MiniReview

Family Perilampidae (Insecta: Hymenoptera) as Parasitoids of Ants (Hymenoptera: Formicidae) and Other Insects

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Abstract

Species in the family Perilampidae are parasitoids of Lepidoptera, Diptera (Tachinidae) Coleoptera, Hymenoptera, Neuroptera, Orthoptera and Raphidioptera. Most are primary parasitoids of beetles (Anobiidae and Platypodidae) and ants (Hymenoptera: Formicidae). In some species, the egg is deposited on the foliage and the larva is of the planidium type. It mounts a member of the secondary host species and eventually parasitizes the parasitoid of the larvae. The family has a cosmopolitan distribution, with about 250 described species and 12 genera. In the Neotropical region, there are 4 genera, with about 30 species: Perilampus (25 species), Burksilampus, Euperilampus and Crysolampus. The aim of the manuscript is to increase the knowledge of the family Perilampidae (Insecta: Hymenoptera). The bibliographic verification of Perilampidae was carried out from 1978 to 2022. Manuscripts published in scientific journals and digital platforms on the subject were examined. This paper expands the knowledge of the bionomy of Perilampidae.

Keywords: beetles, digital platforms, primary parasitoids, scielo, tachinidae

1 INTRODUCTION

The Perilampidae are a small family within the Chalcidoidea, composed mainly of hyperparasitoids. The family is closely related to the Eucharitidae, and the eucharitids appear to have evolved from within the Perilampidae, making the family paraphyletic (Figure 1A-E)[1].

1.1 Description

Diagnostic characters: Jaws deep and robust, crossed when closed, left with 3 teeth, right with 2 teeth; antenna with 13 articles, 1st ringed flagellomere; clypeus separated from the rest of the rostrum by sutures; compact, short and tall mesosome in lateral view; full noteaulice; triangular metasoma in lateral view, terga 2 and 3 fused dorsally; Ovipositor sheath slightly exposed. They are black or metallic luster and measure from 1.0 to 12.0mm (Figures 2-6)[1-4].

1.2 Biology

Eupelmidae, with approximately 850 species and 45 genera, are ectoparasitoids of larvae or prepupae of insects hidden in plants, which may be endoparasitoids of spider oothecae. Perilampidae share is that the first
Figure 2. My illustration of *Perilampus* sp. (Perilampidae). Source: https://www.picuki.com/tag/perilampidae

larval stage is a planidium with the function of finding a host to parasitize. That is, they have a complex metamorphosis, called hypermetamorphosis. On the plants in which these individuals occurred, *Myrcia bella* Cambess (Myrtaceae) and *Pera glabrata* (Schott) Poepp. ex bail. (Peraceae) species of Curculionidae (Coleoptera) were also found preying on their seeds and which are probably their hosts. It is a hyperparasitoids of the Braconidae family (Figures 7-12)[4-11].

1.3 Taxonomy

The family has a cosmopolitan distribution, with about 250 described species and 12 genera. In the Neotropical region, there are 4 genera, with about 30 species: *Perilampus* (25 species), *Burksilampus*, *Euperilampus* and *Crysolampus*.

Subfamilies include Chrysolampinae, Perilampinae and Philomidinae (Figures 13 and 14).

1.4 Some Species


1.5 Objective

The aim of the manuscript is to increase the knowledge of the family Perilampidae (Insecta: Hymenoptera).

2 METHODS

To this end, a bibliographic survey of Perilampidae was carried out in the years 1972 to 2022. Only complete articles published in scientific journals and expanded abstracts presented at national and international scientific events. Data were also obtained from platforms such as: Qeios, Pubmed and Scielo (Marchiori, 2021)[18].

3 STUDIES

3.1 Study 1

3.1.1 Parasitoids and Other Natural Enemies of Ants

Specimens of the Perilampidae family have between 1 and 12mm in length, with dark that can be metallic to black, and wings with reduced venation, whose marginal vein is large medium. Unlike Eucharitidae, Perilampidae has a greater diversity of hosts, encompassing several insect orders, such as Neuroptera, Coleoptera, Diptera and Hymenoptera (Figure 18). However, interactions of these parasitoids with poneromorphs have only been recorded so far in southeastern Peru. The emergence of several Perilampidae (about nine individuals of a species that remains

Figure 3. Perilampidae wasp borosilicate glass sculpture (A and B). Source: https://www.picuki.com/tag/perilampidae
Figure 4. *Philomides hamooniae* Heraty, Derafshan & Ghafouri Moghaddam, 2019, male (holotype; UCRCENT00491418). (11): Head and anterior mesosoma (inset anteroventral view of clypeus and labrum); (12): Right antenna, lateral view; (13): Right antenna, medial view; (14): Head and mesosoma, anterolateral view; (15): Habitus, lateral view; (16): Mesosoma, dorsal view; (17): Mesosoma and gaster, lateral view; (18): Petiole and anterior gaster, ventral view; (19): Mesosoma, lateral view; (20): Fore wing venation, dorsal view; (21): Mesosoma and metasoma, posterolateral view; (22): Apex of gaster and genitalia, subcentral view; (23): Tarsi. Source: https://www.researchgate.net/figure/18-Philomides-hamooniae-male-holotype-UCRCENT00491418-11-head-and-anterior_fig4_333207824

identified) of a single Ponerinae larva *Neoponera luteola* (Roger, 1861), which nests in trunks of *Cecropia membranacea* Trécul (Rosales: Urticaceae).

According to the authors, the nests of *N. luteola* are particularly easy targets for parasitoids because access to the nest is wide and it’s open for the ant queen can collect the Müllerian corpuscles. Further details of the biology and behavior of these parasitoids have not been detailed so far, but the literature describes these interactions with other organisms noting that behavioral and biological characteristics of *Perilampidae* resemble those of its sister group, the *Eucharitidae* (Figure 19).
Figure 7. Perilampidae larvae surrounded by *Aphis nerii* Boyer de Fonscolombe, 1841 (Hemiptera: Aphididae) on *Asclepias syriaca* L. (Apocynaceae). Source: https://en.wikipedia.org/wiki/Perilampidae

Figure 8. Planidia and larva of a parasitoid wasp of the Perilampidae. Source: https://en.wikipedia.org/wiki/Planidium

Figure 9. Planidia (larva) of a parasitoid wasp of the Perilampidae. Source: https://bugguide.net/node/view/746626/bgimage

Figure 10. Larva of a parasitoid wasp of the Perilampidae. Source: Photo by Charleey Eiseman

Figure 11. Prepupae - *Perilampus platigaster* Say, 1836, done feeding and ready to burrow down and spin cocoons. The prepupa of this species looks much like the feeding-stage larva but its head is no longer red. Source: https://bugtracks.wordpress.com/tag/perilampidae

Figure 12. *Perilampus platigaster* Say, 1836 (hyper-parasitoids) emerged from cocoons of braconid (Hymenoptera: Braconidae) wasp larvae that emerged from a few caterpillars that remain unidentified because all of them were parasitized. Source: Photo by Charleey Eiseman

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Figure 15. An entomologist examining wasp specimens in fossilized amber from the Eocene (34-55 million years ago) has identified them as a new species, *Brachyelatus marthae* sp. nov. and the first fossil specimens from the chalcid wasp subfamily Chrysolampinae. Source: http://entomologytoday.org/2020/02/03/previously-unknown-wasps-found-prehistoric-amber-chrysolampinae-brachyelatus-marthae

Among the characteristics shared by these two families are the larval morphology of the planid type and oviposition behaviors females. An adult female lay about 500 eggs in the vicinity of the host from which it emerged (Figure 20).

Figure 16. Rare Perilampidae wasp Chalcidoidea fossil genuine Baltic AMBER 3094. Source: https://www.ambertreasure4u.com/index.php?route=product&product_id=3989

She uses her ovipositor to insert eggs inside of plant tissue, mainly in leaves and fruits, and the first stage, the planidium, is quite sclerotized and active, locating the host and adhering to him. In many cases, the planid does not feed until the host begins its pupal stage. The literature points out that only one planidium will develop in each ant larva in the observed several Perilampidae emerging from a single host.

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The first and second in stars of the larva they develop as typical ectoparasites in the posterior ventral thoracic region of the host pupa. The later stages of the larva, however, they can be secondarily endoparasitoids or hyperparasitoids. Various species of the Perilampinae subfamily are hyperparasitoids, developing in Tachinidae (Diptera) and Ichneumonidae (Hymenoptera). Some species may be obligate hyperparasitoids, while others are facultative.

All Perilampidae complete their development after four instars and are koinobiont. When become adults, they can be observed feeding on flowers (mainly species of the subfamily Perilampinae), but some also feed on honeydew. One female *Perilampus aeneus* (Rossius, 1790) was observed piercing the epidermis of a leaf to feed on exudate (Figure 21).\(^{20-26}\)

3.2 Study 2
3.2.1 Genus *Burksilampus* (Hymenoptera: Perilampidae) (Figure 22)

Five attributes include:
3.3 Study

The Serra do Japi Forest Reserve covers areas of the municipalities of Jundiaí, Cabreúva and Cajamar, in the state of São Paulo, Brazil (Figure 23).

The collections were carried out during five days, between 5 and February 9, 2011 (Figure 24).

The relative abundance of the eight superfamilies of parasitoid Hymenoptera collected in this study (Figure 25).

Burksilampus includes 1 child: Burksilampus anobii (Burks, 1969) [27].

1-Body symmetry: Bilaterally symmetric.
2-Behavioral circadian rhythm diurnal.
3-Developmental mode holometabolous.
4-Visual system: ocelli.
5-Wing morphology has wings.
The presence of Perilampidae (0.62%) was recorded and Pelecinidae (0.15%), families that are not frequent in scientific collections and in samples of parasitoid fauna. Some researchers classified as rare and indicative of conserved areas (Figure 26).

3.3.1 Perilampidae Family
Total: 8 specimens; FRSt; relative frequency of parasitoid (0.62); FRFt: Parasitoids hymenopterans (7.2) (Figure 27)[28-30].

4 CONCLUSION
The species of the Perilampidae family are parasitoids of Lepidoptera, Diptera (Tachinidae) Coleoptera, Hymenoptera, Neuroptera, Orthoptera, Raphidioptera and Anobiidae and Platypodidae beetles.

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Not applicable.

Conflicts of Interest
The author declared no conflict of interest.

Author Contribution
Marchiori CH contributed to the manuscript and approved the final version.

References


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