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Bradysia sp. (Diptera: Sciaridae), a pollinator that can die in flowers of *Ditassa banksii* Schult. (Apocynaceae, Asclepiadoideae)

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ABSTRACT – (*Bradysia* sp. (Diptera: Sciaridae), a pollinator that can die in flowers of *Ditassa banksii* Schult. (Apocynaceae, Asclepiadoideae)). This is the first record of *Bradysia* sp. as a pollinator of *Ditassa banksii* Schult.. This fly usually becomes trapped in the flower and die, but it carries out the pollination too. It is common to find fragments of insects bodies or dead individuals trapped in flowers of Asclepiadoideae. However, this is the first report of *Bradysia* sp. inserting pollinia.
Keywords: fly, pollination, pollinium

RESUMO – (*Bradysia* sp. (Diptera: Sciaridae), um polinizador que pode morrer em flores de *Ditassa banksii* Schult. (Apocynaceae, Asclepiadoideae)). Este é o primeiro registro de *Bradysia* sp. como polinizador de *Ditassa banksii* Schult.. Este díptero geralmente fica preso nas flores e morre, mas também pode realizar a polinização. É comum, em flores de Asclepiadoideae, encontrar partes do corpo de insetos ou até indivíduos já mortos presos nas flores, entretanto, este é o primeiro registro de *Bradysia* sp. inserindo polínias.
Palavras-chave: mosca, polínia, polinização

Introduction

The Asclepiadoideae (Apocynaceae) present peculiar flowers, with the five anthers fused around the gynoecium and the pollen transferred in pollinium, two per pollinarium. A narrow space called guide rail is formed between adjacent anthers; the pollinarium brought by the pollinator is inserted in there (Endress 1996). In general, the inner part of the guide rail is covered with nectariferous tissue and the nectar accumulates below of guide rail, inducing the insects to look for this place (Demarco 2017).

For an insect to remove a pollinarium from the flower it must be strong enough, otherwise, it may become trapped and will die or may lose part of the body to be free from the flower (Corry 1884). There are several records of insects parts, or individuals, trapped in flowers of Asclepiadoideae (Corry 1884, Pant *et al.* 1982) and eventually mutilated insects may themselves be pollinators (Morse 1981, Shuttleworth & Johnson 2009).

Flies with pollinaria attached to the mouthparts are commonly treated as pollinators of Asclepiadoideae (Medeiros *et al.* 2008, Nihei & Schwarz 2011). However, this evidence does not guarantee that these insects can properly insert pollinia in the guide rail, assuming that visitors who can withdraw and transport pollinaria may be able to deposit them, and thus pollinate the plant (Ollerton & Liede 1997).

Studying the floral biology of *Ditassa banksii* Schult., several flowers with trapped insects were observed. This work, therefore, aimed to verify which groups of insects were trapped in the guide rail.

Material and methods

The fieldwork was carried out in the *restinga* (sandbank coastal vegetation) of Environmental Protection Area of Maricá (22°96'46"S, 42°89'47"W), Rio de Janeiro State, Brazil. *Ditassa banksii* is a climbing plant generally supported on bushes and produces many flowers in umbelliform inflorescences. The flowers are white, laterally inclined or facedown. The corolla is subcampanulate to urceolate. The lobes remain erect during anthesis. The corona is double, with five external subulate white lobe longer than the five internal oval-lanceolate white lobes, they are basally connected to each other and cover part

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of the chamber entrance below the guide rail, where the pollinia are inserted by pollinators (figure 1a). The flowers measure in average 4.21 mm ± 0.39 (3.31-5.08 mm; n = 30) in length by 2.86 mm ± 0.72 (1.37-4.28 mm; n = 30) in width. They remain open 7-8 days, produce a honey smell and the nectar has an average sugar concentration of 21.8% ± 3.28 (16-23%, n = 6). In the same area, *Musca domestica* (Linnaeus, 1758) and another unidentified species of Diptera were also considered effective pollinators (Koschnitzke 2015). In November 2008, 68 flowers were collected and later, in the stereomicroscope, they were observed the insects trapped and dead in the guide rails.

Results

Ants and flies were found dead in flowers of *Ditassa banksii*, trapped in guide rails or attached to the pollinaria, mainly by the mouthparts, but also by legs and antennas. An ant, caught by one of front legs, had two pollinaria attached to the other front leg (figure 1b).

Bradysia sp. was found dead in 76% of the collected flowers. Of these, four individuals had one to two pollinaria attached to the mouthparts and were trapped by legs in the guide rail (Figure 1c). It was also observed a pollinarium inserted in the guide rail just below an arrested individual of *Bradysia* sp. (figure 1d).

Discussion

The pollinarium inserted just below an arrested individual of *Bradysia* sp. indicate that the pollinarium was brought by that fly. Therefore, these flies, besides being able to remove pollinaria, may also carry out pollination, even though most of the time they become trapped and die by doing this.

In Asclepiadoideae, there is only one record of pollination by Sciaridae, genus *Sciara* Meigen, in *Marsdenia cymulosa* Benth in Australia (Forster 1992). According to the author, these insects were numerous and active, carrying pollinaria attached to the body moving to flowers of different plants,

Figure 1. *Ditassa banksii* L. a. Pollinarium inserted in the guide rail. b. Ant with one leg trapped and another with an attached pollinarium; c. *Bradysia* sp. trapped by legs and a pollinarium attached to the mouthparts. d. *Bradysia* sp. with the mouthparts trapped in guide rail, with the pollinarium inserted by him just below.

demonstrating that these small flies are capable of cross-pollinating.

Bradysia species are exclusive pollinators of two species of Orchidaceae, *Lindellia crassifolia* Lindl. (Barbosa *et al.* 2009) and *Lepanthes glicensteinii* Luer (Blanco & Barboza 2005). They are also pollinators of *Pleurothallis marthae* (Luer & Escobar) Luer, an Orchidaceae endemic to Colombia (Duque-Buitrago *et al.* 2014), and of *Rheum nobile* Hook.f. & Thomson (Polygonaceae) (Song *et al.* 2013).

The floral complexity of Asclepiadoideae is often interpreted as a highly specialized pollinating system, but in fact their flowers are functionally but not ecologically specialized (Wolff *et al.* 2008); that is, only a few insects can pollinate them, but the nectar can be easily accessed by numerous other insects with short mouthparts. The pollination system of asclepiad flowers can only be considered highly specialized at the functional group level (Shuttleworth & Johnson 2008) when the mutilation of pollinator is not taken into account. When pollinators lose part of their body or die trapped in flowers, the relationship is probably more antagonistic than mutualistic, because the amount of pollinated flowers decreases (Morse 1981) and the pollinators become less efficient (Shuttleworth & Johnson 2009).

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