

New generic assignment to the harvestman *Metaphareus punctatus* (Opiliones: Stygnidae) and observations about its reproductive behavior

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ABSTRACT. We herein propose the transfer of *Metaphareus punctatus* Roewer, 1913, to the genus *Eutimesius* Roewer, 1913 (Heterostyginae) based on the genital morphology of the species and morphology of tarsi III and IV, resulting in the new combination *Eutimesius punctatus* (Roewer, 1913), comb. nov. New geographical records for *E. albicinctus* (Roewer, 1915) are offered, recording sympatry between the congeneric species *E. albicinctus* and *E. punctatus* and data on the reproductive behavior of *E. punctatus* are presented, suggesting the existence of parental care in this species.

KEYWORDS. *Eutimesius*, Heterostyginae, Gonyleptoidea, Venezuela.

RESUMEN. Nueva asignación genérica al opilión *Metaphareus punctatus* (Opiliones: Stygnidae) y observaciones sobre el comportamiento reproductivo. Proponemos aquí la transferencia de *Metaphareus punctatus* Roewer, 1913, al género *Eutimesius* Roewer, 1913 (Heterostyginae), fundamentándonos en la morfología genital de la especie y morfología de los tarsos III y IV, resultando en la nueva combinación *Eutimesius punctatus* (Roewer, 1913), comb. nov. Nuevos registros geográficos para *E. albicinctus* (Roewer, 1915) son ofrecidos, registrando la simpatria entre las especies congénicas *E. albicinctus* y *E. punctatus* y se presentan datos sobre el comportamiento reproductivo de *E. punctatus*, sugiriéndose la existencia de cuidado parental en esta especie.

PALABRAS CLAVE. *Eutimesius*, Heterostyginae, Gonyleptoidea, Venezuela.

The genus *Metaphareus* Roewer, 1912 was described to include the single species *M. albimanus* Roewer, 1912 from Colombia, which is only known to the female until the present. A year later the same author described the second species for the genus, *M. punctatus* Roewer, 1913 from Mérida in Venezuelan Andes (ROEWER, 1913), from a single male. This species remained poorly known until PINTO-DA-ROCHA (1997) drew the external morphology of the males, but the specimen studied by him was damaged and with some legs lost (PINTO-DA-ROCHA, 1997), then its genital morphology, as well as the morphology of the tarsi III-IV remained unknown. This last character has importance in the identification of subfamilies within Stygnidae, as explained in PINTO-DA-ROCHA (1997).

For this article, were examined specimens from four localities in Mérida state in the Venezuelan Andes. From these specimens, two stygnids species were identified: *Metaphareus punctatus* and *Eutimesius albicinctus* (Roewer, 1915). For the first time tarsomerus and genital morphology of males of the first species were studied, allowing us to clarify doubts about the taxonomic position of this species and leading us to propose a new combination for *M. punctatus*. Additionally,

some comments about the natural history of this species are made, recording the first case of parental care in this species and cases of sympatric occurrences with *E. albicinctus*, species only known for its holotype male, and for which four new geographic records are presented here.

MATERIAL AND METHODS

The examined material is deposited in the arachnological collection of Universidad de Los Andes (CAULA, Néstor Sánchez and Antonio de Ascençãõ), Mérida, Venezuela and Museo del Instituto de Zoología Agrícola (MIZA, Quintin A. Arias Celis), Maracay, Venezuela. Genital features were studied following the protocol described by ACOSTA *et al.* (2007). The genital chaetotaxy follows KURY & VILLARREAL (2015). The pictures were taken using a Nikon D5200 digital camera and the image were processed using the software Zerene Stacker and Gimp 2.10.0 and/or Photoshop CS6. The drawings were made with Inkscape 0.92.3. The distribution map was made with ARCGIS 9.3 software. Geographic coordinates (in decimal degrees, WGS84) were obtained using Google Maps.

Abbreviations used in the text: MS, macrosetae of the penis; MS A-E, macrosetae groups; LP, lamina parva.

TAXONOMY

Stygnidae Simon, 1879

Heterostygninae Roewer, 1913

Eutimesius albicinctus (Roewer, 1915)

(Figs 10, 18)

Hoplostygnus albicinctus ROEWER, 1915:107, fig. 58; 1923:462, fig. 581; KÄSTNER, 1937:390, fig. 479; CAPORIACCO, 1951:42; PINTO-DA-ROCHA, 1995:196.

Holostygnus albienetus [misspelling]: BESCH, 1969:728, fig. 8 [and not 9, as mistakenly stated in the publication].

Eutimesius albicinctus PINTO-DA-ROCHA, 1997:185 figs 49-53, 463-464, 597; KURY, 2003:225.

Type data. VENEZUELA, Mérida, holotype ♂, type SMF RI 1096.

Studied material. VENEZUELA, Mérida: Libertador, ♀ (CAULA-Op- 0048), Monte Zerpa, Quebrada La Honda,

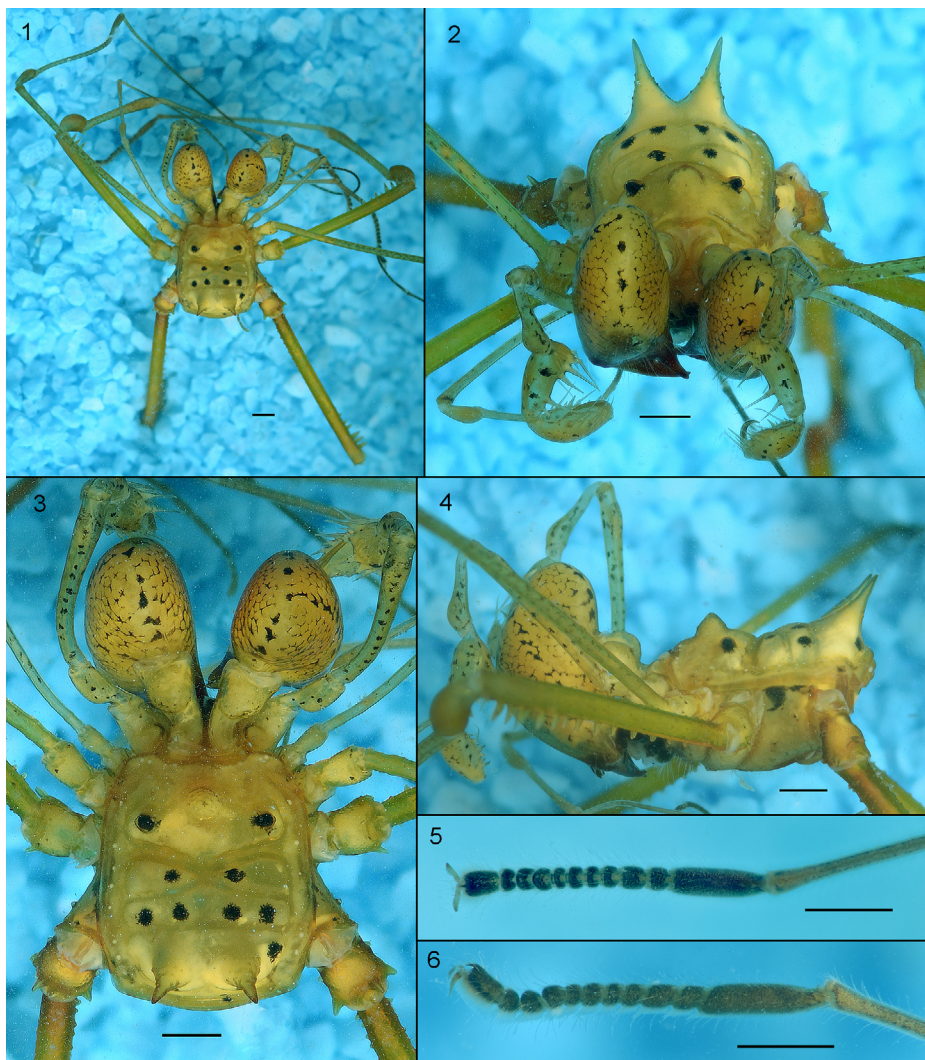
[8.641989, -71.164033], 2176 m, 6.III.2010, Sánchez, N. leg; 2♂, 1♀ (CAULA-Op-0216), Monte Zerpa, Quebrada La Honda. [8.641989, -71.164033], 2176 m, 3.IX.2011, Sánchez, N. & Carrasco, R. leg; 2♂ (CAULAOp-0244) Monte Zerpa, quebrada La Honda, [8.641989, -71.164033], 2176 m. 17.IV.2010, Sánchez, N. leg; Andrés Bello: 2 juveniles, (CAULA-Op-1898), road Mérida – La Azulita, sector La Bravera, 8.641283, -71.383475, 2.360 m, 03.ii.2017, Sánchez, N. & Puente, J. leg.

Remarks. This species have been observed by one of the authors in La Mucuy (VENEZUELA, Mérida, Santos Marquina, 8.629949, -71.037527), however, no specimens have been collected.

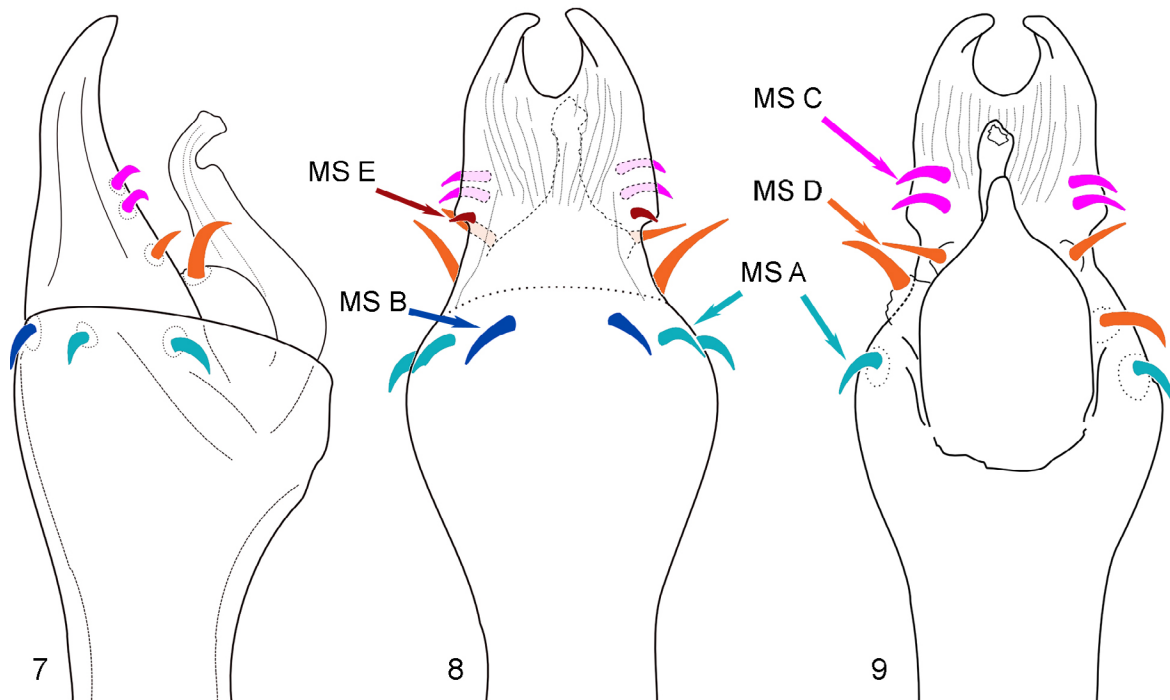
Eutimesius punctatus (Roewer, 1913), comb. nov.

(Figs 1–9, 11-14, 18)

Metaphareus punctatus ROEWER, 1913:432, fig. 170; 1923:573 fig. 719; CAPORIACCO, 1951:42; PINTO-DA-ROCHA, 1997:297, figs 427-431, 604; KURY, 2003:229.



Figs 1-6. *Eutimesius punctatus* (Roewer, 1913), comb. nov. (male MIZA 1749), habitus: 1, dorsal, panoramic view; 2, frontal view; 3, dorsal view, detail of scutum; 4, lateral view; Figs 5-6, leg III, tarsomerus, dorsal and prolateral views. Bars of scale = 1 mm.



Figs 7-9. Penis of *Eutimesius punctatus* (Roewer, 1913), comb. nov., apical portion (MIZA 0065969): 7, lateral view; 8, ventral view; 9, dorsal view.

Type data. VENEZUELA, **Mérida**, holotype ♂, type SMF RI, 832.

Studied material. VENEZUELA, **Mérida**: Campo Elías, ♂, ♀ (MIZA 1749), Sector Piedra Blanca, [8.583611, -71.32611], 2114 m, Viii.2006, Rodríguez C. leg; Andrés Bello, 2♂ (MIZA s/n) road Mérida - La Azulita, El Chorotal, sector El Frontino, 8.668528, -71.417998, 2.255 m, 03.ii.2017, Villarreal, M.O.; García, A. & Sánchez, N. leg; Libertador: ♂, 2♀, (CAULA-Op-0052), Monte Zerpa [8.639417, -71.169138], 2181 m, 11.IV.2010, N. Sánchez & Mendoza I. leg; ♂ (CAULA-Op-0049-1), Monte Zerpa [8.639417, -71.169138], 2186 m, 11.IV.2010, Sánchez N. leg; 6♂, 5♀ (CAULAOp-0050), Monte Zerpa, Quebrada El Macanal, 2160 m, 17.IV.2010, Sánchez N. leg; 7♂, ♀ (CAULA-Op-0051), Monte Zerpa, 2160 m, 25.V.2010, Sánchez N. & De Ascensão A. leg; 2♂, 5♀ (CAULA-Op-0243), Monte Zerpa [8.639722, -71.167444], 2170 m, 24. IX. 2011, Sánchez N. & Mendoza I. leg; 2♂, 3♀ (CAULA-Op-0302), Monte Zerpa, Quebrada La Honda, Río Albarregas, [8.641472, -71.162675], 2140 m 8.x.2011. Sánchez N. & Mendoza I. leg.

Diagnosis. This species can be distinguished from its other all congeneric species by the black spots on the base of mesotergal tubercles contrasting with the yellow greenish background (Figs 1-4, 11, 14) and pattern of the dry-mark (Figs 3, 11, 14).

Genital description (males) (Figs 7-9). General pattern typical for Heterostyginae: with the hammer well

differentiated and carrying the MS A1-A2 and MS B, all aligned forming a ring slightly basal at the beginning of the lamina parva (LP), which is clearly differentiated from the truncus and have lateral margins convergent and curved, with apical circular and deep cleft, and a basal constriction forming a basal neck. MS C1-C2 similar in size, positioned slightly apical at neck of the LP. Only one pair of MS D, located on a monticule, dorsally on the base of LP. Stylus curved dorsally, with small dorsal process.

Natural history. This species inhabits exclusively in cloud forests located in the Andean mountain range system in Mérida state, particularly in protected areas in Sierra de La Culata National Park (Figs 14–16). *Eutimesius punctatus* is characterized for occupying microhabitats above the undergrowth, being frequent to find it on shrubs near small water courses (Fig. 17). Remarkably, in Monte Zerpa, Mérida state, it was frequently found on a species of scaly tree fern *Cyathea caracasana* var. *meridensis* (H. Karst) (Cyatheaceae) a very common species on the edges of streams, which is used by *E. punctatus* to lay his eggs (Figs 13, 17). In this regard, one of the authors observed four events involving posture or care of eggs in these plants, always the eggs were placed on the back of the leaves (at the bottom) (Fig. 13). All these cases were observed at the same locality: brook El Macanal, Monte Zerpa, Mérida state (Figs 15, 17).

The first case only one female was observed next to the clutch (about 50 eggs), which has a semicircular shape; a second case was observed both male and female next to



Figs 10-17. Fig. 10, *Eutimesius albicinctus* (Roewer, 1915), male at live from Chorotal, Mérida, Venezuela; Figs 11-12, *Eutimesius punctatus* (Roewer, 1913), comb. nov., male at live from Chorotal, Mérida, Venezuela; Figs 13, 14, male and egg on fern from Monte Zerpa, Mérida; Figs 15-17, cloud forest in Mérida state, Chorotal (15) and Monte Zerpa (16 and 17).

the clutch (eggs arranged in a similar way to the previous case), in this case after being disturbed they both left the clutch, they were dropped in a vacuum to fall into the leaf litter; a third case was observed, which only the female after the disturbance fled the clutch, in this case the eggs had a different appearance, some of which located on a side edge

looked more recent; and a fourth case in which only a male and some scattered eggs were observed (about 15 eggs in an approximate diameter of 10 cm) (Fig. 13), this could have several interpretations, maybe it is the remnant of a larger clutch cared by this male, or maybe the male was preying on the eggs of an old alien clutch.

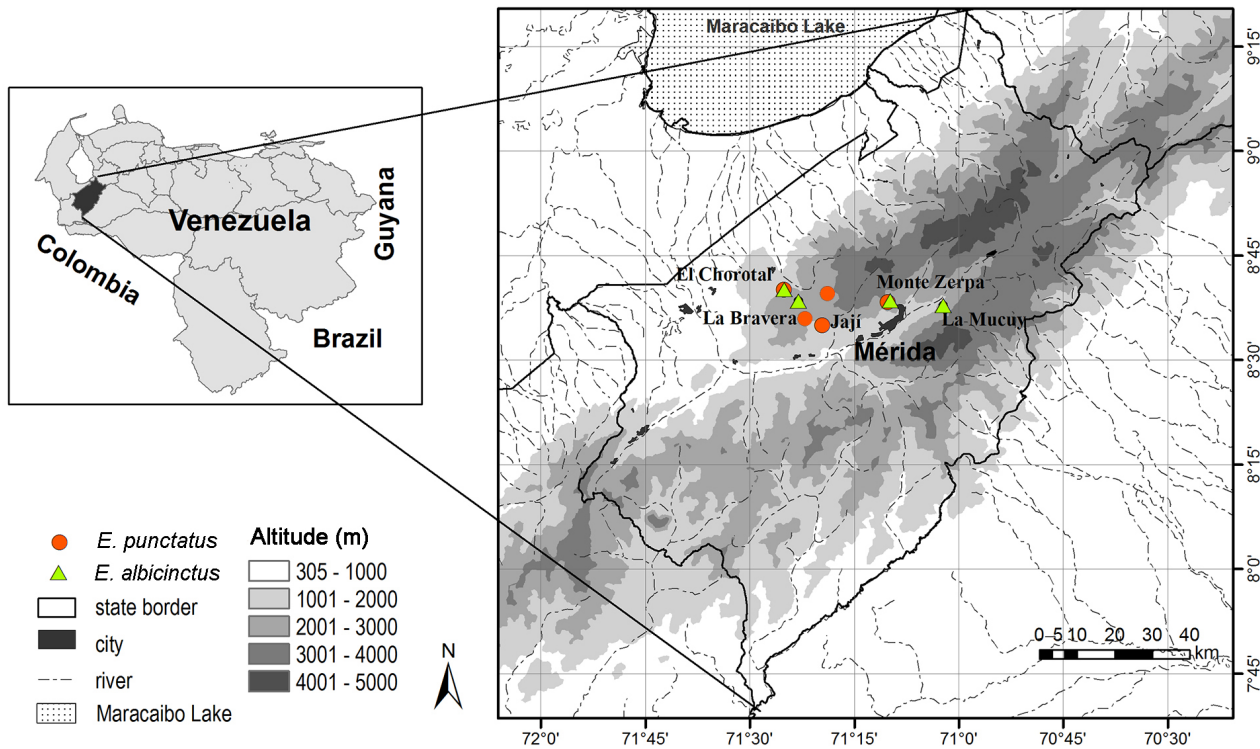


Fig. 18. Geographical distribution of *Eutimesius punctatus* (Roewer, 1913), comb. nov. and *E. albicinctus* (Roewer, 1915).

DISCUSSION

Metaphareus has only two described species, and is considered part of the subfamily Stygninae even though male genitalia of none of his species have been described (PINTO-DA-ROCHA, 1997). Female holotype of the type-species *M. albimanus* Roewer, 1912 apparently is lost. On the other hand, *M. punctatus* was inserted in this genus due to the general similarity of the external morphology of both species, at a time when the criteria of classification of harvestmen were ruled even by the Roewerian methodology.

One of the principal non genital traits used in classification/taxonomy of stygnids harvestmen is the shape of tarsomerus and claw III-IV and the presence and kind of scopula, then, in the absence of information on genital morphology and loss of tarsomerus III-IV, the subfamilial position of *Metaphareus* must be a complicated decision, however in his review of systematics of Stygnidae, PINTO-DA-ROCHA (1997) decided to position it within Stygninae.

The penial morphology of Heterostygninae species is very homogenous, mainly due to the presence of a thin and well-defined lamina parva, with a broadly marked basal constriction; this seems to be a unique feature for this group. However, some variations are found in the number or arrangement of setae, in the size ratio between the hammer and the glans+stylus complex, or in the presence/absence of the dorsal process of the stylus.

Tarsomerus III-IV (short and cylindrical, with opposites claws) (Figs 5, 6) and genital morphology of the

male of *Metaphareus punctatus* (Figs 7–9), fits perfectly into the general pattern described for the subfamily, more specifically sharing all the genital characters found in the genera *Innoxius* and *Eutimesius*, both present in the Andean region.

All the species of *Eutimesius* have variations in the ornamentation and armature of the anterior region of the carapace, however all have two high spines of the area III and a spiniform monticle in the interocular area, while *Innoxius* don't have spines in area III and have a low and rounded interocular mound. Other interesting trait shared by all *Eutimesius* species is the presence of dry-mark on the dorsal scutum (definition of dry-marks as defined by CARVALHO & KURY, 2018, even when we do not intend to establish a homology between both spots).

Metaphareus punctatus have all the traits defined here to *Eutimesius* diagnosis: dry-mark on the lateral border of the dorsal scutum, area III with two high spines, a spiniform monticle in the interocular area and genital morphology similar to the pattern shared by *Eutimesius*+*Innoxius*, then we decide propose the new combination *Eutimesius punctatus* comb. nov. and we call attention to the subfamilial position of the genus *Metaphareus* and the relationships with *Eutimesius*, which should be reassessed whenever males of its type-species are known.

Eutimesius punctatus has been originally referred to the state of Merida by ROEWER (1913), however this location is imprecise. We have found the species in several localities of the Sierra de La Culata, showing a wide distribution,

following the altitudinal range between 2000 and 2400 meters of altitude (Fig. 18), along the mountain range of cloud forests almost continuous between the characteristic localities of that elevation floor (ATAROFF & SARMIENTO, 2003). This wide local distribution contributes to deny the high endemism of the Venezuelan harvestman as González Sponga repeatedly pointed out (GARCÍA *et al.*, 2017).

Sympatry in congeneric species in the family Stygnidae is not common, however here we recorded coexistence of *Eutimesius punctatus* and *E. albicinctus* in at least three studied localities (Fig. 18). Moreover, a third congeneric undescribed species was collected close to the previous ones. Some examples of cases of sympatry in the family are known from the genus *Eutimesius*, which was observed by the first author from cloudy forest in Yaracuy state in Venezuela (Osvaldo Villarreal, unpubl. data) and two species of *Pickeliana* coexisting from Bahia state in Brazil (HARA & PINTO-DA-ROCHA, 2008). Preference for microhabitat seems to have been detected in both *Eutimesius* species studied here. While the specimens of *E. albicinctus* were collected on tree trunks or directly on the substrate in slopes and ravines (Figs 10, 15), the specimens of *E. punctatus* were frequent in green vegetation, on leaves and more frequently in ferns (Figs 11-13, 17). It is striking that both species have markedly different colorations, each similar to the substrate where they were collected (Figs 10-13). There could be segregation due to the use of microhabitats.

In relation to reproductive behavior of *E. punctatus*, in spite of not having been made laboratory tests or systematized observations in the field with the purpose of studying the parental care in this species, some facts seem to indicate the existence of paternal care of the eggs. In all the cases observed there was presence of the male next to the clutch, and when they were disturbed in at least one of the three cases the male remained with the group and in one case the eggs seem to have different stages of embryonic development which is common among harvestmen exhibiting exclusive paternal care (MACHADO *et al.*, 2004; MACHADO & MACÍAS-ORDOÑEZ, 2007; VILLARREAL & MACHADO, 2011). Paternal care in the family have been recorded to the genus *Stenostygnellus*, however previous studies on a single Amazonian species of *Eutimesius* (probably *E. simoni* Roewer, 1913) suggest that maternal care exists in this genus (VILLARREAL & MACHADO, 2011). The eggs laying of *Eutimesius punctatus* are similar in aspect to those of *Stenostygnellus flavolimbatus* and not to *Eutimesius simoni*, by the fact of not being embedded in a transparent gelatinous mass. The species of *Stenostygnellus* with known reproductive behavior hide their eggs in cavities of trunks or in the armpits of plants (VILLARREAL & MACHADO, 2011), while *Eutimesius punctatus* as well as *E. simoni* lay the eggs exposed on the leaves of plants.

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