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Cooperative breeding in captive Emerald Starlings *Coccycolius iris*

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Summary

Cooperative breeding, indicated by helpers at the nest, was observed at two out of three nests of Emerald Starlings *Coccycolius iris* at Chester Zoo. At one nest, three adult birds provisioned the chicks. At a second nest, two one-year-old birds acted as helpers.

Résumé

L'aide au nourrissage, révélée par la présence d'aides auprès du nid, a été constatée pour deux nids sur trois du Choucador iris *Coccycolius iris* au Zoo de Chester. A l'un des nids, trois sujets adultes approvisionnaient les poussins. Au second nid, deux oiseaux d'un an servaient d'assistants.

Introduction

Cooperative breeding occurs when individuals other than the parents help care for youngsters. In birds, this normally involves helpers provisioning the nestlings. Helpers can also take other roles, including nest-building, incubation, sentinel duties and nest defence. Cooperative breeders typically live in the tropics or sub-tropics, are sedentary and long-lived, with low reproductive rates and deferred maturity. Helpers are usually related to the breeding pair and most often are their progeny (Skutch 1987).

Cooperative breeding is known to occur in 200-300 bird species worldwide (Emlen 1984, Brown 1987) and has been recorded in some 60 African species (Grimes 1976, Wilkinson 1994).

Helpers at the nest have been recorded in the wild in a number of African starlings (Sturnidae) including the Cape Glossy Starling *Lamprotornis nitens*, Pied Starling *Spreo bicolor* (Craig 1983), Superb Starling *S. superbus* (Ezra 1924, T.R. Huels *in* Grimes 1976), Chestnut-bellied Starling *S. pulcher* (Wilkinson 1978, 1982, Wilkinson & Brown 1984), Fischer's Starling *S. fischeri* (Miskell 1977) and

Golden-breasted Starling *Cosmopsarus regius* (Someren 1956, Huels 1981). Co-operative breeding is also suspected in the Lesser Blue-eared Glossy Starling *L. swainsonii* where up to four adults were seen close to an active nest (Wilkinson 1994). Long-tailed Glossy Starlings *L. caudatus*, in common with many co-operative breeders, defend group territories (Wilkinson 1988), and Walsh (1987) noted "probably three different individuals made repeated visits to a hole — doubtless feeding young". Captive young Long-tailed Glossy Starlings will help in feeding chicks at their parents' subsequent nests (Wilkinson 1988).

Emerald Starlings are endemic to West Africa, where they inhabit orchard bush, and wooded and open savanna from Guinea to Sierra Leone (Bannerman 1953, Mackworth-Praed & Grant 1973, Hall & Moreau 1970), and a narrow belt in the central guinea savanna of Ivory Coast (Thiollay 1985). Their nest and eggs are undescribed in the wild (Mackworth-Praed & Grant 1973, Walters 1980). Although behaviour in captivity may differ from that in the wild, the following observations may serve to stimulate field studies of these attractive starlings.

Methods

Emerald Starlings were received from several other collections between 1989 and 1991 and released into the large, planted, walk-through Tropical House at Chester Zoo, England. The origin of these birds was unknown but given the rarity of reports of succesful captive breedings (Pyper 1994) they were almost certainly wild-caught. The Tropical House incorporates an area of *c.* 50 x 40 m, and is *c.* 13 m high. It contains water features, tall palms and tropical planting, and is home to a variety of tropical birds from Africa, Asia, Australia and South America. The number of Emerald Starlings ranged from three to five during the period of study. Casual observations were made over the period 1989-1995 with concentrated studies during nesting activity in 1992, 1993 and 1994. Two of the adults were colour-ringed. Immatures bred in 1993 were individually identifiable in 1994 by the distinctive patterning of their transitional adult plumage.

Observations

Nesting activity was signalled in 1990, 1992, 1993 and 1994 by Emerald Starlings carrying nest material. Unusually for starlings, this involved carrying small leaves or pieces of green leaves which appeared to have been cut out from living plants. The birds were seen carrying these pieces into nest boxes located *c.* 10 m high on the inside walls of the Tropical House. Because of the inaccessibility of these nest sites and the shyness of the starlings during the early stages of the nesting cycle no observations relating to nest-building or incubation by individual birds were recorded at Chester.

The bird-keepers reported a first breeding attempt in May 1990 when Emerald Starlings were noted carrying insects to one of the nest boxes. However no chicks fledged and the behaviour of the adults was not monitored.

1992 nest watches

In April 1992 four adult Emerald Starlings were held in the Tropical House, two unbanded (Unb) one carrying an orange ring (O) and another (later identified as a female) a dark green ring (DG). Observations on 2 May, of adults carrying live insects to a wooden nest-box mounted diagonally on an end wall of the Tropical House, indicated that a chick (or chicks) had hatched. Feeding visits were recorded over five 30-min observation periods between 13 and 17 May. Only two birds were then seen to carry food to the nest, DG and a Unb (Table 1). The possibilty of a third bird feeding the chicks could not be eliminated. One of the bird-keepers reported once seeing three individuals waiting by the nest with food in their bills. However, during the observation periods the two pairs (the nesting DG and Unb, and O with a second Unb) most frequently remained apart and approaches near the nest by the second pair resulted in aggressive chasing by the nesting pair. Three chicks were hatched on this nesting attempt but on 15 May one was found dead on the ground below the nest-site. Concern that the chicks may have not been receiving sufficient live food, because of competition from other birds in the Tropical House, led to the remaining two nestlings, which were then well-feathered but not ready to fledge, being removed from the nest by the keeper and caged in a small aviary together with DG. The keeper reported that the nest-box was found full of dry leaves with no obvious nest structure.

Neither chick survived and post-mortem reports indicated their death was associated with a nematode infestation. DG was released back into the main area of the Tropical House. One of the two Unb disappeared, being last seen on 2 June, either having escaped or died without it's body being discovered.

Table 1. Emerald Starlings 1992. Number of feeding visits in 30-min nest watches.

Date	Time*	Unb**	DG♀	O	Total
13 May	12.06	1	1	0	2
13 May	12.36	3	4	0	7
16 May	11.30	0	0	0	0
16 May	12.00	6	1	0	7
17 May	8.30	2	2	0	4
TOTAL		12	8	0	20

*Time nest watch commenced. **1 or 2 birds?

Table 2. Emerald Starlings 1993. Number of feeding visits in 20-min nest watches.

Date	Time*	Unb♂	DG♀	O	Total
9 June	9.07	4	2	9	15
10 June	10.13	3	3	2	8
14 June	9.53	0	2	5	7
15 June	8.42	2	2	3	7
16 June	9.30	4	2	1	7
16 June	16.50	4	2	2	8
19 June	8.30	3	3	4	10
19 June	8.50	2	0	2	4
20 June	8.37	3	1	3	7
21 June	8.21	10	2	2	14
TOTAL		30	19	33	87

*Time nest watch commenced.

1993 nest watches

The 1993 breeding attempt began with only three birds in the Tropical House: O, DG female and Unb.

Chicks hatched by 2 June, as indicated by the keepers' first observations of starlings entering the nest with live food. Feeding visits were monitored over ten 20-min periods between 9 and 21 June. All three birds fed the chicks in the nest (Table 2). The greatest number of feeding visits were by O (33 feeds) and Unb (35 feeds) with 19 by DG. This suggests, but does not prove, that O and Unb were the parents. The reduction in feeding rates to the nest by O on and after 16 June (Table 2) was directly related to an eye-injury received by this bird as a result of aggression from a Giant Cowbird *Scaphidura oryzivora*. The chicks fledged when I was away from the zoo during the week following 22 June with a chick being seen with an adult away from the nest on 29 June. All three adults continued to provision the two fledglings until at least 9 July. Observations were then hindered by the fledglings occupying dense vegetation. Both fledglings survived and retained their dull immature plumage through the winter. Even at twelve months old, the youngsters retained patches of their dull immature plumage but this was gradually lost over the following few months.

1994 nest watches

The 1994 breeding attempt began with five birds—the adults DG, O and Unb and the two immatures hatched in 1993. The immatures were individually identifiable

Table 3. Emerald Starlings 1994. Number of feeding visits in 30-min nest watches.

Date	Time*	Unb♂	DG♀	O	Imm A	Imm B	Total
27 May	9.30	1	4	0	0	0	5
27 May	10.00	3	2	0	3	0	8
30 May	8.45	1	3	0	2	0	6
30 May	9.15	3	3**	0	2	1	9
31 May	8.22	1	-	0	1	0	2
31 May	8.52	1	-	0	1	0	2
4 June	8.50	4	-	0	7	0	11
4 June	9.20	1	-	0	3	0	4
5 June	8.45	1	-	0	4	0	5
5 June	9.15	1	-	0	1	0	2
6 June	8.30	4	-	0	4	3	11
6 June	9.00	7	-	0	1	1	9
TOTAL		28	12	0	29	5	74

*Time nest watch commenced. **DG was found dead on afternoon of 30 May.

as one had patches of glossy adult plumage on its underparts (A) whilst the other retained the dull plain underparts of its immature plumage (B).

Chicks hatched by 23 May, when the keepers first reported birds carrying food to the nest, and feeding visits were monitored over twelve 30-min periods between 27 May and 6 June (Table 3). Feeding visits were recorded for DG, Unb and both immatures but not from O. Until its death on 30 May DG was the most frequent feeder, suggesting it was one of the parents. On post-mortem, DG was found to have died of renal, hepatic and pulmonary congestion, and to be a female. She was presumed to have been mated with Unb male, as the only other adult provisioner. The immatures, which were then one year old, were believed, on the basis of the relative frequencies of provisioning at the 1993 nest (Table 2), to be offspring of this Unb male and O. This interpretation would suggest that O were a female. Although the immatures were siblings there was a pronounced difference in their provisioning rates, with A being the most active helper.

Discussion

Carrying of green leaves as nest material by Emerald Starlings was previously reported by Ellis (1980) who observed unsuccesful nesting attempts at London

Zoo. The inaccessibility of the nest sites at Chester Zoo and the shyness of the starlings during the incubation period resulted in incomplete observations of this stage of their nesting cycle. Bruch (1983), reporting his observations of the captive breeding of Emerald Starlings in Germany, also commented on their shyness. Although not having observed any evidence of incubation, following hearing calls from the nest-box he inspected it to discover one live chick, a dead chick and a pale blue egg, indicating a clutch of three. The base of the nest box was covered by a layer of pine needles. Bruch kept three adults together at this time. All three were observed carrying live food and were presumed to have fed the chick. However, 14 days after the chick was first discovered, one of the adults was fatally injured, evidently having been attacked by the breeding pair.

Robiller & Geistner (1985) reported a further successful captive breeding at Vogelpark Walsrode, Germany, where a pair of Emerald Starlings nested in a hollow log, the floor of which was lined with green leaves and pine needles. Three newly hatched chicks and a light blue unhatched egg were observed 13 days after a previous inspection of the nest had revealed three eggs. The fourth chick hatched two days later but this and one of the older nestlings failed to survive. The remaining two chicks were well feathered at 15 days old and fledged after 21 days.

Pyper (1994) described two breeding attempts by a captive pair of Emerald Starlings and noted that, although timid and shy at the nest, both the male and female of his pair carried grass, fibre, and green shoots into the nest-box he provided. A clutch of three eggs laid by Pyper's birds, in 1992, were described as light blue with red/brown blotching; and a second clutch, laid in 1993, also contained three eggs. Pyper (1994) estimated the incubation period to be 13-15 days and his report indicates a nestling period of around 21 days. Adult plumage was attained at 12-14 months, as for the birds bred at Chester.

Nest defence against conspecifics was noted at Chester in 1992. Pyper (1994) reported aggression between Emerald Starlings around breeding time, leading to the death of one of his birds. The observation of consistent and frequent helping at the nest by an adult, apparently unrelated to the breeding pair, at Chester in 1993 poses an interesting question which cannot be answered with the incomplete knowledge of parentage at these nests. Helping by the two immatures in 1994 follows the pattern typical of many cooperative breeders in that these birds were probably offspring of the male parent if not also of the female at this nest.

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Lesser Blue-eared Glossy Starling – Merle metallique de Swainson – *Lamprotornis chloropterus*
Photo: M.E.J. Gore