

Nest, eggs and effort partitioning in incubation and rearing by a pair of the Black-cheeked gnateater, *Conopophaga melanops* (Passeriformes, Conopophagidae), in an Atlantic Rainforest area of Rio de Janeiro, Brazil

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RESUMO. Ninho, ovos e partilha de esforço na incubação e na criação de ninhegos por um par de *Conopophaga melanops* (Passeriformes: Conopophagidae) em área de Floresta Atlântica do Rio de Janeiro, RJ, Brasil. O presente estudo descreve um ninho e os ovos de *C. melanops*, encontrado em área de Floresta Atlântica em regeneração, e fornece dados quantitativos sobre o comportamento de incubação e de alimentação de ninhegos por um par reprodutor, durante o período diurno. O ninho foi encontrado no sub-bosque da mata sobre uma bromélia. O macho e a fêmea alternaram a incubação durante o dia e o macho despendeu significativamente mais tempo no ninho do que a fêmea. Os filhotes permaneceram no ninho por 18 dias. Os itens alimentares fornecidos aos ninhegos foram artrópodes. O número de visitas aos ninhegos não diferiu entre os sexos, durante o dia, em nenhuma das fases observadas. Embora não tenha havido diferença significativa entre o tempo que o macho e a fêmea despenderam com os ninhegos, o macho gastou duas vezes mais tempo no ninho durante o dia do que a fêmea. Tanto na fase de incubação como na fase de criação dos ninhegos, apenas a fêmea foi registrada dormindo no ninho, à noite.

PALAVRAS-CHAVE: *Conopophaga melanops*, ninho, ovos, incubação, ninhegos, cuidado parental, Mata Atlântica.

ABSTRACT. The present study describes a nest and the eggs of *C. melanops*, found in an area of regenerating Atlantic Forest, providing a quantification of incubation and feeding rates of nestlings during the day by a reproductive pair. The nest was found in the understory of the forest on a bromeliad. Male and female alternated the incubation during the day, when the male spent significantly more time incubating than the female. However, only the female was recorded sleeping in the nest at night. The nestlings of *C. melanops* spent 18 days in the nest. The food items provided to the nestlings were arthropods. The number of visits did not differ significantly between sexes for incubation or rearing stages. During the day, there was no significant difference between the male and the female in the time spent in the nest while rearing. However, the male spent two times more in the nest than the female in this stage, and only the female was recorded sleeping in the nest at night.

KEY WORDS: *Conopophaga melanops*, nest, eggs, incubation, nestlings, Atlantic Forest.

The gnateater species are little-known birds of the understory of tropical and subtropical South American forests (Meyer de Schauensee 1970). The Black-cheeked gnateater (*Conopophaga melanops*) is an endemic species of Brazilian Atlantic Forest (Stotz *et al.* 1996, Sick 1997) and occurs in eastern Brazil, from Paraíba to Santa Catarina (Sick 1997, Straube 1989), and in mountainous regions of Espírito Santo and Rio de Janeiro states. *Conopophaga melanops* is sometimes syntopic with *C. lineata* (Sick 1997).

Conopophaga melanops and the other species of the genus were originally included in Formicariidae (Ames *et al.* 1968) and later they were settled in Conopophagidae, although their morphology and behavior resemble Rhinocryptidae (Sick 1997). Foraging tactics of *C. melanops* were described and quantified by Alves and Duarte (1996) in an area of Atlantic Forest of Ilha Grande, RJ. These authors found that *C. melanops* fed solitarily or in pairs, capturing insects from the leaf litter or at low heights above ground, the main foraging tactic being

ground feeding. Willis *et al.* (1983) described the behavior of Rufous gnateater, *Conopophaga lineata*, in detail including incubation and nestling feeding rates by males and females. Although some aspects of breeding behavior (eggs and nest description, time of eclosion and leaving of nest by nestlings) of *C. melanops* are recorded in the literature (Straube 1989), no quantitative data on breeding behavior has been reported.

Herein, we describe a nest and the eggs of *C. melanops* found in an area of regenerating Atlantic Forest, Rio de Janeiro state, providing a quantification of incubation and feeding rates of nestlings by the reproductive pair. We also tested if division of labor differ between male and female.

STUDY AREA AND METHODS

The study was carried out at Ilha Grande, Rio de Janeiro State, Brazil, in a disturbed area of Atlantic Forest. Ilha Grande is an island located in the south coast of the

State, approximately 150 km from the city of Rio de Janeiro, in the municipality of Angra dos Reis (figure 1). The island has an area of approximately 19,000 ha, covered by Atlantic Rain Forest in different successional stages. The climate is hot and humid, rainfall is seasonal with approximately 1500 mm of rain along the year (Oliveira and Netto 1996).

The nest, containing two eggs, was found on October 26th 2000 by one of us (CFDR). Observations were made using binoculars (7 x 35) from approximately 10 m from the nest, in two nest stages: incubation and rearing. The periods of observation on rearing stage corresponded to its initial and final stages, because nestlings of *C. melanops* remain in the nest for approximately 18 days (Sick 1997).

Total observation time (40 h) was divided in 24 h for incubation and 16 h for rearing. For the incubation period we observed the nest for six hours; at two hours intervals, in four consecutive days, including both morning and afternoon periods. In the first day, the observations started at 06:00 h and on the following, at 08:00 h (repeating this sequence for the next two days). For the rearing stage, observations were carried out from 10:00-12:00 h and from 14:00-16:00 h (when chicks were four and five days old – initial stage – and 10 – 11 days – final stage). Because *C. melanops* is sexually dimorphic (Sick 1997), the time spent by each sex in breeding care with eggs and nestlings could be easily quantified, and division of labor could be determined for each sex.

The methodology used was the “focal animal” sampling (Altmann 1974) to observe nest behavior. During incubation, the time spent in the nest and the number of visits by each member of the breeding pair were recorded. During rearing, the time spent in the nest, the number of visits, and the food item brought to the nest by the male and the female were also recorded.

To compare the feeding rates and the time spent in the nest by both members of the breeding pair, the number of visits and time spent in the nest per two hours (the interval of observation time) were used. Differences in such rates were tested using Kruskal-Wallis test, since data were not normally distributed (Zar 1999).

RESULTS AND DISCUSSION

Nest. The nest was found in the understory of a secondary Atlantic Forest on a bromeliad, *Neoregelia johannis* (23°11'013" S and 44°11'767" W) at sea level, attached laterally to a boulder. The nest was covered on the top side by a bromeliad leaf. No direct sunlight was observed reaching the nest.

The open cup nest (figure 2a) was located 87 cm above the ground. The nest was constructed primarily from debris and dry leaves. The lining was of thin strands of unidentified plant matter. The construction was solid but had loose borders. Looking the nest from some distance it

looked like a pile of debris and dry leaves (figure 2b). The messy appearance of the nest likely helped camouflage it from predators, as Willis *et al.* (1983) suggested for the congeneric *C. lineata*.

Measurements of the nest were: outer diameter (excluding loose borders), 10.0-12.0 cm; inner diameter, 7.5-9.5 cm; internal depth, 4.3 cm, outside depth (excluding projections), 6.5 cm. The nest weighed 12.5 g (in the field). Aspects of the nest dimension and construction found for *C. melanops* at Ilha Grande are quite similar to those found by Straube (1989) for a nest of the same species found 57 cm above the ground in the Atlantic Rainforest of Paraná State in Southern Brazil (nest dimensions: outer diameter, 10 cm; inner diameter, 5.7, internal depth, 4.2 cm).

Eggs. The two eggs were salmon color with darker spots around the large end, the “pink” type (*sensu* Oniki 1979). Eggs are apparently similar to those of *C. melanops* (Straube 1989) and *C. lineata* (Willis *et al.* 1983). The eggs were 23.0 x 16.8 and 23.1 x 16.9 mm large and weighted 3.4 and 3.6 g, respectively. The dimensions found by Straube (1989) for two eggs (22.5 x 17.5 and 22.7 x 17.0 mm) were also similar to these ones.

Incubation. The male and female alternated incubation during the day. The incubation behavior of *C. melanops* in the present study was very similar to this behavior reported for the same species by Straube (1989) and for *C. lineata* described by Willis *et al.* (1983). At Ilha Grande, several times the male and female spent more than 120 min in which they only occasionally moved their heads. The eggs were rarely left uncovered. Changeovers in *C. melanops* were usually silent for the female, but the male occasionally vocalized before sitting on the eggs. In *C. lineata* changeovers are silent for both sexes (Willis *et al.* 1983). In *C. melanops* of Ilha Grande, the bird approaching the nest usually used some close perches before entering into the nest and sitting on the eggs, whereas in *C. lineata* the approaching bird settled rapidly, without pauses (Willis *et al.* 1983).

During the day the male spent significantly more time incubating the eggs (43 min/h) than did the female (14 min/h) (Mann-Whitney, $U = 114$, $p = 0.014$, $N = 12$). The average number of visits/h was 0.46 for both sexes and did not differ significantly between male and female ($U = 78$, $p = 0.701$, $N = 12$). Based on 22 h and 50 min of observation during incubation period, the male attended 75.8% of the day time hours, while the female attended 24.2% of the time.

Once it was observed a rapid change of the male leaving the nest and the female coming to the nest rapidly around 19:00h. The birds movements were usually fast and silent. Besides that, the female was also recorded once leaving the nest early in the morning (at the beginning of the observation period, at 06:00 h). Since the only sex registered sleeping on the nest at night was the female

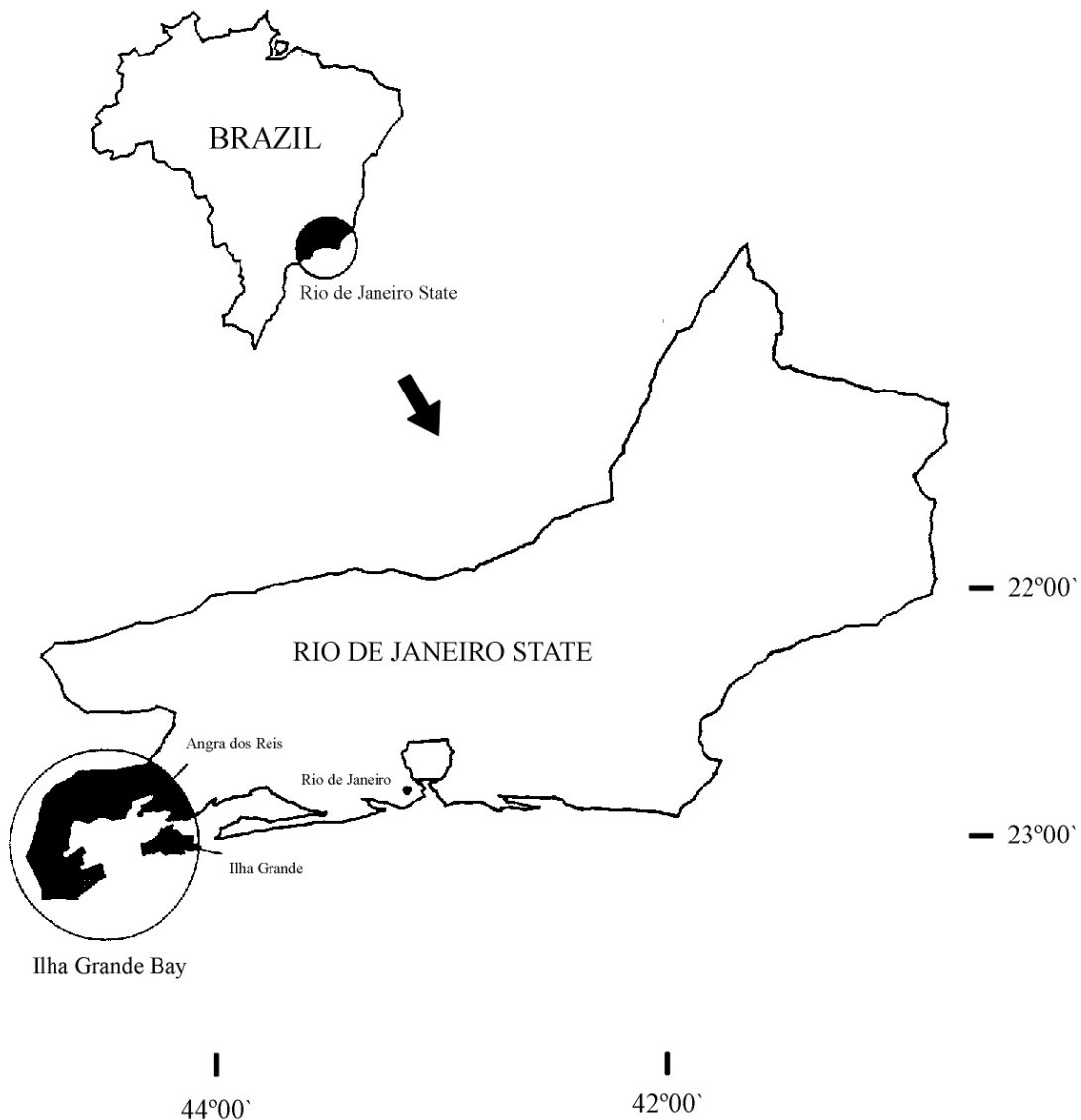


Figure 1. Geographic location of Ilha Grande, RJ, Southeast of Brazil (modified from Alves *et al.* 2000).

(twice after 20:00h and once before 05:00h), she most likely incubated at night. The female was recorded before 05:00h (still dark) sleeping with loose feathers and head hidden under one of her wings.

Sometimes there were intervals between departures of one individual and arrival of the other. The nest was unattended only for 4.8% of the total observation time during the day. The chicks were born on 7th November. The time spent in the nest since it was first found (26th October, when they looked likely recently laid) until the chicks were born was 12 days. Therefore, the incubation period was at least 12 days.

Rearing chicks. Distraction displays were recorded for the male while rearing nestlings and also during incubation. Sometimes the male stayed on the nest when someone was closer than 1m. When the male was flushed from the nest by the approaching observer, it hopped away on the ground fluttering its wings in a distraction display 1-2m away from

the nest. Once on the ground the male began walking away from the nest slowly with one of the wings spread, feigning injury. This kind of behavior was also recorded for *C. melanops* (Straube 1989) and for *C. lineata* (Willis 1972, Sick 1964), and is common in Formicariidae species (Sick 1997), being described in detail for the Spotted Antbird, *Hylophylax naevioides* by Willis (1972).

The feeding visits to nestlings were not significantly different between male and female ($U = 32$, $p = 1.00$, $N = 8$). The average number of visits/h was 1 and 1.5, respectively. During the day there was no difference between the male and the female in the time spent in the nest (Mann-Whitney, $U = 45$, $p = 0.171$, $N = 8$) (figura 3). However, if we remove the first two hours of observations (when the female spent the whole time in the nest), the male spent significantly more time in the nest than the female ($U = 44$, $p = 0.013$, $N = 7$). Actually, the male spent, on average, twice the time spent by the female in

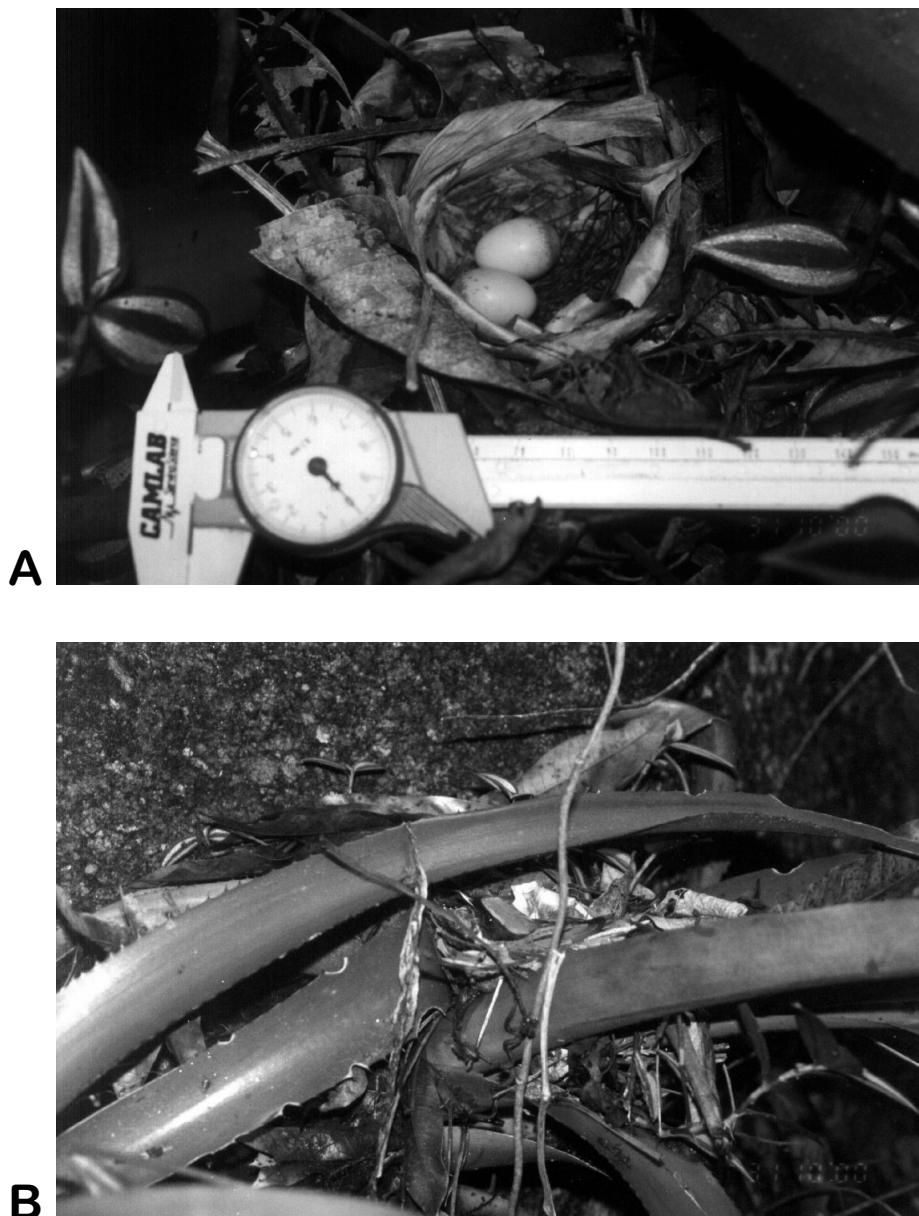


Figure 2. a) Nest and eggs of *Conopophaga melanops*; b) General view of the nest with the male incubating, at an area of Atlantic Forest, Rio de Janeiro State, Brazil.

the nest during the day (15 min/h and 7.9 min/h of the observation time, respectively). The male spent 65.6% and the female 34.4% of a total of 6 h and 10 min while the nest was attended. The nest was unattended for 23% of the total observation time. The male spending more time than the female can be compensated for by if the female stays in the nest at night. The nestlings of *C. melanops* spent 18 days in the nest in the present study, the same time reported for this species by Sick (1997). Willis *et al.* (1983) registered 14 days for a young of the congeneric *C. lineata* leaving the nest.

The food items which could be easily and with confidence identified using binoculars were caterpillars, grasshoppers, and other Orthoptera (such as walking sticks, Phasmidae, and long-horned grasshoppers, Tettigonidae).

Feeding habits of *C. melanops* chicks at Ilha Grande seemed to be quite similar to the congeneric *C. lineata* at a fragment of Atlantic Rainforest of São Paulo State (Willis *et al.* 1983).

The nest construction, the incubation and rearing behavior, and also the prey items brought to nestlings were in general quite similar for *C. melanops* in different areas and for the congeneric *C. lineata*. Similarities between the two *Conopophaga* species suggest that reproductive behaviors may be evolutionarily constrained.

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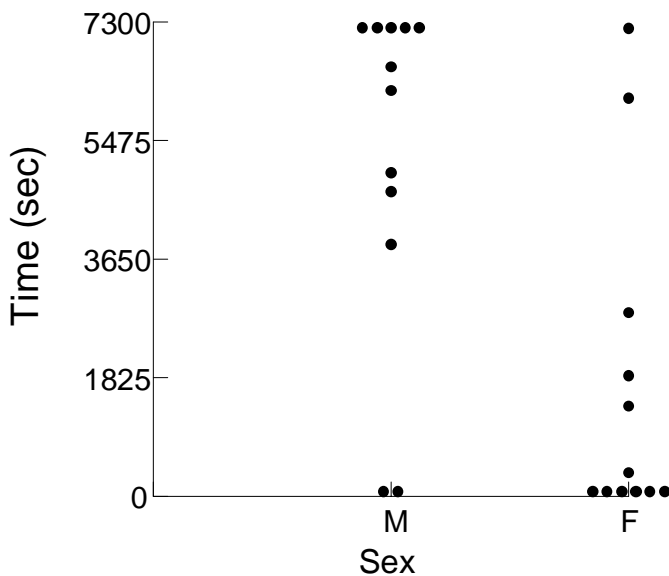


Figure 3. Time (in seconds) spent in the nest by male (M) and female (F) of a breeding pair of *Conopophaga melanops* at an area of Atlantic Forest, Rio de Janeiro State, Brazil. Each point refers to a two hours observation period.

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