



Climbing for Survival? A New Altitudinal Limit from Black-cheeked Gnateater (*Conopophaga melanops*) in Atlantic Forest

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ABSTRACT – The Brazilian Atlantic Forest, despite being one of the most threatened biomes in the world, remains one of the great hotspots of global biodiversity and bird endemism. Elevation plays a significant role in influencing the high number of endemic bird species in this region. The Black-cheeked Gnateater (*Conopophaga melanops*), endemic to the Atlantic Forest, is typically found in lowland forests along the east coast of Brazil, ranging from sea level to 800 meters above sea level. Due to its high sensitivity to ecological disturbances, it serves as an excellent bioindicator of environmental quality. During a field sampling expedition in Parque Nacional da Serra dos Órgãos, we captured two individuals of *C. melanops* at altitudes of 1287 and 1409 meters. To explain this new altitude record, we propose two hypotheses. First, the lack of previous sampling in the highest regions of the Atlantic Forest, likely due to limited access and scarce historical studies, may have resulted in the underreporting of this species at higher elevations. Second, there is the possibility that bird populations are migrating to more pristine areas at higher elevations due to habitat loss in the lowland regions. The second hypothesis raises important implications for the conservation of the Black-cheeked Gnateater. Since this species relies on intact habitats for its survival, we must consider whether deforestation in its historic range could be driving these new altitude records.

Keywords: Occurrence expansion; mountain biodiversity; deforestation; global warming; conservation.

Escalar para Sobreviver? Um Novo Limite Altitudinal do Cuspidor-de-máscara-preta (*Conopophaga melanops*) na Mata Atlântica

RESUMO – A Mata Atlântica brasileira, apesar de ser um dos biomas mais ameaçados do mundo, continua sendo um dos grandes pontos quentes da biodiversidade global e do endemismo de aves. O relevo desempenha um papel significativo na influência do grande número de espécies de aves endêmicas nesta região. O Cuspidor-de-máscara-preta (*Conopophaga melanops*), endêmico da Mata Atlântica, é tipicamente encontrado em florestas de baixada ao longo da costa leste do Brasil, variando do nível do mar a 800 metros de altitude. Devido à sua alta sensibilidade à distúrbios ecológicos, ele serve como um excelente bioindicador da qualidade ambiental. Durante uma expedição de amostragem de campo no Parque Nacional da Serra dos Órgãos, capturamos dois indivíduos de *C. melanops* a altitudes de 1287 e 1409 metros. Para explicar esse novo registro de altitude, propomos



duas hipóteses: Primeiramente, a falta de amostragem prévia nas regiões mais altas da Mata Atlântica, provavelmente devido ao acesso limitado e estudos históricos escassos, pode ter resultado na subnotificação dessa espécie em altitudes mais elevadas. Em segundo lugar, existe a possibilidade de que as populações de aves estejam migrando para áreas mais preservadas em altitudes mais elevadas devido à perda de habitat nas regiões de baixada. A segunda hipótese levanta implicações importantes para a conservação do Cuspidor-de-máscara-preta, uma vez que essa espécie depende de *habitats* intactos para sua sobrevivência, devemos considerar se o desmatamento em sua área histórica de ocorrência pode estar impulsionando esses novos registros.

Palavras-chave: PARNASO; biodiversidade de montanha; desmatamento; aquecimento global; conservação.

¿Escalar para Sobrevivir? Un Nuevo Límite Altitudinal del Cuspidor-de-mejillas-negras (*Conopophaga melanops*) en el Mata Atlántica

RESUMEN – A pesar de ser uno de los biomas más amenazados del mundo, la Mata Atlántica brasileña sigue siendo uno de los grandes puntos calientes de la biodiversidad global y del endemismo de aves. La altitud juega un papel significativo en la influencia del alto número de especies de aves endémicas en esta región. El Chupadientes Enmascarado (*Conopophaga melanops*), endémico de la Mata Atlántica, se encuentra típicamente en bosques de tierras bajas a lo largo de la costa este de Brasil, desde el nivel del mar hasta 800 metros sobre el nivel del mar. Debido a su alta sensibilidad a las perturbaciones ecológicas, sirve como un excelente bioindicador de la calidad ambiental. Durante una expedición de muestreo en el Parque Nacional da Serra dos Órgãos, capturamos dos individuos de *C. melanops* a altitudes de 1287 y 1409 metros. Para explicar este nuevo registro de altitud, proponemos dos hipótesis: En primer lugar, la falta de muestreo previo en las regiones más altas de la Mata Atlántica, probablemente debido al acceso limitado y a escasos estudios históricos, podría haber resultado en la subnotificación de esta especie en altitudes más elevadas. En segundo lugar, existe la posibilidad de que las poblaciones de aves estén migrando a áreas más prístinas a altitudes más elevadas debido a la pérdida de hábitat en las regiones de tierras bajas. La segunda hipótesis plantea importantes implicaciones para la conservación del Chupadientes Enmascarado. Dado que esta especie depende de hábitats intactos para su supervivencia, debemos considerar si la deforestación en su área histórica podría estar impulsando estos nuevos registros de altitud.

Palabras clave: PARNASO; biodiversidad de montaña; deforestación; calentamiento global; conservación.

Introduction

The Brazilian Atlantic Forest, despite being one of the most threatened biomes in the world (Myers et al., 2000), remains one of the great centres of avian richness and endemism (Jenkins et al., 2015), housing 223 endemic species out of a total of 891 (Piacentini et al., 2015). Elevation plays a crucial role in influencing the abundance of endemic bird species (Vasconcelos e Rodrigues, 2010; Chaves et al., 2015). The Black-cheeked Gnatcatcher (*Conopophaga melanops*), the sole representative of the *Conopophaga* genus endemic to the Brazilian Atlantic Forest, is a passerine bird belonging to the Conopophagidae family. Existing literature suggests that the Black-cheeked Gnatcatcher

primarily inhabits lowland forests along the east coast of Brazil but can occasionally be found on mountain slopes, with recorded altitudes ranging from sea level to 800 meters (Parker III et al., 1996; Sick, 1997; Mallet-Rodrigues, 2010). One possible explanation for the altitudinal distribution limit of *C. melanops* could be competition for the same ecological niche with its congener, *Conopophaga lineata* (Wied, 1831), which takes over at altitudes exceeding 800 meters in the mountainous regions of eastern Brazil (Sick, 1997).

Living within dense forests, the Black-cheeked Gnatcatcher utilizes the lower stratum for foraging on the ground or at low heights (Alves e Duarte, 1996). This behaviour makes it challenging



to observe. Due to its behavioural characteristics, the Black-cheeked Gnatcatcher is classified as a sedentary bird species that depends on the forest interior (Sick, 1997). Its high sensitivity to ecological disturbances makes it an excellent bioindicator of environmental quality, as it is only found in mature forests and significant expanses of Atlantic Forest fragments (Machado e Fonseca, 2000; Piratelli 2008; Manhães e Loures-Ribeiro, 2011; Melo et al., 2018). Historically, fragmentation and habitat loss have posed threats to bird species in the Atlantic Forest (Brooks e Balmford, 1996; Pizo e Tonetti, 2020), and anthropogenic changes, such as global warming, have driven organisms to exhibit movements never observed by science (Chen et al., 2011; Tingley et al., 2012), putting their conservation at risk.

Here, we report a new record on the altitudinal distribution of *C. melanops* in Serra dos Órgãos National Park.

Material and Methods

The Parque Nacional da Serra dos Órgãos (PARNASO) in Teresópolis, Rio de Janeiro, Brazil, is located within the Atlantic Forest biome. This protected area spans 20,024 hectares and encompasses a diverse range of environments, from lowland forests along the coastal region (below 400 meters) to montane forests (up to 1,500 meters) and ‘Campos de altitude’ (above 1,800 meters) (Veloso et al., 1991).

The region’s complex geography includes exposed rock peaks covered by grassland vegetation and valleys with dense forests (Fig. 1-G). Ombrophilous forests with large trees, tangles of vines, and epiphytes thrive on the slopes of these peaks (Fig. 1-C/D/E). For an epidemiological

study of avian malaria involving the local bird community, ornithological nets were extended between 1,200 and 1,500 meters above sea level (22° 26’ 46.216” S 43° 0’ 31.880” W) (Fig. 1-F). These ornithological nets, measuring 12 meters in length by 3 meters in height with a mesh size of 16 mm, were set up individually and in linear configurations of three nets, creating 200-meter-long transects. They were deployed from before sunrise until midday and checked every 15 minutes. Following capture, the birds were identified using the field guide by Sigrist (2014).

All procedures were conducted in accordance with the guidelines of the Biodiversity Information and Authorization System (Sisbio) of the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio), under authorization n. 68906-1/2019, and were approved by the Ethics Committee for Animal Use at the Universidade Federal de Juiz de Fora, under protocol n. 031/2017.

Results

During a field sampling in November 2020 at PARNASO, two adult males of *C. melanops* were captured (Fig. 1-A/B) at altitudes of 1287 and 1409 meters. They were sampled for blood parasites and then released into the wild. Until now, it had been widely believed that the altitudinal distribution limit of this species in the Atlantic Forest was around 800 meters (Straube, 1989; Alves and Duarte, 1996; Sick, 1997; Machado and Fonseca, 2000; Alves, 2002; Lopes et al., 2005; Lunardi et al., 2007; Piratelli, 2008; Souza, 2008; Lima and Ropper, 2009; Mallet-Rodrigues, 2010; Manhães and Loures-Ribeiro, 2011; Lima, 2013; Melo et al., 2018). However, the records presented in this study invite us to reconsider the altitudinal limit of the species occurrence.

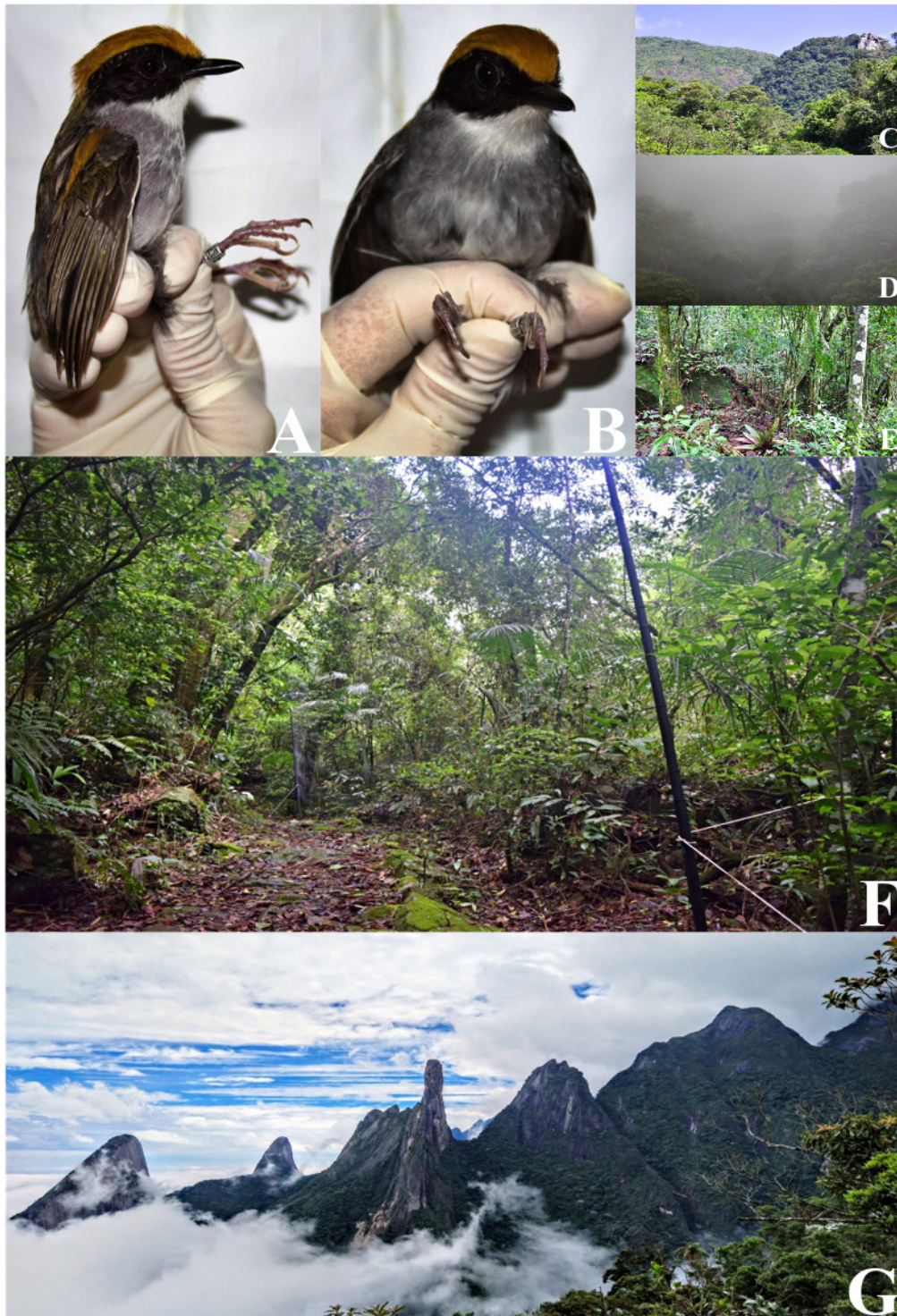


Figure 1 – A/B – Specimens of *Conopophaga melanops*; C/D/E – Environments of Serra dos Órgãos National Park (PARNASO); F – Ornithological net during the fieldwork at the specimen sampling site; G – “Dedo de Deus” Peak with dense montane forest on the slopes of the peaks.

Discussion

Historically, our understanding of a species distribution has relied on compiled reports from studies conducted over time. However, a

significant challenge arises in regions that have been poorly sampled, such as the high altitudes of the Atlantic Forest mountains. These remote and often difficult-to-access areas have seen sporadic

ornithological studies, even spanning more than a century (Vasconcelos e Pacheco, 2012; Chaves et al., 2015). Consequently, we believe that the lack of extensive sampling in these regions may have contributed to masking the true altitudinal distribution limit of the Black-cheeked Gnatcatcher over the years.

In the region where PARNASO is located, the Black-cheeked Gnatcatcher has historically been observed below 800 meters in altitude (Cory e Hellmayr, 1924; Naumburg, 1937; Pinto e Camargo, 1961; Scott e Brooke, 1985; Mallet-Rodrigues e Noronha, 2003a; Mallet-Rodrigues e Noronha, 2003b; Mallet-Rodrigues, 2005). According to Mallet-Rodrigues (2007), it has been considered a 'reasonably common' species, appearing in more than 50% of bird lists. However, the Black-cheeked Gnatcatcher is highly sensitive to environmental disturbances and relies on primary forests (Machado e Fonseca, 2000; Piratelli, 2008; Manhães e Loures-Ribeiro, 2011; Melo et al., 2018), which are no longer abundant in the region today (SOS Mata Atlântica/INPE 2020).

The locations where the new records were obtained are within a Federal Protected Area, characterized by extensive tracts of preserved forests. The lowland areas of the Atlantic Forest surrounding PARNASO, which are typical habitats for this species distribution (Sick, 1997), have historically suffered significant habitat loss and biodiversity decline (Collar et al., 1992; Alves et al., 2000; Lima et al., 2020). This makes it increasingly unlikely for large populations of *C. melanops* to persist (Melo et al., 2018). Hence, another plausible explanation for these new records could be the Black-cheeked Gnatcatcher populations shifting to higher altitudes, where the environmental conditions are more conducive to their survival (Lunardi et al., 2008; Souza et al., 2011; Freeman et al., 2018).

Conclusion

Among the two proposed explanations for the new record – namely, the absence of sampling in the highest regions of the Atlantic Forest and the possibility of bird populations relocating to better-preserved areas – the latter highlights its significance for the conservation of the Black-cheeked Gnatcatcher. Given that this species relies on pristine environments for its survival and is considered a bioindicator of habitat quality in

the Atlantic Forest (Piratelli, 2008), there is a credible possibility that deforestation in the vicinity of PARNASO is the root cause of these new sightings. This hypothesis gains further credibility when considering the findings of Lunardi et al. (2008) and Melo et al. (2018), which shed light on the vulnerability of Black-cheeked Gnatcatcher populations within the dwindling forest fragments in their historic range.

To confirm this hypothesis, we strongly encourage further in-depth studies on Black-cheeked Gnatcatcher populations, especially in the PARNASO region. Additionally, we hope that these new records and the issues raised will serve as a catalyst for more research in the mountainous regions of Brazil. These areas have been historically under-sampled despite being rich in biodiversity and facing increasing threats in our changing planet (WWF, 2020). In conclusion, given the new records of *C. melanops* in the Serra dos Órgãos National Park, we believe that the altitudinal limit of the species occurrence warrants a reevaluation.

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