

## Frugivory by birds in *Siphoneugena widgreniana* O. Berg (Myrtaceae) in the Chapada dos Perdizes, Minas Gerais, Brazil

Frugivoria por aves em *Siphoneugena widgreniana* O. Berg (Myrtaceae) na Chapada dos Perdizes, Minas Gerais, Brasil

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**Abstract** Seed dispersal by birds is one of the main reproductive strategies of trees in tropical forests and considering birds-plants interactions may allow better conservation planning. As information about frugivory in the globally threatened *Siphoneugena widgreniana* O. Berg (Myrtaceae) is almost inexistent, we provide a list of birds that consumed fruits of *S. widgreniana* and may act as seed dispersers. For this, the fruit consumption of three individuals of *S. widgreniana* by birds was registered. These observations were realized in Chapada das Perdizes, located between the municipalities of Carrancas and Minduri, southern Minas Gerais state, southeastern Brazil. Fifteen species of birds were registered and may play a role in seed dispersal were considered potential dispersers of the studied plant, highlighting the *Tangara* genus of the Thraupidae family.

**Keywords:** birds, conservation, seeds dispersal, frugivory, ornithocory.

**Resumo:** Dispersão de sementes por aves é uma das principais estratégias reprodutivas de espécies arbóreas de florestas tropicais e considerar interações ave-planta pode permitir melhor planejamento de estratégias de conservação. Como informações ecológicas

sobre frugivoria na espécie globalmente ameaçada *Siphoneugena widgreniana* O. Berg (Myrtaceae) é quase inexistente, nós promovemos uma lista de aves que consomem frutos dessa espécie vegetal e que podem atuar como dispersores de sementes. Para isto, o consumo de frutos de três indivíduos de *S. widgreniana* por aves foi registrado. Estas observações foram realizadas na Chapada das Perdizes, localizada na região limítrofe dos municípios de Carrancas e Minduri, sul do estado de Minas Gerais, sudeste do Brasil. Quinze espécies de aves que foram registradas e possivelmente exercem um papel na dispersão de sementes foram consideradas potenciais dispersoras da planta estudada, destacando o gênero *Tangara* da família Thraupidae.

**Palavras-chaves:** aves, conservação, dispersão de sementes, frugivoria, ornitocoria.

### Introduction

Seed dispersal by animals is the primary strategy adopted by trees in tropical forests (ca. 50% to 90% of species; HOWE and SMALLWOOD, 1982), and according to Willson et al. (1989), in rain tropical

forests the mean dispersion of seeds of tree species by vertebrates varies from 70% to 90%. Fruit consumption (frugivory) by birds is a key step in the reproduction of most of these plants (HERRERA, 1994). Preference, selection, manipulation, and ingestion of fruits by the dispersers govern the frugivory (CÔRTEZ and URIARTE, 2013). While birds benefit by feeding on fruits, plants may depend on these consumers to disperse their seeds. Thus, this bird-plant interaction (frugivory) is usually defined as mutualistic (COATES-ESTRADA and ESTRADA, 1988).

Some taxa of the Myrtaceae family, even before having a basic knowledge of their biology and their ecological interactions, are disappearing from their habitats (LANDRUM and KAWASAKI, 1997), according to the list of species of this family that are threatened in the Brazilian territory (IUCN, 2017). The species of Myrtaceae that occur in Brazil, mostly produce fruits with fleshy pericarp, which are attractive to most vertebrates, thus making them potential dispersers of Myrtaceae seeds, for example: birds and primates (LANDRUM and KAWASAKI, 1997, GRESSLER et al., 2006).

For the specie *Siphoneugena widgreniana*, there is only one study involving consumption and possible dispersion of its fruits by the bird (MOURA, 2014). There are also two studies involving fruit consumption, and potential dispersion by birds, of two other species of the genus *Siphoneugena* (PIZO et al. 2002, CESTARI and PIZO, 2013).

As information about frugivory in the *Siphoneugena widgreniana* O. Berg (Myrtaceae) is almost inexistent, we provide a list of birds that consume fruits of this globally threatened species (IUCN, 2017) and may play an important role in seed dispersal. We also provide informations about the foraging behavior of these frugivorous.

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## Materials and methods

### *The studied plant*

*Siphoneugena* is a genus with nine species distributed from Porto Rico to northern Argentina, but most species are found in the southeastern Brazil (PROENÇA, 1990). *Siphoneugena widgreniana* is found in the Amazon, Cerrado, Caatinga and Atlantic forest, with a patchy geographical distribution along the mountains above 900 m of altitude (PROENÇA,

1990). Fruits are globular, glabrous and with persistent bracteoles (9-11.5 mm in diameter) and the plant has a strong pepper scent and apparent spots in the base of the leaves (PROENÇA, 1990). Ecological information about *S. widgreniana* is almost inexistent and the specie is globally categorized as vulnerable (IUCN, 2017). There is only one study involving consumption and possible dispersion of its fruits by the bird popularly known as Swallow-tailed Cotin-ga (*Phibalura flavirostris* Vieillot, 1816) (MOURA, 2014). In the literature, for the genus in question, there are mentions of consumption of *S. naguilfoyleiana* and *S. densiflora* fruits by birds (PIZO et al. 2002, CESTARI and PIZO, 2013).

To identify the specie *S. widgreniana*, was collected fertile botanical material and compared to exsicates of ESAL Herbarium of the Federal University of Lavras, and confirmed by botanical experts.

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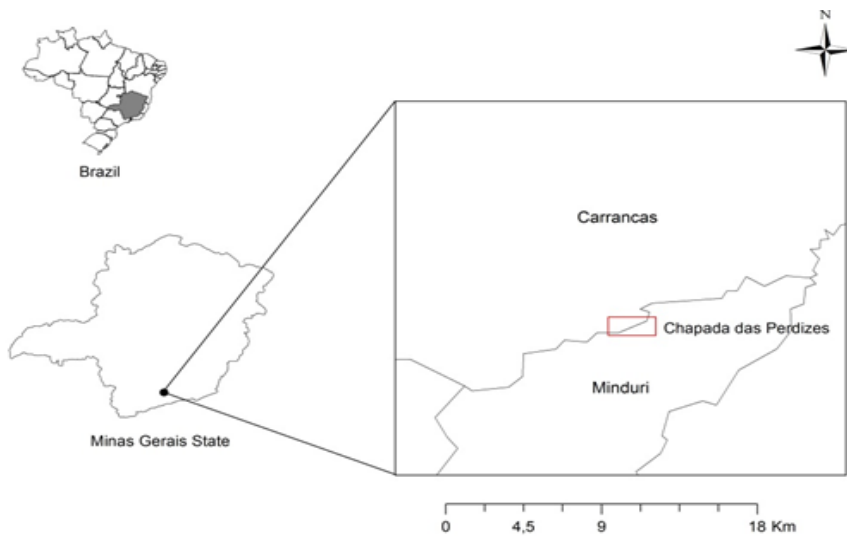
## Methods

Between 16 and 19 March 2009, we occasionally detected birds consuming fruits of three individuals of *S. widgreniana* from 07:00h to 12:00h using binoculars (Nikon 8x40) and a camera (Sony H50). To obtain the records the focal plant method was used, according to Moura (2014). The nomenclature used for the birds followed the Piacentini et al. (2015). The study site, commonly known as “Sítio Gênese”, is located at Chapada das Perdizes (21°35'37”S e 44°34'14”W), between the municipalities of Carrancas and Minduri, southern Minas Gerais state, southeastern Brazil (Figure 1). Altitude is 1310-1530 m and vegetation is mainly high altitude grasslands, with patches of Riparian and Semi-deciduous Atlantic Forest (OLIVEIRA-FILHO et al., 2004, MOURA and CORRÊA, 2012). Climate is Cwb following Köppen classification, with mean annual precipitation of 1,529.7 mm and mean annual temperature of 19.4°C (PEREIRA et al., 2007).

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## Results and Discussion

We detected 15 bird species from five families and 10 genera consuming fruits of *S. widgreniana* (Table 1). Most species were members of the Thraupidae family, with four species of *Tangara*: *T. cyanoventris* (VIEILLOT, 1819) (Figure 2A),



**Figure 1** Study area in red (Chapada dos Perdizes) between the municipalities of Carrancas and Minduri in the state of Minas Gerais, southeastern Brazil

**Table 1** List of birds that consumed fruits of *Siphoneugena widgreniana* (Myrtaceae), registered at Chapada dos Perdizes, between the municipalities of Carrancas and Minduri in the state of Minas Gerais, southeastern Brazil.

Family	Species	Common name	Type of record
COTINGIDAE	<i>Phibalura flavirostris</i> (Vieillot, 1816)	Swallow-tailed Cotinga	V,F
TYRANNIDAE	<i>Elaenia chiriquensis</i> (Lawrence, 1865)	Lesser Elaenia	A,V,F
	<i>Elaenia obscura</i> (d'Orbigny and Lafresnaye, 1837)	Highl and Elaenia	A,V,F
	<i>Myiarchus ferox</i> (Gmelin, 1789)	Short-crested Flycatcher	A,V
TURDIDAE	<i>Turdus rufiventris</i> (Vieillot, 1818)	Rufous-bellied Thrush	V,F
	<i>Turdus leucomelas</i> (Vieillot, 1818)	Pale-breasted Thrush	V
THRAUPIDAE	<i>Tangara cyanovenris</i> (Vieillot, 1819)	Gilt-edged Tanager	A,V,F
	<i>Tangara desmaresti</i> (Vieillot, 1819)	Brassy-breasted Tanager	A,V,F
	<i>Tangara sayaca</i> (Linnaeus, 1766)	Sayaca Tanager	A,V,F
	<i>Tangara cayana</i> (Linnaeus, 1766)	Burnished-buff Tanager	A,V,F
	<i>Stephanophorus diadematus</i> (Temminck, 1823)	Diademed Tanager	A,V,F
	<i>Schistochlamys ruficapillus</i> (Vieillot, 1817)	Cinnamon Tanager	A,V,F
	<i>Tersina viridis</i> (Illiger, 1811)	Swallow Tanager	A,V,F
	<i>Dacnis cayana</i> (Linnaeus, 1766)	Blue Dacnis	V,F
CARDINALIDAE	<i>Piranga flava</i> (Vieillot, 1822)	Hepatic Tanager	V,F
<b>5 families</b>	<b>15 species</b>		

A= sound identification, V= visual identification, F= photographic record.



**Figure 2** Species of *Tangara* consuming fruits of *Siphoneugena widgreniana* registered at Chapada dos Perdizes, between the municipalities of Carrancas and Minduri in the state of Minas Gerais, southeastern Brazil: A–*T. cyanoventris*; B–*T. sayaca*; C–*T. desmaresti*; D–*T. cayana*. (Photos by Aloysio Souza de Moura).

*T. sayaca* (LINNAEUS, 1766) (Figure 2B), *T. cayana* (LINNAEUS, 1766) (Figure 2C) and *T. desmaresti* (VIEILLOT, 1819) (Figure 2D).

Most birds arrived at the tree alone or in pairs, with the exception of *T. cyanoventris* and *T. desmaresti* with groups of up to six individuals or in mixed flocks. Only one agnostic encounter was detected between *Turdus leucomelas* and *Elaenia chiriquensis*. During the occasion, *E. chiriquensis* swallowed one fruit entirely after returning to the plant after being expelled from the tree. The aggressiveness of *Turdus leucomelas* towards other birds while feeding on fruits was already detected in another study (PIZO, 1997). This type of behavior may negatively affect seed dispersal, because the possible dispersing species can abandon the action before handling or ingesting the fruit. Nevertheless, the low number of agonistic encounters was probably due to the fact that the observed plant had many fruits, which may decrease competition (WILLIS, 1966, CAZETTA et al., 2002).

From all birds that consumed fruits of *S. widgreniana*, *Phibalura flavirostris* is the only species considered rare (SNOW et al., 2004; PERLO, 2009; MOURA, 2014) and classified as near threatened by IUCN (2017) and as vulnerable in state of Minas Gerais, southeastern Brazil (SILVEIRA et al., 2008). The observation of *Stephanophorus diadematus* feeding on *S. widgreniana* was also surprising, since the species was rarely recorded in southern Minas Gerais (MOURA and CORREA, 2012, LOMBARDI et al., 2012).

Birds that swallowed the fruits entirely were from the species *Phibalura flavirostris*, *Elaenia chiriquensis*, *Elaenia obscura*, *Myiarchus ferox*, *Turdus rufiventris*, *Turdus leucomelas*, *Tangara sayaca*, *Tangara cayana*, *Tersina viridis*, *Piranga flava* and *Tangara cyanoventris*. On the contrary, *Tangara desmaresti*, *Stephanophorus diadematus*, *Schistochlamys ruficapillus* and *Dacnis caya* napecked the fruits.

Information about birds-plants interactions may help planning conservation of threatened spe-

cies. All 15 bird species observed feeding on *S. widgreniana* may play a role in seed dispersal. The species that swallowed fruits entirely may disperse seeds far from the plant. Birds that pecked the fruits may also help in seed dispersal by dropping a large amount of fruits and seeds on the ground, as secondary dispersers (ants and ground birds) can also play a role in the dispersal of these fruits (DÁRIO, 1994; FRANCISCO and GALETTI, 2001).

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