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Cooperative breeding in the Violet-tailed Sunbird *Anthreptes aurantium*

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Summary

Cooperative breeding by the Violet-tailed Sunbird *Anthreptes aurantium* is reported for the first time. Two nestlings in the Republic of Congo were fed by four fully grown birds, two of which were in adult plumage. After fledging, the two young continued to be fed by all four fully grown birds, and at least five birds were still together as a group almost three months after the young left the nest. A bird in adult female plumage accounted for 35 % of the nest visits, followed by a bird in adult male plumage (26 %). Two birds moulting to adult male plumage were less regular visitors, but their combined visits accounted for 39 % of the total. Notes on diet and plumage variation are also presented.

Résumé

Coopération dans la reproduction chez le Souimanga à queue violette *Anthreptes aurantium*. Un cas de coopération dans la reproduction chez le Souimanga à queue violette *Anthreptes aurantium* est rapporté pour la première fois. Deux oisillons en République du Congo ont été nourris par quatre oiseaux de taille adulte, dont deux en plumage adulte. Ayant dépassé le stade d'oisillon, les deux jeunes continuèrent d'être alimentés par les quatre oiseaux de taille adulte et au moins cinq oiseaux étaient encore ensemble, formant un groupe, trois mois après l'abandon du nid par les jeunes. Un oiseau en plumage de femelle adulte comptait pour 35 % des visites, suivi par un oiseau en plumage mâle adulte (26 %). Deux oiseaux en phase de mue vers un plumage mâle adulte étaient des visiteurs moins habituels, mais leurs visites à eux deux comptaient pour 39 % du total. Des notes sur leur nourriture et les variations de plumage sont également présentées.

Introduction

The Violet-tailed Sunbird *Anthreptes aurantium* is a poorly known species, occurring in only a few central African countries, and always near water (Cheke & Mann 2001). In Gabon, the species is thought to breed throughout the year, with the possible exception of the major dry season (Brosset & Erard 1986). Among the few observations of nesting behaviour, there are no reports of cooperative breeding, and only females have been observed to feed nestlings (Brosset & Erard 1986, Cheke & Mann 2001). We report here observations by TK from the Republic of Congo of two nestlings being fed by one female and three males, plus several complementary observations concerning breeding habits of the species.

Study site and observations

Most of the observations were made at the confluence of the Lefini and Louna rivers (3°0'S, 15°30'E) in the Lefini Faunal Reserve, 150 km north of Brazzaville in the Republic of Congo. Some complementary observations were made at Iboubikro (3°16'S, 15°28'E), the base-camp of the neighbouring Lesio-Louna Reserve, on the banks of the small Lesio river. Both reserves are part of the Batéké Plateau, an expanse of savanna, gallery forests along watercourses and small dry forest patches, extending from SE Gabon through central Congo and southern Democratic Republic of Congo (DRC) to northern Angola. The resident avifauna consists of elements of the Guinea-Congolian and Zambezian biomes (Dowsett-Lemaire 1997, 2001, King & Chamberlan 2007).

On 30 Dec 2003, at the Lefini-Louna confluence, a nest containing two nestlings was seen being visited by four Violet-tailed Sunbirds. The pear-shaped nest (Fig. 1) was typical for the species in both structure and positioning (Cheke & Mann 2001). It was constructed of leaves, had a side entrance and was hanging in a small tree just over the edge of the Lefini river. Two of the birds feeding the young were in full adult plumage, one of them in typical adult female plumage (referred to below as f) and the other in typical adult male plumage, although with a small patch of orange on the belly between the legs (m1). As with other males in the area, its underside appeared whiter than the illustrations in Borrow & Demey (2001) or Cheke & Mann (2001). The two other birds resembled adult females, but on closer inspection appeared to be in the early stages of moult to adult male plumage. One (m2) had a greyish head with a few bluish feathers, particularly down the sides of the neck, and faint pectoral tufts. The other (m3) was similar to m2 but with brighter orange pectoral tufts, many more purplish feathers on the head and neck and no pale supercilium. Three weeks later, on 20 Jan 2004, the same group was observed, when m2 exhibited brighter pectoral tufts and m3 a purpler head. Two months later, on 25 Mar 2004, what was surely the same group was observed again, when two of the three males were observed, both in full adult plumage.



Figure 1. Violet-tailed Sunbird nest at the Lefini-Louna confluence, Congo Republic, Dec 2003 (photo: T. King).

All four individuals regularly fed the two nestlings on 30 Dec 2003, which turned out to be the last day before fledging. During the day, all visits to the nest by each bird were noted during four one-hour observation sessions, starting at 10h15, 12h20, 14h20 and 16h20. The frequency of visits per hour averaged 14.25 (range 9–19; Table 1). The female visited the nest more than any of the three males, averaging five visits per hour, accounting for 35 % of all visits. The bird in full adult male plumage was the next most frequent visitor, at an average of 3.75 visits per hour, accounting for 26 % of all visits. The two other males were less regular visitors, but their combined visits

accounted for 38.6 % of all visits (Table 1). During three of the four observation sessions, the female removed a white faecal sac from the nest, while none of the males did so.

Table 1. Frequency of visits to nest by each provisioning bird per hour, 30 Dec 2003.

Provisioner	Hour beginning:				Mean visits per h	% of total visits
	10h15	12h20	14h20	16h20		
f	8	4	5	3	5	35.1
m1	3	7	4	1	3.75	26.3
m2	2	6	3	1	3	21.1
m3	1	2	3	4	2.5	17.5
Totals	14	19	15	9	14.25	

During the following morning, the two nestlings left the nest just before 8h00 and perched for a while on the thin branches near the nest. At 8h04 one nestling (j1) flew to the next tree, c. 3 m away, and perched there. The second nestling (j2) flew to the same tree at 8h22, perching on a twig slightly lower down, having landed virtually upside-down. This gave the opportunity for another one-hour observation session, starting at 8h26, this time also noting to which juvenile each visit was made (Table 2). Each provisioning bird visited each juvenile at least once, but j1 received 16 of the 23 visits (70 %).

Table 2. Frequency of visits to each juvenile by each provisioning bird during one hour soon after fledging, 31 Dec 2003.

Provisioner	Recipient:		Total visits	% of total visits
	j1	j2		
f	4	2	6	26
m1	2	2	4	17
m2	5	2	7	30
m3	5	1	6	26
Totals	16	7	23	

During the 80 visits to the juveniles recorded over the two days, the food delivered was identified to some extent on just 19 occasions. On 18 of these occasions, the food appeared to be an arthropod (caterpillar 6, cricket 3, spider 1, unidentified 8), while on the remaining occasion a green berry was brought.

Upon fledging, both juveniles were olive-green above, with yellow supercilium, throat and breast, very short yellow tail with black terminal band, and orange gape.



Figure 2. Juvenile Violet-tailed Sunbird in the early stages of body moult to adult plumage, mist-netted in the Lesio-Louna Reserve, Congo Republic, Jan 2006 (photo: D. Hayman).

Three weeks later, on 20 Jan 2004, they were in typical juvenile plumage as described by Borrow & Demey (2001). On 25 Mar 2004, almost three months after fledging, they showed an iridescent green tinge to the back and tail. This was the last time both juveniles were observed; during the next observation at the site, on 16 Apr 2004, only one was seen, with two males in adult plumage and a female. The female was nest-building.

Subsequent observations at the site in 2004 were of a group of three males in adult plumage in Aug, then a male and female in Nov. In 2005, a male and female were observed in Mar, while in Jun a male, a female and one juvenile roosted together at night close to a nest in the same tree that had the 2003 nest. The male had a small orange belly-patch, similar to that of m1. In Jan 2006, two very vocal juveniles were observed, one of them being fed a small fruit by an adult female, with two males in full adult plumage close by, one of which had brighter pectoral tufts than the other. In Jul 2003, five months prior to the observations of cooperative breeding, an adult male had been observed feeding two juveniles. Although we have no evidence to support this, it is possible that this was m1, and the two juveniles may have been m2 and m3.

At another well-visited site, Iboubikro in the Lesio-Louna Reserve, groups of more than three birds were not observed. Pairs were seen frequently, and on two occasions a pair was observed with a single juvenile (15 Jan and 1 Oct 2004). On the latter occasion, the male was feeding the juvenile with small flying termites that were swarming, while the female was feeding herself with termites. A female and a juvenile were mist-netted together in Jan 2006, with the juvenile in body moult and showing some iridescent green feathers (Fig. 2). In Jul 2006 a female was observed nest-building in a tree c. 20 m from the Lesio river.

Discussion

Cooperative breeding has been reported in a wide range of bird species (Stacey & Koenig 1990) and has been confirmed in 152 oscine passerines (3.3 % of 4583 species: Cockburn 2003). Cooperative breeders have longer post-fledging periods with continuing parental care in comparison with species whose fledglings are only fed by two adults (Langen 2000). The Violet-tailed Sunbird group described here remained together for over two months, also indicating a long post-fledging period. Explanations for the evolution of cooperative breeding include habitat saturation, with birds unable to breed themselves helping others which may be their close relatives, as predicted by kin selection theory. Arnold & Owens (1998) suggested that low mortality rates predisposed certain avian lineages to cooperative breeding and that sedentariness and slow population turnover reduced opportunities for independent breeding. Such ecological constraints were also considered likely to be important in favouring cooperative breeding by Hatchwell & Komdeur (2000).

This is only the fourth case of cooperative breeding to be noted amongst the Nectariniidae. Helpers have been reported feeding young of the Purple-rumped Sunbird *Leptocoma zeylonica* (Ganguly 1986), the Green Sunbird *Anthreptes rectirostris* (Brosset & Énard 1986), the Seychelles Sunbird *Cinnyris dussumieri*, a species known to be polygynous (Lucking 1996), and, now, the Violet-tailed Sunbird. Extra-pair copulations have been seen in the Purple-rumped Sunbird (Ganguly 1986), the Palestine Sunbird *C. osea* (Zilberman *et al.* 1999) and the Malachite Sunbird *Nectarinia famosa* (Cheke & Mann 2001).

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