



The predator *Coenosia Attenuata* Stein (Diptera, Muscidae) on cultivated plants from Brazil

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ABSTRACT

Coenosia attenuata Stein (1903) is a predatory fly that is commonly found in greenhouses and open fields preying on whiteflies, leafminers, psocopterans and other insects. The species is widespread in the Old World and its distribution has expanded in recent times to Neotropical countries including Chile, Colombia, Costa Rica, Ecuador and Peru. We report here for the first time the presence of *C. attenuata* in Brazil, occurring in different sites in the State of Ceará (Northeastern Brazil). Expansion of the distribution range of this muscid to the eastern parts of South America opens up the possibility of applying the beneficial predator as a biological control agent for protected crops of the region.

Key words: Biological control, geographical distribution, hunter-fly, natural enemy, tiger-fly.

INTRODUCTION

The predator fly *Coenosia attenuata* Stein (1903) (Muscidae, Coenosiinae), commonly known as the tiger-fly or hunter-fly, is widespread in Palaearctic, Afrotropical, Oriental, and Australian regions (Couri and Salas 2010), and its distribution has expanded in recent times to the Nearctic and Neotropical regions. In Central and South America, observations of this species were first reported some 15 years ago and now cover Costa Rica (Hernández-Ramírez 2008), Ecuador and Peru (Martínez-Sánchez et al. 2002), Colombia (Pérez 2006) and Chile (Couri and Salas 2010). A redescription of *C. attenuata* and a review of the available European literature relating to the biology and habits of this species are available (Hoebeke et al. 2003).

Tiger-flies are commonly found in greenhouses and open fields. Adults measure 2.5 to 4.0 mm and exhibit sexual dimorphism whereby the females are slightly larger than the males, grayish in color with darker stripes on the abdomen, while fully the dichoptic males are grayish with yellow legs, brown tarsi and silver lunule and frons (Couri and Salas 2010). Under controlled conditions (25°C and 70% relative humidity), the complete life cycle of *C. attenuata* takes 26 days with the larval and pupal stages each lasting 10 days (Prieto et al. 2005). Both larvae and adults are polyphagous, preying mainly on whiteflies, leafminer flies, psocopterans and other insects (Mateus 2012). Moreover, according to Uguine et al. (2010), tiger-fly larvae have the capacity to feed on a large numbers of fungus gnats.

In consideration of its feeding behavior, *C. attenuata* is recognized as an effective predator of greenhouse pests with promising application in

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biological control. Martins et al. (2012) investigated the predatory capacity, under laboratory conditions, of the muscid against several insects, including other natural enemies (predators and parasitoids) and pests that commonly attack protected crops, and reported that the tiger-fly was able to kill all of the species tested. In a study of the spatial distribution, flight and predator activities of *C. attenuata* on crops of cucumber, sweet pepper and tomato cultivated in greenhouses, Mateus (2012) found that 59% of the selected prey were whiteflies and that many flights of the predators were associated with territorial behavior rather than predatory activity. A review article by Pohl et al. (2012) described the presence of the predator for the first time in Turkey and highlighted its importance in the control of greenhouse pests. These authors also reported that *C. attenuata* can not only colonize greenhouses from the outside for short periods but can also complete their developmental cycle in greenhouse soil and become established *in situ* for protracted periods.

In this paper, we report for the first time the occurrence of *C. attenuata* in Brazil. We found it [or the introduced species] in several localities in the State of Ceará (Northeastern Brazil) in chrysanthemum (*Chrysanthemum morifolium* Ramat.) and tomato (*Solanum lycopersicum* L.) crops in greenhouses and a crop of baby's breath flower (*Gypsophila paniculata* L.) in the open.

MATERIALS AND METHODS

Muscid flies were captured in November 2016 and January 2017 at three sites in the municipalities of São Benedito and Guaraciaba do Norte, situated in the Serra da Ibiapaba region of Ceará State, northeastern Brazil, approximately 350 km from the State capital (Fortaleza) (Table I).

Insects were trapped using entomological nets in greenhouses with crops of chrysanthemum (*Chrysanthemum morifolium* Ramat.) (Figure 1)

and tomato (*Solanum lycopersicum* L.) (Figures 2 and 3) and in an open crop of baby's breath flowers (*Gypsophila paniculata* L.) (Figure 4). Adult flies were preserved in 95% ethanol and transferred to the Laboratory of Diptera at the Museu Nacional, Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ, Brazil, where they were mounted on entomological pins and labelled. MC identified the specimens which are now deposited at the collection of Museu Nacional, Universidade Federal do Rio de Janeiro (MN, UFRJ).

RESULTS AND DISCUSSION

A total of 37 muscid flies, each identified unambiguously as *C. attenuata*, were captured at the three study sites comprising 17 on greenhouse chrysanthemums, 4 on greenhouse tomatoes and 16 on the crop of baby's breath flowers (Table I). The overall frequency of captured females (65%) was higher than that of males (35%).

In crops growing in protected environments, the predation capacity of *C. attenuata* is high for a wide range of prey, although female flies exhibit a probable food preference for whiteflies and the larvae of leafminer flies (Martins et al. 2012). Studies performed in greenhouses with tomato crops revealed that the predation flight activities of *C. attenuata* against whiteflies are influenced by temperature and the level of visibility at the hunting site (Bonsignore 2016). Interestingly, females performed more predatory flights and territorial defense activities in comparison with males.

An important practical issue associated with the potential application of *C. attenuata* as a biological control agent is that of rearing flies in sufficient quantities at reasonable cost. Some progress in this area has been reported recently by Martins et al. (2015), who described a method for rearing muscid flies in the laboratory and established the optimal levels for various critical parameters such as number of rearing cages and

TABLE I
Summary of specimens of *Coenosia attenuata* Stein (Diptera, Muscidae) captured in entomological nets placed in greenhouses, protected crop and in an open field site in Northeastern Brazil by Sousa and Braga.

| Crop | Collection site | Coordinates and altitude | Collection date | Number of individuals |
|---------------------------------------|---|---|-----------------|-----------------------|
| <i>Chrysanthemum morifolium</i> Ramat | São Benedito, Ceará, Brazil (greenhouse) | 04°03'53.6" S 40°53'43.4" W 889 m | 24.xi.2016 | 4♂, 10♀ |
| | | | 26.i.2017 | 1♂, 2♀ |
| <i>Solanum lycopersicum</i> L. | Guaraciaba do Norte, Ceará, Brazil (protected crop) | 04°03'53.7" S 40°53'43.4" W 868 m | 25.i.2017 | 2♂, 2♀ |
| <i>Gypsophila paniculata</i> L. | São Benedito, Ceará, Brazil (open field) | 04°03'50.5" S 40°53'14.5" W 855 m | 24.xi.2016 | 5♂, 6♀ |
| | | | 26.i.2017 | 1♂, 4♀ |



Figure 1 - (1) Image of *Chrysanthemum morifolium* Ramat. greenhouses; (2) Image of *Solanum lycopersicum* L. protected crop, external overview of the culture; (3) Image of *Solanum lycopersicum* L. protected crop, internal view of the culture; (4) Image of *Gypsophila paniculata* L. open crop.

adequate substrates for oviposition and rearing of larvae. Such methods may be applicable to other members of the “greenhouse predator community”, which includes *Coenosia* species such as *C. atra* Meigen (1830), *C. humilis* Meigen (1826), *C. strigipes* Stein (1916), *C. tigrina* Fabricius (1775) and *C. testacea* Robineau-Desvoidy (1830), since they all prey on whiteflies, black fungus gnats and leaf-miner flies and have potential application as biological control agents (Kühne 2000).

Documentation of the presence of *C. attenuata* in Brazil is very important because it demonstrates that the range of the predator has expanded towards the eastern parts of South America. In this context, Seabra et al. (2015) investigated the geographical dispersal patterns of the tiger-fly through phylogenetic studies involving mitochondrial cytochrome oxidase I and nuclear white and elongation factor-1 α genes. According to these authors, the most likely region of origin of the species is the Mediterranean and that colonization of the New World was probably a result of three independent colonization's, one from the Middle East to North America, another from Europe to South America (Chile) and a third from an undetermined origin to South America (Ecuador).

The present new record of *Coenosia attenuata* reinforces the question about which would be the geographical origin of the populations, for example, how the Chilean populations that came from Europe spread out to the Northeastern of Brazil? This question is, of course, a further question to be analyzed.

The presence of *C. attenuata* in Brazil, described here for the first time, provides an opportunity to study the biology and ecology of this insect in new settings and opens up the possibility of applying the natural predator as a biological control agent for protected crops of the region.

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