

SCIENTIFIC NOTE

New Occurrence of non-Pollinating Fig Wasps (Hymenoptera: Chalcidoidea) in *Ficus microcarpa* in Brazil

FERNANDO H A FARACHE, VANESSA T DO Ó, RODRIGO A S PEREIRA

Depto. de Biologia, Faculdade de Filosofia, Ciências e Letras de Ribeirão Preto/USP, Av Bandeirantes 3900, 14040-901, Ribeirão Preto, SP; fhafarache@gmail.com, raspereira@yahoo.com.br

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Nova Ocorrência de Vespas não-Polinizadoras (Hymenoptera: Chalcidoidea) em Sicônios de *Ficus microcarpa* no Brasil

RESUMO - *Ficus microcarpa* é uma figueira asiática cultivada com finalidades ornamentais. A espécie polinizadora específica, *Eupristina verticillata* Waterston, e as não-polinizadoras *Walkerella microcarpae* Bouček e *Philotrypesis emeryi* Grandi, foram relatadas associadas a *F. microcarpa* no Brasil. No presente estudo, relatamos pela primeira vez a ocorrência de *Odontofroggata ishii* Wiebes e *Philotrypesis taiwanensis* Chen *et al* em *F. microcarpa* no Brasil. Nossos resultados sugerem que tais vespas foram introduzidas recentemente no país. Considerando que ~20 espécies de vespas são associadas a *F. microcarpa* em sua região de origem, novas ocorrências poderão ser registradas no futuro no Brasil.

PALAVRAS-CHAVE: Interação inseto-plantas, Moraceae, Pteromalidae, mutualismo, vespa-de-figo

ABSTRACT - *Ficus microcarpa* is an Asian fig tree that is ornamentally cultivated. The specific pollinator, *Eupristina verticillata* Waterston, and the non-pollinators *Walkerella microcarpae* Bouček and *Philotrypesis emeryi* Grandi, have been reported associated to *F. microcarpa* in Brazil. In here we report for the first time the occurrence of *Odontofroggata ishii* Wiebes and *Philotrypesis taiwanensis* Chen *et al* in *F. microcarpa* in Brazil. Our results suggest that *P. taiwanensis* and *O. ishii* represent a recent influx of these wasps into Brazil. Considering that ~20 fig wasp species are associated with *F. microcarpa* in its native area, novel occurrences can be reported in the future in Brazil.

KEY WORDS: Fig wasp, Moraceae, mutualism, plant-insect interaction, Pteromalidae

Ficus microcarpa is native to Asia and was introduced as an ornamental tree in many Brazilian towns. In 1938, its pollinator *E. verticillata* Waterston was introduced in North America (Nadel *et al* 1992), and in the early 1990's it arrived in Brazil.

Non-pollinating fig wasps developing in *F. microcarpa* figs in Brazil have been reported since the 1980's (Neves & Isaias 1987, Ramírez & Montero 1988, Figueiredo & Motta Jr 1993, Figueiredo *et al* 1995). *Walkerella microcarpae* Bouček was firstly reported in 1984 by Ramírez & Montero (1988). Strong sexual dimorphism occurs in this species, with winged female and wingless fighting males (Figueiredo & Motta Jr 1993). *Philotrypesis emeryi* Grandi was observed after 1988, in several towns in the state of São Paulo (Figueiredo *et al* 1995). Females of *P. emeryi* are winged and males are dimorphic, with fully winged and wingless forms (Beardsley 1998).

In this study, we report the occurrence of *Odontofroggata ishii* Wiebes and *Philotrypesis taiwanensis* Chen *et al* in *F. microcarpa* figs in Brazil. We studied cultivated fig trees in

urbanized areas, as *F. microcarpa* does not occur in forested habitats. Fig samples were taken haphazardly year along.

We sampled approximately 30 figs prior to wasp emergence in three *F. microcarpa* trees (total of 103 figs) at the Universidade de São Paulo, in Ribeirão Preto, São Paulo State (21°10'S 47°48'W), in March and September of 2005, and in April of 2006. Figs were individualized in plastic flasks to allow all wasps to emerge. Additionally, three massive fig samples were taken from trees in Rio Claro, SP (22°19'S 47°36'W), in December, 2006. Approximately 50 figs from each tree were put in a 500 ml jar covered with a *voil* cloth for wasp emergence. Identifications were based on published taxonomical keys and original specific descriptions (Ishii 1934, Wiebes 1980, Bouček 1993, Beardsley 1998, Chen *et al* 1999). Photos were taken with a Leica MZ16 stereoscope equipped with a DFC320 digital camera coupled with an image automontage software (CombineZM software).

Eupristina verticillata, *W. microcarpae*, *P. emeryi*, *P. taiwanensis* and *O. ishii* wasps (Fig 1) were present in

all samples from both localities. This is the first report of *P. taiwanensis* and *O. ishii* wasps in Brazil. *Philotrypesis taiwanensis* differs from *P. emeryi* because of its entire dark body (Fig 1C-D), the number of annelli (2 in the former and 3 in the later) and the number of mandible teeth (2 in the former and 3 in the later). *Odontofroggatia ishii* differs from other species of the genus because its propodeum has two rounded ridges in the anterior part, and its longitudinal

ridges are connected with the posterior margin in females (Fig 1F) (Wiebes 1980). Moreover, the male gastric petiole bears a pair of conspicuous lateral tooth-like projections (Fig 1G) (Beardsley 1998).

The pollinating species *E. verticillata* was the most abundant species in the sampled figs (~ 50 wasps per fig). The other species occurred in lower rates in figs (2.7 to 3.6 wasps per fig in average, Table 1). *Philotrypesis taiwanensis*

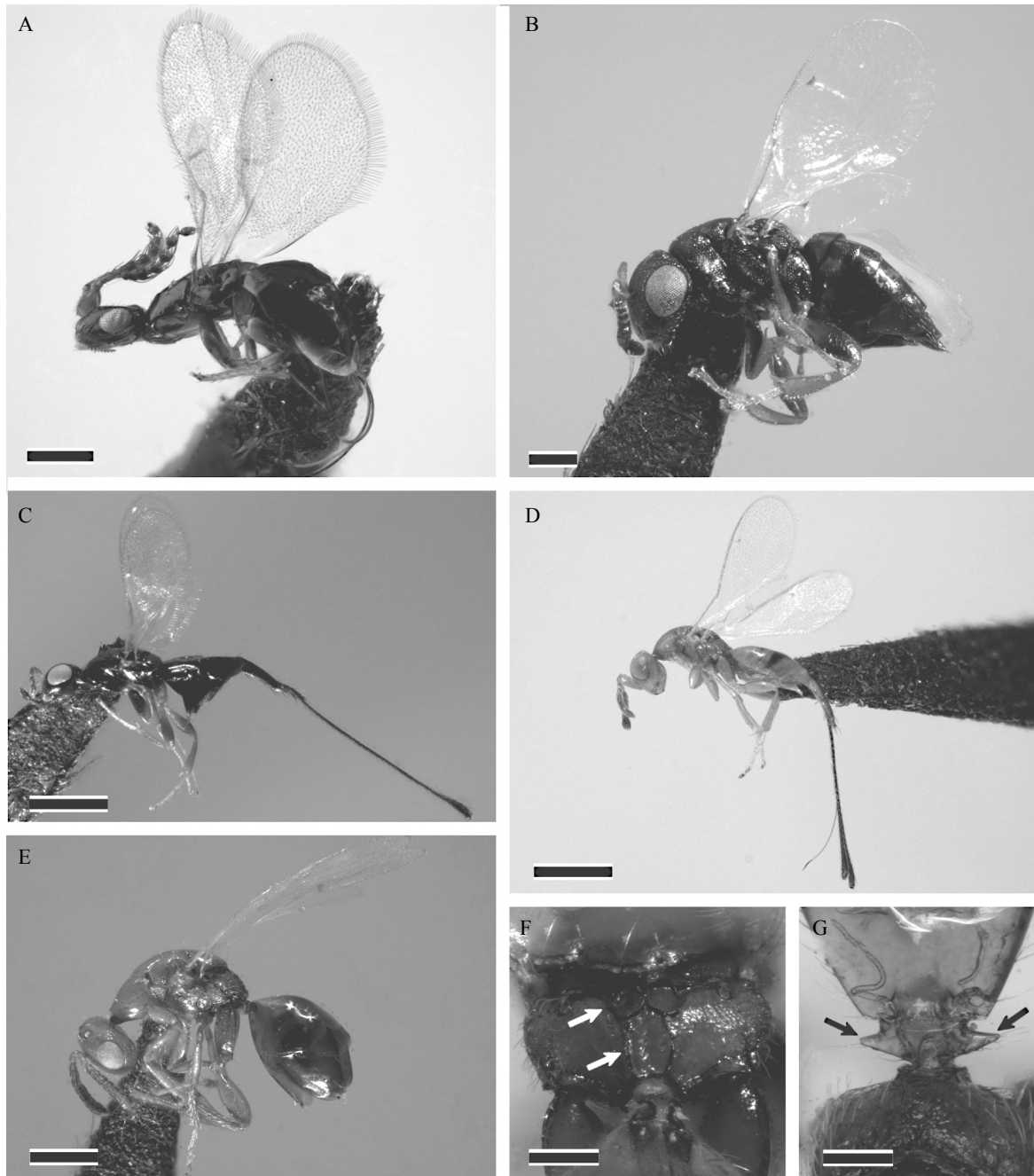


Fig 1 Females of fig wasps associated with *Ficus microcarpa* in Brazil. A – *Eupristina verticillata*; B – *Walkerella microcarpae*; C – *Philotrypesis taiwanensis*; D – *Philotrypesis emeryi*; E – *Odontofroggatia ishii*; F – *O. ishii*: female propodeum with the rounded and longitudinal ridges (arrows), and G – *O. ishii*: male gastric petiole with a pair of lateral tooth-like projections (arrows). Scale bars: A-B = 0.2 mm, C-E = 0.5 mm and F-G = 0.1 mm.

Table 1. Quantitative data of fig wasp fauna associated with *F. microcarpa* in Brazil. N = number of figs used to count wasps. In the last sampled tree in Ribeirão Preto (April, 2006) only *P. taiwanensis* and *O. ishii* were quantified. We excluded figs where the focal species did not occur to estimate abundance rates.

Species	Subfamily	N	Frequency	Abundance (X ± SD)
<i>Eupristina verticillata</i>	Blastophaginae	51	0.55	51.6 ± 35.68
<i>Walkerella microcarpa</i>	Otitellinae	51	0.67	3.3 ± 1.94
<i>Philotrypesis emeryi</i>	Sycoryctinae	51	0.55	3.4 ± 2.47
<i>Philotrypesis taiwanensis</i>	Sycoryctinae	100	0.17	3.2 ± 4.06
<i>Odontofroggatia ishii</i>	Epichrysomallinae	100	0.30	2.3 ± 1.60

and *O. ishii* were less frequent (they occurred in 17 and 30% of figs, respectively) than the other species (55 to 67% of figs, Table 1).

Philotrypesis taiwanensis and *O. ishii* have been reported in areas where *F. microcarpa* naturally occurs (Chen *et al* 1999), or where it was introduced, such as Hawaii, California and Florida (Beardsley 1998). Our results suggest that *P. taiwanensis* and *O. ishii* represent a recent influx of such wasps into Brazil. Neither species were reported in a previous exhaustive study in Southeastern Brazil (Figueiredo *et al* 1995). Moreover, the frequency of infested figs by *P. taiwanensis* and *O. ishii* is lower than that observed for the other three previously reported species.

At least 20 fig wasp species have already been reported in their native areas (Beardsley 1998, Chen *et al* 1999) and nine species were recorded in Hawaii (Beardsley 1998). Taking into account the diversity of fig wasps that inhabit *F. microcarpa* figs and the gradual influx of associated species in Brazil, new occurrences will probably be reported in the future. Such events open new opportunities for future studies on the fig wasp fauna in Brazil.

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References

Beardsley J W (1998) Chalcid wasps (Hymenoptera, Chalcidoidea) associated with fruit of *Ficus microcarpa* in Hawaii. Proc Hawaii Entomol Soc 33: 19-34.

Bouček Z (1993) The genera of chalcidoid wasps from *Ficus* fruit in the new world. J Nat Hist 27: 173-217.

Chen Y R, Chuang W C, Wu W J (1999) Chalcid wasps on *Ficus microcarpa* L. in Taiwan (Hymenoptera: Chalcidoidea). J Taiwan Mus 52: 39-79.

Figueiredo R A, Motta Jr J C (1993) Biology of *Walkerella yashiroi* (Ishii) (Hymenoptera, Chalcidoidea). Naturalia 18: 27-32.

Figueiredo R A, Motta Jr J C, Vasconcellos L A S (1995) Pollination, seed dispersal, seed germination and establishment of seedlings of *Ficus microcarpa*, Moraceae, in southeastern Brazil. Rev Brasil Biol 55: 233-239.

Ishii T (1934) Fig chalcidoids of Japan. Kontyu 8: 84-100.

Nadel H, Fran J H, Knight Jr R J (1992) Escapees and accomplices: the naturalization of exotic *Ficus* and their associated faunas in Florida. Fla Entomol 75: 29-38.

Neves L J, Isaias R M S (1987) Ocorrência de agente galhador em flores de *Ficus microcarpa* L.f. Bradea 4: 327-330.

Ramírez-B W, Montero-S J (1988) *Ficus microcarpa* L., *F. benjamina* L. and other species introduced in the New World, their pollinators (Agaonidae) and other fig wasps. Rev Biol Trop 36: 441-446.

Weiblen W B (2002) How to be a fig wasp. Annu Rev Entomol 47:229-330.

Wiebes J T (1980) The genus *Odontofroggatia* Ishii (Hymenoptera, Chalcidoidea, Pteromalidae, Epichrysomallinae). Zool Meded 56: 1-6.

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