SCIENTIFIC NOTE

Occurrence of *Physoclypeus farinosus* Hendel (Diptera: Lauxaniidae) in Flowerheads of Asteraceae (Asterales)

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Ocorrência de *Physoclypeus farinosus* Hendel (Diptera: Lauxaniidae) em Capítulos de Asteraceae (Asterales)

RESUMO - É apresentada a ocorrência de *Physoclypeus farinosus* Hendel em capítulos de Asteraceae de várias localidades brasileiras. Discute-se brevemente o uso desse recurso por essa mosca.

PALAVRAS-CHAVE: Região Neotropical, recurso floral, interação inseto-planta, Compositae

ABSTRACT - The occurrence of *Physoclypeus farinosus* Hendel in flowerheads of Asteraceae from different Brazilian localities is presented. The use of this resource by this fly is discussed.

KEY WORDS: Neotropical Region, floral resource, insect-plant interaction, Compositae

The family Lauxaniidae, one of the largest families of schizophoran Diptera, is composed of 149 genera and nearly 1550 species worldwide, except Antarctica (Kim 1994). In the Neotropics they comprise 62 genera, with a described fauna of nearly 400 species (Silva 1993, Gaimari & Silva in press). The family exhibits a variety of morphological patterns; adults are small, rarely exceeding 6 mm in length, with various patterns of marks and colors (Shewell 1987).

The lauxaniids are known to be mainly saprophagous in their larval stage, found in fallen leaves, decaying grasses, under bark of trunks in decomposition, and in nests of birds and mammals. Nevertheless, the majority of that data was obtained from non-Neotropical regions and focus on less than 1.5% of the known lauxaniid species (Miller 1977a, b; Miller & Foote 1975, 1976). Few species of lauxaniids have been reported as phytophagous found in roots, stems and leaves of clover (Marchal 1897, Oettingen 1934), in ovary galls of violets (*Viola* sp.) (Kaltenbach 1874), and in phylloclades of *Opuntia* spp. cacti (Hering 1951). Needham (1948) cited *Spilochroa ornata* Johnson as a lauxaniid species in flowerheads of *Bidens pilosa* (Asteraceae); currently this fly species is included in the Heleomyzidae (Thompson 2000).

Oldroyd (1964, *apud* Miller 1977b) suggested that their larval alimentary content consist of decomposed plant matter, including rotten trunk material, mold of leaves and peat soil. Within the family there has been some degree of saprophytic specialization, including the habit of forming mines between the epidermal layers of fallen leaves. Hering (1951) considers that although those larvae technically build mines, their behavior represents specialization of saprophagy rather than a phytophagous existence. Miller & Foote (1976) indicated a possibility that the larvae, in that case, are feeding on the microorganisms such as fungi, yeast and bacteria of the parenchyma in decay. According to Miller & Foote (1976), another line of specialization includes the utilization of material in decomposition found in nests, mainly of birds. Due to the great amount of data indicating a saprophagous existence for lauxaniid larvae, any data concerning phytophagy, according to Miller (1977b), must be cautiously considered. In some cases, it is probable that the larvae are feeding in plant tissue already attacked by fungi.

Miller (1977b) summarized the few available data for the Neotropical region, citing the larval microhabitat for species in two genera (*Allominettia latelimbata* (Macquart) – orange fruit in decomposition; *Poecilominettia* sp. – in a South American cuckoo nest).

Kevan & Baker (1983), for California, and Gonçalves-Alvim & Macedo (1998), for Minas Gerais, Brazil, reported that adult lauxaniids are frequently seen visiting flowers, although their activities are not specified. They could be feeding on nectar or pollen, or visiting for copulation or oviposition. Kato *et al.* (1995) observed specimens of a species of *Homoneura* Wulp feeding on nectar of the male strobile of *Gnetum cuspidatum* (Gnetaceae); the larvae feed within fallen leaves, while the adults may be attracted by the odor emitted by the strobiles that may be similar to some fungal odors.

The Asteraceae is the largest plant family on Earth, with around 23,000 species, being notably more abundant in open environments and/or non-forest. It is characterized by having its flowers being reduced and organized in the form

of a flowerhead (Bremer 1994). Those flowerheads supply food in a sheltered feeding site to a rich and various fauna of endophagous insects (Lewinsohn 1991). In the South and Southeast of Brazil there are three dipteran families among the main endophages: Agromyzidae, Cecidomyiidae and Tephritidae (Lewinsohn 1991, Prado *et al*. 2002, Almeida *et al.* 2006).

Hendel (1907) described the genus *Physoclypeus* designating the type species as *Chlorops flavus* Wiedemann. The genus currently is composed of seven species, distributed from the United States of America to Argentina (Silva 1993). Presently, there are no published data on their biology. Among the species, *Physoclypeus farinosus* Hendel was originally described from material from Bolivia; nowadays the species is known from some localities in Brazil and Argentina (Mello & Silva, unpubl. data).

The studied material in this work proceeds from collections made in 50 areas in five Brazilian states (Minas Gerais, Rio de Janeiro, São Paulo, Paraná, Santa Catarina and Rio Grande do Sul). More detailed data on the collecting sites is given in Almeida *et al.* (2004). At those sites, Asteraceae flowerheads were collected and taken to the laboratory, kept in plastic jars covered with net cloth until the adult emergence was complete. Specimens of Lauxaniidae in Asteraceae inflorescences were obtained in thirteen sites, listed in the next paragraph. Another set of lauxaniids, collected in flowerheads of Asteraceae by Gonçalves-Alvim & Macedo (1998), was also analyzed in this study. Those two sets of specimens were sent to the first author for identification. Several specimens had not totally emerged and could not have the sex determined. After identification, the material was deposited in the collection of the Museu de Zoologia da USP/SP (MZUP).

All the 180 specimens received for analysis were identified as *Physoclypeus farinosus* Hendel. Table 1 has the

Table 1. Species of Asteraceae from which *P. farinosus* were reared, with their location, taken from our data, listed by tribes.

Tribe	Species	Location*
Astereae	*Baccharis ligustrina* DC	2
	Conyza sp. 3	14, 19
	Erigeron maximus (D. Don) DC.	14
	Noticastrum decumbens (Baker) Cuatrec.	14
	Solidago chilensis Meyen	17
Cardueae	*Cirsium vulgare* (Savi) Tem.	14
Cynareae	*Arctium minus* Bernh.	14
Eupatorieae	*Adenostemma brasilianum* Cass.	11
	Ageratum conyzoides L.	1, 11, 13
	A. fastigiatum (Gardner) K. & R.	1, 2, 3, 6, 8, 9, 10, 11, 12
	Austroeupatorium silphiifolium (Martius) K & R	1, 10
	Barrosoa betonicaeformis (DC.) K & R	15
	Campovassouria cruciata (Vell. Conc.) K & R	15
	Campuloclinium macrocephalum (Lees) (DC)	14, 20
	C. purpurascens (Schultz-Bip. ex. Baker) K & R	1
	Chromolaena chaseae (B. Robinson) K & R	5
	C. congesta (Arn. and Hook) K & R	15
	C. laevigata (Lam.) K & R	5, 6, 8, 17
	C. squalida (DC) K & R	1, 2, 6
	C. stachyophylla (Sprengel) K & R	2, 9
	Grazielia gaudichaudeana (DC.) K & R	4
	G. intermedia (DC.) K & R	4
	Heterocondylus alatus (Vell. Conc.) K & R	2
	H. grandis (Schultz-Bip. ex Baker) K & R	19
	Koanophyllon thysanolepis (B. Robinson) K & R	2
	Mikania glaziovii Baker	10
	M. hastato-cordata Malme	21
	M. micrantha H. B. K.	11

Continue

Table 1. Continuation.

Tribe	Species	Location*
Eupatorieae (continuation)	*M. officinalis* Martius	2, 5
	Praxelis clematidea (Griseb.) R.M.King & H.Rob.	8, 21
	Symphyopappus cuneatus (DC.) Schultz-Bip. ex Baker	13
	S. itatiayensis (Hieron.) K & R	4
	Trichogonia villosa Schultz-Bip. ex. Baker	9
Heliantheae	*Bidens pilosa* L.	6
	Calea graminifolia Sch. Bip. ex Krasch	2
	Calea sp. 7	7
Mutisieae	*Actinoseris arenaria* (Baker) N. Roq.	9
	Gochnatia amplexifolia (Gardner) Cabrera	7
	Jungia floribunda Less.	19
Senecionae	*Erechtites hieraciifolia* L. (Raf.) ex DC	2, 3, 5
	E. valerianaefolia (Link ex Spreng.) DC	20
	Senecio adamantinus Bong.	2, 5
	S. jürgensenii Hemsl.	16, 19
	S. pinnatus Poir.	14
	S. pulcher Hook. & Arn.	15
Vernonieae	*Chrysolaena platensis* (Spreng.) H. Rob.	18
	Cyrtocymura scorpioides (Lam.) H. Rob.	7, 9
	Elephantopus mollis H. B. & K.	11
	Lessingianthus tomentellus (Mart. ex DC) H. Rob	9
	Lychnophora ramosissima Gardn.	2
	Vernonanthura chamaedrys (Less.) H. Rob.	15
	V. mariana (Baker) H. Rob.	2, 9
	V. montevidensis (Spreng) H. Rob.	16
	V. petiolaris (DC) H. Rob.	1
	V. subverticillata (Baker) H. Rob.	3
	V. tweedieana (Baker) H. Rob.	20

* Localities, by State: Minas Gerais: (1) Bocaina de Minas, (2) Diamantina, (3) Grão Mogol, (4) Itamonte, (5) Joaquim Felício, (6) Lima Duarte, (7) Ouro Branco, (8) Passa Quatro, (9) Santana do Riacho; Rio de Janeiro: (10) Itatiaia, (11) Resende; São Paulo: (12) Campos do Jordão, (13) São Bento do Sapucaí; Santa Catarina: (14) Bom Jardim da Serra, (15) Lages, (16) Matos Costa, (17) S. Cecília, (18) São Joaquim; Rio Grande do Sul: (19) Cambará do Sul, (20) Gravataí, (21) Guaíba

list of Asteraceae species from which *P. farinosus* has been reared. They were recorded from several cities of five states as follows: Minas Gerais: Diamantina, Grão Mogol, Ibitipoca, Itatiaia, Joaquim Felício, Ouro Branco, Passa Quatro, S. J. Chapada, Santana do Riacho, Serra da Canastra (Parque Nacional); Rio de Janeiro: Visconde de Mauá; São Paulo: Campos do Jordão; Santa Catarina: Bom Jardim da Serra, Lages, Matos Costa, Santa Cecília, São Joaquim, Urupema; Rio Grande do Sul: Cambará do Sul, Gravataí, Guaíba.

The data obtained represents the first occurrence of lauxaniids reared from flowerheads of Asteraceae. Since lauxaniids have been considered saprophagous and data from phytophagy must be cautiously considered according to Miller (1977b), more studies are needed to make clear if the larvae of *P. farinosus* were eating or not the vegetal tissues of the flowerheads. Lauxaniids were obtained from collections throughout the year, in different months (February; April; May; June; July; September; October; December), in different weather conditions. This would give a clue that they could not be eating just microorganisms, although we could not affirm that they are phytophagous.

The specimens of *P. farinosus* were all collected from 56 different plant species, belonging to 35 genera from eight tribes of Asteraceae (Table 1). Insects may use non-related plants that share key attributes such as chemical substances, or preferences for microhabitat or geographic distribution (Prado & Lewinsohn 2004), but data from McCall & Primack's studies (1992) indicate that the

relationship between insects and flowers are non specific and vary among the communities, such that the shape of flower, temperature, light and season of the year were the variables that most influenced insect visitation rates. The data found in the present study indicate that, at least for the identified taxon, does not exist specialization, according to McCall & Primack's (1992) criteria. In a different study on Diptera-Asteraceae interactions in the Cerrado region in the city of Assis, São Paulo State, flowerhead collections for a period of one year did not yield any lauxaniids (T. Yamada, personal communication).

It is believed that when *P. farinosus* females oviposit into the flowerheads, they are looking for appropriated places for larval development, with abundant food, which, in some cases, could be fungal hyphae in the flowerheads during decomposition. Data from these collections (e.g., variable relative humidity), do not correlate with possible presence of fungi.

An interesting fact was that only one species of lauxaniid was collected, despite the extensive sampling area and the fact that the family is highly diverse in the Neotropical region. The data also expands the known distribution for the species.

Overall, the results reinforce the need for further studies of the biology of Lauxaniidae in the Neotropical region.

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