

(REVIEW ARTICLE)



## Studies of the family Drynidae (Insecta: Hymenoptera) as parasitoids of cicadas (Cicadellidae)

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### Abstract

Most Dryinidae act as cenobiont ectoparasitoids of Cicadellidae (Cicadelloidea), Delphacidae, Flatidae and Membracidae (Hemiptera). Females of Dryinidae feed on nectar and other sugary solutions and, with the exception of Aphelopinae, they also have a predatory habit and feed on fluids and tissues of their hosts. Only Aphelopinae acts as polyembryonic endoparasitoids that attack Membracidae nymphs. Superparasitism is reported for some female Gonatopodinae. Drynidae have biparental reproduction or parthenogenetic thelytok or arrhenotoky. Dryinidae species can be bi or multivoltine, according to the region where they live; as they are not good fliers, their ability to disperse depends more on their hosts than on themselves. The purpose of this paper is to seek knowledge about the Drynidae Family. For the mini-review, the bibliographic search used the following databases: Biological Abstract, Academia.edu, Resergate and Frontiers from November 2022 to December 2022. The articles were published from 1984 to 2022 in indexed scientific research, book scientific chapters, these banks, university dissertations, national and international scientific articles, scientific journals, documents and even in general journals when considered of interest.

**Keywords:** Polyembryonic; Ectoparasitoid; Parasitoid primary; Nymphs

### 1. Introduction

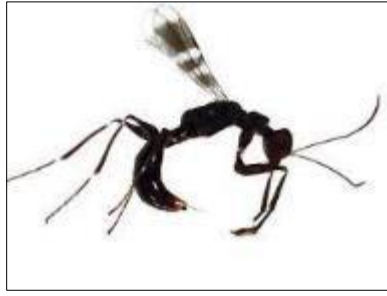
The Chrysoidea act as parasitoids of Phasmatoidea eggs, as ectoparasitoids of Cicadellidae, nymphs of Embioptera or larvae of Lepidoptera Coleoptera; some are kleptoparasites in nests of aculeate Hymenoptera. Dryinidae is cosmopolitan and its species can be found in almost all terrestrial environments, from sea level to altitudes above three thousand meters (Figures 1, 2 and 3) [1,2].



Source: [https://commons.wikimedia.org/wiki/File:Gonatopus\\_alpinus\\_2.jpg](https://commons.wikimedia.org/wiki/File:Gonatopus_alpinus_2.jpg)

**Figure 1** *Gonatopus alpinus* Gourlay, 1954 female: *Gonatopus* is a genus of flowering plants in the Araceae family, comprising 5 validly described species. The genus is native to eastern and southern Africa and is closely related to the genus *Zamioculcas*

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Source: Photo 1209742, (c) Stephen Thorpe, all rights reserved, uploaded by Stephen Thorpe and Source: <https://en.wikipedia.org/wiki/Dryinidae>

**Figure 2** *Dryinus koebelei* (Perkins, 1905) specimen of Dryinidae Family

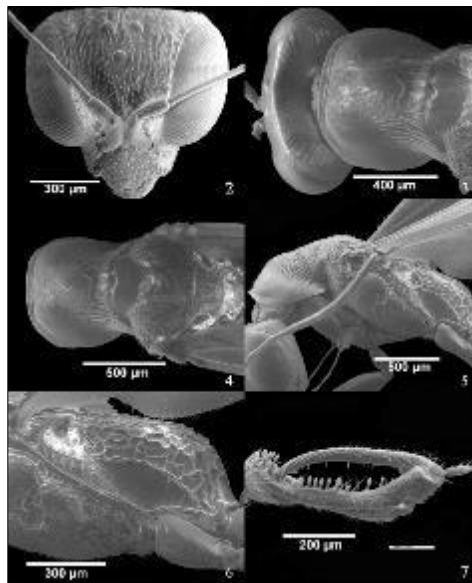


Source: <https://www.mapress.com/zt/article/view/zootaxa.4630.1.1/0>

**Figure 3** Dryinidae of the Afrotropical region (Hymenoptera, Chrysoidea)

### 1.1. Description

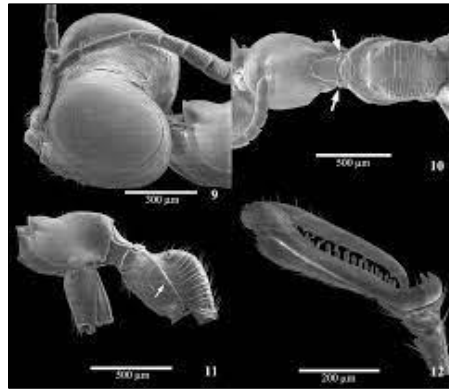
Mesosoma with well-developed pronotum anteriorly, with posterolateral tubercles that touch or not the tegules; wings forewings with one to three (occasionally four) cells closed by pigmented veins and hindwings without closed cells and jugal lobe; formula of tibial spurs in males is 1-1-2 and variable in females (Figure 4) [3,4,5].



Source: <https://www.scielo.br/j/bjb/a/4kNWW7V8KJqc633ZJKdkkdv/?lang=en#ModalFig27>

**Figure 4** figs. 2-7 *Dryinus auratus* sp. nov. Female. 2. Head, frontal view. 3. Head, dorsal-posterior view. 4. Mesosome, dorsal view. 5. Mesosome, lateral view. 6. Propodeum, side view. 7. Claw

Sexual dimorphism ranges from mild to very marked, making it difficult to associate females with their respective males - this explains that the taxonomy of Dryinidae is based mainly on females. The Dryinidae have an ovipositor capable of laying eggs in different regions of the body of their hosts, unlike most of the Aculeata (Figure 5) [5,6,7].



Source: <https://www.scielo.br/j/bjb/a/4kNWW7V8KJqc633ZJKdkkdv/?lang=en#ModalFig912>

**Figure 5A** figs.9-12 *Gonatopus mariae* sp. nov. (Paratype). Female. 9. Head, dorsolateral view. 10. Dorsal mesosoma view. 11. Mesosoma and propodeum, lateral view. 12. Claw

## 1.2. Biology

Most Dryinidae act as cenobiont ectoparasitoids of Cicadellidae (Cicadelloidea), Delphacidae, Flatidae and Membracidae (Hemiptera). Females of Dryinidae feed on nectar and other sugary solutions and, with the exception of Aphelopinae, they also have a predatory habit and feed on fluids and tissues of their hosts. Only Aphelopinae acts as polyembryonic endoparasitoids that attack Membracidae nymphs (Figure 6) [8,9,10].



Source: [https://brill.com/view/journals/ise/52/2/article-p167\\_167.xml](https://brill.com/view/journals/ise/52/2/article-p167_167.xml)

**Figure 5B** Interactions between dryinids and their hosts are poorly known in the Neotropical region, especially for the Brazilian fauna. This study aims to expand this incipient knowledge by describing a new species of *Anteon* and four new species of *Gonatopus* reared from parasitized leafhoppers (Cicadellidae) collected in the state of Paraná, Southern Brazil. The new species, *Gypona elianeae* sp. nov., *Gypona josei* sp. nov., *Gypona meloi* sp. nov., *Gypona pinhalensis* sp. nov. And *Gypona taquarensis* sp. nov., are associated with leafhopper. Species of Dryinidae parasitizing the leafhoppers species: *Curtara concava* (DeLong & Freytag, 1976), *Gypona* sp., *Reticana* sp. (Gyponini), *Graminella* sp. (Deltocephalini) and *Copidinomus* sp.

Superparasitism is reported for some female Gonatopodinae. Drynidae have biparental reproduction or parthenogenetic thelytok or arrhenotoky. Dryinidae species can be bi or multivoltine, according to the region where they live; as they are not good fliers, their ability to disperse depends more on their hosts than on themselves. Many females of Gonatopodinae associated with leafhoppers are wingless and resemble ants; they take advantage of this similarity to capture their prey and perform parasitism (Figures 6 and 7) [11,12,13].



Source: <https://www.fredmiranda.com/forum/topic/788852>

**Figure 6** *Issus coleoptratus* (Fabricius, 1781) (Hymenoptera: Drynidae) nymph with dryinid larva under the right wing. Found a plant hopper nymph with a parasitic larva lodged under a winglet. Looks rather similar to the wasp larvae you sometimes get on *Araniella* spiders possibly as Dryinid (primitive aculeate wasps) from the WAB website



Source: <https://bugguide.net/node/view/979835>

**Figure 7** Drynidae larva ectoparasitoids parasitizing cicada ectoparasitoid Cicadellidae

Drynidae locates their hosts; there is a chance that localization occurs through the perception of substances excreted by the hosts. Some species of Drynidae have been used in biological control programs: *Gonatopus nigricans* (Perkins, 1905) and *Haplogonatopus vitiensis* (Perkins, 1905) were introduced in Hawaii in the second half of the 1990s to control *Perkinsiella saccharicida* Kirkaldy, 1905 (Hemiptera, Delphacidae) which causes damage to sugarcane crops (Figure 8) [14,15,16].

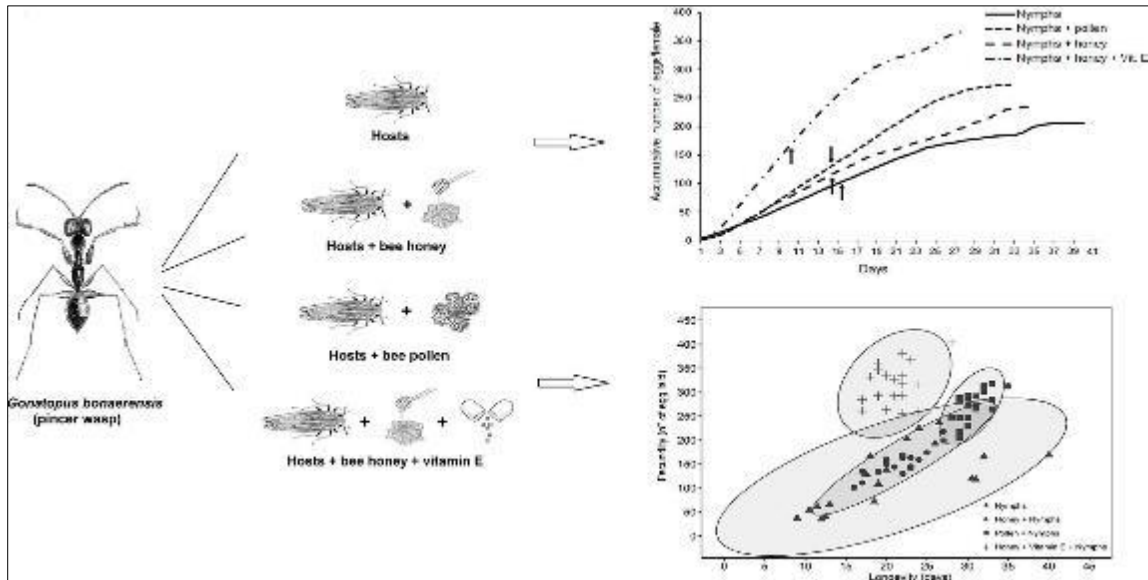


Source: <https://nathistoc.bio.uci.edu/hymenopt/Drynidae%20larvae.htm>, Photo 32144560, Stephen Thorpe, some rights reserved, uploaded by Stephen Thorpe and <https://www.biodiversity4all.org/photos/32144560>

**Figure 8** Dryinid Wasp larvae, a parasite on planthopper's and *Dryinus koebelei* (Perkins, 1905)

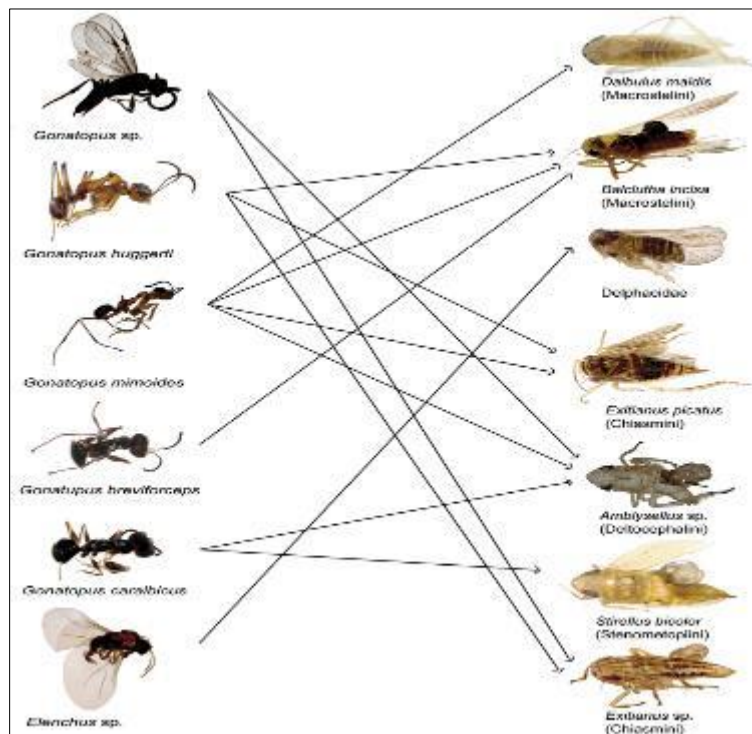
### 1.2.1. Biocontrol

*Aphelopus albopictus* Ashmead, 1893 was introduced in 1935 in New Zealand for the control of *Edwardsiana crateagi* (Douglas, 1873) (Cicadellidae: Typhlocybae) in apple cultivation and *Neodryinus typhlocybae* (Ashmead, 1893) was introduced in Italy, France, Slovenia and Switzerland for the control of *Metcalfa pruinosa* (Say, 1830) (Flatidae) in ornamental plants. Almost nothing is known about the biology and relationships of the Drynidae with their hosts, which makes their use in biological control programs difficult (Figures 9 and 10) [17,18,19].



Source: <https://en.x-mol.com/paper/article/1391827567197704192>

**Figure 9** Marked differences were verified in longevity, fecundity, host-feeding and parasitism levels when the diet of females was supplemented with pollen, bee honey, or with honey + vitamin E. The addition of pollen to the diet significantly increased the longevity of females. In concordance with the record of a greater number of eggs laid throughout their lives, pincer wasp females provided with nymphs + honey + vitamin E parasitized significantly more host nymphs and carried out fewer host-feeding activities than those maintained under other diets. When females had access to supplementary food sources, the concurrent host-feeding decreased, increasing the effectiveness of this pincer wasp. Even though a good number of hosts were healthy after the exposure period, greater phenomena of self-superparasitism were recorded in females that received alternative food sources

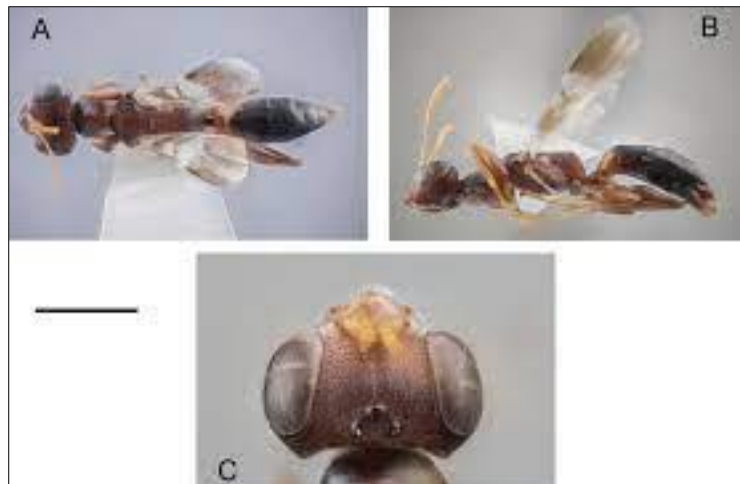


Source: <https://jhr.pensoft.net/article/12990/>

**Figure 10** Total of parasitoid-host interactions found on the edges of maize agroecosystem in the winter seasons of 2014 and 2015. The name in parenthesis shows the name of the host tribe

### 1.3. Taxonomy

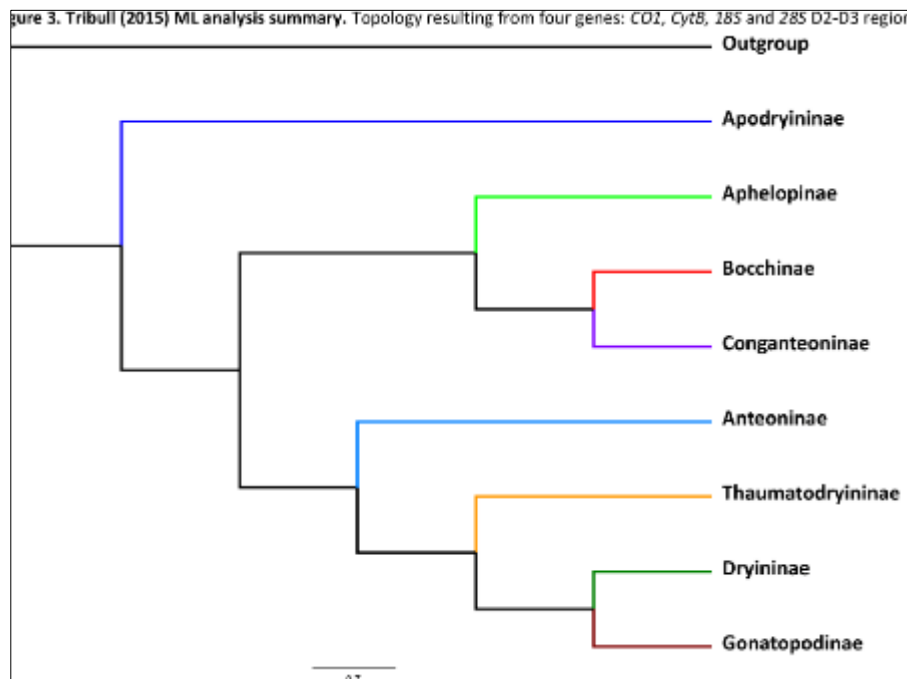
*Dryinus* is home to approximately 270 species of which 110 are reported for the Neotropics and of these, about 40 have occurrence records for Brazil. Dryininae is home to about 340 species grouped into nine genera, of which three are fossils. Among the Dryininae *Dryinus* is the only genus present in all zoogeographic regions (Figure 11) [20,21,22].



Source: <https://zookeys.pensoft.net/article/35974/zoom/fig/11/>

**Figure 11** *Dryinus* female holotype: habitus in dorsal (A) and lateral (B) view; head in dorsal view (C)

Dryinidae is cosmopolitan, with about 1700 described species grouped into 48 genera and 14 subfamilies; for the Neotropics Aphelopinae, Anteoninae, Bocchinae, Gonatopodinae, Apodryininae and Dryininae are reported, which include 22 genera and about 470 species. Chrysidoidae, one of the 21 hymenopterans superfamilies, is monophyletic and comprises seven families, including Dryinidae, all present in the Neotropics (Figure 12) [23,24,25].



**Figure 12** Tribull (2015) ML analysis summary. Topology resulting from four genes: CO1, CytB, 18S and 28S D2-D3 region

### 1.3.1. Dryinid wasps of the Afrotropical Region

Subfamilies: Anteoninae, Aphelopinae, Apoaphelopinae, Apodryininae, Bocchinae, Conganteoninae, Dryininae, Gonatopodinae and Thaumatomyrinae [26,27].

#### Objective

The objective of this work is to seek knowledge about the family Drynidae (Insecta: Hymenoptera).

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## 2. Methods

The purpose of this paper is to seek knowledge about the Drynidae. For the article, the bibliographic search used the following databases: Biological Abstract, Academia.edu, Resergate and Frontiers from November 2022 to December 2022. The articles were published from 1984 to 2022 in indexed scientific research, book scientific chapters, these banks, university dissertations, national and international scientific articles, scientific journals, documents and even in general journals when considered of interest.

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## 3. Studies selected and carried out

### 3.1. Study 1

Drynidae (Hymenoptera: Chrysidoidea) of Paraguay.

New reports

#### 3.1.1. Subfamily Aphelopinae [28,29].

*Aphelopus jamaicanus* Olmi, 1984

Distribution

Mexico; Cuba; Jamaica; Netherlands Antilles; Hondura; Costa Rica; Panama; Colombia; Venezuela; Puerto Rico; Cuba; Argentina; Uruguay; Paraguay.

*Aphelopus ocellaris* Olmi, 1989

Distribution

Brazil; Paraguay.

#### 3.1.2. Subfamily Anteoninae

*Panamanian anteon* Olmi, 1989

Distribution

Mexico; Belice; Honduras; Nicaragua; Costa Rica; Panama; Venezuela; Ecuador; Peru; Brazil; Argentina; Paraguay [28,29].

*Deinodryinus atlanticus* Olmi, 1984

Distribution

Mexico; Nicaragua; Costa Rica; Panama; Ecuador; Brazil; Argentina; Paraguay [28,29].

*Deinodryinus incaicus* Olmi, 1989

Distribution

Dominica; Costa Rica; Panama; Venezuela; Colombia; Ecuador; Brazil; Bolivia; Argentina; Paraguay [28,29].

*Deinodryinus noyesi* Olmi, 1984

Distribution

Mexico; Guatemala; Honduras; Costa Rica; Trinidad And Tobago; Colombia; Venezuela; Southern; Ecuador; Peru; Brazil; Bolivia; Argentina; Paraguay [28,29].

*Deinodryinus peruvianus* Olmi, 1984

Distribution

Costa Rica; Trinidad And Tobago; Colombia; Venezuela; Ecuador; Peru; Bolivia; Brazil; Argentina; Paraguay [28,29].

*Deinodryinus trinity* Olmi, 1984

Distribution

Mexico; Honduras; Costa Rica; Trinidad And Tobago; Venezuela; Colombia; Brazil; Argentina; Paraguay [28,29].

3.1.3. Subfamily Dryininae

*Dryinus atrox* Olmi, 1989

Distribution

Costa Rica; Panama; Paraguay [28,29].

*Dryinus febrigi* Olmi, 1984

Distribution

Paraguay [28,29].

*Dryinus pegnai* Olmi sp. nov.

Distribution

Panama; Ecuador; Peru; Paraguay [28,29].

*Dryinus surinamensis* Olmi, 1984

Distribution

Mexico; Hondura; Costa Rica; Panama; Colombia; Southern; Ecuador; Peru; Brazil; Paraguay [28,29].

3.1.4. Subfamily Gonatopodinae

*Gonatopus contortus* Olmi, 1984

Distribution

Argentina; Bolivia; Paraguay [28,29].

*Gonatopus huggerti* Olmi, 1992

Distribution

Peru; Paraguay [28,29].

*Neodryinus forest* Olmi sp. nov.

Distribution

Paraguay [28,29].

*Trichogonatopus albomarginatus* (Cameroon, 1485)



## Distribution

Costa Rica; Panama; Colombia; Venezuela; Brazil; Argentina; Paraguay [28,29].

### 3.2. Study 2

*3.2.1. Corn Spittlebug: See how to identify it, what are its damages corn, its relationship with stunting disease and the best handling.*

Among the diversity of insects that cause damage to agriculture, the corn leafhopper *Dalbulus maidis* (Delong & Wolcott, 1923) (Homoptera: Pentatomidae) is currently considered one of the most severe pests in Latin America. This leafhopper specializes in maize plants and the problem occurs because it sucks the sap of the plants and transmits viruses and mollicutes from corn stunting [30].

Infestation by *D. maidis* has increased in several regions of Brazil, causing the disease it transmits (sickness) to also gain more and more importance. Production losses of 70% or more are observed in corn fields in the South, Goiás, Triângulo Mineiro, northwest Minas Gerais and other regions of the country. Faced with this problem, it is necessary to understand more about the bioecology, vector behavior and its interaction with the maize stunting complex in order to improve its management [30].

The corn leafhopper *D. albulus maidis* belongs to the order Hemiptera and the family Cicadellidae. They are small-sized insects, measuring 0.4 cm, with a white to straw color and two black spots on the dorsal part of the head. Individuals have an embryonic period of 5 to 10 days, a nymph stage of 14 to 16 days, taking an average of 24 days to reach the adult stage. This phase has an average longevity of 45 days, which varies within the same population and with the ambient temperature [30].

*3.2.2. What does the sharpshooter do with the corn?*

These insects cause injuries to maize plants by sucking sap, injecting toxins and transmitting phytopathogens, especially those related to stunting. The leafhopper becomes a transmitter of these phytopathogens after feeding on an infected plant. For this, the insect needs a few seconds or hours of suction to acquire and later transmit phytopathogens to other maize plants.

Leafhopper adults can feed on other plants in the corn family, but they only reproduce in corn plant pods. In the off-season, leafhoppers survive and multiply in corn stalks or other corn crops to which the adults disperse by flight.

*3.2.3. Biological control*

For the biological control of corn leafhoppers, the entomopathogenic fungus *Beauveria bassiana* (Balsamo) Vuillemin, 1912 (Moniliaceae) is usually used. In countries like Argentina and Mexico, parasitoids of *D. maidis* are studied, which can be divided into two categories: those that parasitize eggs and those that parasitize nymphs and adults.

Eggs parasitoids belong to the family Mymaridae and Trichogrammatidae (Hymenoptera: Chalcidoidea), while those of nymphs and adults are species of Dryinidae (Hymenoptera) [30].

### 3.3. Study 3

Dryinidae (Hymenoptera, Chrysidoidea) has a cosmopolitan distribution and acts as ecto and endoparasitoids of nymphs and leafhopper adults (Hemiptera, Auchenorrhyncha). In Brazil, 5 subfamilies, 15 genera, and approximately 150 species. The objective of this study was to identify the species of Dryinidae collected with a Moericke trap in a forest of a gallery in the Municipality of Pratápolis. The collections were carried out using a Moericke trap.

A total of 11 specimens of Dryinidae belonging to 3 subfamilies were obtained: Aphelopinae, Anteoninae and Gonatopodinae. Of Aphelopinae, it was recognized only one species *Aphelopus difusus* Olmi, 1984; of Anteoninae, four species were recognized: *Deinodryinus costaricanus* Olmi, 1987, *Deinodryinus elegans* Olmi, 1984 and *Deinodryinus speciosus* Olmi, 1984 [31].

### 3.4. Study 4

Dryinidae (Hymenoptera, Chrysidoidea) has a cosmopolitan distribution and, in the Neotropics, are recognized approximately 500 species contained in 22 genera and 6 subfamilies: Anteoninae, Aphelopinae, Apodryininae,

Bocchinae, Dryininae and Gonatopodinae. For Brazil, 15 genera and approximately 150 species and 5 subfamilies are registered [32],

The Dryinidae act as ecto and endoparasitoids of leafhopper nymphs and adults (Hemiptera, Auchenorrhyncha). The goal of this study was to identify the genera of Dryinidae collected in the Serra da Canastra National Park (PNSC), a municipality from São Roque de Minas, in Minas Gerais. The material studied comes from the INCT Project – HYMPAR/Southeast, collected using a Malaise trap and sweep net [32].

A total of 84 specimens of Dryinidae were obtained, belonging to 5 subfamilies: Aphelopinae, Anteoninae, Bocchinae, Dryininae and Gonatopodinae. From Aphelopinae, the 2 genera recognized in the subfamily, *Aphelopus*, were collected, with a total of 44 specimens (representing 52.38% of the total collected), and *Crovettia*, all males; of Gonatopodinae, was recognized only *Gonatopus*, with a total of 10 specimens (representing 11.90% of the total collected), of which 8 are females and 2 males; of Bocchinae only *Bocchus* was recognized 6 specimens/7.14%), all males; of Anteoninae, two genera were recognized, *Anteon* (4 specimens/4.74%), all females, and *Deinodryinus* (6/7.14%), all mal and of Dryininae, only *Dryinus* Latreille (3/3.57%) was recognized, of which 2 females and 1 male (Figures 13 and 14) [32].



Source: <https://nl.wikipedia.org/wiki/Aphelopus>

**Figure 13** Genus *Aphelopus* (Dryinidae)



Source: <http://www.waspweb.org/Chrysoidea/Dryinidae/Gonatopodinae/Gonatopus/index.htm>

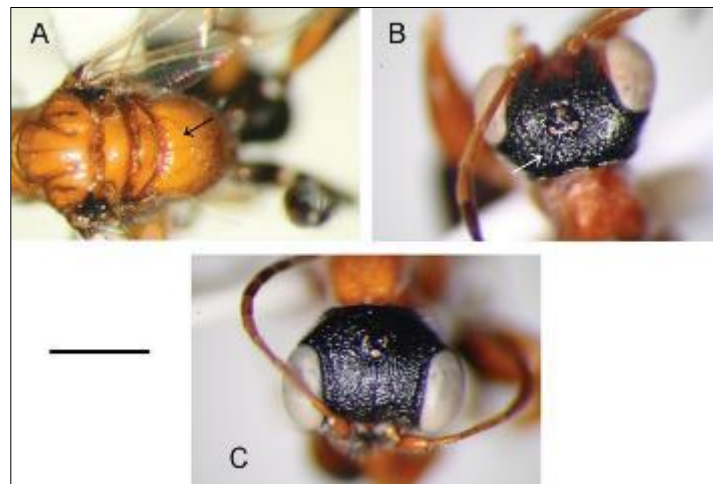
**Figure 14** Genus *Gonatopus* (Dryinidae)

The Dryinidae are a group of parasitoid wasps poorly sampled in the vast majority of existing surveys, a pattern also observed in this study, considering the data collection period (approximately 15 months). Comparing the ratio of males and females, males represented more than 80% of the total specimens collected. All Dryinidae subfamilies and about 50% of the genera that occur in Brazil are represented in the PNSC (Figures 15 16, 17 and 18) [32].



Source: [http://www.waspweb.org/Chrysididae/Dryinidae/Anteoninae/Anteon/Anteon\\_blacki.htm](http://www.waspweb.org/Chrysididae/Dryinidae/Anteoninae/Anteon/Anteon_blacki.htm)

**Figure 15** Genus *Anteon* (Drynidae)



Source: <https://zookeys.pensoft.net/article/30647/>

**Figure 16** *Deinodryinus*: female from Arizona, Madera Canyon: A mesosoma in dorsal view C head in dorsal view. *Deinodryinus*, female from Kentucky, Herndon Farm: B head in dorsal view. Scale bars: 0.84 mm (A), 0.61 mm (B), 0.59 mm (C)



Source: <https://www.scielo.br/j/bjb/a/4kNWW7V8KJqc633ZJKdkkdv/?lang=en>

**Figure 17** Genus *Dryinus* (Drynidae)



Source: <http://www.waspweb.org/chrysoidea/dryinidae/Bocchinae/Bocchus/index.htm>

**Figure 18** Genus *Bocchus* (Dryinidae)

### 3.5. Study 5

In the Neotropical region, this superfamily is represented by 7 families: Bethyidae, Chrysididae, Dryinidae, Embolemidae, Sclerogibbidae, Scolebythidae and Plumariidae; which are rare. Traditionally, this superfamily is considered ectoparasitoids and its species are used in biological control: Dryinidae on leafhoppers (Insecta: Hemiptera: Cicadellidae) and Bethyidae on lepidopterans (Insecta: Lepidoptera) and Coleoptera (Insecta: Coleoptera) [33].

This study aimed to report the families of Chrysoidea that occur in an area of Caatinga, in the Municipality of Patu, Rio Grande do Norte. Samplings were carried out with two Malaise traps [33].

The traps were installed in the native Caatinga forest, with little anthropic action, located at the foot of Serra do Lima. 732 specimens of Chrysoidea were obtained: Bethyidae (657 specimens / 89.8% of the total collected), Dryinidae (62/8.5%) and Chrysididae (13/1.8%). The most frequent months were: September for the Chrysoidea (314) and Bethyidae (296), October for the Chrysididae (seven) and November for the Dryinidae (27) [33].

### 3.6. Study 6

The Dryinidae, exclusive parasitoids of Hemiptera *Auchenorrhyncha*, account for approximately 1400 species distributed on all continents, except Antarctica; their populations are affected by parasitoid hymenopterans of the families Encyrtidae, Diapriidae, Ceraphronidae, Chalcididae and Pteromalidae [34,35].

For Argentina, 122 species of Dryinidae are cited of which three encrypted parasitoids are known: *Cheiloneurus cristatus* De Santis, 1957, *Cheiloneurus cupreicollis* (Ashmead): Gahan, 1914 (Hymenoptera: Encyrtidae) and *Helegonatopus pseudophanes* Perkins, 1906 (Hymenoptera: Encyrtidae) [34,35].

In Santa Maria, Catamarca, three females and two males of *Toya propinqua* (Fieber, 1866) (Homoptera; Delphacidae) were collected, four nymphs of *Toya* sp. and two nymphs of *Delphacodes* sp. (Hemiptera: Delphacidae) parasitized by *Gonatopus chilensis* (Olm, 1984) (Dryinidae, Gonatopodinae) (Figure 19) [34,35].



Source: Photo 5486861, (c) Stephen Thorpe, some rights reserved (CC BY-NC), uploaded by Stephen Thorpe and <https://inaturalist.ca/photos/5486861>

**Figure 19** Genus *Cheiloneurus* (Dryinidae)

In the laboratory it was observed that two Drynidae cocoons were affected by a parasitoid whose larvae left the host in two different situations: one of them left the Drynidae larva when it was still building the cocoon, while the other emerged from a specimen that it was in a state of prepupa; the adults of these parasitoids emerged at 25 and 27 days respectively. The specimens were identified as *Cheiloneurus cupreicollis* (Ashmead, 1894) (Hymenoptera: Encyrtidae) (Figure 20) [34,35].



Source: Photo 109737565, (c) fotis-samaritakis, some rights reserved (CC BY-NC), uploaded by fotis-samaritakis and <https://inaturalist.ca/photos/109737565>

**Figure 20** Genus *Cheiloneurus* (Drynidae)

Species of the genus *Cheiloneurus* Westwood, 1833 generally develop as endoparasitoids larval (primary and secondary) of microhymenoptera that affect Coccoidea, Fulgoroidea, Cicadelloidea and Lygaeidae (Hemiptera), Curculionidae and Coccinellidae (Coleoptera), as well as Syrphidae and Cecidomyiidae (Diptera) [34,35].

### 3.7. Study 7

Drynidae wasps of the Afrotropical Region

#### 3.7.1. Anteoninae

Parasitoids of Leaf hoppers: Cicadellidae (including Idiocerinae and Macropsinae) (Figures 21- 28) [36,37].

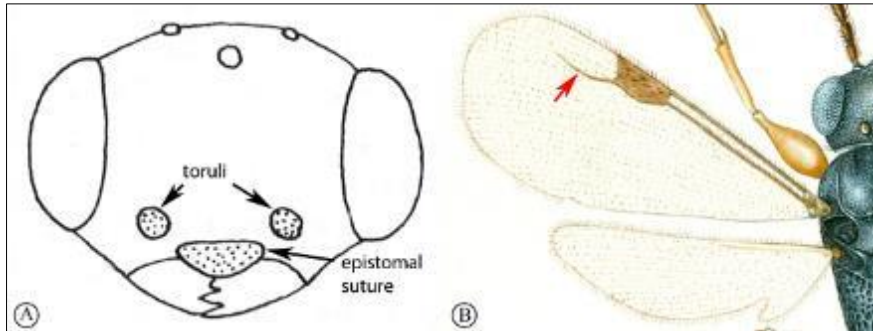


Source: Photographs © Simon van Noort (Iziko Museums of South Africa).

**Figure 21** Subfamily Anteoninae

#### 3.7.2. Aphelopinae

Hosts: Typhlocybinae (Cicadellidae) and Membracidae. Species of *Crovettia* are known for their completely diaphanous parasitism and polyembryony [36,37].



Source: <http://www.waspweb.org/Chrysoidea/Dryinidae/> and Photographs © Simon van Noort (Iziko Museums of South Africa).

**Figure 22** Subfamily Epistomal suture not touching antennal toruli (A); forewing with 2r-rs&Rs vein long and regularly curved (B) *Aphelopus* Dalman

### 3.7.3. *Apoaphelopinae*

Host: unknown [36,37].



Source: <http://www.waspweb.org/Chrysoidea/Dryinidae/> and Photographs © Simon van Noort (Iziko Museums of South Africa)

**Figure 23** Subfamily *Apoaphelopinae*

### 3.8. *Apodryininae*

Host: Unknown [36,37].



Source: Source: Source: <http://www.waspweb.org/Chrysoidea/Dryinidae/> and Photographs © Simon van Noort (Iziko Museums of South Africa).

**Figure 24** Subfamily *Apodryininae*

### 3.8.1. *Bocchinae*

Host: Parasitoids of Issidae (Hemiptera) [39,40].



Source: <http://www.waspweb.org/Chrysoidea/Dryinidae/> and Photographs © Simon van Noort (Iziko Museums of South Africa)

**Figure 25** Subfamily Bocchinae

**3.8.2. Conganteoninae**

Host: unknown [39,40].



Source: <http://www.waspweb.org/Chrysoidea/Dryinidae/> and Photographs © Simon van Noort (Iziko Museums of South Africa)

**Figure 26** Subfamily Conganteoninae

**3.8.3. Dryininae**

Hosts: Flatidae (Hemiptera) [39,40].



Source: <http://www.waspweb.org/Chrysoidea/Dryinidae/> and Photographs © Simon van Noort (Iziko Museums of South Africa)

**Figure 27** Subfamily Dryininae

**3.8.4. Gonatopodinae**

Parasitoids of Leaf hoppers: Cicadellidae (Hemiptera) [39,40].

Hosts: Flatidae (Hemiptera).



Source: <http://www.waspweb.org/Chrysididae/Dryinidae/> and Photographs © Simon van Noort (Iziko Museums of South Africa)

**Figure 28** Subfamily Thaumatomyzinae

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#### 4. Conclusion

It is undoubtedly an important work, both for hymenopterologists who are dedicated to the study of Dryinidae and for other Entomologists interested in the biological control of harmful insects.

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