www.biotaxa.org/rce. ISSN 0718-8994 (online) Revista Chilena de Entomología (2020) 46 (4): 699-705.

Scientific Note

New Tachinidae parasitoid records for Mesomphaliini (Coleoptera: Chrysomelidae: Cassidinae) in the Neotropical region

Nuevos registros de parasitoides Tachinidae en Mesomphaliini (Coleoptera: Chrysomelidae: Cassidinae) en la región Neotropical

Ronaldo Toma[1] and Thiago Marinho Alvarenga[2]

[1]*Fiocruz - Mato Grosso do Sul, Rua Gabriel Abrão, 92, CEP 79081-746, Jardim das Nações, Campo Grande, MS, Brasil.* rtkuna1@gmail.com
[2]*Research associate at the LEIA – Laboratório de Ecologia de Interações e Agroecossistemas – Instituto de Biologia da Universidade Estadual de Campinas – UNICAMP Cidade Universitária Zeferino Vaz - Rua Monteiro Lobato, 255 - Campinas - SP - Brasil - CEP 13083-862. E-mail: marinho.bio@gmail.com*

ZooBank: urn:lsid:zoobank.org:pub:81D81D9F-6BEF-43C3-B86A-22B570E321DC
https://doi.org/10.35249/rche.46.4.20.15

Abstract. New records of Tachinidae flies parasitizing Mesomphaliini species (Coleoptera: Chrysomelidae: Cassidinae) collected in the Neotropical region. We provided the first records of parasitism of *Cyrtonota thalassina* (Boheman, 1850), *Botanochara* sp. and *Paraselenis flava* (Linnaeus, 1758) by species of *Eucelatoria* Townsend, 1909 (Blondeliini) and parasitism of *P. flava* by a species of *Voria* Robineau-Desvoidy, 1830 (Voriini). A species of *Eucelatoria* parasitizing *Chelymorpha* sp. is recorded for Brazil for the first time. New host plant records are provided: *C. thalassina* on *Ipomoea saopaulista* O'Donell and *P. flava* on *I. aristolochiifolia* G. Don.

Key words: Blondeliini, Brazil, *Ipomoea*, subsocial, Voriini.

Resumen. Nuevos registros de moscas Tachinidae parasitando especies de Mesomphaliini (Coleoptera: Chrysomelidae: Cassidinae) recolectadas en la región Neotropical. Proporcionamos los primeros registros de parasitismo de *Cyrtonota thalassina* (Boheman, 1850), *Botanochara* sp. y *Paraselenis flava* (Linnaeus, 1758) por especies de *Eucelatoria* Townsend, 1909 y parasitismo de *P. flava* por una especie de *Voria* Robineau-Desvoidy, 1830 (Voriini). Se registra por primera vez para Brasil una especie de *Eucelatoria* parasitando *Chelymorpha* sp. Se proporcionan nuevos registros de plantas hospedantes, *C. thalassina* sobre *Ipomoea saopaulista* O'Donell y *P. flava* sobre *I. aristolochiifolia* G. Don.

Palabras clave: Blondeliini, Brasil, *Ipomoea*, subsocial, Voriini.

Mesomphaliini (Coleoptera: Chrysomelidae) is the second-largest tribe of Cassidinae *s. str.* ("tortoise beatles" not including Hispinae *s. str.*), comprising about 555 species classified into 25 genera (Borowiec and Świętojańska 2018). Species occur predominantly in South America, with few species also distributed in North and Central America (Borowiec and Świętojańska 2018). Members of this tribe are phytophagous, which monophagous or oligophagous species are usually associated with Convolvulaceae and Asteraceae, many of them recorded feeding on species of *Ipomoea* L. (Convolvulaceae) (Jolivet 1988; Buzzi 1994; Borowiec and Świętojańska 2018).

Received 3 October 2020 / Accepted 24 November 2020 / Published online 23 December 2020
Responsible Editor: José Mondaca E.

OPEN ACCESS Este es un artículo de acceso abierto distribuido bajo los términos de la licencia Creative Commons License (CC BY NC 4.0)

Most Mesomphaliini exhibit solitary behavior, but larval gregariousness occurs in subsocial and non-subsocial species (Chaboo *et al*. 2014). Subsocial behavior, displayed as maternal care of immatures, is documented for at least 32 species of three genera of this tribe (not including Eugenysini): *Acromis* Chevrolat, 1836, *Omaspides* Chevrolat, 1836, and *Paraselenis* Spaeth, 1913 (Chaboo *et al*. 2014; Macedo *et al*. 2015; López-Pérez 2017; Leocádio *et al*. 2020).

All tachinid flies with known life histories are parasitoids of other arthropods, mainly insects, including Coleoptera (Wood 1985). Cassidinae *s. str.* is the most frequently parasitized subfamily within Chrysomelidae, with Hymenoptera and Tachinidae listed as the major parasitoids for the group (Cuignet *et al*. 2008). However, there are few records of tachinid parasitoids for the Cassidinae in the Neotropical region (Buzzi 1988). Except for the record of *Ebenia* Macquart, 1846 parasitizing *Chelymorpha alternans* Boheman, 1854, the records of parasitism of Mesomphaliini by Tachinidae used to be attributed to the genus *Eucelatoria* Townsend, 1909 (Boldt *et al.* 1991; Cox 1994; Buzzi 1994; Olivares-Donoso *et al*. 2000; Nogueira-de-Sá and Vasconcellos-Neto 2003; Cuignet *et al.* 2008).

Fieldwork was carried out by Thiago Marinho Alvarenga in the municipalities of Campinas and Jundiaí (Serra do Japí), state of São Paulo, Brazil, from January 2012 to December 2018. Fifth instar larvae of tortoise beetles were collected from species of *Ipomoea* and reared in laboratory on sterilized leaves of the same host plants. In few days, it was observed that some of them were infected with tachinid larvae, which later completed their development cycle, killing the hosts.

Tachinid pupae collected from larvae, prepupae, and pupae of tortoise beetles were reared to obtain adults for identification. Adult tachinids were identified according to Thompson (1961), Wood (1985), Cortés and Gonzalez (1989), Wood and Zumbado (2010), Fleming *et al*. (2017), and Burington (2017), while Mesomphaliini adult specimens were determined using the taxonomic key provided by Borowiec and Świętojańska (2018). Diptera voucher specimens (n= 15) were deposited at the Zoological Collection of Universidade Federal de Mato Grosso do Sul, Brazil (ZUFMS).

We recorded species of the genus *Eucelatoria* (Blondeliini) parasitizing *Cyrtonota thalassina* (Boheman, 1850), *Botanochara* sp., *Chelymorpha* sp., and *Paraselenis flava* (Linnaeus, 1758), and a species of *Voria* Robineau-Desvoidy, 1830 (Voriini) parasitizing three specimens of *P. flava.* The fifth instar larvae, prepupae, and pupae became dark when infected by tachinid flies (Figs. 1A, 1B). We also registered *I. aristolochiifolia* G. Don as host plant of *P. flava* for the first time. The association was previously recorded for *I. batatas* (L.) Lam. and *I. purpurea* (L.) Roth (Montes and Raga 2010; Borowiec and Świętojańska 2018).

Cyrtonota thalassina occurs in Argentina, Brazil (Pará, from Minas Gerais to Rio Grande do Sul) and Paraguay (Simões and Monné 2011; Borowiec and Świętojańska 2018). Biological information of *Cyrtonota* juvenile stages is only known for four species (Buzzi 1988; Buzzi *et al*. 2000; Cedeño-Loja and Chaboo 2020), including *C. thalassina*. This species has solitary larvae and pupae. The observation of *Eucelatoria* sp. 1 (one female from Jundiaí) represents the first record of a tachinid species parasitizing this genus. *Cyrtonota thalassina* was collected on *Ipomoea saopaulista* O'Donell for the first time. Associations were firstly recorded on *I. grandifolia* (Dammer) O'Donell and *I. purpurea* (Borowiec and Świętojańska 2018; Gomes 2018).

As well as for the other Cassidinae *s. str*. genera, there are few studies on the life history of *Botanochara*. Species collected in this study has solitary fifth instar larvae. *Eucelatoria* sp. 2 (one female from Campinas) is the first record of a tachinid species parasitizing the genus *Botanochara.* The host was collected on *I. aristolochiifolia.*

Despite the wide distribution and abundance of *Chelymorpha* species in the Neotropical region, less than a dozen species have their life histories known (Morrison and Windsor

2018). *Chelymorpha* species were already reported as *Eucelatoria* host: *Chelymorpha cassidea* Fabricius, 1775 parasitized by *Eucelatoria dimmocki* (Aldrich, 1932) in the United States (Aldrich 1932) and *Chelymorpha varians* (Blanchard, 1851) parasitized by *Eucelatoria parkeri* (Sabrosky, 1952) in Uruguay and Chile (Sabrosky 1952; Olivares-Donoso *et al*. 2000). In Panama, reports were made on *Chelymorpha alternans* adults parasitized by a species of *Eucelatoria*, while larval and pupal stages were parasitized by *Ebenia* sp. and two other unidentified tachinid species (Cuignet *et al.* 2008). *Chelymorpha* sp. larvae and pupae collected in this work displayed gregarious behavior. This parasitism by a tachinid species, *Eucelatoria* sp. 3 (two males and two females from Campinas), is recorded for Brazil for the first time. *Chelymorpha* sp. was collected associated with *Ipomoea* sp.

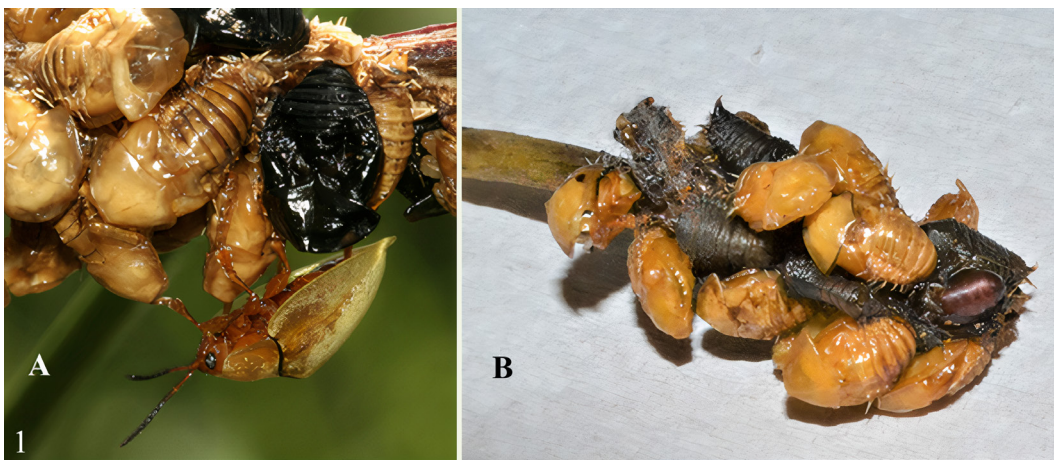

Figure 1. A. Female of *Paraselenis flava* (Linnaeus, 1758) guarding offspring (pupae). B. Pupae of *P. flava* parasitized with *Eucelatoria* sp. (pupa), collected from *Ipomoea batatas* (L.) Lam.

Subsocial behavior is documented for ten species of *Paraselenis*, including *P. flava*, an important pest of *Ipomoea batatas* (sweet potato) in Brazil (Montes and Raga 2010; Chaboo *et al.* 2014; Leocádio *et al*. 2020). Cuignet *et al.* (2008) recorded a species of *Eucelatoria* (Diptera: Tachinidae) parasitizing *Paraselenis tersa* (Boheman, 1854) in Panama. In Brazil, an unidentified tachinid species was observed parasitizing larvae of *Paraselenis aulica* (Boheman, 1854) and *Paraselenis dichroa* (Germar, 1824) (Macedo *et al*. 2015; Cuozzo *et al.* 2017). Here we record for the first time the occurrence of two tachinid species, *Eucelatoria* sp. 4 (three males and three females from Campinas) parasitizing *P. flava* on *I. batatas* and *I. aristolochiifolia*, and *Voria* sp. (one male and two females from Campinas) parasitizing *P. flava* on *I. aristolochiifolia* (Figs. 2A-2H).

Consideration on parasitoid flies:

Voriini species have been recorded as parasitoids mainly on larvae of Noctuidae and Uraniidae (Lepidoptera) (Fleming *et al*. 2017). Occasionally sawfly larvae (Hymenoptera) have already been recorded parasitized by Voriini species (Thompson 1961), although this record is doubtful according to Herting (2017). The parasitism of Coleoptera by *Voria* had never been recorded until this study. For Lepidoptera, females of *Voria* lay incubated eggs directly on the host larvae. Hatching and penetration of the tachinid first instar larvae occur a few minutes after oviposition (Thompson 1915; Elsey and Rabb 1970). The specimens of *Voria* sp. fit with the redescription of *Voria ruralis* (Fallén, 1810) by Thompson (1961), but slightly differ in few color aspects. According to Fleming *et al*. (2017), species of

Voria are remarkably similar, presenting subtle differences in the head coloration and male terminalia morphology. Identification through molecular methods suggests that *V. ruralis* represents a species complex.

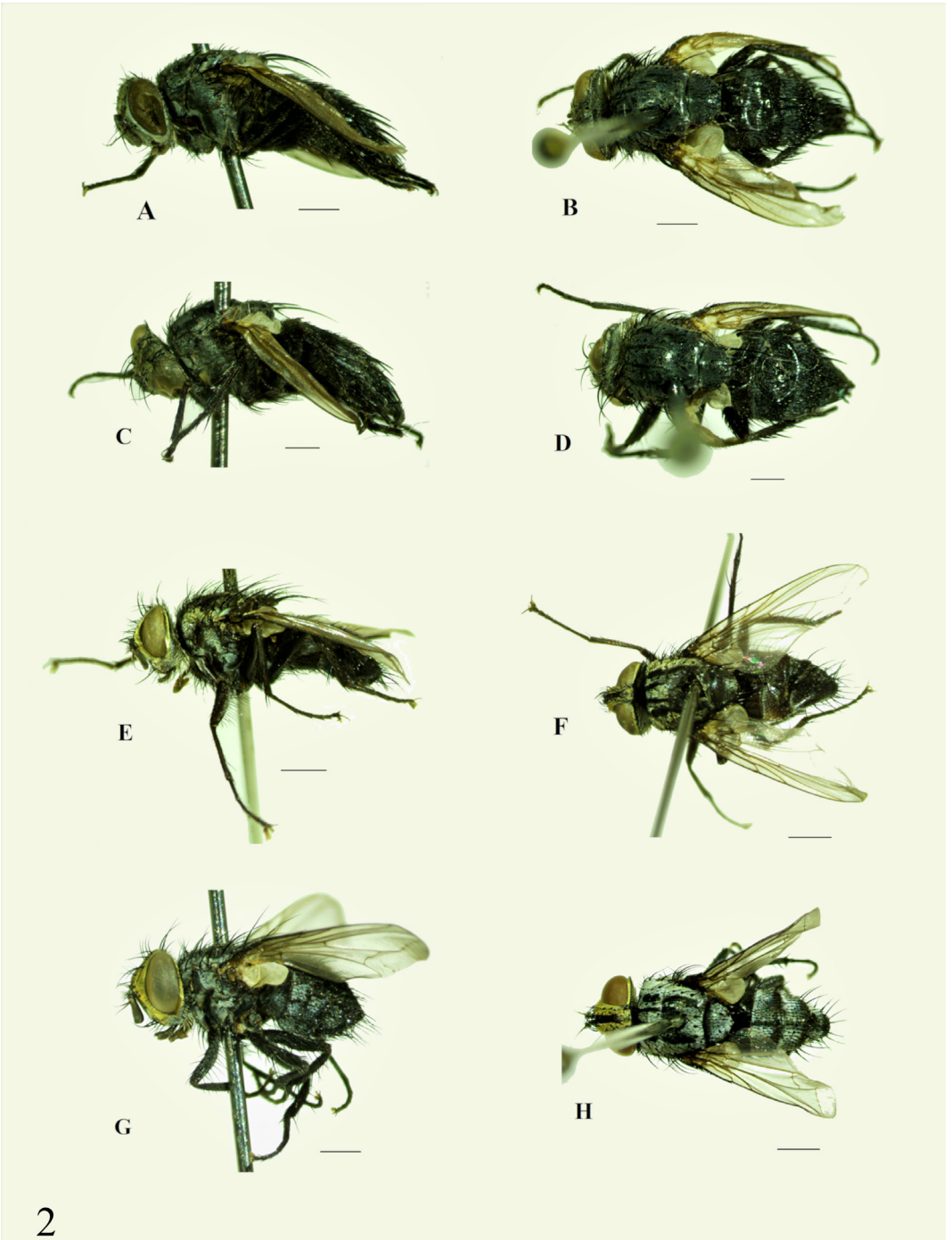

Figure 2. A-B. *Voria* sp., male in lateral and dorsal views. C-D. *Voria* sp., female in lateral and dorsal view. E-F. *Eucelatoria* sp., male in lateral and dorsal views. G-H. *Eucelatoria* sp., female in lateral and dorsal views. Scale bar: 1 mm.

Eucelatoria is one of the largest genera of Blondeliini restricted to the New World, with more than 50 described species. Most host records consist in Lepidoptera larvae, although there are few species known to infect larvae of Chrysomelidae beetles (Wood and Zumbado 2010). Including the new records, *Eucelatoria* species parasite 16 genera of four Cassidinae *s. str*. tribes (Cassidini, Ischyrosonychini, Omocerini, and Mesomphaliini), from solitary to subsocial species, including species of seven Mesomphaliini genera (*Anacassis* Spaeth, 1913, *Botanochara, Chelymorpha, Cyrtonota, Omaspides*, *Paraselenis*, and *Stolas* Billberg, 1820) (Boldt *et al.* 1991; Cox 1994; Buzzi 1994; Olivares-Donoso *et al*. 2000; Nogueira-de-Sá and Vasconcellos-Neto 2003; Cuignet *et al.* 2008). Females of *Eucelatoria* lay incubated eggs directly inside the host using the sternite 7 modified into a hook-like piercer (Stireman *et al.* 2006; Wood and Zumbado 2010).

Eucelatoria species recorded here belong to the *Eucelatoria dimmocki* species group according to Burington (2017) identification key and share the following combination of characters with this group: apical scutellar bristles present, prosternum with black setae, only one anterodorsal bristles on mid tibia, parafacial bare, katepisternum with three bristles, fore tibia lacking posterodorsal bristles, and postpronotal bristles arranged in triangle.

Literature Cited

Aldrich, J.M. (1932) Records of dipterous insects of the family Tachinidae reared by the late George Dimmock, with description of one new species and notes on the genus *Anetia* Robineau-Desvoidy. *Proceedings of the United States National Museum, 80*: 1-8.

Boldt, P.E., Cordo, H.A. and Gandolfo, D. (1991) Life history of *Stolas* (*Anacassis*) *fuscata* (Klug) (Coleoptera: Chrysomelidae) on seepwillow, *Baccharis salicifolia* (R.&P.) Pers. (Asteraceae). *Proceedings of the Entomological Society of Washington, 93*: 839-844.

Borowiec, L. and Świętojańska, J. (2018) World Catalog of Cassidinae, Wrocław, Poland. Accessed July 1, 2020. Available in: http://www.cassidae.uni.wroc.pl/katalog%20internetowy/index.htm

Burington, Z. (2017) Evolution and biogeography of the Tachinid Flies with focus on the Tribe Blondeliini (Insecta: Diptera: Tachinidae). Thesis (Doctor of Phylosophy). Wright State University. Fairborn, OH, USA.

Buzzi, Z.J. (1988) Biology of Neotropical Cassidinae. pp. 559-580. *In*: Jolivet, P., Petitpierre, E. and Hsiao, T.H. (eds.) *Biology of Chrysomelidae*. Kluwer Academic Publishers, Dordrecht/Boston/London.

Buzzi, Z.J (1994) Host plants of Neotropical Cassidinae. pp. 205-212. *In*: Jolivet, P.H., Cox, M.L. and Petitpierre, E. (eds.) *Novel aspects of the biology of Chrysomelidae.* Springer Science+Business Media Dordrecht, Dordrecht.

Buzzi, Z.J, Frieiro-Costa, F.A. and Filho, M.F. (2000) Imaturos de *Cyrtonota conglomerata* (Boheman, 1862) (Coleoptera: Chrysomelidae: Cassidinae). *Revista Brasileira de Entomologia, 44*: 21-26.

Cedeño-Loja, P.E. and Chaboo, C.S. (2020) Natural history notes on *Cyrtonota sericinus* (Erichson, 1847) in Ecuador (Coleoptera: Chrysomelidae: Cassidinae: Mesomphaliini). *Revista Peruana de Biología, 27*: 127-130.

Chaboo, C.S., Frieiro-Costa, F.A., Gómez-Zurita, J. and Westerduijn, R. (2014) Origins and diversification of subsociality in leaf beetles (Coleoptera: Chrysomelidae: Cassidinae: Chrysomelinae). *Journal of Natural History, 48*: 2325-2367.

Cortés, P. and González, A. (1989) Generos Voriinos de Taquinidos chilenos (Diptera: Tachinidae: Voriini). *Memórias do Instituto Oswaldo Cruz, 84*: 115-123.

Cox, M.L. (1994) The Hymenoptera and Diptera parasitoids of Chrysomelidae. pp. 419-467. *In*: Jolivet, P.H., Cox, M.L. and Petitpierre, E. (eds.) *Novel aspects of the biology of Chrysomelidae.* Springer Science+Business Media Dordrecht, Dordrech.

Cuignet, M., Windsor, M.D., Reardon, J. and Hence, T. (2008) The diversity and specificity of parasitoids attacking Neotropical tortoise beetles (Chrysomelidae: Cassidinae). pp. 345-367. *In*: Jolivet, P.H., Santiago-Blay, Jorge A., and Schmitt, M. (eds.) *Research on Chrysomelidae*. Leiden: The Netherlands.

Cuozzo, M.D., Frieiro-Costa, F.A. and Souza, B. (2017) Life history of *Paraselenis* (*Spaethiechoma*) *dichroa* Germar 1824 Coleoptera Chrysomelidae Cassidinae in natural conditions of Atlantic Forest from Brazil. *Journal of Natural History, 51*: 9-10.

Elsey, K.D. and Rabb, R.L. (1970) Biology of *Voria ruralis* (Diptera: Tachinidae). *Annals of the Entomological Society of America, 63*: 216-222.

Fleming, A., Wood, D., Smith, M., Dapkey, T., Hallwachs, W., and Janzen, D. (2017) A new species of *Voria* Robineau-Desvoidy (Diptera: Tachinidae) from Area de Conservación Guanacaste in northwestern Costa Rica. *Biodiversity Data Journal, 5*: e20123. https://www.doi.org/10.3897/BDJ.5.e20123

Gomes, P.A. de A. (2018) História natural de Cassidinae Gyllenhal, 1813 *sensu stricto* (Coleoptera: Chrysomelidae) na Floresta Nacional de Passa Quatro -MG. Tese apresentada à Universidade Federal de Lavras, como parte das exigências do Programa de Pós-Graduação em Entomologia, para a obtenção do título de Doutora. Universidade Federal de Lavras, Brasil.

Herting, B. (2017) A critical revision of host records of Palearctic Tachinidae (Diptera) until 1937. *Stuttgarter Beiträge zur Naturkunde A, 10*: 41-173. https://doi.org/10.18476/sbna.v10.a3

Jolivet, P.H. (1988) Food habits and food selection of Chrysomelidae bionomic and evolutionary perspectives. pp. 1-20. *In*: Jolivet, P., Petitpierre, E. and Hsiao, T.H. (eds.) *Biology of Chrysomelidae*. Kluwer Academic Publishers, London.

Leocádio, M., Simões, M.V.P., Sekerka, L., Schrago, C.G., Mermudes, J.R.M. and Windsor, D.M. (2020) Molecular systematics reveals the origins of subsociality in tortoise beetles (Coleoptera: Chrysomelidae: Cassidinae): Evolution of subsociality in Cassidinae. *Systematic Entomology, 45*: 894-910.

López-Pérez, S. (2017) Aspectos sistemáticos y biológicos de Cassidinae Gyllenhal, 1813 (Coleoptera: Chysomelidae). *Dugesiana, 24*: 35-46.

Macedo, M.V., Flinte, V., Abejanella, A. and Chaboo, C.S. (2015) Three new reports of subsocial tortoise beetles from South America (Chrysomelidae: Cassidinae). *Annals of the Entomological Society of America, 108*: 1088-1092.

Montes, S.N.M. and Raga, A. (2010) "Fusquinha" *Paraselenis flava* (L. 1758) praga da batata doce. *Instituto Biologico - APTO, Documento Técnico, 4*: 1-8.

Morrison, C.R. and Windsor, D.M. (2018) The life history of *Chelymorpha alternans* (Coleoptera: Chrysomelidae: Cassidinae) in Panamá. *Annals of the Entomological Society of America, 111*: 31-41.

Nogueira-de-Sá, F. and Vasconcellos-Neto, J. (2003) Natural enemies of Neotropical Cassidinae (Coleoptera: Chrysomelidae). pp. 161-173. *In*: Furth, D.G. (ed.) *Special Topics in Leaf Beetle Biology*. Pensoft, Moscow.

Olivares-Donoso, R., Fuentes-Contreras, E. and Niemeyer, H.M. (2000) Identificación de parasitoides de *Chelymorpha varians* Blanchard (Coleoptera: Chrysomelidae: Cassidinae) en una localidad de Chile central. *Revista Chilena de Entomología, 27*: 65-69.

Sabrosky, C.W. (1952) New larvaevorid fly parasitic on tortoise beetles in South America (Diptera). *Journal of the Washington Academy of Sciences, 42*: 325-327.

Simões, M.V.P. and Monné, M.L. (2011) Inventário das espécies de Cassidinae (Insecta: Coleoptera: Chrysomelidae) do Parque Nacional do Itatiaia, RJ, Brasil. *Biota Neotropica, 11*: 215-228.

Stireman, J.O., O'Hara, J.E. and Wood, D.M. (2006) Tachinidae: evolution, behavior, and ecology. *Annual Review of Entomology, 51*: 525-555.

Thompson, W.R. (1915) Sur les caracteres anatomiques et ethologiques des tachinaires du genre *Plagia* Meig. *Comptes rendu de la Société de biologie et de ses filiales, 78*: 671-674.

Thompson, W.R. (1961) The Tachinids (Diptera) of Trinidad. I. The Voriines. *Transactions of the American Entomological Society, 87*: 21-44.

Wood, D.M. (1985) A taxonomic conspectus of the Blondeliini of North and Central America and the West Indies (Diptera: Tachinidae). *Memoirs of the Entomological Society of Canada, 132*: 1-130.

Wood, D.M. and Zumbado, M.A. (2010) Tachinidae (tachinid flies, parasitic flies). pp. 1343-1417. *In*: Brown, B.V., Borkent, A., Cumming, J.M., Wood, D.M., Woodley, N.E. and Zumbado, M. (eds.) *Manual of Central American Diptera. Volume* 2. NRC Research Press, Ottawa.