nest is higher than most adjacent trees, particularly those downslope thereby providing a wide view over the canopy to the north, which direction was normally used by the eagles for take-off. The nest was c.1 m in diameter, 0.8 m deep, and comprised sticks up to c.3 cm in diameter, with lianas growing on the sides, possibly originating from leafy lianas brought by the eagles (Fig. 2). Such 'adorning' of the nest with greenery has been reported previously[1].

We visited the nest on 22 occasions between 1 April and 1 November 2011, for a total of 70 hours, including some day-long visits. We were unable to precisely determine the dates of laying and hatching. However, we did observe the young eagle's first flights and could therefore estimate the hatching date as 17 May, based on 114 days to fledging[10]. By comparing our own observations with 11 developmental milestones provided by Whitacre *et al*.[10], we can confirm 17 May as a fair estimate of hatching date. Laying and commencement of brooding occurred between 1 and 15 April, consistent with the incubation period of 40–50 days assumed by Bierregaard[1].

We first saw the young eagle on 30 June, at c.44 days of age (it was not seen on days 10, 13, 21 and 28). On 30 June the female was away from the nest for 80% of the day, including a period of 30 minutes of light rainfall. In lowland Guatemala[10], the female only left the young alone at 59 days. It is probable that this difference reflects the cooler climate (and considerably higher elevation) of our site, relieving the female of the need to shade the young earlier in its development.

Development of the young and adult behaviour was otherwise similar to those in lowland Guatemala, with two exceptions. Firstly, the young appeared less excitable (e.g., less jumping during wing exercising and less reaction to over-flying vultures and other large birds) and secondly, and more significantly, we observed the female withhold food from the young for many hours, during consecutive full-day visits 81 and 99 days after estimated hatching, which behaviour has not previously been reported in the literature.

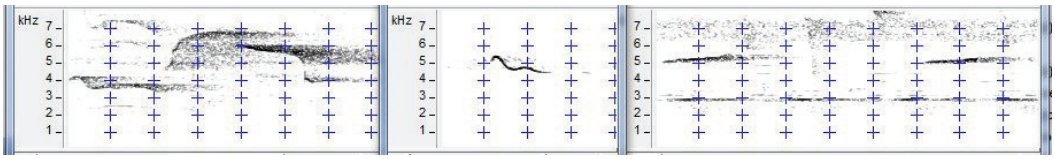
At 81 days, the female left the nest area at 06h12, was seen soaring overhead at 10h30 and returned to the nest at 11h08, remaining in the environs without a break of more than 15 minutes until 14h13. Additionally, during this period, the young made begging whistles almost constantly, again implying the adult's continuous presence. At 13h16 the female was seen with a Woolly Mouse Opossum *Micoureus demerarae*, presumably captured during the period of absence prior to 11h08. However, the prey was



5. Normal whistles of adults; note slightly lower pitched whistle of a second distant eagle at bottom right

6. Long double whistle of female

7. Long single whistle of female with short introductory notes



Begging whistle of eaglet at 28 days

High-pitched, short double-whistle of female, *weeyuh*

8. Begging whistle of eaglet at 81 days

9. Whistles of eaglet after fledging (133 days); ignore lower trace (insect)

Figure 5 'Normal whistles', three from one bird (probably the female), two from the other at slightly lower pitch.
Figure 6. Long doubled whistle from female.
Figure 7. Variant of female's long whistle with introductory 'squeal', which is also commonly given alone.
Figure 8. Begging whistle of young at 81 days.
Figure 9. Whistles of post-fledged young at 133 days.
All recordings made with EDIROL R-09HR and Sennheiser ME-67 microphone by Anthony Crease; software: Wavesurfer.

not delivered to the young until nearly 16h58. During this period the female landed and quickly took off from the nest on seven occasions without depositing the prey, despite the nestling's begging; and also whistled sporadically from nearby, causing the pullus to redouble its begging calls. The eventual delivery just permitted the young to feed before dusk. Similar behaviour was observed 18 days later, when an unidentified large batrachian was withheld for c.4 hours. Whatever the reason for this behaviour, it appears that other factors than maximum weight gain, which would best be achieved by feeding the young rapidly, are functioning.

The female did not incubate the egg or remain with the young continuously, but took short absences when it was warm or the nest was sunlit. However, she was always present early in the morning prior to hatching and when the young was <50 days old, and she therefore presumably spent the night on the nest during this c.100-day period. At 81 days after hatching, the female was not on the nest before sunrise and was only present eight minutes during the entire day, with absences from the nest area of several hours at a time. From this age (and probably earlier) only the female was observed bringing (and withholding) prey. The male was not seen to deliver prey after the young was 50 days old.

The male's participation in the breeding process was primarily to feed the female during the incubation period, and both the female and the nestling in the early stages. He also assisted with nest maintenance by bringing sticks. Once the female could leave the young alone and commence hunting, the male was rarely seen nearby. His visits with food were generally <10 minutes in duration although, exceptionally, during our (30-minute) morning and afternoon visits on 6 May (c.11 days before estimated hatching), the male remained above the nest while the female incubated. When the male delivered food, the female always vacated the nest beforehand, unlike at the nest observed by Bierregaard[1].

On our final visit on 1 November, 53 days after fledging, the young was not present in the nest tree at 05h25 and neither it nor the adults were seen nearby.

Plumage of the barred-phase male closely matches illustrations and descriptions in major references[4,6,8]. The juvenile's plumage also corresponds to previously published information[4,8], except that the entire crest and nape was white (Figs. 3–4).

An extreme dark phase, which is relatively scarce and was described as *M. taeniatus*[5], was illustrated in Ferguson-Lees & Christie[4] and briefly described by Bierregaard[1]. Our female was even darker and further differed in having no white on the wings, back or nape; brownish tones were visible in strong sunlight (Fig. 1); underparts almost black except for diffuse white bars around the thighs; undertail-coverts white, and no barring visible on upper belly or above; three tail bars appeared bright white from below but pale brownish grey above (Fig. 1); single long crest feather white, tipped black (Fig. 1); and entire underwing boldly and coarsely barred black and white.

Crest shape is a function of wind direction, leading to surprising variations (cf. Figs. 1 and 2). In the female, the basal part of the quill of the single longest crest

feather was devoid of barbs for c.30% of its length, perhaps due to wear as it is pushed to and fro between the shorter crest feathers when rotating the head in windy conditions (Fig. 1). Loss of barbs was not observed in the juvenile at 19 weeks, supporting the hypothesis of wear as the cause of loss.

Vocalisations comprise whistles of variable length, separation and pitch pattern, and always show a second, and sometimes also a faint third, harmonic. On 1 April 2011, when both adults were at the nest prior to laying, they uttered similar whistles ('normal whistles'), of 1.0–1.4 seconds duration, their pitch rising slightly to a peak of 2.7–3.0 kHz, then falling slightly, *wiieeeuh* (Fig. 5). In the sonogram, three loud whistles by one bird and two fainter ones by the other at slightly lower pitch and longer spacing are visible. The louder whistles are probably from the female, which appears stronger voiced, based on our cumulative experience. The female also made loud and much longer (2.5–3.6 seconds) whistles of similar pitch and pattern on 6 July 2011 (Fig. 6). Whether this reflected warning or alarm is unclear. The whistles were mostly given doubled with the second somewhat shorter (75%). A variant of the long whistle was also recorded in which the pitch dropped very slightly through 3 kHz and was preceded by a short (0.38-seconds) high-pitched, bisyllabic squeal, *skee'yuh* (Fig. 7), which rises from 4 to 6 kHz, before falling. This squeal was also commonly given alone.

Begging whistles of the young at 81 days are short (0.35 seconds), see Fig. 8, and have a characteristic pattern, which peaks early at 5.5 kHz and then falls, rises and falls to c.4.5 kHz; *tsiu*. They are similar to those recorded at 50 days and appear to be an attempt to reproduce the adult's 'squeal'. These begging whistles were given in bouts of 3–10 with 1–2 seconds between whistles. As previously reported[10], the young appeared only to beg when the adults were in view or audible, and was otherwise silent. At 19 days after fledging, the juvenile gave a different whistle (presumably not begging as the adults were absent), similar in pattern to the 'normal' whistles of adults, but higher and shorter, *twee* (Fig. 9).

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Anthony Crease and Ivan Tepedino
El Pauji, Oficina de Correos Ipostel, Santa Elena de Uairén, Estado Bolívar, Venezuela.
E-mails: trcrease@gmail.com and ivantepui@yahoo.com.

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