

Breeding period of Araripe Manakin *Antilophia bokermanni* inferred from vocalisation activity

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O presente estudo objetivou estimar o período reprodutivo de *Antilophia bokermanni* através da quantidade mensal de emissões sonoras de machos adultos. Foram coletadas amostras de canto de *A. bokermanni* entre os períodos de junho de 2002 a maio de 2003, em floresta úmida na Chapada do Araripe, Brasil. A maior atividade vocal ocorreu entre os meses de agosto e janeiro com um pico entre setembro e outubro. Baseando-se, principalmente, na vocalização da ave observada e os dados existentes para *Antilophia galeata* sugerimos que o período reprodutivo de *A. bokermanni* começa em agosto, atinge o seu ápice entre setembro e outubro, e termina em fevereiro. A postura dos ovos ocorreria entre os meses de setembro e dezembro.

Araripe Manakin *Antilophia bokermanni* is a recently described and Critically Endangered species known from a few localities in the foothills of the Chapada do Araripe, in southern Ceará, Brazil^{2,4,6}. Few data are available concerning its ecology, and its overall population is estimated as being fewer than 50 individuals⁴. We aimed to determine the species' breeding period, by evaluating the months with greatest vocal activity in adult males, which is of key importance in formulating an efficient conservation plan for the manakin, as censusing territorial males is probably the most cost-effective method for monitoring its population trends.

Methods

Araripe Manakin occurs in the humid forest that covers the north-east slope of the Chapada do Araripe, at elevations of 600–800 m^{2,4,6}. The Chapada do Araripe is an enclave of cerrado (dry savanna) surrounded by semi-arid areas covered in caatinga (thorn forest) at lower elevations, with humid forest along part of its slope, due to the presence of abundant watercourses¹⁴ (294 springs representing 85% of the region's water resources⁸). These forests extend for c.200 km along the slope of the Chapada and are similar to the Atlantic Forest, consisting of 8–15-m-high trees, of an estimated 100+ species¹. In this region, mean annual rainfall is 1,033 mm⁸.

Field work was undertaken monthly from June 2002 to May 2003, at two localities: (1) Nascente do Sítio Melo (07°18'S 39°23'W), municipality of Barbalha; and (2) Nascente da AABEC (07°15'S 39°29'W), municipality of Crato. Forests at the study sites are threatened by agricultural development, and there is evidence of selective logging and small dams being constructed.

Sample effort encompassed 288 hours of observation between dawn (05h30) and dusk (18h00), and localities were sampled equally¹¹. Song and calls were discriminated and organised according to their number per hour. Months with

greater vocal activity were interpreted as corresponding to the species' breeding period⁵. To estimate the number of males during periods with greater vocal activity, the number of individuals singing simultaneously or at intervals of up to five seconds was differentiated. A Spearman Rank Correlation¹³ was used to compare vocal activity and rainfall, with a significance level set at $P \leq 0.05$ (two-tailed).

Results

Some 8,858 songs of probably nine males (five at Nascente do Sítio Melo and four at Nascente da AABEC) were recorded. Vocal activity and rainfall were negatively correlated (Fig. 1). Greatest vocal activity was in September–October, and lowest activity in March–May. Vocalisation occurred during the entire day but peaks were noted between 12h00 and 13h00 and 14h00 and 16h00 (Fig. 2). The geographical coordinates of the two sites in this study correspond to the north-westernmost points for Araripe Manakin. Although previously cited as a new north-west limit for the species by Azevedo Júnior *et al.*², those authors repeated (for the municipality of Crato) the geographical coordinates of the type locality, Nascente do Farias, in Barbalha (07°19'S 39°24'W). The geographical coordinates of Fazenda Bebida Nova are 07°14'S 39°29'W.

Discussion

According to Marini¹¹, in Helmeted Manakin highest vocal activity occurs in August–November (peaking August), with the breeding season lasting from July to December, and brood patches noted in August–January. Additionally, two females were found nesting in late September and October¹¹. Ihering¹⁰ considered October to be the laying period of Helmeted Manakin.

Highest vocal activity recorded for the Araripe Manakin was in August–January (one month longer than in Helmeted Manakin), with a peak in September–October. Given the similarities between

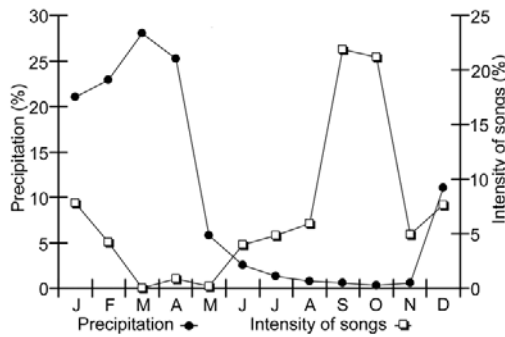


Figure 1. Comparison between rainfall and song intensity in Araripe Manakin *Antilophia bokermanni* in the Chapada do Araripe. Source (rainfall from June 2002 to May 2003): Instituto Nacional de Meteorologia. Statistics: $N=12$; $r_s=-0.608$; $P < 0.05$.

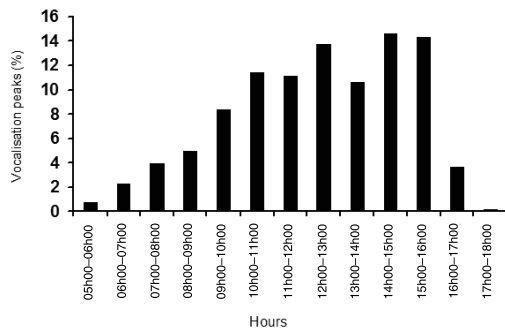


Figure 2. Vocalisation peaks in Araripe Manakin *Antilophia bokermanni* during daytime.

the species, and the observation of two female Araripe Manakins with the initial stage of a brood patch in late July², the Araripe Manakin's reproductive period probably commences in August, peaks in September–October, and ends in February, with females laying eggs probably in September–December.

Significant negative correlation between vocal activity and rainfall presumably reflects the end of the Araripe Manakin's breeding season, which coincides with the rainfall peak in March. At this time, nestlings would require more food and fructification is also higher in the Chapada do Araripe. During the wet season (January–April) c.76% of cerrado tree species bordering gallery forests occupied by Araripe Manakin are fruiting⁷.

Efficient population monitoring of a threatened species is crucial for its conservation³. Annual censuses between 10h00 and 14h00 (when vocalisations peaked) in September–October would permit

males to be counted per stream, and an estimation of females and young could be arrived at using sex and age ratios for similar species: according to Sick¹², the sex ratio in Helmeted Manakin is 1:1.

Surveys of other patches of suitable forest along streams on the slopes of the Chapada do Araripe, especially in September, are needed in order to search for new meta-populations or subpopulations, as these could still evolve through colonisation by young forced to leave already-occupied territories⁹.

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