Impact of *Forpus xanthopterygius* (Spix, 1824) (Aves, Psittacidae) on flowers of *Handroanthus serratifolius* (Vahl.) S. O. Grose (Bignoniaceae)

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(With 1 figure)

Abstract

Handroanthus serratifolius produces flowers during the dry season in the Cerrado biome, and it may be an important food source to some bird species. For Psittacidae species, like *Forpus xanthopterygius,* flowers are important in their diet. This study intended to characterize the behavior of *F. xanthopterygius* and evaluate the damage to the flowering and in the reproduction of *H. serratifolius.* Four individuals of *H. serratifolius* were observed for 60 hours to register size of groups, the time and duration of visit, and the number of flowers predated by *F. xanthopterygius*. The groups that visited the plants had between 2 and 12 individuals. The mean time of visits was 60.31 minutes (±22.29). The size of groups was correlated to number of flowers predated and was influenced by number of flowers offered. During the flowering, each *H. serratifolius* individual loses approximately 1,052 flowers per week.

Keywords: Forpus xanthopterygius, predation, flowers, *Handroanthus serratifolius.*

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Resumo

Handroanthus serratifolius produz flores durante a estação seca no bioma Cerrado, e pode ser um importante recurso alimentar para algumas aves. Para espécies de Psittacidae, como *Forpus xanthopterygius,* flores são importantes itens na sua dieta. Este estudo teve como objetivo caracterizar o comportamento de *F. xanthopterygius* e avaliar o dano à floração e reprodução de *H. serratifolius.* Quatro indivíduos de *H. serratifolius* foram observados durante 60 horas para registrar: tamanho de grupo, tempo e duração de visitas, e o número de flores predadas por *F. xanthopterygius.* Os grupos que visitaram as plantas tinham de dois a 12 indivíduos. As visitas duraram, em média, 60,31 minutos (±22,29). O tamanho do grupo foi correlacionado ao número predado de flores e foi influenciado pelo número de flores oferecidas. Durante a floração, cada indivíduo de *H. serratifolius* perdeu aproximadamente 1052 flores por semana.

Palavras chave: Forpus xanthopterygius, predação, flores, *Handroanthus serratifolius.*

1. Introduction

Handroanthus (*Tabebuia*) [*serratifolia*] *serratifolius* (Vahl.) S. O. Grose (Bignoniaceae), commonly known as the Yellow Ipe, is a tree found in most parts of the Brazilian territory, in secondary formations, such as "capoeiras" and "capoeirões". Flowering occurs from August to November and the fruits mature between October and December (Lorenzi, 1992). As *H. serratifolius* produces flowers during the dry season in the Cerrado biome, it may be an important food source for some bird species. The nectar is a caloric reward compatible with some birds' energetic demands and so this resource attracts diverse taxa that can act as pollinators (Lotz and Schondube 2006).

The Psittacidae family has a typically frugivorous/granivorous diet and preferably eats seeds (Galetti 1997, Simão et al., 1997; Koutsos et al., 2001; Renton, 2001; Sick, 2001; Sigrist, 2006). Its members are capable of acting as predators because they destroy the seeds or discard them near the mother-plant (Galetti, 1997). Although the Psittacidae presents a preference for seeds, many studies have emphasised the importance of flowers in the diet of this family, especially during the dry

season, when the fruits are scarcer (Galetti, 1993; Pizo et al., 1995, Ragusa-Netto, 2004; 2005).

Among the opportunistic birds that visit *H. serratifolius*, the *Forpus xanthopterygius* (Spix, 1824) species (Blue-winged Parrotlet) stands out. *Forpus xanthopterygius* is the smallest Brazilian member of the Psittacidae family (12 cm and 26 g), whose distribution is disjunct in the Western Amazon rainforest and Eastern Brazil (Sick, 2001; Sigrist, 2006). It inhabits semi-open areas, forest edges, "capoeiras", savannas, fields, "caatingas", "restingas" and gardens. Its diet is predominantly composed of fruits, hard seeds (Pizo et al., 1995; Sigrist, 2006) and flowers (Pizo et al., 1995). Thus, the goal of this study was to characterize the behavior of *F. xanthopterygius* and evaluate the damage to the flowers and, consequently, to the reproduction of *Handroanthus serratifolius*.

2. Material and Methods

Four individuals of *Handroanthus serratifolius* located in different points within the urban perimeter of Patos de Minas, Minas Gerais, Brazil (18° 33' 54" S and 46° 28' 44" W) were studied. The observed individuals were, on average, 8.75 m (± 0.96) high and presented an average trunk diameter at chest height of 31.25 cm (± 15.48).

The data were collected in August and September of 2004, from 06:00 AM to 12:00 PM and 03:00 PM to 6:00 PM, totalizing 60 hours. Binoculars 7 × 35 were used. The size of the groups of *F. xanthopterygius* that visited *H. serratifolius*, the time and duration of the visits and number of predated flowers were registered.

The number of flowers was estimated by counting them in a quarter of the canopy and the value obtained was then multiplied by four. To obtain the number of predated flowers, the base of the tree was cleaned at the beginning of the observation period and the number of flowers fallen to the ground around the base (that is, cut by *F. xanthopterygius*) was registered at the end.

3. Results and Discussion

The flowering of *H. serratifolius* intensified by the third week of August, undergoing a steep increase up until the second week of September and declining during the following weeks. *Forpus xanthopterygius* visited the flowers in groups of two to twelve birds. No evident agonistic interaction was detected; however, the movement of *F. xanthopterygius* individuals around the plant made the access or the permanence of other bird species in the plant difficult.

The mean time of visits by the groups was 60.31minutes (±22.29). Although the visits were more common in the morning, there was not a significant difference between the visiting periods ($\chi^2 = 0.73$; p = 0.3930; gl = 1). The long time permanence on the plant may be associated with the concentrated offer of the resource and with ease of locating and obtaining it. It is possible that several trips among food patches, in a time of scarce resources, represent an additional and unfavorable cost. Conversely, as the resource is used, the quality of the patch decreases, to the point when it is no longer attractive (Pyke et al., 1977) and this situation will press the species to disperse to places where the resource is more abundant, resulting in the population fluctuations registered in Psittacidae (Pizo et al., 1995).

The size of the *F. xanthopterygius* groups that visited *H. serratifolius* was correlated to the number of flowers offered (rs = 0.7957; p = 0.0002) (Figure 1). The number of flowers predated was correlated to the number of visitors (rs = 0.8744; p = 0.000), to the amount of flowers offered (rs = 0.8488; p = 0.000; n = 16) and to the duration of the visits (rs = 0.7272; p = 0.0014).

Forpus xanthopterygius acts as an opportunistic species when it explores this resource. The genus *Handroanthus* (*Tabebuia*) tends to produce nectar in concentrations ranging from 23 to 30.6% (Barros, 2001; Souza et al. 2004). This concentration could be considered high (Lotz and Schondube 2006), for example, when compared to diurnal (16%) (Melo, 2001) and nocturnal (13.4%) concentrations (Gribel, 1986) of *Caryocar brasiliense* (Cambess) (Piqui), a quiropterophilous species that also blooms in the dry season. Apparently, *F. xanthopterygius* has a considerable energetic gain by using a concentrated resource, with a relevant caloric reward and in times of scarcity of other resources and water. *Brotogeris chiriri* (Vieillot 1818) assumed a similar behavior in the Pantanal region, using *Inga vera* (Willd), which flowers during the dry season, as an important food source in the studied area (Ragusa-Netto, 2004). These studies demonstrated that population fluctuations detected in Psittacidae are associated to resource availability and may result in dietary changes in certain times of the year (Pizo et al., 1995).

The rates of flowers predated were of 2.10 to 17.24% (mean = 6.06 ± 4.15). The estimated predation rate for each plant was 150.35 flowers/day. This means that, for each week of flowering, each individual loses approximately 1,052 flowers and, depending on the length of this phenophase, thousands of flowers will

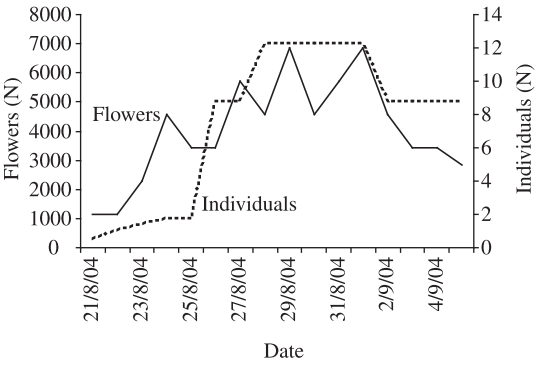

Figure 1. Number of individuals of *F. xanthopterygius* according to the presence of *H. serratifolius* flowers.

be predated. *Forpus xanthopterygius* acts as a predator of *Handroanthus* (*Tabebuia*) [*serratifolia*] *serratifolius* flowers because, as it visits the plant and explores the energetic reward (nectar), it does not perform pollination and cuts the flowers, making pollination by other agents impossible. This behaviour is the most common in this family; therefore, pollination by Psittacidae seems to be a rare type of interaction, although possible in some cases (Ragusa-Netto, 2002).

4. Conclusion

This study showed the magnitude of the damage caused by *F. xanthopterygius* in its interaction with *Handroanthus serratifolius*. Although in terms of the number of impaired flowers, the impact is great, when the reproductive event is considered, probably the damage doesn't harm the formation of fruits significantly, since the total flower number is high, exceeding, on some occasions, seven thousand flowers simultaneously (Figure 1). Despite this fact, it is important to emphasise that the environmental heterogeneity may increase the use of the habitat by many frugivorous bird species and maintain local populations that are more stable, as this situation prevents the dispersion of individuals due to resource scarcity (Carlo et al., 2004).

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