

Contribution to the knowledge of the Chrysididae (Insecta: Hymenoptera)

Carlos Henrique Marchiori *

Instituto Federal Goiano, Biology, Parasitology, Goiânia, Goiás, Brazil.

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Abstract

Chrysididae Family of solitary Hymenoptera, of medium size, which deposit their eggs in the offspring of other Hymenoptera, so that the larvae of these serve as food for the larvae that will emerge two eggs. Remembering the cuckoo bird's behavior of using other birds' nests to lay their eggs. The objective of this manuscript was to know the Family Chrysididae (Insecta: Hymenoptera). For this, a bibliographic survey of Chrysididae was carried out in the years 1911 to 2021. Only complete articles published in scientific journals and expanded abstracts presented at national and international scientific events were considered. Data were also obtained from platforms such as Academia.edu, Frontiers, Qeios, Biological Abstract, Publons, Dialnet, World, Wide Science and Springer.

Keywords: Cuckoo wasp; Ectoparasitoids; Endoparasitoids; Kleptoparasites; Phylogeny

1. Introduction

Chrysididae is a family of Apocrita Hymenoptera commonly known as golden wasps or cuckoo wasps. It is a cosmopolitan family with more than 3,000 described species (Figures 1-4) [1].



(Source: <https://www.greenme.com.br/informarse/animais/82280-vespa-cuco-inseto/>)

Figure 1 Specimen of the Chrysididae Family

* Corresponding author: Carlos Henrique Marchiori
Instituto Federal Goiano, Biology, Parasitology, Goiânia, Goiás, Brazil.



(Source: <https://www.greenme.com.br/informarse/animais/82280-vespa-cuco-inseto/>)

Figure 2 Specimen of the Chrysididae family visiting the flowers to obtain nectar for food



(Source: <https://www.greenme.com.br/informarse/animais/82280-vespa-cuco-inseto/>)

Figure 3 Specimen of the Chrysididae family visiting the nests of other insects for food



(Source: <https://www.greenme.com.br/informarse/animais/82280-vespa-cuco-inseto/>)

Figure 4 Paper wasp *Polistes* sp. (Hymenoptera: Vespidae) and a cuckoo wasp Chrysididae

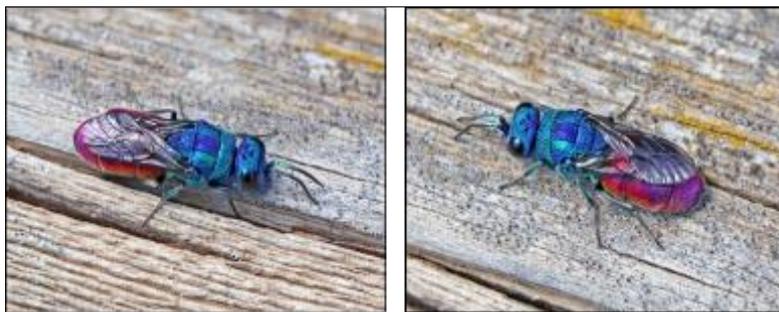
1.1. Description

They are generally brightly colored metallic, green, red, or blue wasps, which is why they are also often called jewel wasps, gold wasps, or emerald wasps. The body covering usually has a wrought-iron texture. The bodies of cuckoo wasps present well-defined shapes and with several bright metallic colors, which work as mimicry (natural camouflage), to protect themselves from predators (Figures 5-6) [2].



(Source: [https://commons.wikimedia.org/wiki/Category:Chrysididae#/media/File:Cuckoo_wasp_Captured_in_India_\(49578661693\).jpg](https://commons.wikimedia.org/wiki/Category:Chrysididae#/media/File:Cuckoo_wasp_Captured_in_India_(49578661693).jpg))

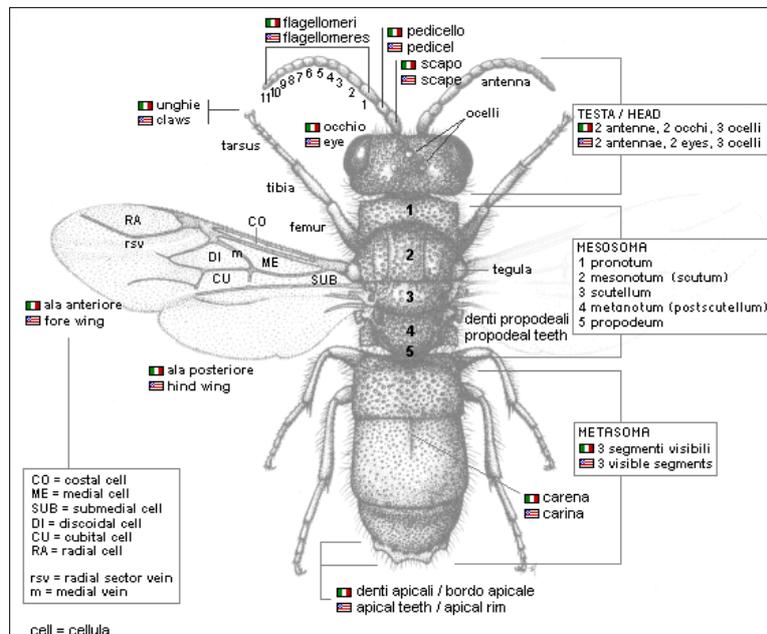
Figure 5 Specimen of the Family Chrysididae with colored metallic blue



(Source: [https://commons.wikimedia.org/wiki/Category:Chrysididae#/media/File:Cuckoo_wasp_Captured_in_India_\(49578661693\).jpg](https://commons.wikimedia.org/wiki/Category:Chrysididae#/media/File:Cuckoo_wasp_Captured_in_India_(49578661693).jpg))

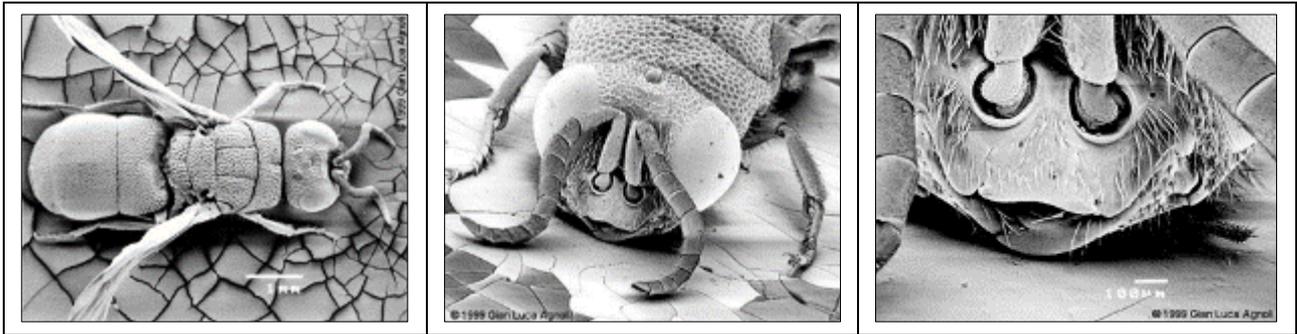
Figure 6 Specimen of the Family Chrysididae with colored metallic green

They measure 6 to 12 mm. Female antennae have 12 segments, male antennae 13. The female's stinger has been modified into an egg-laying tube, so unlike other Aculeata they cannot sting (Figures 7-12) [3,4].



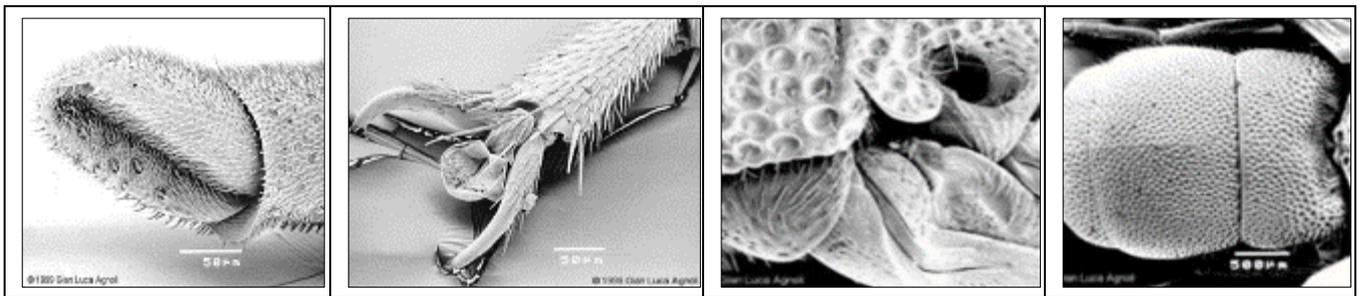
(Source: <https://www.chrysis.net/chrysididae/morphology-of-chrysididae/>)

Figure 7 Morphology of Chrysididae



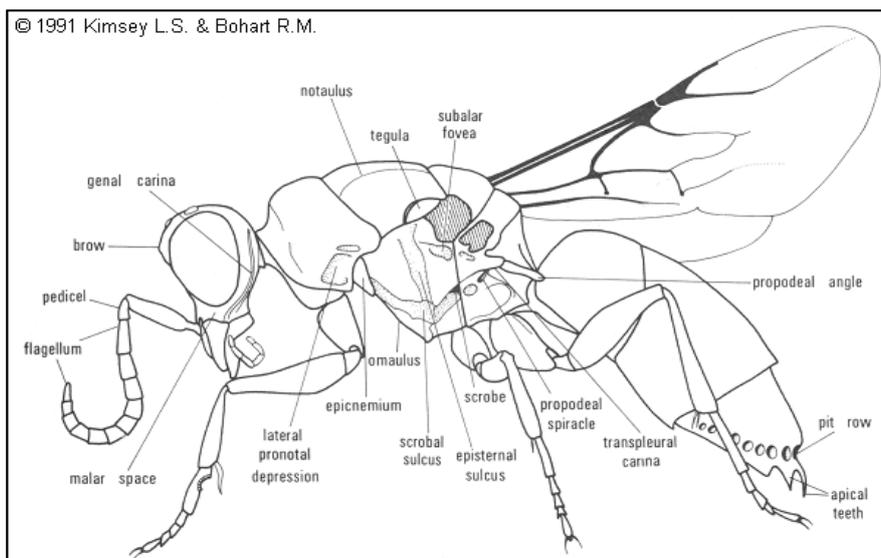
(Source: <https://www.chrysis.net/chrysididae/morphology-of-chrysididae/>)

Figure 8 The scape, the pedicel and 11 flagellomeres (F-1, F-2, etc.), usually cylindrical. The relative length of the first 3 flagellomeres is of diagnostic importance. The clipeus is generally short and broad, except for the genus *Stilbum*. The mandibles are simple and are armed with 0-3 apical teeth. The central part of the face is occupied by a depression (scapal basin) capable of receiving the antennas in a folded position



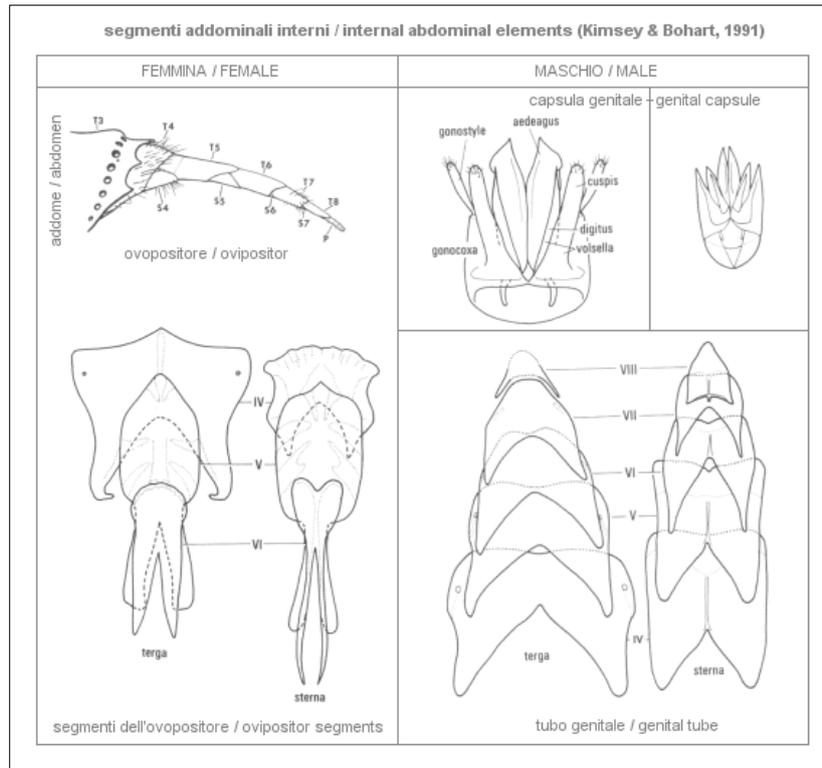
(Source: <https://www.chrysis.net/chrysididae/morphology-of-chrysididae/>)

Figure 9 Modern hymenopterological nomenclature the terms mesosoma and metasoma are used instead of thorax and abdomen, respectively. The reason is that the first abdominal segment (propodeum) is joint with the morphological thorax and the famous “wasp-waist” articulates two abdominal segments and not the thorax to the abdomen



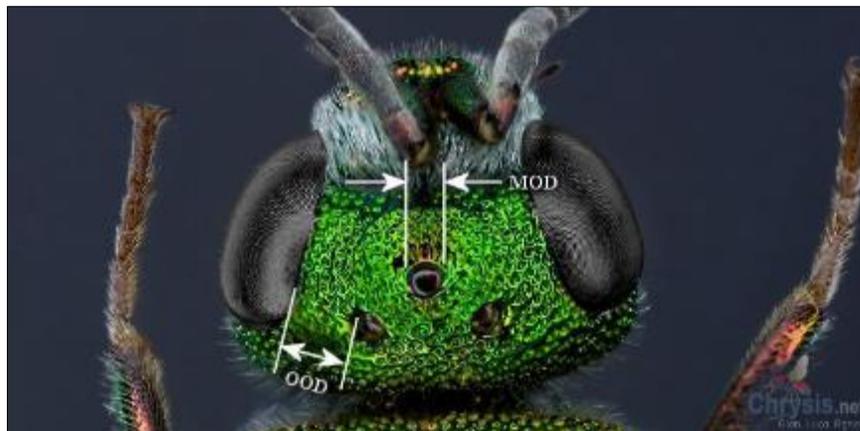
Source: from Kimsey & Bohart, 1990

Figure 10 Body in lateral view



(Source: Kimsey & Bohart, 1990)

Figure 11 Abdomen is significantly modified reduced to only 3 visible segments and other internal segments. Parnopinae have 4 in males and 3 in females, the Allocoeliini 2 tergites and 3 sternites in both sexes. In the other tribes males and females have 3 abdominal segments. A useful diagnostic structure is found on the anal edge of the last tergite, characterized by teeth, carina, bumps and spots

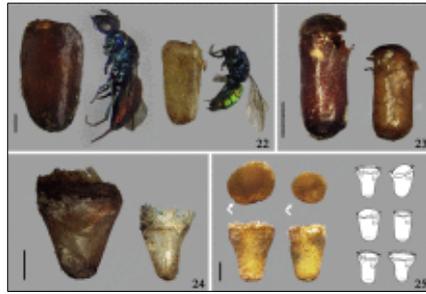


(Source: Kimsey & Bohart, 1990)

Figure 12 MOD, The Diameter of the Median Ocellus. This quantity is used as the unit for all the other measures taken on a given specimen, which become relative measures instead of absolute measures (eg. 3 millimeters). OOD (Ocellar-Ocular Distance), is the minimum distance between the lateral ocellus and the compound eye. PD (Puncture Diameter) and the diameter of the punctuation on a given area, eg. On the pronotum, on the T-2

1.2. Lifestyle and habits

Family (Chrysididae) of solitary Hymenoptera, of medium size, which deposit their eggs in the offspring of other Hymenoptera, so that the larvae of these serve as food for the larvae that will emerge two eggs. Remembering the cuckoo bird's behavior of using other birds' nests to lay their eggs (Figures 13-14) [4, 5].



(Source: <https://www.sciencedirect.com/science/article/abs/pii/S0044523120300140>)

Figure 13 The cocoons of cuckoo wasps (Hymenoptera: Chrysididae) are complex and diverse formations. They usually have several specific structures: Patches, covers, arches, bases, pores, nipples, internal discs and transverse opercula. Eleven morphological types of cocoons are established for cuckoo wasps



(Source: <https://www.britannica.com/animal/cuckoo-wasp>)

Figure 14 All cuckoo wasps are solitary (nonsocial), external parasites, mostly of full-grown bee or wasp larvae. Species of the genus *Cleptes* are parasitic on sawfly larvae; those of *Mesitiopterus* are parasitic on the eggs of the walking tic

The best known are members of the largest subfamily, Chrysidinae. They are generally kleptoparasites that lay their eggs in the nests of their hosts, where the larva consumes the host's egg or larva and then the stored food. Other subfamilies are parasitoids of saw wasps or stick insects. The Chrysididae Family deposits food stored on them. Can also be ectoparasitoids or endoparasitoids (Figures 15-19) [4,5].



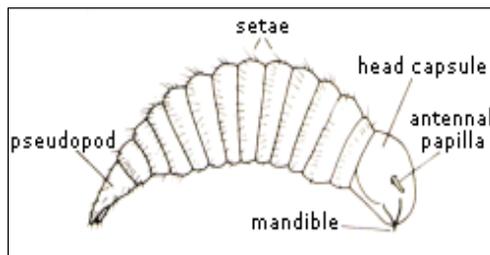
(Source: <https://www.chrysis.net/chrysididae/biology-of-chrysididae/>)

Figure 15 Emergence of a pupal Chrysididae



(Source: <https://www.chrysis.net/chrysididae/biology-of-chrysididae/>)

Figure 16 There are two basic strategies in parasitizing hosts. The first one wants that the Chrysididae starts with eating the host egg or the young host larva and then eats the food resources present in the nest (Kleptoparasitism); the second one wants that the chrysidid waits for the development of the host larva to its prepupal stadium, and then the Chrysididae kills it after cleaning the nest



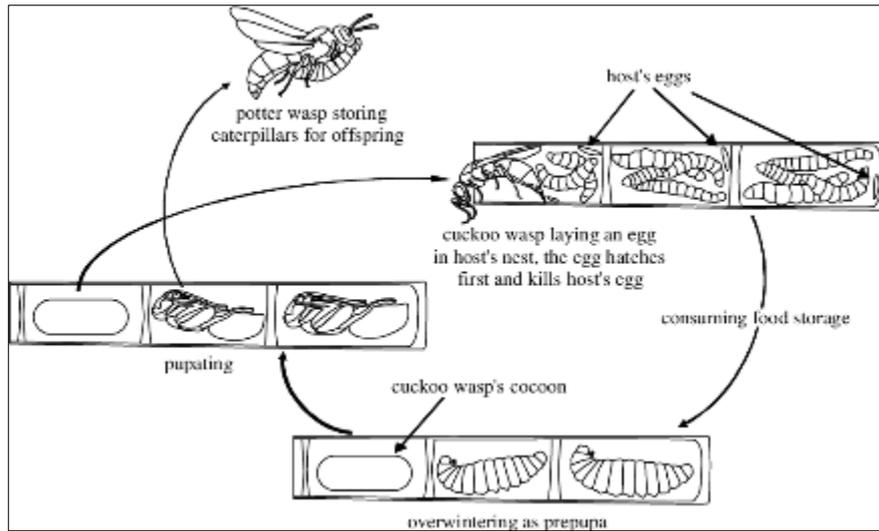
(Source: From Morgan (1984))

Figure 17 Chrysidid larva



(Source: Elkins Park, Montgomery County, Pennsylvania, USA July 30, 2012)

Figure 18 Cuckoo wasp *Chrysis angolensis* Radoszkowski 1881 in black and yellow mud dauber nest *C. angolensis*. Here it is fully inside the nest. It stayed in there for a long time. Looked like it might be eating either the eggs or the spider meat left by the mud Dauber that built it originally Images of this individual: tag all

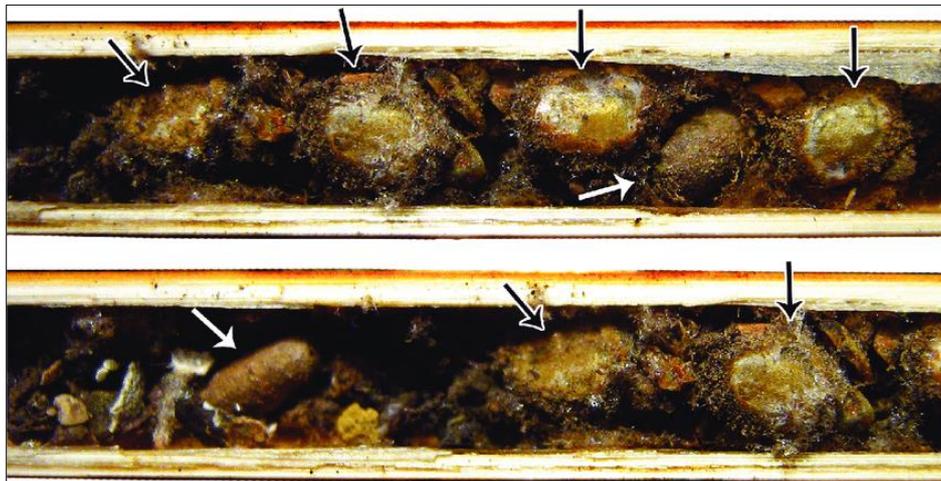


(Source: <https://www.semanticscholar.org/paper/A-phylogenetic-revision-of-the-Chrysis-ignita-group-Soon/c2f421b4d8fa9f10b54c32e40f290abee83e79e2/figure/0>)

Figure 19 Life cycle of typical representatives of the Chrysididae species group

1.3. Food

Cuckoo wasps appreciate flower nectars, especially from species such as: *Achillea millefolium* Euphorbia paralyzes. Examples of cuckoo wasp species the variation of colors and shapes differentiates the cuckoo wasp species (Figure 20) [6, 7].

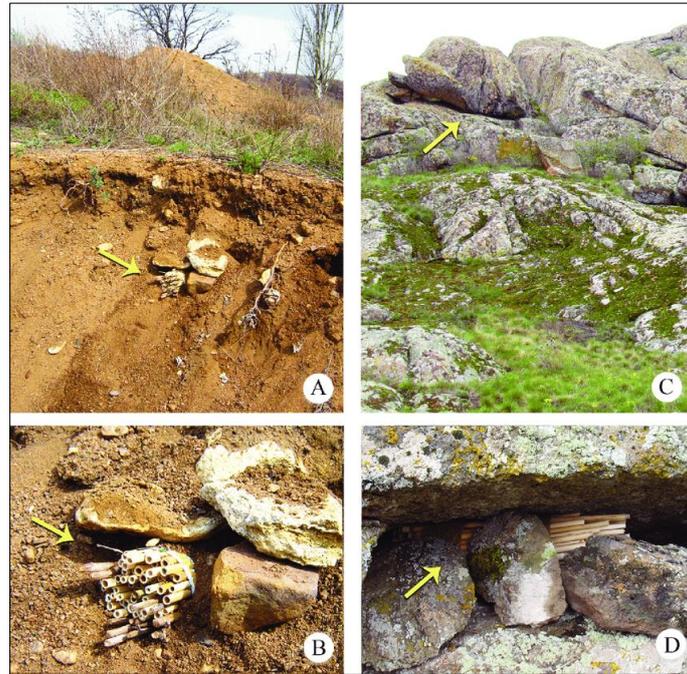


(Source: https://www.researchgate.net/figure/The-artificial-traps-containing-nests-of-Solierella-compedita-Piccioli-1969-used-for_fig2_317166868)

Figure 20 Two nests of *Solierella compedita* (Piccioli, 1869) containing cocoons of this wasp (pointed at by white arrows) and cocoons of *Hedychridium monochroum* du Buysson, 1888. (Pointed at by black arrows)

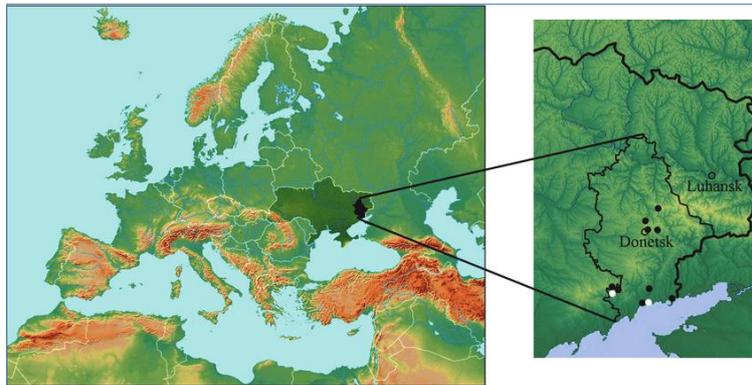
1.4. Geographic distribution

The cuckoo wasp is found in sandy and warm areas of Europe and Africa, but it is worth knowing and appreciating the beauty of this insect. They present their greatest diversity of species in desert areas. They are usually associated with the species they parasitize, solitary bees or other wasps, which in turn have the greatest variety of species in such regions (Figures 21-22) [7,8].



(Source: https://www.researchgate.net/figure/The-artificial-traps-containing-nests-of-Solierella-compedita-Piccioli-1969-used-for_fig2_317166868)

Figure 21 The artificial traps containing nests of *Solierella compedita* (Piccioli, 1969) used for attraction of cuckoo wasps: A), B) vicinities of Mariupol city; C), D) "Kamyani Mohyly" Reserve



(Source: https://www.researchgate.net/figure/The-artificial-traps-containing-nests-of-Solierella-compedita-Piccioli-1969-used-for_fig2_317166868)

Figure 22 The places of exposition of trap-nests in southeastern Ukraine (white circles-trap-nests containing *Solierella compedita* (Piccioli, 1869), black circles-other trap-nests)

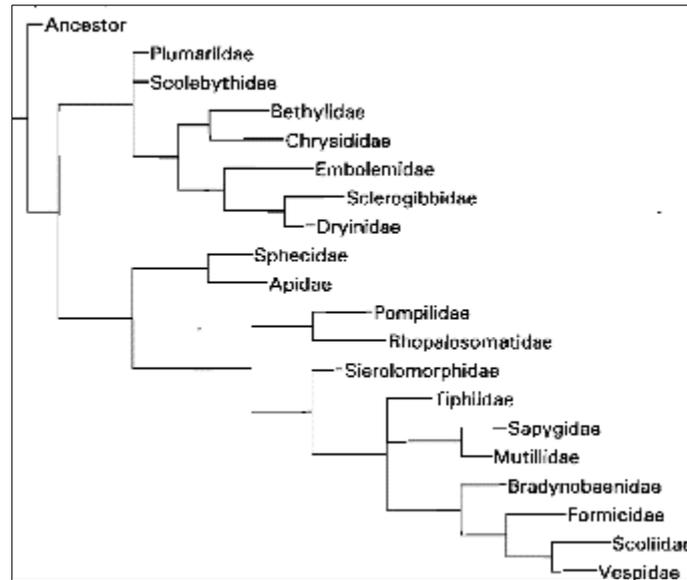
1.5. Natural defense mechanism

The surface of the cuckoo wasp's body is made up of cuticular hydrocarbons (CHCs), which have several functions such as: Protecting the body from water and for chemical communication, through the imperceptible smell they exude.

In this way, this wasp manages to dodge other insects by detecting them through the odor, which favors it to approach and carry out its parasitism in the other's nest, without being perceived by the smell [7,8].

1.6. Reproduction

The female cuckoo wasp not only takes advantage of the nests of bees and other insects but also hosts its eggs in the paralyzed worker bees, for example by the bee wolf, which would serve as food for the larvae of this bee species. With this, the cuckoo wasp has a parasitic behavior, as it takes advantage of the burrows and food provisions of this bee and other wasps as well (Figure 23) [7,8].



(Sources: Brothers DJA, Carpenter JM. Phylogeny of Aculeata: Chrysoidea and Vespoidea (Hymenoptera). Journal of Hymenoptera Research. 1993; 2(1): 227-304) and German entomological journal. 1978; 25: 365-435)

Figure 23 Phylogeny of Aculeata after Konigsmann E. The phylogenetic system of Hymenoptera. Part 4: Aculeata (suborder Apocrita)

1.7. Nomenclature

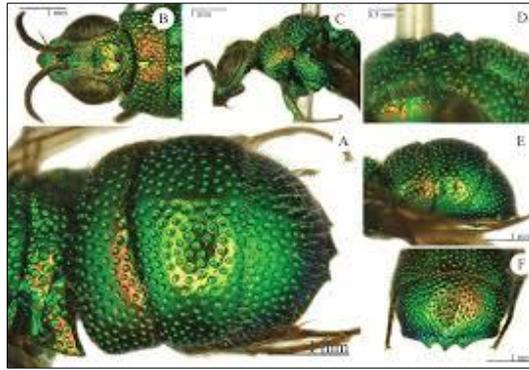
The term "cuckoo wasp" refers to the cuckoo-like way wasps in the family lay eggs in the nests of unrelated host species. Chrysididae, the scientific name of the family, refers to their shiny bodies and is derived from the Greek chrysis, chrysid, "golden vase, gold-embroidered dress", plus the family suffix idae. The common names of many species honor their appearance: jewel wasp, golden wasp, emerald wasp, ruby wasp, and so on.

Subfamilies: Amiseginae, Cleptinae, Chrysidinae and Loboscelidiinae (Figures 24-27).



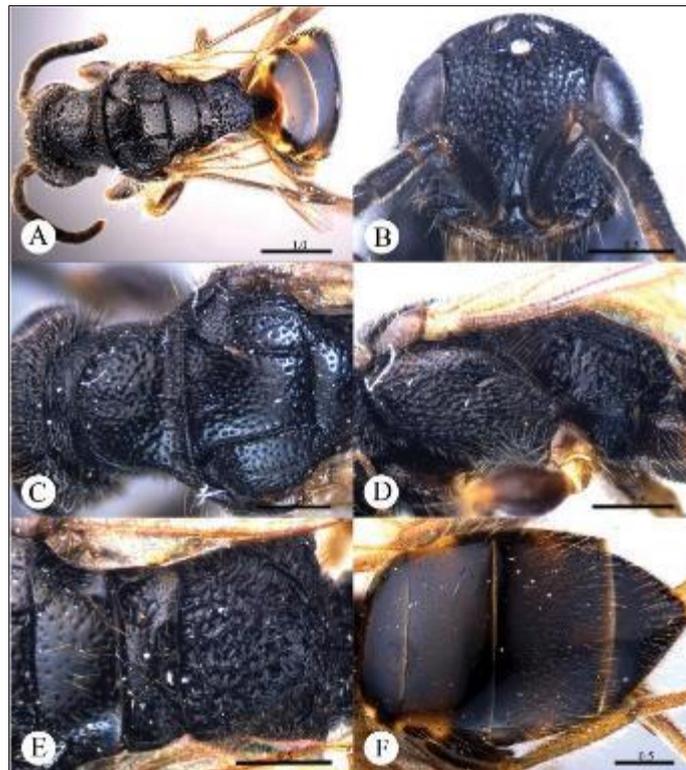
(Source: file:///C:/Users/User/Downloads/JHR_article_60048_en_1.pdf)

Figure 24 Subfamily Amiseginae, paratype, female (A) lateral habitus (B) head, frontal view (C) metasoma, dorsal view (D) head and mesosoma, dorsal view (E) dorsal habitus (F) anterior wing (G) inner margin of metabasitarsus



(Source: file:///C:/Users/User/Downloads/34222.pd)

Figure 25 Subfamily Chrysidinae female. (A). Metasoma, dorso-lateral view; (B). Head, frontal view; (C). Mesosoma, lateral view; (D). Mesosoma, dorsal view; (E). Metasoma, postero-lateral view; (F). Metasomal tergite 3, posterior view



(Source: <https://zookeys.pensoft.net/article/3646/>)

Figure 26 Subfamily Cleptinae holotype, female. (A) Habitus dorsal (B) Head anterior (C) Pronotum and mesoscutum dorsal (D) Mesopleuron and metapleuron lateral (E) Mesoscutellum, metanotum and propodeum dorsal (F) Metasoma dorsal



(Source: <https://zookeys.pensoft.net/article/2272/>)

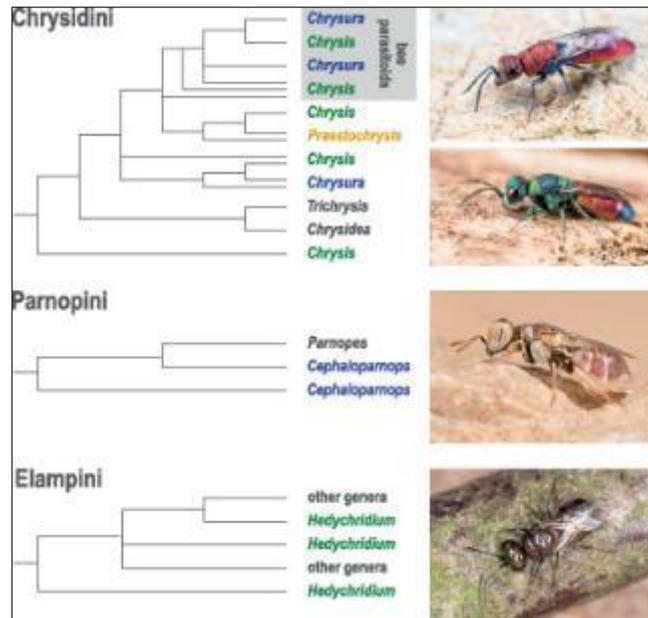
Figure 27 Subfamily Loboscelidiinae holotype. (1) lateral habitus (2) head in frontal view (3) head and pronotum in lateral view (4–5) dorsal view of head and pronotum 6 antenna

Genus: *Adelphe*, *Amisega*, *Caenochrysis*, *Chrysis*, *Cleptidea*, *Edychridium*, *Exallopypga*, *Exochrysis*, *Hedychridium*, *Hedychrum*, *Holopyga*, *Ipsiura*, *Neochrysis* and *Pleurochrysis* (Figures 28-30) [9].



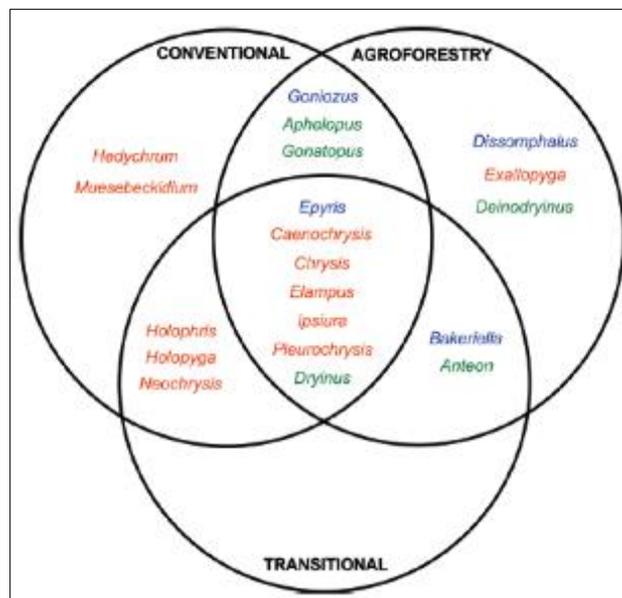
(Source: [https://www.semanticscholar.org/paper/Chrysidid-wasps-\(Hymenoptera%3A-Chrysididae\)-from-and-Lucena-Melo/27578e9d2ac0a48d1a5d2d4e22381de5f054a1ee/figure/1](https://www.semanticscholar.org/paper/Chrysidid-wasps-(Hymenoptera%3A-Chrysididae)-from-and-Lucena-Melo/27578e9d2ac0a48d1a5d2d4e22381de5f054a1ee/figure/1))

Figure 28 *Auricleptes nebulosus* Lucena & Melo, gen. et sp. nov. (A) Habitus dorsal; (B) habitus lateral; (C) dorsal view of pronotum; (D) dorsal view of metanotum and propodeum. Chrysidid wasps (Hymenoptera: Chrysididae) from Cretaceous Burmese amber: Phylogenetic affinities and classification



(Source: <https://resjournals.onlinelibrary.wiley.com/doi/epdf/10.1111/syen.12323>)

Figure 29 Phylogenetic analysis of cuckoo wasps (Hymenoptera: Chrysididae) reveals a partially artificial classification at the genus level and a species-rich clade of bee parasitoids



(Source: <https://www.scielo.br/j/paz/a/pMfgMnn7Gj6sGtChJNFKDXL/?lang=en#>)

Figure 30 Venn diagram showing exclusive and shared genera of Chrysididae among conventional, agroforestry and transitional systems in the “Pontal do Paranapanema” region, São Paulo, Brazil. Bethylinidae in blue, Chrysididae in red and Dryinidae in green color

Objective

The objective of this manuscript was to know the Family Chrysididae (Insecta: Diptera).

2. Methods

The method used to prepare this mini review was Marchiori 2021 methodology [10].

3. Studies conducted and selected

3.1. Study 1

Chrysis semicincta Lepeletier, 1806. This species has a bluish-green head, black eyes, a blue stripe between the wings, bluish-green feet, and transparent wings. Her jaws are reddish-brown, her chest has nuances of colors such as metallic green, and blue and the side of her body has metallic green and purplish-blue tones. This insect lives in the following regions: Southwest Europe (France) and North Africa (Figure 31).



(Source: <https://www.biodiversity4all.org/taxa/705606-Chrysis-semicincta>)

Figure 31 *Chrysis semicincta* Lepeletier, 1806

Hedychrum rutilans Dahlbom, 1854 is another species of cuckoo wasp (family Chrysididae), but belongs to the genus *Hedychrum*. This species is found in Italy, Greece, France, Switzerland, Portugal, Spain, Austria, Bulgaria, Poland, Portugal and North Africa. The head and thorax of this wasp have metallic bluish green nuances and the abdomen is a very intense dark pink (Figure 32) [11].



(Source: https://pt.wikipedia.org/wiki/Hedychrum_rutilans)

Figure 32 *Hedychrum rutilans* Dahlbom, 1854

3.2. Study 2

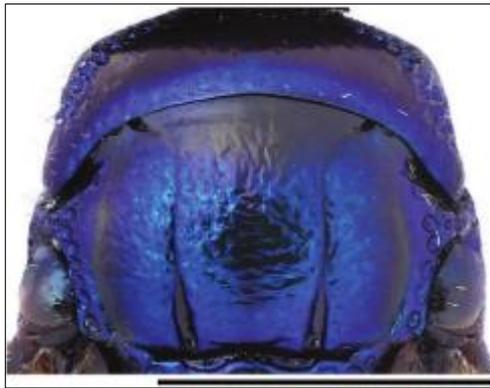
Omalus biaccinctus du Buysson, 1892

Ellampus biaccinctus du Buysson, 1892 (Figure 33-34).



(Source: <https://www.artsdatabanken.no/Pages/200925/>)

Figure 33 *Omalus biaccinctus* du Buysson 1892



(Source: <https://www.artsdatabanken.no/Pages/200925/>)

Figure 34 Mesosoma, lateral view (arrow indicating mesopleuron): *Omalus biaccinctus* (Du Buysson, 1892) ♀

Distribution. Lebanon. Europe, European part of Russia, Crimea, western Asia.

Remarks. Found in the *Quercus* sp. and *Cedrus libani* wooded areas of Tannourine.

Host: *Passaloecus turionum* Dahlbom, 1844, *Passaloecus gracilis* (Curtis, 1834) (Curtis) and *Passaloecus eremita* Kohl, 1893 (Crabronidae). Adults have been reared from old resin-galls of *Retinia resinella* (Linnaeus, 1758) (Lepidoptera: Tortricidae) and pieces of pine wood with host nests inside. The females oviposit in living aphids at the hunting site of their host, and the egg is brought into the host's nest concealed in the aphid prey. Thus, the females do not enter the nest of their host for oviposition (Figures 35-36) [12].



(Source: <https://www.bwars.com/wasp/crabronidae/pemphredoninae/passaloecus-eremita>)

Figure 35 *Passaloecus eremita* Kohl, 1893 (Crabronidae)



(Source: <https://projects.biodiversity.be/lepidoptera/species/4676/>)

Figure 36 *Retinia resinella* (Linnaeus, 1758) (Lepidoptera: Tortricidae)

3.3. Study 3

Chrysoidea are probably the most neglected group, compared to the relatively well-known Apoidea and Vespoidea, which goes against their diversity and importance in natural ecosystems.

The Chrysididae are considered one of the largest and best-known groups among the Chrysoidea in terms of taxonomy and systematics. It is a group of wasps with parasitic habits, with about three thousand described and cataloged species, distributed in eighty genera and four subfamilies around the world (Figure 37A).



(Source: Daercio LA, Kimsey A, Lynn S, Almeida EAB. The Neotropical cuckoo wasp genus *Ipsiura* Linsenmaier, 1959 (Hymenoptera: Chrysididae): revision of the species occurring in Brazil, *Zootaxa*. 2016; 4165(1): 1-71: 21)

Figure 37A Distribution of *Ipsiura* spp. in South America

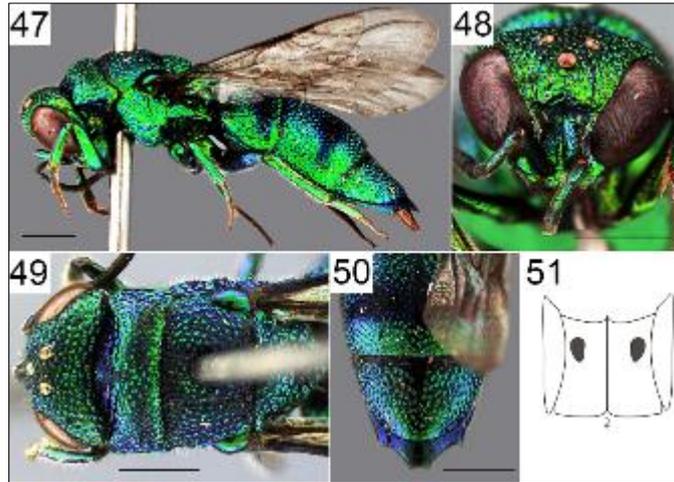
All known chrysidids are parasitoids of other insects, including phasmid eggs, immature stages of “Symphyta” wasps, but the vast majority are more easily recognized through representatives of the subfamily Chrysidinae, which are mostly bee kleptoparasitic wasps and solitary wasps (Figure 37B).



(Source: <http://www.waspweb.org/Chrysoidea/Chrysididae/Chrysidinae/Chrysidini/index.htm>)

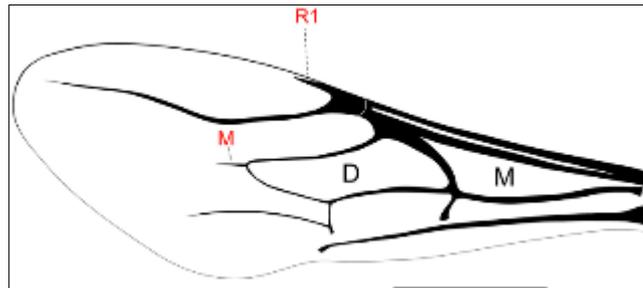
Figure 37B Specimens of Chrysidini

Chrysidini occurs only in the Palearctic Region. This makes more general interpretations impossible for the tribe as a whole and more specifically for the lineages present in the Neotropics. Chrysidini occurs only in the Palearctic Region. This makes more general interpretations impossible for the tribe as a whole and more specifically for the lineages present in the Neotropics. Although they feed on nectar as adults, chrysalids, in general, are occasionally sampled in flower collections (Figures 38-39).



(Source: <http://tb.plazi.org/GgServer/html/03D687A8FA55AC4C97CBC53FFEF9E21B>)

Figure 38 *Psiura*, holotype ♀. (47). Habitus, lateral view. (48). Head, frontal view. (49). Mesosoma, dorsal view. (50): T3, postero-dorsal view ♀



(Source: Daercio LA, Kimsey A, Lynn S, Almeida EAB. The Neotropical cuckoo wasp genus *Ipsiura* Linsenmaier, 1959 (Hymenoptera: Chrysididae): revision of the species occurring in Brazil, *Zootaxa*. 2016; 4165 (1): 1-71: 21)

Figure 39 Generalized *Ipsiura* fore wing. R1 and M veins indicated in red. Discoidal and medial cells are indicated by “D” and “M”, respectively

The *Ipsiura* Linsenmaier, 1959 are parasitoids of wasps of the genera *Eumenes* and *Pachodynerus* (Vespidae: Eumeninae), in addition to wasps of the genera *Trypoxylon* and *Sceliphron* (Sphecidae), however, there are records of only a few species that present documented records of hosts and it is not known for sure if there is specificity or if these parasites use hosts in a generalized way (Figures 40-41) [13].



(Source: Hermesn MG, Bolívar Rafael Garcete-Barrett R. Notes on Neotropical Eumeninae, with the description of a new species of *Pachodynerus* de Saussure (Hymenoptera, Vespidae). *Revista Brasileira de Entomologia*; 2013; 57(2): 169–172)

Figure 40 *Pachodynerus* (Hymenoptera: Vespidae) paratype male; (1), Habitus, dorsal view; (2), Head, frontal view; (3), Posterior half of the mesosoma, dorsal view; (4), Metasoma in dorsal view



(Source: <https://pt.wikipedia.org/wiki/Sceliphron>)

Figure 41 Genus *Sceliphron*

3.4. Study 4

3.4.1. Chrysidini

Chrysidine wasps of Africa and Madagascar (Life: Kingdom: Metazoa (animals); Phylum: Arthropoda; Class: Hexapoda; Order: Hymenoptera; Superfamily: Chrysoidea; Family: Chrysididae; Subfamily: Chrysidinae) *Brugmoia*, *Chrysidea*, *Chrysis* Linnaeus, 1761 *Chrysura*, *Odontochrydium*, *Praestochrysis*, *Primeuchroeus*, *Pseudospinolia*, *Spintharina*, *Spintharosoma* *Stilbichrysis*, *Stilbum* and *Trichrysis* (Figure 42).



(Source: Chrysidini - WaspWeb.pdf)

Figure 42 Specimens of Chrysidini

Distribution Worldwide. Biology Parasites of solitary bees and wasps. Diversity in excess of 1200 described species in 24 genera [14].

3.5. Study 5

I caught this Cuckoo wasp (Chrysididae sp.) sneaking into a newly made mud dauber nest just after the builder in the previous photo left for another load of mud (note the darker, wet mud). This pretty, metallic green wasp will lay her egg in the nest.

Her larvae will eat the spiders which were to be the "baby food" for the mud dauber larvae and then those larvae will be eaten by the parasitic cuckoo wasp larvae. Unlike the cuckoo birds which are often much larger than their unwilling host parents, these wasps are much smaller than the wasps they parasitize (Figure 43).



(https://www.easttennesseewildflowers.com/gallery3/index.php/insects/Copy_of_Cuckoo_bee1)

Figure 43 Cuckoo wasp (Chrysididae sp.)

3.5.1. *Trichrysis cyanea* (Linnaeus,1758)

The only entirely metallic blue wasp in Britain.

It has been reared from its hosts: *Trypoxylon figulus* (Linnaeus, 1758) (Hymenoptera: Crabronidae) and *Trypoxylon attenuatum* F. Smith, 1851 (Hymenoptera: Crabronidae). Other hosts seem to be *Pemphredon lethifera* (Shuckard, 1837) (Hymenoptera: Crabronidae), *Stigmus pendulus* Panzer, 1804 (Hymenoptera; Pemphredonidae), *Hylaeus pectoralis* Förster, 1871 (Hymenoptera: Colletidae), *Heriades truncorum* (Linnaeus, 1758) (Apoidea: Megachilidae), and *Chelostoma florissomne* (Linnaeus, 1758) (Hymenoptera: Megachilidae) (Figures 44-51) [15].



(Source: <https://www.bwars.com/wasp/chrysididae/chrysidinae/trichrysis-cyanea>)

Figure 44 Specimens of *Trichrysis cyanea* (Linnaeus,1758)



(Source: https://war.wikipedia.org/wiki/Heriades_truncorum)

Figure 45 *Heriades truncorum* (Linnaeus, 1758) (Apoidea: Megachilidae)



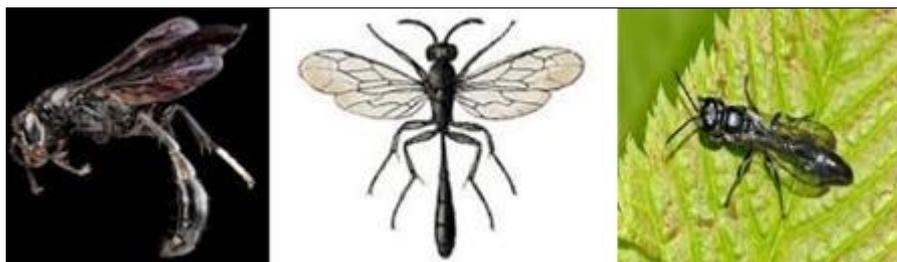
(Source: <https://www.bwars.com/bee/megachilidae/chelostoma-florissomne>)

Figure 46 *Chelostoma florissomne* (Linnaeus, 1758) (Hymenoptera: Megachilidae)



(Source: https://pt.wikipedia.org/wiki/Trypoxylon_figulus)

Figure 47 *Trypoxylon figulus* (Linnaeus, 1758) (Hymenoptera: Crabronidae)



(Source: https://pt.wikipedia.org/wiki/Trypoxylon_attenuatum)

Figure 48 *Trypoxylon attenuatum* F. Smith, 1851 (Hymenoptera: Crabronidae)



(Source: <https://www.bwars.com/wasp/crabronidae/inae/pempredon-lethifer/>)

Figure 49 *Pempredon lethifera* (Shuckard, 1837) (Hymenoptera: Crabronidae)



(Source: <https://bdj.pensoft.net/article/8050/>)

Figure 50 *Stigmus pendulus* Panzer, 1804 (Hymenoptera; Pempredonidae)



(Source: <https://www.bwars.com/bee/colletidae/hylaeus-pectoralis/>)

Figure 51 *Hylaeus pectoralis* Förster, 1871 (Hymenoptera: Colletidae)

4. Conclusion

The best known are members of the largest subfamily, Chrysidinae. They are generally kleptoparasites that lay their eggs in the nests of their hosts, where the larva consumes the host's egg or larva and then the stored food. Other subfamilies are parasitoids of saw wasps or stick insects. The Chrysididae Family deposit food stored on them. Can also be ectoparasitoids or end parasitoids.

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