

# A new record of *Rhamphocelus carbo* (Pallas, 1764) consuming *Pagamea guianensis* Aubl

## Abstract

White-sand vegetation occupies about 7% of the Amazon and their largest extension occurs in the Rio Negro basin. Campinas and campinaranas, are shrub and forest vegetation types characterized by sandy, poor in nutrients soil, and present high endemism in both plant and animal species. Among the plant species that are restricted to the areas of campina and campinarana is *Pagamea guianensis* Aubl, a dioecious shrub with annual flowering cycle. In tropical forests, birds play an important role for seed dispersal. Here we identified *Rhamphocelus carbo* (Ave: Thraupidae) as a consumer and possible disperser of *P. guianensis*. Birds consumed the whole fruit and seeds and then defecate the seeds intact.

**Keywords:** birds, fruit dispersal, campinarana, white sand, frugivory

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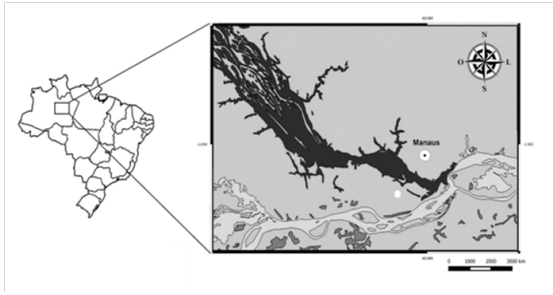
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## Introduction

White sand-vegetation is patchily distributed across the Amazon and characterized by open vegetation (Campinas) and low-canopy forests (campinaranas). These plant formations occupy about 7% of the Amazon<sup>1</sup> and their greatest extent is found in the Rio Negro basin.<sup>2</sup> They are characterized by sandy, poor in nutrients soils, with poor drainage, very low fertility and a scleromorphic physiognomy, with a high number of endemic plant species. The plant genus *Pagamea* Aubl is common and restricted to white-sand vegetation patches.<sup>3</sup> It includes dioecious species, distylic and homostylic, with little floral morphological variation between them. Fleshy fruits have evolved independently at least 12 times in the Rubiaceae.<sup>4</sup> Most of these appear to have originated during the Eocene to Oligocene, i.e. the radiation period for some animal taxa (birds and mammals) comprising most extant dispersers of Rubiaceae fruits.<sup>4</sup> *Pagamea guianensis* Aubl., is inserted in the clade guianensis, the most diversified and widely distributed, where all species are dioecious, with sessile flowers.<sup>3</sup> We observed that the flowering occurs from December to May, with greater intensity in February, the fruiting begins in February with maturity in June. Fruits are indehiscent, drupe type with ellipsoid seed.

Communities of birds in white sand vegetation are characterized by low number of species when compared to terra firme forests, with high level of endemism,<sup>5-7</sup> a distinctive species composition<sup>8</sup> and with a number of species that regularly consume fruits. Seed dispersal is the process where seeds are taken to distances considered safe from the parent plant, where competition and predation may theoretically be smaller.<sup>9,10</sup> In tropical forests, animal-mediated dispersal is very common<sup>11,12</sup> and birds play a very important role among dispersing vertebrates because of their abundance, frequency of feeding on fruits, variety of seed sizes that they can ingest and by enabling long distance dispersal.<sup>13,14</sup> In campinas and campinaranas, seed dispersal by birds

may play an important role due to the patchy distribution of these habitats, but very little information exists to date about this process. Thus, in this note we report on consumers and possible dispersers of *P. guianensis*. The study area is located near Iranduba, ca. 10km from the Rio Negro bridge, that connects Manaus to other cities to the south-west, on the secondary road Lago do Januári, Community Vale do Amanhecer (2°11'52.5"S, 60°07'02.8"W;) (Figure 1). The vegetation type is grassy-woody *campina*, surrounded by arboreal *campinarana*. The study site is located in a new urban expansion area with considerable recent landscape change. We obtained information on fruit consumers and possible dispersers of *P. guianensis* with focal observations and video records conducted in July 2015. A total of 32 hours of observation were done. Five 12-m mist-nets were operated close to the recording sites during one morning in April 2016 (6:00-11:00), captured birds were banded and released immediately. During our video or focal observations we recorded a single bird species, *Rhamphocelus carbo* (Pallas, 1764) (Ave: Thraupidae), silver-beaked Tanager, consuming fruits of *P. guianensis*. They foraged in groups of males and females for two to three minutes. With mist-nets we captured five *R. carbo* individuals (2 females and 3 males). During handling, we observed that they had consumed the whole fruits and seeds, as they defecated *P. guianensis* seeds intact (Figure 2). *Rhamphocelus carbo* presents a marked sexual dimorphism. The female has a dark brown forehead and back, wings and a pure black tail; abdomen, flanks and rust-brown uropyge; the jaw is black.<sup>15</sup> The male features are the purple head and chest, blackened wings and tail, the upper and black beak, and the lower beak is whitish in color. The species is usually found in small groups frequently with predominance of males and females and a few juveniles, they are omnivorous, foraging insects and fruits.<sup>16,17</sup> This species is common in forest and shrubby habitats and is also frequent in human-modified landscapes.<sup>17</sup> Males in the breeding season exhibit territoriality using an early morning chorus which means that their breeding ground goes up to a 10m radius.<sup>16</sup>



**Figure 1** Study area, a campinarana localized in the community Vale do Amanhecer (white point), city of Iranduba, Amazonas.



**Figure 2** *Ramphocelus carbo*, possible disperser of *P. guianensis*.

- A. Female
- B. Male
- C. *R. carbo* visiting *Pagamea guianensis*
- D. Drupe fruits of *P. guianensis*

## Discussion

*Ramphocelus carbo*, locally known as “pipira-vermelha”,<sup>15</sup> was the only species observed consuming the fruits of *Pagamea guianensis* in our study area. *Ramphocelus carbo* is a species widely distributed in the Amazon and commonly observed in secondary forests or *capoeiras* of northern Brazil. Its distribution includes also Guianas, Venezuela, Paraguay and Bolivia and in Brazil extends from the Amazon to the east of Piauí, from central Brazil to the west of Paraná and south of Mato Grosso do Sul.<sup>15–18</sup> It is noteworthy that this bird species is not considered as a regular campina bird species.<sup>8,19</sup> The presence of *R. carbo* in our study area is probably associated to the recent history of disturbance on the surrounding landscape. Because these birds consumed the seeds and defecated them intact, it is highly likely that they act as seed dispersers for *P. guianensis*. Another Rubiaceae flesh fruit, *Faramea cyanea* Mull. Arg. was studied in the gallery forest and in the cerradão in Brazil,<sup>20</sup> and there was a predominance of omnivorous birds dispersers, followed by frugivorous and insectivorous. However, some relationships between fruit types and distribution did suggest that long distance dispersal has played a significant role in the biogeographical history of the

Rubiaceae.<sup>4</sup> Drupes were over-represented among genera inhabiting “islands”. For the authors, this suggests that possession of drupes might promote long-distance dispersal, which is essential for plants inhabiting patchy environments like white-sand ecosystems.

## Conclusion

*P. guianensis* has as dispersing potential the bird *Ramphocelus carbo*.

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## Conflict of interest

None.

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