

Pollen feeding in three harvestman species of Brazilian Atlantic Forest (Opiliones, Gonyleptidae)

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Abstract: Pollen feeding is relatively rare among spiders and harvestmen, but is relatively common in some mite species. Harvestmen are usually omnivorous and frequently include plant material in their diet, but we found only one paper describing the ingestion of pollen by species of the group. Here we reported natural history observations regarding pollen feeding in three harvestman species in an Atlantic Forest area, in Southeastern Brazil.

Key words: Laniatores, Gonyleptidae, *Neosadocus*, *Promitobates*, *Sodreana*, diet, tropical forest, omnivory

Alimentación de polen en tres especies de opiliones del Bosque Atlántico brasileño (Opiliones, Gonyleptidae)

Resumen: La alimentación de polen es relativamente rara entre arañas y opiliones, pero es relativamente común en algunas especies de ácaros. Los opiliones son generalmente omnívoros y con frecuencia incluyen material vegetal en su dieta, pero sólo se encontró un artículo que describe la ingestión de polen por especies del orden. Aquí reportamos observaciones de historia natural acerca de la alimentación de polen en tres especies de opiliones en un área del Bosque Atlántico, en el sureste de Brasil.

Palabras clave: Laniatores, Gonyleptidae, *Neosadocus*, *Promitobates*, *Sodreana*, dieta, bosque tropical, omnivoría

Introduction

Although arachnids are considered predators, members of some orders show a great diversity of feeding habits. Harvestmen, for example, are known to be omnivorous animals, with tendency to carnivory in some species (Acosta & Machado, 2007). Harvestmen may include small invertebrates (Machado *et al.*, 2000), fruits (Machado & Pizo, 2000), mollusks (Nyffeler & Symondson, 2001), and even small vertebrates such as tree frogs (Castanho & Pinto-da-Rocha, 2005; Manzanilla *et al.*, 2008) and bird nestlings (Benson & Chartier, 2010) in their diet. To the best of our knowledge, there is only one report of ingestion of pollen by a harvestman. Pfeifer (1956) found at necropsy large amounts of pollen in the intestinal tract of *Opilio parietinus* (De Geer, 1778) (Eupnoi: Phalangidae), but the author does not mention from which plant the pollen came from.

Despite being uncommon among arachnids in general, some mite species belonging to the genus *Euseius* De Leon, 1967 (Phytoseiidae) may have a diet specialized in pollen (McMurtry & Croft, 1997). Moreover, some spider species have already been observed eating pollen. Orb weavers like *Araneus diadematus* Clerck, 1757 (Araneidae) intentionally ingest grains of pollen trapped in their webs (Ludy, 2004; Ludy & Lang, 2006). Regarding the benefits of pollen as a food source, Smith and Mommsen (1984) suggest that pollen feeding is a valuable complement for *A. diadematus* diet that enables the survival of the individuals when prey is scarce. However, a recent study with the bowl and doily spider *Frontinella communis* (Hentz, 1850) (= *F. pyramitela* Chamberlin & Ivie, 1944) (Linyphiidae) have shown that a diet based mainly on pollen is not enough to sustain adult's body weight (Carrel *et al.*, 2000).

Here we report natural history observations regarding pollen feeding in three harvestman species in an Atlantic Forest area in Southeastern Brazil. These three species belong to the large Neotropical family Gonyleptidae, which include several taxa known to feed on plant parts (review in Acosta & Machado, 2007). Our observations, however, are the first report of pollen feeding in the family.

Material and methods

The study was made at Parque do Zizo (24°0'58.80"S, 47°48'45.90"W, 660 m above sea level), a private Atlantic Forest Reserve at the municipality of Tapiraí, state of São Paulo, Southeastern Brazil. Natural history observations were made on 4th November 2011, between 20:30 h and 21:30 h, with the use of flashlights.

Because no harvestman was collected, identifications were based on photos and pertinent references (Kury & Pinto-da-Rocha, 2007; Pinto-da-Rocha & Bragagnolo, 2010; Bragagnolo & Pinto-da-Rocha, 2012). One plant was collected, processed and deposited in Herbário Regional da Pontifícia Universidade Católica de São Paulo, state of São Paulo, Brazil.

Results

In a forest trail, we observed two *Neosadocus maximus* (Giltay, 1928) (Gonyleptinae) males feeding on pollen of *Anthurium sellowianum* Kunth (Araceae), both in the same spadix (Fig. 1-3). Due to this observation, we began to actively search for open inflorescences of this plant. Soon after, we observed a *N. maximus* female (Fig. 4) and a *Promitobates intermedius* male (Mello-Leitão, 1935) (Mitobatinae) (Fig. 5) feeding on pollen from other individual of the same plant species. In all these cases, it was possible to perceive pollen adhered to harvestmen mouthparts and, in higher magnification photos, we can see that individuals were carrying whitish masses that appeared to be stamens (Fig. 6). In another plant, a *Sodreana granulata* (Mello-Leitão, 1937) (Sodreaninae) female was also observed feeding on *A. sellowianum* (Fig. 7), but this individual fled upon our approach. In an attempt to complement the observations, we looked for other harvestmen eating pollen in the following night, but we did not find any individual in feeding activity.

Discussion

Our observations suggest that individuals of the three harvestman species tear off the stamens of *A. sellowianum* and eat them together with the pollen. This suggestion is supported by the fact that there were inflorescence regions with intact stamens bearing pollen, next to some regions where the stamens and pollen were apparently removed (Fig. 4). Moreover, we did not observe any other food resource for harvestmen in the inflorescences, so we assume they were only feeding on flower parts. The account presented here suggests that ingestion of pollen may be more common than one might think, and shows the ability of some harvestman species to exploit ephemeral resources to supplement their diet.

Most species of *Anthurium* are probably bisexual, with a marked protogyny (Croat, 1980), which prevents self-pollination. Although it is tempting to think that harvestmen are pollinators of these plants, more field work are needed because when the stamens

arise, pollination probably has already occurred. Thus, for harvestmen to function as pollinators, they would have to be attracted by the inflorescences in which anthesis had just started. However, even if harvestmen were able to pollinate the flowers, they probably would not be efficient in this process, because the plants are separated by several meters in the field and the mobility of harvestmen is small when compared to flying insects, such as bees and flies, which are the main pollinators of these plants (Croat, 1980).

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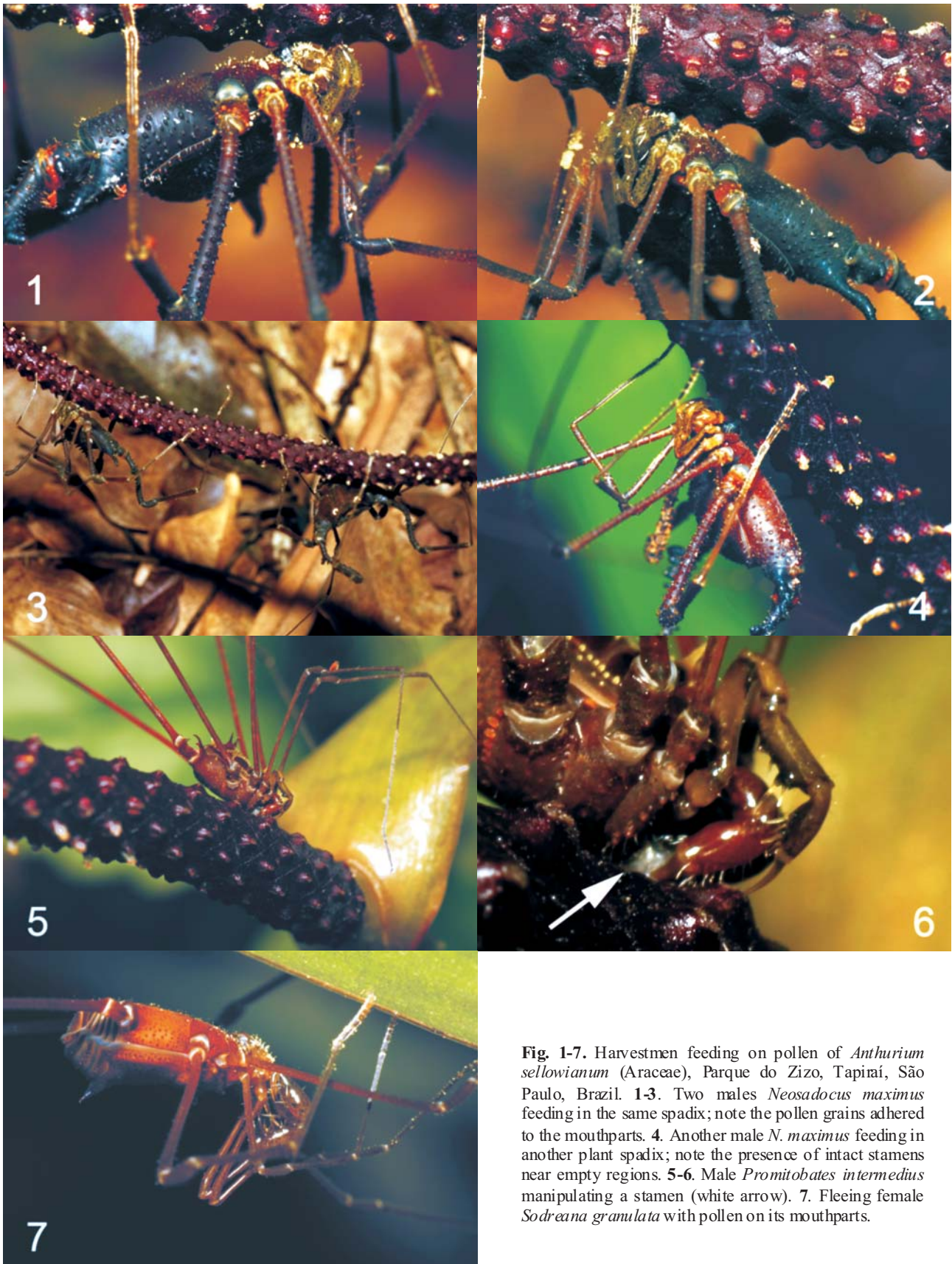


Fig. 1-7. Harvestmen feeding on pollen of *Anthurium sellowianum* (Araceae), Parque do Zizo, Tapiraí, São Paulo, Brazil. **1-3.** Two males *Neosadocus maximus* feeding in the same spadix; note the pollen grains adhered to the mouthparts. **4.** Another male *N. maximus* feeding in another plant spadix; note the presence of intact stamens near empty regions. **5-6.** Male *Promitobates intermedius* manipulating a stamen (white arrow). **7.** Fleeing female *Sodreana granulata* with pollen on its mouthparts.