The parakeet *Brotogeris tirica* feeds on and disperses the fruits of the palm *Syagrus romanzoffiana* in Southeastern Brazil

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**Abstract:** Small psittacids remain unrecorded as dispersal agents of palm fruits in Brazil. I record here the plain parakeet (*Brotogeris tirica*), an Atlantic forest endemic, feeding on and dispersing the fruits of the palm *Syagrus romanzoffiana* at Ubatuba, northern coast of São Paulo, Southeastern Brazil. The birds removed the fruit and carried it away from the mother-tree in about 40% of the feeding records. While perched on trees and shrubs of the understory, the parakeets removed and ingested most of the mesocarp, dropping the partly consumed fruit. As the parakeets damaged no the embryo and may feed at a distance from the mother-tree, they act as primary dispersal agents. This is the first substantiated record of a small Neotropical psittacid as a stomatochorous dispersal agent of palm fruits the size of *A. romanzoffiana* drupes.

**Keywords:** Bird-plant symbiosis, Psittacidae, Arecaceae, feeding behaviour, synzoochory.


**Resumo:** Psitacídeos de pequeno porte não constam como dispersores de frutos de palmeiras no Brasil. Registro aqui o periquito-rico (*Brotogeris tirica*), endêmico da mata Atlântica, alimentando-se em e dispersando frutos da palmeira *Syagrus romanzoffiana* em Ubatuba, litoral norte do Estado de São Paulo. As aves removiam o fruto e, em cerca de 40% dos registros alimentares, carregavam-no à distância da árvore-mãe. Empoleirados em ramos de arvoretas e arbustos no sub-bosque, os periquitos retiravam e ingeriam a maior parte do mesocarpo, deixando cair o resto do fruto. Uma vez que estas aves se alimentam sem danificar o embrião e podem fazê-lo a certa distância da árvore-mãe, agem como dispersores primários. Este é o primeiro registro documentado de um psitacídeo Neotropical de pequeno porte como dispersor estomatocórico de frutos de palmeira com as dimensões das drupas de *S. romanzoffiana*.

**Palavras-chave:** Simbiose ave-planta, Psittacidae, Arecaceae, comportamento alimentar, sinzoocoria.
Introduction

Parrots, parakeets, and macaws – family Psittacidae – feed mostly on seeds, fruits, and flowers including petals and nectar (e.g., Forshaw 1989, Pizo et al. 1995, Collar 1997, Sick 1997, Ragusa-Neto 2004). Nevertheless, parrots and their kin are primarily seed-predators, as they feed on the embryo of the fruits they forage on (Collar 1997, Sick 1997) and thus rarely act as primary fruit dispersers. Seeds occasionally dispersed by psittacids are tiny, such as those of Ficus spp., Cecropia spp., and Muntingia calabura and even in these instances the dispersed seeds form a small portion compared with those destroyed while the parrots feed on the fruits (Janzén 1981, Collar 1997).

The Neotropical parakeets grouped in the genus Brotogeris form an assemblage of small psittacids (16-25 cm, 52-80 g, see Collar 1997) that feed on fruits, flowers, nectar, algae, insects, and snails (Collar 1997, Ragusa-Neto 2004, Paranhos et al. 2007). In Southeastern Brazil, Brotogeris chiriri and B. tirica are recorded to feed on palm fruits, of which they eat the pulp (Galletti 1997, Ragusa-Neto 2004, Paranhos et al. 2007). None of the latter authors mention the possibility that Brotogeris parakeets might disperse palm seeds, especially the larger ones. However, Christianini (2006) states that B. chiriri feeds on the pulp of the exotic palm Archontophoenix cunninghamaiana and drops the “seed” under the mother-tree.

I record here the plain parakeet (Brotogeris tirica), an Atlantic forest endemic (Collar 1997, Sick 1997) feeding on and dispersing the fruits of the palm Syagrus romanzoffiana in the coastal lowland forest at São Paulo, Southeastern Brazil. Besides general observations on the parakeets’ behaviour, four main questions were focused in this short study: 1) Which techniques the birds use to feed on the palm fruits? 2) Are the fruits eaten by the birds on the mother-tree or carried to be consumed away from it? 3) If carried away, which is the maximal observable distance the birds carry the fruits? and 4) May the birds be regarded as dispersal agents of this palm species?

Material and Methods

Field records were made at the Praia do Estaleiro (23° 20.255’ S and 44° 53.014’ W) in Ubatuba, São Paulo state, Southeastern Brazil. The study site is a mix of wetland and mangrove vegetations close to a stream. One focal-tree (cf. Marcondes-Machado & Argel-de-Oliveira 1988) of the palm Syagrus romanzoffiana was observed on 11 July 2007 and two other focal-trees were observed on 13 of the same month. The behaviour of the parakeets was initially assessed with naked eye at a distance of about 10-15 m, and then observed through binoculars and a 300 mm auto-phocus telephoto lens. “Ad libitum” searching for at the points where the parakeets were recorded feeding on the branchlets bases) or directly on the fruits. They perched and moved deftly around and chose certain fruits to feed on. Three main feeding techniques were recorded: 1- feeding on a fruit still attached to a branchlet of the infructescence (Figure 1a; N = 13); 2- feeding on a fruit previously removed with the bill from a branchlet and held with the feet (Figure 1b; N = 9); 3- removing the fruit, putting it in the bill with the feet and carrying it away from the mother-tree (Figures 1c and 2a, b; N = 17). The fruits were removed with biting movements at their attachment on the branchlet. To feed on a fruit the birds removed the epicarp (“peel”) and fed on portions of the mesocarp (“pulp”), which they bit and chewed (Figures 1a, b and 2b). Sometimes they spat out pieces of husk. After a while, the partly consumed fruit was dropped and the bird came for a new one.

In all feeding records in which the parakeets used the foot to hold the fruit while feeding on it or to put it in the bill to be carried away (N = 26) the birds used the left one.

Of the 39 feeding records, the parakeets either fed on the mother-tree (N = 22; 56.41%) or removed the fruit and flew away a distance (N = 17; 43.58%). While feeding either on the palm tree or elsewhere in the understory, the parakeets remained silent. The birds that flew to consume the fruits elsewhere were found by spotting the orange colour of the palm fruits, since the parakeets’ green plumage blended with the understory vegetation they perched on (Figure 2b). The distances the parakeets were found feeding on the palm fruits in the understory varied 10.3-40.1 m (x = 22.14; sd = 13.80; N = 9) from the mother-tree of which the birds removed the fruits. No dropped fruit showed damage to the endocarp. A seedling and a sapling (Figure 2c) were found 10.2 m and 12.1 m from the nearest adult S. romanzoffiana tree, respectively.

Discussion

The fruits (= drupes) of Syagrus romanzoffiana are recorded as food for at least two psittacid species in Brazil, Myiopsitta monachus (Fallavena & Silva 1988) and Brotogeris chiriri (Paranhos et al. 2007). The feeding techniques I recorded for B. tirica while feeding on A. romanzoffiana drupes roughly correspond to those described by Paranhos et al. (2007) for B. chiriri while feeding on a variety of fruits in a detailed study on the feeding behaviour of this latter species. The use of the left foot only to pick up or handle food recorded for B. tirica in the present study agrees with the notion for tendency of “left-handedness” in several psittacid species, although this is still a controversial issue (see Friedman & Davis 1938, McNeil et al. 1971, Collar 1997, Sick 1997, Paranhos et al. 2007). These latter authors observed about 70% of “left-handedness” for B. chiriri feeding records in the wild (Paranhos et al. 2007).
Parakeets disperse palm drupes

Figure 1. Three feeding techniques of the parakeet *Brotogeris tirica* while consuming the fruits of the palm *Syagrus romanzoffiana*: a) a bird feeds on a fruit still attached to a branchlet of the infructescence; b) another individual removed the fruit and holds it with its foot while feeding; and c) a parakeet puts a fruit in its bill to feed on it away from the mother-plant – note use of left foot to hold the fruit by both birds.

Figure 1. Três técnicas alimentares do periquito *Brotogeris tirica* para consumir os frutos da palmeira *Syagrus romanzoffiana*: a) um indivíduo consome um fruto ainda preso ao ramo da infrutescência; b) outro indivíduo removeu o fruto e o segura com o pé enquanto come; e c) um indivíduo coloca um fruto no bico para se alimentar distante da árvore-mãe – note uso do pé esquerdo em ambos os indivíduos.

Transport of fruits removed from the mother-tree is only mentioned en passant for *B. chiriri* (Paranhos et al. 2007) although for *B. tirica* there are records of transporting infructescence pieces of *Cecropia* spp., which bear minute seeds (Marcondes-Machado & Argel-de-Oliveira 1988). However, as both *B. tirica* and *B. chiriri* are regarded mostly as seed predators (Marcondes-Machado & Argel-de-Oliveira 1988, Paranhos et al. 2007) the fate of the transported pieces remains to be evaluated. In the present study,

about 40% of the palm fruits were carried for a distance from the mother-tree by *B. tirica* individuals. Since these parakeets feed on the external parts of the fruit only and were unable to break through the thick and hard endocarp that harbours the embryo (pers. obs.), they might be classified as dispersal agents even if they were to drop the drupes under the mother-plant. The drupes dropped to the ground may be regarded as a form of dispersal roughly equivalent to barochory (dispersal by weight only, see van der Pijl 1982). Secondarily, the drupes may be carried away from the mother-tree by rain wash (hydrochory) or some animal foraging on the ground (zoochory). However, the parakeets carrying the drupes to observable distances of up to 40 m from the mother-tree would qualify *B. tirica* as primary dispersal agents of *A. romanzoﬀiana* at certain localities. Moreover, these parakeets may have the potential to carry the fruits farther than the distances recorded here, although this remains to be verified. The finding of a seedling and a sapling away from any adult palm of this species seems to strengthen the dispersal role, even if occasional, of these parakeets (however, any other dispersal type cannot be ruled out here).

The dispersal process that involves birds carrying plant propagules in their bills is called stomatochory, a type of synzoochory (van der Pijl 1982). The size of *A. romanzoﬀiana* drupe (about 20 mm) and the size of *B. tirica* bill (the same size or slightly lower) makes likely that this fruit type is near the maximal size this parakeet would be able to carry in its bill. Thus, this is the first substantiated record of a small Neotropical psitacid that acts as a stomatochorous dispersal agent of palm fruits the size of *A. romanzoﬀiana* drupes.

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**References**


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Figure 3. Two *B. tirica* parakeets quarrel while on a *A. romanzoﬀiana* intructescence – note that both birds hold a fruit with the left feet. **Figura 3.** Dois periquitos *B. tirica* em disputa numa intrutescência de *A. romanzoﬀiana* – note que ambos estão segurando um coquinho com o pé esquerdo.