

SHORT COMMUNICATION

On the first tachinid fly (Diptera, Tachinidae) carrying Asclepiadoideae pollinaria in the Neotropical Region

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ABSTRACT. On the first tachinid fly (Diptera, Tachinidae) carrying Asclepiadoideae pollinaria in the Neotropical Region. This paper reports the first Neotropical Tachinidae species possibly associated to pollination of Asclepiadoideae: a female of *Euacaulona sumichrasti* Townsend, 1908 (Diptera, Tachinidae, Phasiinae, Trichopodini) carrying pollinaria of *Gonolobus parviflorus* Decne., 1844 (Apocynaceae, Asclepiadoideae, Asclepiadeae: Gonolobinae) attached to its proboscis. The fly specimen was collected in Paraguay, Departamento Canindeyú. The pollinarium is illustrated and described herein. This represents the first anthophilous record to *G. parviflorus* and to the genus.

KEYWORDS. Anthophily; Apocynaceae-Asclepiadoideae; *Euacaulona*; *Gonolobus*; pollination; Trichopodini.

RESUMO. Sobre o primeiro taquinídeo (Diptera, Tachinidae) carregando polinários de Asclepiadoideae na Região Neotropical. Esta contribuição relata a primeira espécie neotropical de Tachinidae possivelmente associada à polinização de Asclepiadoideae: uma fêmea de *Euacaulona sumichrasti* Townsend, 1908 (Diptera, Tachinidae, Phasiinae, Trichopodini) transportando dois polinários de *Gonolobus parviflorus* Decne., 1844 (Apocynaceae, Asclepiadoideae, Asclepiadeae: Gonolobinae) presos à sua probóscide. O espécime foi coletado no Paraguai, Departamento Canindeyú. O polinário é ilustrado e caracterizado. Este é o primeiro registro de antofilia para *G. parviflorus* e para o gênero.

PALAVRAS-CHAVE. Antofilia; Apocynaceae-Asclepiadoideae; *Euacaulona*; *Gonolobus*; polinização; Trichopodini.

Pollination of Asclepiadoideae (Apocynaceae) flowers occurs with the removal of pollinaria (each pollinarium consisting of a translator apparatus bearing two pollinia on each side) and then the pollinia insertion into the stigmatic chambers, with the removal and transport being performed by insects (Vieira & Sheperd 1999). Nevertheless, only flower visitation and the ability to carry pollen do not qualify an anthophilous insect as a pollinator (Kevan & Baker 1983). To be an effective pollinator, it must visit the flowers in such a way as to transfer pollen regularly from anthers to stigmata, either between plants, between flowers on the same plant, or within the same flower (Larson *et al.* 2001).

Pollination and reproduction of plants have been studied since the eighteen century (Perry 1938). With regard to Asclepiadoideae, Knuth (1909) described in details the pollination in several milkweeds species, providing a list of insects discriminated whether visitors, nectar thieves or pollinators according to the position of the translators found attached to the insect body. Schill & Jäkel (1978) studied the pollinaria of 408 asclepiad species (including *G. parviflorus*) under optic, scanning and transmission microscopy techniques. Several collectors have observed (according to the collecting labels) a repulsive scent emitted by the flowers of *G. parviflorus*. Addi-

tionally, Asclepiadoideae is placed first in a list of plant families (Faegri & van der Pijl 1980) which adopt myiophily, by producing substances which stimulate feeding or ovipositing by flies or by having trapping-flowers.

Diptera appears as the third most recorded insect order pollinating the Asclepiadoideae, after Hymenoptera but close to Lepidoptera. On the other hand, for some groups (Marsdeniae, Ceropegieae and Asclepiadeae-Gonolobinae) the dipteran species play a major role in their pollination system (Ollerton & Liede 1997). Within the dipterans, the Tachinidae are considered the main pollinators of the Asclepiadeae, while with lower importance (frequency below 20%) to pollination of remaining species of Asclepiadoideae belonging to Ceropegieae (as 'Stapeliae'), Marsdeniae and Asclepiadeae-Gonolobinae (Ollerton & Liede 1997).

This paper reports the first Neotropical Tachinidae species possibly associated to pollination of Asclepiadoideae. The fly specimen was collected from Paraguay, Departamento Canindeyú. This is also the first anthophilous record to the genus *Gonolobus*.

Report of the anthophily. We found one female of *Euacaulona sumichrasti* Townsend, 1908 (Tachinidae, Phasiinae, Trichopodini) carrying pollinaria of *Gonolobus*

parviflorus Decne., 1844 (Apocynaceae, Asclepiadoideae, Asclepiadeae, Gonolobinae) attached to its proboscis (Figs. 1, 2). The tachinid fly specimen was collected from Paraguay, Departamento Canindeyú, Estancia Rio Corrientes (24°05'S, 54°35'W) on 26–30 January 1984 by T. Bonace, and is deposited at the Department of Zoology, Universidade Federal do Paraná, Curitiba, Brazil (DZUP).

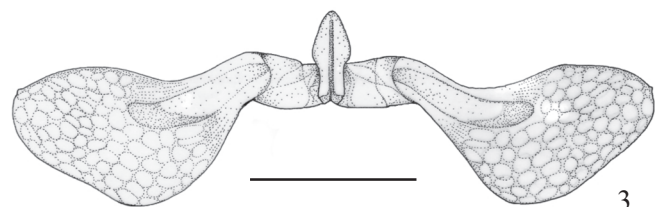
This tachinid is the single species belonging to genus *Euacaulona* Townsend, 1908 (Guimarães 1971; Toma 2003), and its distribution ranges on Mexico, Guiana, Brazil (Amazonas, Santa Catarina, Paraná) and Paraguay (new record) (Toma 2003).

According to ASCLEPOL Database (Ollerton & Liede 2010), a global compilation of anthophilous insects associated with Asclepiadoideae, there is a total of 24 tachinid entries (recognized as genera or species) recorded on 16 asclepiad species (Table I). The present note is the first record of a Neotropical tachinid on Asclepiadoideae, and only the fourth world record for Trichopodini (the other three with Nearctic species of *Trichopoda* Berthold, 1827 and *Xanthomelanodes* Townsend, 1893, Table I). Tachinid flies are characterized as having parasitoid larvae which grows inside arthropod hosts (mainly insects) and, because the regular flower visitation, the adults are considered nectarivores anthophilous, nonetheless the importance of flower to their bionomics is scarcely known (Larson *et al.* 2001).

Although this record supports *E. sumichrasti* as pollinaria carrier, there is no data in the literature whether it could be an effective pollinator. In ASCLEPOL Database, all the recordings of Tachinidae on Asclepiadoideae are characterized by observations of flies with pollinaria or pollinia attached to some part of the body. Under natural conditions, there is no evidence that tachinids are able to carry pollinia and transfer them to the flower's stigma. In fact, observation of effective pollination is very rare among the Diptera, with only two cases registered so far (for Sciaridae and Chloropidae species on *Marsdenia cymulosa* Benth. in Australia) (Ollerton & Liede 2010).

This is the first anthophilous record to *G. parviflorus*, and also to genus *Gonolobus*. Previously, an undetermined species of Calliphoridae (Diptera) was recognized carrying pollinia of *G. argentinensis* T. Mey. in Argentina (Ollerton & Liede 2010), but the current identity of this plant species is *Matelea fiebrigii* (Schltr.) Goyder (Goyder 2006). Another species of *Matelea*, *M. reticulata* (Engelm. ex A.Gray) Woodson from Mexico, was recorded as visited by an undetermined species of Tachinidae (Ollerton & Liede 2010). Interestingly, *Gonolobus* and *Matelea* are both members of Gonolobinae, and cladistic analyses have indicated a close relationship (Rapini *et al.* 2003, 2007; Liede-Schumann *et al.* 2005; Krings *et al.* 2008) and, perhaps, they could even constitute a single broad genus (Krings *et al.* 2008). Despite any nomenclatural decision concerning *Gonolobus* and *Matelea*, this clade gathers three records in the Neotropics. More recently, Medeiros *et al.* (2008) reported the presence of pollinaria of two different species of *Tassadia* Decne. attached to the mouthparts

of four species of *Cerqueirellum* Py-Daniel, 1983 (Diptera, Simuliidae) in Northern Brazil (Amazonia).



Figs. 1–3. 1, Head of *Euacaulona sumichrasti* Townsend in lateral view showing the pollinaria (indicated with arrow) attached to its proboscis; 2, Detail of the proboscis and the pollinaria in the opposite view. Scale bar = 1 mm; 3, Pollinarium of *Gonolobus parviflorus* Decaisne found attached to the proboscis of *Euacaulona sumichrasti*. Scale bar = 410 μ m.

Table I. List of Asclepiadoideae species and their anthophilous Tachinidae species (from Ollerton & Liede 2010). Plant species accompanied by their recording place; fly species accompanied by their systematic placement.

Plant species (by subfamily)	Recording site	Tachinidae species	Tachinidae subfamily and tribe
Asclepiadoideae-Asclepiadinae			
<i>Asclepias incarnata</i> L.	USA	<i>Gymnocyttia occidua</i> (Walk.)	Phasiinae: Gymnosomatini
		<i>Trichopoda lanipes</i> (Fabr.)	Phasiinae: Trichopodini
		<i>Panzeria</i> sp.	Tachininae: Ernestiini
<i>Asclepias purpurascens</i> L.	USA	<i>Spallanzania hesperidarum</i> (Williston)	Exoristinae: Goniini
		<i>Spallanzania</i> sp.	Exoristinae: Goniini
<i>Asclepias speciosa</i> Torr.	USA	<i>Pararchytas decius</i> (Walk.)	
<i>Asclepias syriaca</i> L.	USA	<i>Belvosia bifasciata</i> (Fabr.)	Exoristinae: Goniini
		<i>Belvosia unifasciata</i> (R.-D.)	Exoristinae: Goniini
		<i>Trichopoda plumipes</i> (Fabr.)	Phasiinae: Trichopodini
		<i>Linnaemyia</i> sp.	Tachininae: Ernestiini
		<i>Archytas analis</i> (Fabr.)	Tachininae: Tachinini
<i>Asclepias tuberosa</i> L.	USA	<i>Spallanzania hesperidarum</i>	Exoristinae: Goniini
		<i>Spallanzania</i> sp.	Exoristinae: Goniini
<i>Asclepias verticillata</i> L.	USA	<i>Spallanzania hesperidarum</i>	Exoristinae: Goniini
		<i>Spallanzania</i> sp.	Exoristinae: Goniini
		<i>Linnaemyia</i> sp.	Tachininae: Ernestiini
		<i>Archytas analis</i>	Tachininae: Tachinini
		<i>Archytas apicifer</i> (Walk.)	Tachininae: Tachinini
		<i>Cylindromyia euchenor</i> (Walk.)	Phasiinae: Cylindromyiini
		<i>Xanthomelanodes arcuatus</i> (Say)	Phasiinae: Trichopodini
Asclepiadoideae-Metastelmatinae			
<i>Cynanchum formosum</i> N.E.Br.	Peru	undet. Tachinidae	
<i>Cynanchum leave</i> (Michx.) Pers.	USA	<i>Phasia aeneoventris</i> (Williston)	Phasiinae: Phasiini
		<i>Panzeria</i> sp.	Tachininae: Ernestiini
<i>Cynanchum viminale</i> L.	South Africa	undet. Tachinidae	
Asclepiadoideae-Astephaninae			
<i>Vincetoxicum nigrum</i> (L.) Moen.	USA	undet. Tachinidae	
Asclepiadoideae-Gonolobinae			
<i>Matelea reticulata</i> (Engelm. ex Gray) Woods.	Mexico	undet. Tachinidae	
Marsdenia			
<i>Cosmostigma racemosa</i> Wight	India	<i>Blepharipa</i> sp.	Exoristinae: Goniini
		<i>Lophosia imbuta</i> (Wied.)	Phasiinae: Cylindromyiini
<i>Gymnema sylvestre</i> (Retz.) Schultes	India	undet. Tachinidae	
<i>Marsdenia tenacissima</i> Wight & Arn.	India	undet. Tachinidae	
Ceropegieae			
<i>Duvalia pubescens</i> N.E.Br.	South Africa	undet. Tachinidae	
<i>Stapelia</i> sp.	India	undet. Tachinidae	

Description of the pollinarium of *G. parviflorus*. Attached to the proboscis of *E. sumichrasti* there were one entire pollinarium and another pollinium bearing a single caudicle. Below we provide a morphological description of the pollinarium. Examination and morphometric data were made using an Olympus microscope, and drawings were made using the same microscope but coupled with a camera lucida.

Pollinarium (Fig. 3): Corpusculum with total length 0.222 mm, length above caudicles 0.139 mm, width at upper mid

third 0.057 mm, width at middle 0.090 mm, width at lower mid third 0.065 mm, sagittiform, clearly smaller than pollinia. Caudicles (or translator arms) with upper length 0.082–0.164 mm, basal length 0.074–0.164 mm, width at corpusculum 0.082–0.107 mm, horizontal, articulated and with a reticulate membrane. Pollinia with length 0.609–0.683 mm, width 0.312–0.345 mm, its shape from trapezoid to subromboid, sterile and excavate at about the center of proximal part (Morphological terminology following Newton 1984, and Kunze 1991, 1995).

Geographical distribution of *G. parviflorus*. Searching through online databases of non-Brazilian collections (CHG 2010; FMNH 2010; IBODA 2010; SMNH 2010; NYBG 2010), we found records of South American samples of *G. parviflorus* collected in Argentina, Bolivia, Ecuador, Peru, Paraguay and Brazil. In Brazil, it is represented by less than 20 specimens from the states of Mato Grosso do Sul, Minas Gerais, Rio de Janeiro, São Paulo, Paraná and Santa Catarina. In Paraguay, there are records by the collectors Hassler and Fiebrig (CHG 2010; IBODA 2010) which account a total of eight specimens (this material are referred to under the names *Gonolobus selloanus* (E.Fourn.) Bacigalupo or *Exolobus selloanus* E.Fourn., which are currently junior synonyms of *G. parviflorus*). There is no record of *G. parviflorus* for the locality from which the tachinid fly was captured (Departamento Canindeyú, Estancia Rio Corrientes). The Departamento Canindeyú is characterized by dry and riparian forests of the Atlantic Forest biome, and these are mostly preserved within conservation units close to the boundary with Brazil (Spichiger *et al.* 1992; Monge 2009). The preferred habitats of *G. parviflorus* are the sunspots and the forest edges (Fontella-Pereira *et al.* 1985).

The geographical distribution of *G. parviflorus* ranges from Ecuador, Peru, Bolivia, Brazil (Mato Grosso do Sul, Minas Gerais, Rio de Janeiro, São Paulo, Paraná and Santa Catarina), Argentina and Paraguay (Fontella-Pereira *et al.* 1985; CHG 2010; FMNH 2010; IBODA 2010; SMNH 2010; NYBG 2010).

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