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Description of the pupal case of *Systropus (Systropus) nitidus* Wiedemann, 1830 (Diptera, Bombyliidae, Toxophorinae, Systropodini)

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ABSTRACT

The pupal case of Systropus *(*Systropus*)* nitidus *Wiedemann reared from an unidentified tipical Limacodidae (Lepidoptera) cocoon is described and illustrated for the first time. Only species of Limacodidae are recorded as host of the immature stages of* S. *(*Systropus*). The geographical distribution of* S. *(*Systropus*)* nitidus *is restricted to Brazil, from Pará to Santa Catarina states. This is the first pupal case description and illustration of a Neotropical species of the subgenus* Systropus.

Keywords: Morphology; Pupal skins; Parasitoids; Moth; Bee flies.

INTRODUCTION

Bombyliidae is a large family of Diptera which includes species whose larvae are predators or parasites (Metcalf & Flint, 1984). There are many reports in literature of specimens from the subgenus *Systropus* Wiedemann (1820) being parasitoids of Limacodidae larvae (Lepidoptera) (Adams & Yanega, 1991), showing to have considerable specificity between these bee flies and the larvae of Limacodidae, as the moths of this family are the only known records of parasitism by the subgenus *Systropus* (Yeates & Greathead, 1997).

The subgenus *Systropus* Wiedemann (*Systropus,* Systropodini, Toxophorinae) includes over 140 species distributed worldwide, the majority occurring in Oriental region (Evenhuis & Greathead, 1999). The species are remarkable, among all Bombyliidae, by the thin and long shape of its body, typically very wasp-like in appearance (Adams & Yanega, 1991).

There is some evidence for evolutionary shifts in the Systropodini regarding the position of the host in the environmental, means of host location (above ground) and host range (Yeates & Greathead, 1997). Evidence suggests that the plesiomorphic behaviour in the subfamily Toxophorinae is for host to be located in the ground or substrate layer (Yeates & Greathead, 1997). *Systropus,* on the other hand, oviposits large black eggs only onto the integument of the

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limacodid larvae (Genty, 1972) that feed on foliage above the substrate (Yeates & Greathead, 1997) and apparently develop as internal parasites of the moth larvae, emerging from the host cocoons (Greathead, 1987).

Carrera & D'Andretta (1950) revised and redescribed the Brazilian species of *Systropus* including *S.* (*S.*) *nitidus* Wiedemann, 1830. No reference to the immature stages or host records was made by the authors.

Very little is known about the immature stages of the subgenus *Systropus.* From the actually 149 included species (Evenhuis & Greathead, 1999), descriptions of pupal skins are available for only three of them: the Afrotropical *Systropus* (*Systropus*) *barnardi* Hesse, 1938 and *S.* (*S.*) *crudelis* Westwood, 1876 and the Nearctic *S.* (*S.*) *macer* Loew, 1863 (Westwood, 1876; Hesse, 1938; Brooks, 1952).

The present study describes and illustrates for the first time the pupal case of a Neotropical species of the subgenus *Systropus: S.* (*S.*) *nitidus.* The species is restricted to Brazil (Amapá, Goiás, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Pará, Paraná, Rio de Janeiro, Santa Catarina and São Paulo) (Evenhuis & Greathead, 1999) and this is the first record of a Brazilian Systropodini parasitizing a Limacodidae moth larvae.

MATERIAL AND METHODS

This paper is based on a single pupal skin from Ipiranga (São Paulo, SP, Brazil), which is glued in a paper triangle, pinned separated from the adult specimen. Both, adult and pupal skin, are deposited at the Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil (MZUSP).

The analysis and illustrations were made using stereomicroscope Zeiss Stemi SV 6 equipped with a camera lucida.

RESULTS

Systropus (Systropus) nitidus Wiedemann (Figs. 1 A-E)

Systropus nitidus Wiedemann 1830:2, 641; Westwood 1842:3-4; Schiner 1868:135; Westwood 1876:577; Osten Sacken 1887:1, 157; Dyar 1900:526; Bezzi 1905:2, 270; Kertész 1909:5, 95; Bezzi 1912:10, 82; Curran 1942:80, 51; Carrera & D'Andretta 1950:295, 296, 303, 304, 306, 318, 319; Adams & Yanega 1991:444; Herrera & Rodríguez 1998:1-2; Evenhuis & Greathead 1999:65; Couri *et al.* 2000:91, 94, 96; Flores-Pacheco *et al.* 2006:71.

Pupal case: (Fig. 1A) Length: 21.17 mm. Head width: 3.36 mm. Thorax width: 3.09 mm. Abdominal width: 5.00 mm, tapering to 0.45 mm at width of anal segment (n = 1).

Coloration: predominantly light brown.

Head: Without cephalic spines, tubercles or setae, only a reduced transverse sharp ridge (Fig. 1B) above antennal sheaths, both dark brown; antennal sheaths external, long, almost reaching tip of labrum, united dorsally on the median line forming a low ridge (Fig. 1C); mouth-parts long, apex of labellum almost reaching wing tip (Fig. 1D).

Thorax: Dark brown, with a humpbacked appearance; thorax and appendages without spines, tubercles, or setae; prothoracic spiracles light brown, raised above surface and located posterior to the head (Fig. 1A).

Abdomen: Tergite I predominantly dark brown; tergites II-VII with a central row of chitinous rods, orange with dark brown tip, each ones slightly upturned at the apex, almost all with similar length, only those along midline slightly shorter, except on tergite VIII, with short and long chitinous rods interspersed (Fig. 1E); anterior margin of tergites II-VIII with incomplete dark brown bands at center and not reaching sides of the tergites (Fig. 1E); anal segment milky white to light brown, with one pair of small tubercles at center, each one with a small round reddish spot at apex; anal segment also port a tumid or tubercular process terminally on each side, thus forming a bifid process (Fig. 1E). Pleurae II-VII with conspicuous bristle-like processes at center and small light brown spiracles placed on anterior margin of pleura. Pleura VIII with dark brown spiracles rounded by a circular milky white to light brown area (Fig. 1A).

Host: Lepidoptera (Limacodidae).

Examined material: BRAZIL: *São Paulo,* Ipiranga, II.1915, 01 puparium, deposited at Museu de Zoologia da Universidade de São Paulo (MZUSP), São Paulo, Brazil.

Geographical records: Brazil: Amapá, Goiás, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Pará, Paraná, Rio de Janeiro, Santa Catarina and São Paulo.

Comments: There is a doubtful record of *S.* (*Systropus*) *nitidus* parasitizing larvae of *Acharia fusca* (Stoll) in San Alberto Colombia (Genty, 1972). As the author did not mentioned where the voucher specimens are deposited or who has determinate the bee flies, this record in Colombia is not considered here as valid.

DISCUSSION

Despite of the lack of information about the host associated with the studied material of *Systropus* (*Systropus*) *nitidus,* there is a tipical Limacodidae pupal case pinned together, from where the adult bee fly reared and its pupal case was kept, confirming the moths of this family as the only known host of the subgenus *Systropus.* As stated by Yeates & Greathead (1997), this specific relationship between the Limaco-

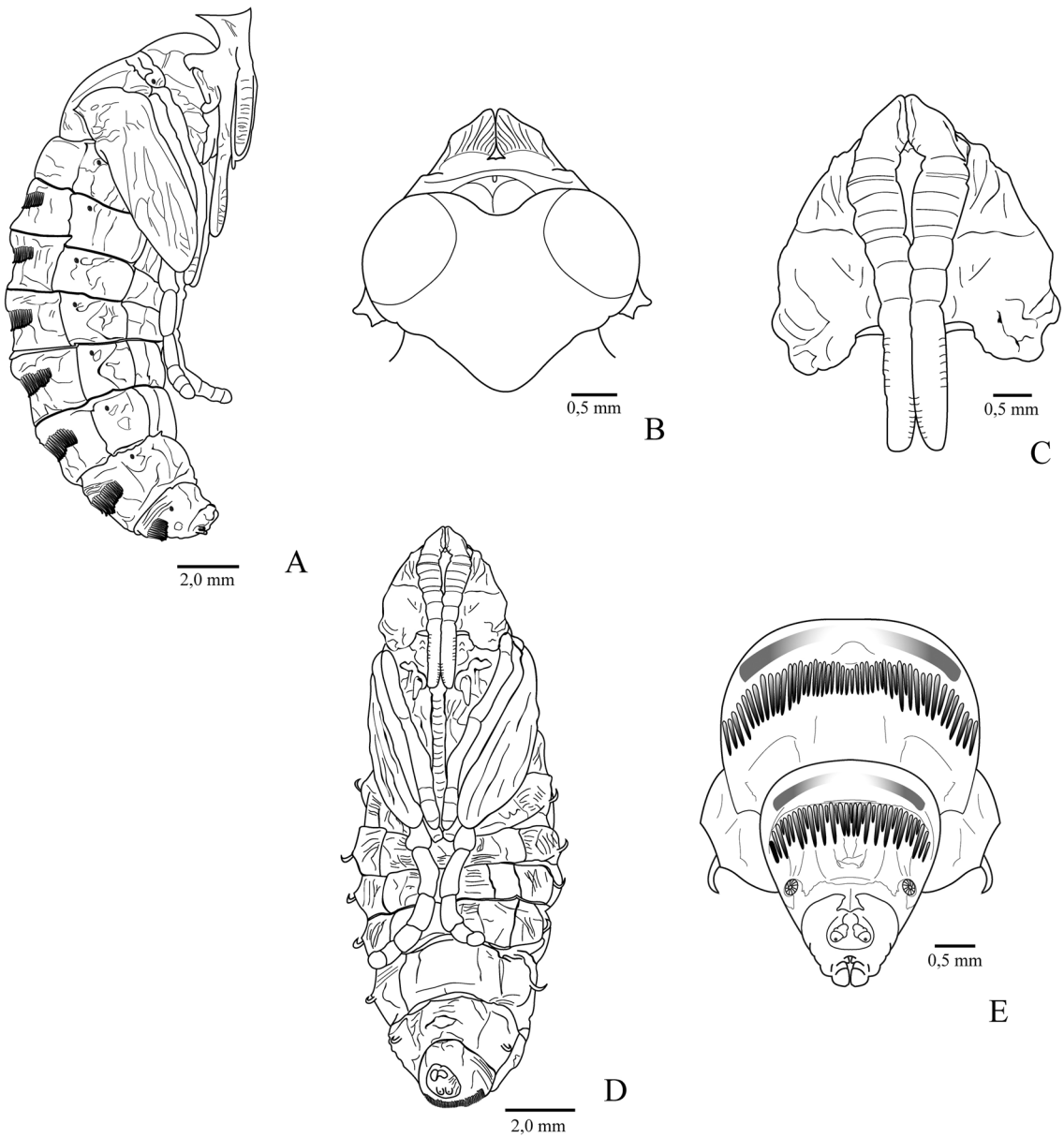

FIGURE 1: A-E. Pupal case of *Systropus* (*Systropus*) *nitidus.* **A,** Habitus, lateral view. **B,** Head, dorsal view. **C,** Head, ventral view. **D,** Habitus, ventral view. **E,** Abdominal segments 7-8 and anal segment, dorsal view.

did moths and the *Systropus* bee flies may be answered by the fact that the location of the host is carried out by the adult females, under the substrate, with much more efficient capability to find the right host than a planidium first instar larvae do in the ground or substrate layer.

From the three actually known pupal cases of the subgenus *Systropus* (*S.* (*S.*) *barnardi* Hesse, 1938; *S.* (*S.*) *macer* Loew, 1863; and *S.* (*S.*) *crudelis* Westwood, 1876), *S.* (*S.*) *nitidus* is similar to those of *S.* (*S.*) *barnardi* and *S.* (*S.*) *macer* by a reduced and not prominently projecting cephalic transverse ridge, for the scattered but strongly developed chitinous rods, and also for the absence of a distinct process on sides of tergite I. On the other hand, the pupal case of *S.* (*S.*) *nitidus* is similar to the one of *S.* (*S.*) *crudelis* by presenting bristle-like process, on each side of the abdominal pleurae II-VII, more conspicuous and longer than in any other known species.

RESUMO

O pupário de Systropus *(*Systropus*)* nitidus *Wiedemann, originado de uma crisálida não identificada típica de Limacodidae (Lepidoptera), é descrito e ilustrado pela primeira vez. Somente espécies de Limacodidae são registradas como hospedeiros de estágios imaturos de* S. *(*Systropus*). A distribuição geográfica de* S. *(*Systropus*)* nitidus *é restrita ao Brasil, do estado do Pará ao de Santa Catarina. Esta é a primeira descrição e ilustração de pupário de uma espécie Neotropical do subgênero* Systropus.

Palavras-chave: Morfologia; Pupários; Parasitóides; Mariposas.

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