Description of the Family Argidae (Insecta: Hymenoptera)

Carlos Henrique Marchiori *

Department of Biological Science, Instituto Federal Goiano, Goias, Brazil.

International Journal of Biological and Pharmaceutical Sciences Archive, 2023, 06(02), 054–065

Publication history: Received on 14 August 2023; revised on 28 September 2023; accepted on 01 October 2023

Article DOI: https://doi.org/10.53771/ijbpsa.2023.6.2.0093

Abstract

Sawflies, horntails, and wood wasps Argidae sawflies Argidae occur in all tropical, temperate, and subarctic regions of the world. Even though worldwide in distribution, the fauna of the Neotropical Region is the most diverse. Representatives of all subfamilies, except the Australian Zenarginae, occur in the neotropics. In the number of genera (32) and numbers of species (over 350), the Neotropical fauna includes more than twice the number of genera and nearly half the species as the rest of the world's regions. Adults of Argidae some species can be found on various types of flowers, especially the larger species belonging to the Arginae subfamily. In this case, the eggs are laid in groups on the surface of a leaf, and the female takes care of the eggs and young larvae. The larvae feed in groups, presenting defined feeding patterns, and, when they complete their development, weave cocoons in groups protected by a common cover. The purpose of the manuscript is to describe the Biology, Ecology, behavior, damage, and taxonomy of the family Argidae (Insecta, Hymenoptera, Symphita). The articles were published from 1979 to 2023 in indexed scientific research, book scientific chapters, theses banks, university dissertations, national and international scientific articles, scientific journals, documents, and even in general journals when considered of interest and digital platforms: Universidade de São Paulo, Scielo Universidade de Brasilia, WaspWeb, Biological Abstract, and ResearchGate. The main terms used were: Hymenoptera, Symphyta, Woodwasps, Horntails, Sawflies, and Tenthredinoidea. In summary, basically, the following steps of analysis were covered:

- Exhaustive reading of each article aiming at a global understanding and discovery of the approach used by its authors;
- Identification of the central ideas of each article;
- Classification of ideas around nuclei of meaning;
- Comparison between the different nuclei of meaning present in the studied articles;
- Classification of the nuclei of meaning in broader axes (themes) around which the authors' discussions revolved and
- Writing of the interpretative syntheses of the theme.

Keywords: Larvae; Feeding patterns; Cocoons; Symphyta; Sawfly

1. Introduction

Symphyta is a suborder of hymenopteran, probably paraphyletic insects that include the most primitive members of the order. Members of the suborder are distinguished from other Hymenoptera by the connection between the thorax and abdomen, which lacks the narrowing common in wasps, and by the caterpillar-like larvae of other arthropods [1].

They may be referred to by the common name of saw-flies, due to the appearance of the ovipositor, used by females to perforate plants to deposit eggs. Some populations of several species can cause substantial economic damage to forests and crop plants. Other species, however, have tapered ovipositors to perforate the wood. One of the taxa within the

* Corresponding author: Carlos Henrique Marchiori

Symphyta would have given rise to the suborder Apocrita (wasps, bees, and ants, probably from the family Orussidae, the only group of the suborder that has parasitic members [1].

Objective

The purpose of the manuscript is to describe the Biology, Ecology, behavior, damage, and taxonomy of the family Argidae (Insecta, Hymenoptera, Symphita).

2. Methods

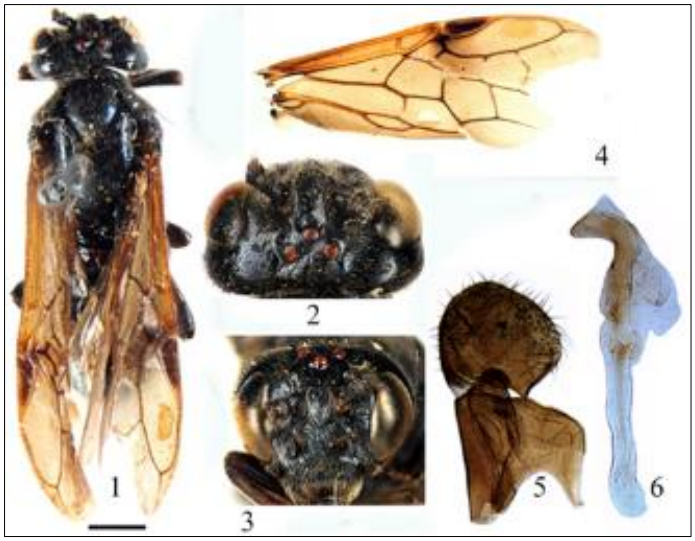
The articles were published from 1979 to 2023 in indexed scientific research, book scientific chapters, theses banks, university dissertations, national and international scientific articles, scientific journals, documents, and even in general journals when considered of interest and digital platforms: Universidade de São Paulo, Scielo Universidade de Brasilia, WaspWeb, Biological Abstract, and ResearchGate. The main terms used were: Hymenoptera, Symphyta, Woodwasps, Horntails, Sawflies, and Tenthredinoidea. In summary, basically, the following steps of analysis were covered: (a) exhaustive reading of each article aiming at a global understanding and discovery of the approach used by its authors; (b) identification of the central ideas of each article; (b) classification of ideas around nuclei of meaning; (c) comparison between the different nuclei of meaning present in the studied articles; (d) classification of the nuclei of meaning in broader axes (themes) around which the authors' discussions revolved and (e) writing of the interpretative syntheses of the theme.

2.1. Family Argidae

Sawflies, horntails, and wood wasps Argidae sawflies Argidae occur in all tropical, temperate, and subarctic regions of the world. Even though worldwide in distribution, the fauna of the Neotropical Region is the most diverse. Representatives of all subfamilies, except the Australian Zenarginae, occur in the neotropics. In the number of genera (32) and numbers of species (over 350), the Neotropical fauna includes more than twice the number of genera and nearly half the species as the rest of the world's regions [1-3].

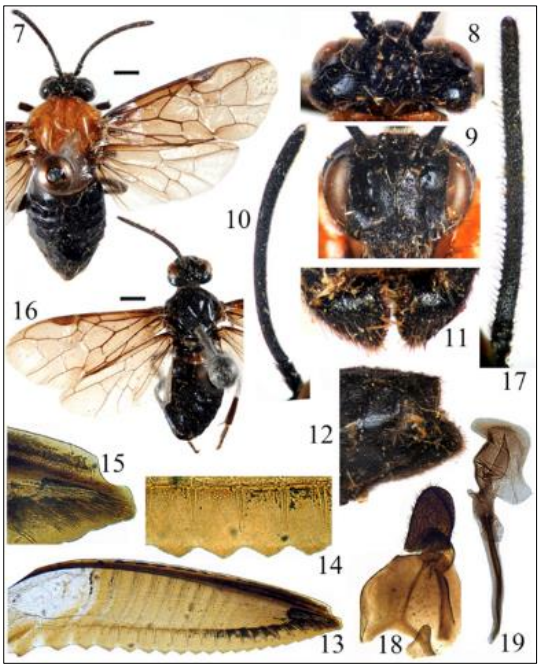
2.1.1. Description

Argidae are thick or elongated Hymenoptera, ranging from 4 to 12 mm in length. All are easily recognized by the 3-segment antennas. In males of some species, the third segment is bifurcated. All have a closed anal cell in the forewing and most have a closed anal cell in the hindwing. Typically, the coloration can be black, black with all or part of the chest behaviors, or yellow with several black spots. The wings can be transparent, yellowish, black, or yellowish with black tips (Figures 1-4) [4-6].



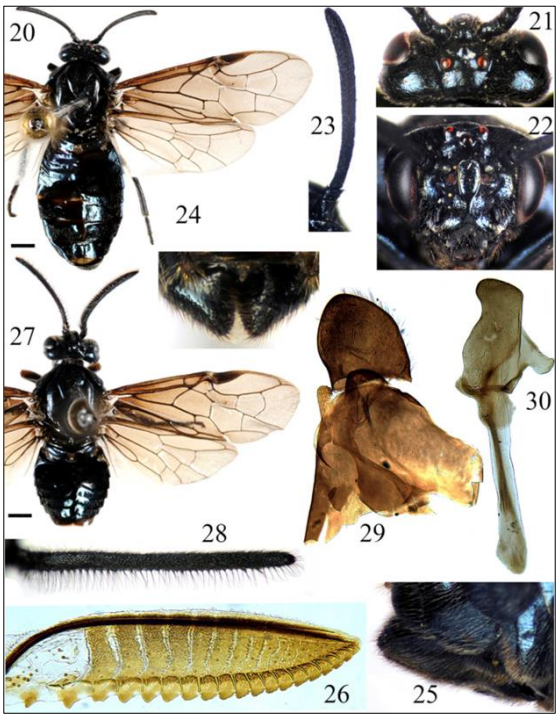
Source: https://www.sciencedirect.com/science/article/pii/S2287884X16000261

Figure 1 figs 1–6. *Arge koreana* Wei & Lee sp. nov. Holotype male. (1), adult, dorsal view; (2), head, dorsal view; (3), head, frontal view; (4), forewing; (5), harpe and gonostipe; (6), penis valve



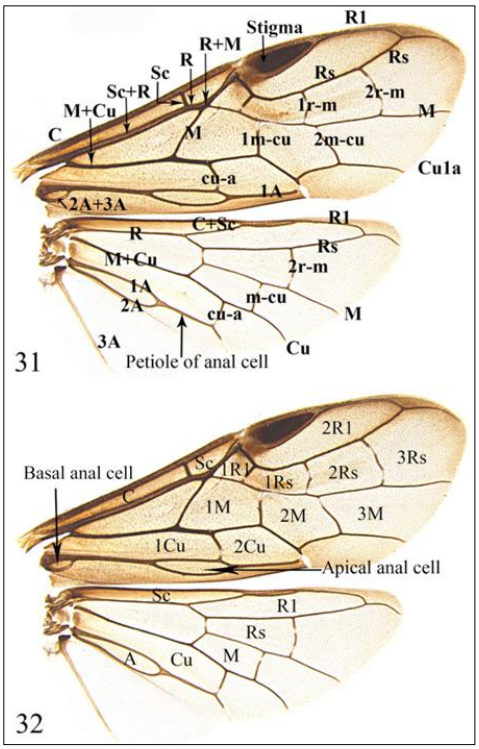
Source: https://www.sciencedirect.com/science/article/pii/S2287884X16000261

Figure 2 figs 7–19. *Arge pseudorejecta* Wei & Lee sp. nov. (Figures 7–15. Holotype, female; Figures 16–19, Paratype, male). (7), adult female, dorsal view; (8), head, dorsal view; (9), head, front view; (10), antenna; (11), sheath ovipositor, dorsal view; (12), the apex of abdomen, lateral view; (13), lancet; (14), the third to sixth serrulae; (15), the apex of lancet; (16), adult male; (17), male antenna; (18), harpe and gonostipe; (19), penis valve



Source: https://www.sciencedirect.com/science/article/pii/S2287884X16000261

Figure 3 figs 20–30. *Arge shengi* Wei & Lee sp. nov. (20–26. Holotype, female; 27–30, Paratype, male). (20), adult female, dorsal view; (21), head, dorsal view; (22), head, frontal view; (23), antenna; (24), ovipositor sheath, dorsal view; (25), the apex of abdomen, lateral view; (26), lancet; (27), adult male; (28), male antenna; (29), harpe and gonostipe; (30), penis valve

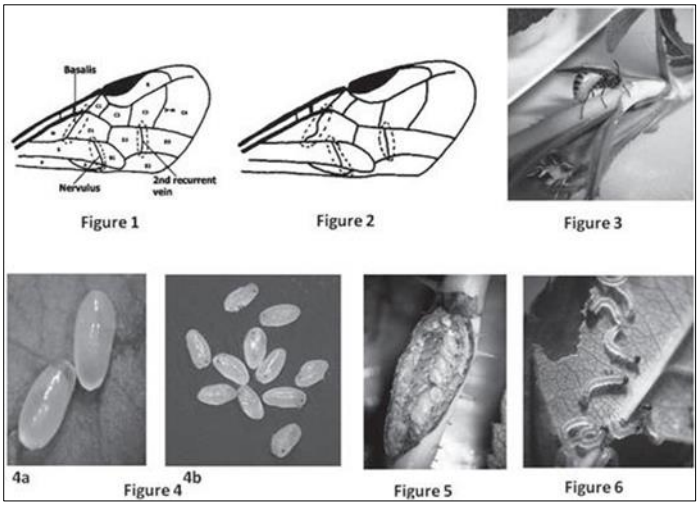


Source: https://www.sciencedirect.com/science/article/pii/S2287884X16000261

Figure 4 figs 31–32. Venation of wings of Argidae. (31), veins; (32), cells

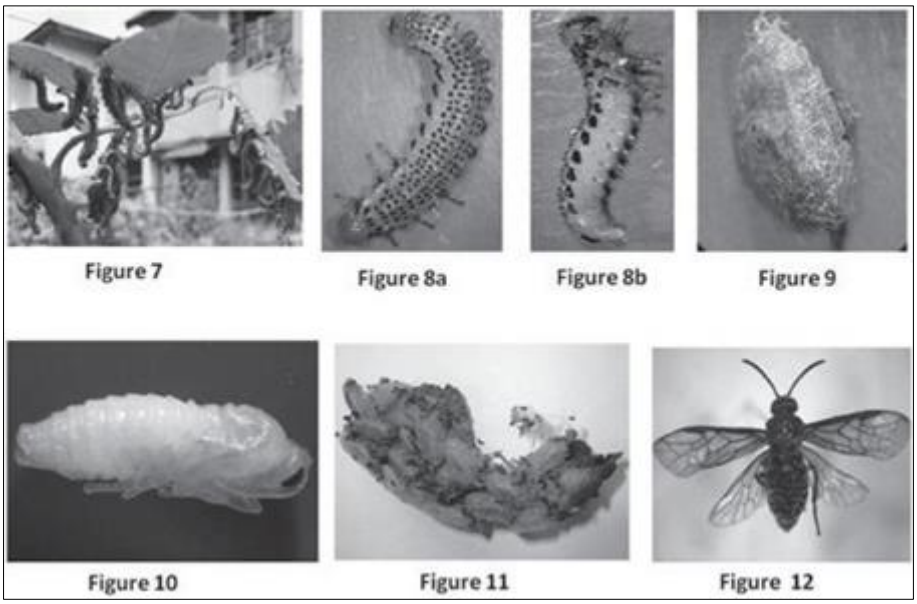
2.1.2. Biology, behaviour and Damage

Adults of Argidae some species can be found on various types of flowers, especially the larger species belonging to the Arginae subfamily. Some of the South American species have subsocial habits similar to those of some Pergidae. In this case, the eggs are laid in groups on the surface of a leaf, and the female takes care of the eggs and young larvae. The larvae feed in groups, presenting defined feeding patterns, and, when they complete their development, weave cocoons in groups protected by a common cover (Figures 5-7) [7-9].



Source: https://bioone.org/journals/florida-entomologist/volume-96/issue-4/024.096.0408/Arge-xanthogaster-Hymenoptera--Argidae--A-New-Threat-to/10.1653/024.096.0408.full

Figure 5 (3). Egg laying posture of female. Adult females possess a strong sawlike ovipositor, which is used to make parallel cuts in the fresh/tender shoots of the host plant; (4a and 4b). Eggs are oval shaped and yellow in color; (5). Eggs of in 2 longitudinal rows in a branch of a rose plant. Sawfly places eggs singly in 2 parallel longitudinal rows in slits in the young shoots; (6). First instar larvae feeding on rose leaf from the leaf edge. After hatching the neonates quickly start feeding and devour tender leaves on rose bushes



Source: https://bioone.org/journals/florida-entomologist/volume-96/issue-4/024.096.0408/Arge-xanthogaster-Hymenoptera--Argidae--A-New-Threat-to/10.1653/024.096.0408.full

Figure 6 *Arge xanthogaster* (Cameron, 1876). (7). Larvae of feeding on rose leaves. Early larval instars are gregarious and feed heavily on leaves and flower buds. Slight disturbance of the larvae results in them curling the posterior of their bodies in a snake-like manner; (8a). Dorsal view of mature larva. Mature larvae turn yellow with black spots and feed individually. Full-grown larvae show aposematic body colors as well as pubescence; 8b. Ventral view of mature larva; (9). Cocoon. Mature larvae fall down to the ground and spin cocoons (dirty white in color) located on or in the soil; (10). Pupa of A. xanthogaster; (11). Cocoons of A. xanthogaster aggregated in a group; and (12). Dorsal view of an adult of A. xanthogaster

Source: Argidae - Photo (BY-NC-SA 3.0) Smith, D. R. and D. H Janzen

Figure 7 Female of the Argidae Family voting

Species of the genus *Sericoceros*, which are associated with papaturro *Coccoloba* sp. and chaperno *Lonchocarpus* sp., may show similar social tendencies, but most species of Argidae oviposit within plant tissue, probably not protecting the eggs and larvae feeding. lonely. *Arge rosae* (Linnaeus, 1758) (Hymenoptera: Argidae) known as the false caterpillar of the rosebush. The larvae have a characteristic appearance, and feed exclusively on rose leaves, producing their defoliation [10-12].

2.1.3. Taxonomy

In the world, 6 subfamilies, 45 genera, and about 800 species are known. In the Neotropics, there are 5 subfamilies, 32 genera, and about 370 known species.

Subfamilies Arginae, Atomacerinae, Erigleninae and Sterictiphorinae. [13-14].

3. Selected manuscripts

3.1. Study 1

3.1.1. Classification of Afrotropical Hymenoptera (Wasps, Bees, Ants).

Subfamilies: Arginae and Athermantinae.

Distribution: Worldwide, but most diverse in the tropics.

Biology: Phytophagous. Larvae feed on leaves of ferns, horsetails, gymnosperms, and angiosperms, occasionally they feed on the pith of twigs or on catkins.

Genus: *Arge* Schrank, 1802 and *Triarge* Forsius, 1931.

Distribution: Worldwide, but most diverse in the tropics.

Biology: Phytophagous. Larvae feed on leaves of ferns, horsetails, gymnosperms, and angiosperms, occasionally they feed on the pith of twigs or on catkins.

Some Species: *Arge hereroensis* Koch & Goergen, 2010, *Arge infuscatipennis* Forsius, 1927, *Arge intermedia* Pasteels, 1963 and *Arge iota* Pasteels, 1953.

Distribution: Worldwide, but most diverse in the tropics.

Biology: Phytophagous.

Somes Species: *Triarge citrusdalensis* Koch, 2006, *Triarge driehoekensis* Koch, 2010 and *Triarge flavoapicalis* Koch, 2006.

Distribution: Namibia and South Africa.

Biology: Unknown [15-16].

Sawflies from northern Ecuador and a checklist for the country Hymenoptera: Argidae

Family Argidae

- *Manaos mammeatus* (Konow, 1906)
- *Manaos mulsus* (Konow, 1906)

Note. This is a new record for Ecuador. The species was previously known from Brazil, Peru, and Surinam.

Ptenos delta (Malaise, 1957)

Note. This is a new record for Ecuador. It was previously known only from Brazil and Peru.

- (as *Hemidineura delta* Smith, 1992).
- *Scobina inculta* (Konow, 1906a)
- *Scobina notaticollis* (Konow, 1899a)
- *Scobina strophosa* (Konow, 1906a)

- *Scobina styx* Malaise, 1949

Note. This is a new record for Ecuador. It was previously known only from northern Argentina.

Scobina sp.

3.2. Study 2

3.2.1. Arge rosae (Linnaeus, 1758) (Hymenoptera: Argidae)

False rose bush caterpillar exclusively to the rose bush. Larva Up to 20 mm round head and yellowish-green body with black dots from which hairs grow. It has 6 pairs of false legs not to be confused with a lepidopteran caterpillar, which has 5 pairs.

Adult 10 mm head and body black with an orange abdomen (not to be confused with Diptera, since it has two pairs of wings and not one). Egg: Arranged in rows of about 20 and placed inside the stem through an incision made by the female.

The first adults appear in spring. After mating, the female lays eggs in the manner mentioned above. The new larvae feed on the leaves until they complete their development. It is then that they are dropped to the ground to pupate. In mid-summer, the adults appear whose offspring will give rise to a second generation, whose larvae will feed until, with the drop in temperature, they go to the ground to hibernate. In the following spring, they will pupate and the adults will appear, thus completing the biological cycle.

- **Defoliation**: The larva feeds on the leaves of the rose bush, starting at the edges and respecting the central nerve of the leaf. Drying of shoots: the adult female, to make the spawn, makes incisions in the tender stems, drying them.
- **Chemical:** Until recently, the active substance authorized for this pest was meditation, but today, since its inclusion in the phytosanitary registry has not been defended, it cannot be used. It can be sprayed with a broad-spectrum insecticide such as a pyrethroid, eg deltamethrin. The treatment is carried out after observing the larvae. The larvae are easy to find and can be removed manually.
- **Biological:** Parasitoids: *Asecodes erxias* (Walker, 1848) (Hym.: Eulophidae), *Anastatus bifasciatus* (Geoffroy, 1785) (Hym.: Eupelmidae) and ichneumonid wasp (Hym.: Ichneumonidae) (Figure 8) [17-18].

Source: https://www.semanticscholar.org/paper/On-the-egg-parasitoids-of-Aproceros-leucopoda-an-Pricop-Cardas%CC%A7/8fb687b93e300ec73b707b5d6d63052f6b70d3b2

Figure 8A *Proceros leucopoda* Takeuchi, 1939 (Argidae) attack and the two identified parasitoids associated with Ulmus sp. (Ulmaceae): (a, b)- attacked leaf with parasitized egg; (c, d, e) – habitus, female antenna and fore wing of *Asecodes erxias* (Walker, 1848) (Hym.: Eulophidae) emerging from egg; (f, g, h, i)– male antenna, forewing vein, male habitus and genitalia of *Anastatus bifasciatus* (Geoffroy, 1785) (Hym.: Eupelmidae); (j) – ichneumonid wasp (Hym.: Ichneumonidae) (original)

3.3. Study 3

3.3.1. Sawflies Arge (Symphita) of Britain and Ireland sawfly Arge pagana (Panzer, 1797) larva

Two species of sawfly *Arge pagana* (Panzer, 1797) and *Arge ochropus* (Gmelin, 1790), and it is difficult to say which in the early instar stage. But if you find the original egg scar on the stem, you'll know for sure what species it is. If it has a double row of cells it is Arge pagana, and a single row determines *A. ochropus*. Birds sometimes catch them for protein.

Large sawfly larvae *A. pagana* in the last few days, and they've chewed rose leaves and grown fat from them. This is the final stage of the instar and the others have dropped from the leaf at the edge of the garden to pupate, and this was the last one remaining, still munching [19-21].

3.4. Study 4

3.4.1. Argidae

Insects of Britain and Ireland

Sawflies

Adults small to medium-sized; 5–11 mm long. Head. Antenna segments 3 (with the third very long, and forked in some males). Antennae with a very elongated third segment. Thorax. Pronotum deeply indented or emarginated at the back. Mesoscutellum not separated from the scutum laterally, axillae not defined. Cenchri present. Fore-wings with a conspicuous pterostigma; with the venation well developed. Hind tibiae without specialized spurs. The abdomen is broadly sessile at its base, without a marked constriction. Ovipositor of females not visibly protruding; adapt as a saw.

Larvae with segmented legs, or legless or the legs vestigial (in leag miners); phytophagous. British representation. Species in Britain 15 (with twelve Arge species); *Arge*, *Aprosthema* Konow, 1899, and *Sterictiphora* Billberg, 1820. Classification. Suborder Symphyta; Superfamily Tenthredinoidea [22-25].

3.5. Study 5

3.5.1. *Adurgoa gonagra* (Klug, 1834) (Hymenoptera: Argidae) belongs of the superfamily Tentredinoidea, family Argidae, which is distributed in Argentina (Buenos Aires and Entre Ríos) and neighboring countries (Malaise). The adult does not cause damage, but the larva, which, as occurs with most of the Argidae, feeds on foliage. They are in the background about their biological cycle or their food preferences. The only host plants mentioned belong to the genera L. (Fabaceae) or *Senna* Mill. (Fabaceae).

The lack of research, both in terms of the host plants and the biological characteristics of *A. gonagra* were, for causes that motivated the study of this species. The female individually embeds each egg in the edges of the nests. Oviposition presents as blisters that protrude abaxially or adaxially, in rows of three to eight, along the edge of the limbo. The eggs, bright light green, are oval with a more pointed end and measure approximately 0.8 to 1mm long. The embryonic period oscillates between three and five days.

The first instar larvae have habits gregarious and to feed themselves they come together front leading from the edge of the leaves towards the petiole, devouring the upper epidermis. In subsequent stages, they feed on all the sheets respecting the ribs, so that the leaflets remain like tulle. Laboratory breeding is difficult because there is a high percentage of mortality in the first larval stages. The larvae, limaciformes, are yellow, greenish-yellow, or green, with black bristles on the back. The heir measurements range from 2.5 and 15 mm for the first and last stages, respectively.

The head capsule is green, brown, or black, according to the period elapsed since the change. Five larval instars were observed, which developed in a period of 18 to 20 days. The daily foliar consumption was 10 mm^2 in the first larval stage reaching 100 mm^2 in the last one. Pupa wrapped in a silky colored cocoon yellowish brown or dark brown located in a little chamber in the ground 3.5 cm deep. The cocoon is protected by sheets attached to it in the absence of soil. The pupal stage lasts approximately five days in the spring-summer generations and all winter in the corresponding generation of grown-ups.

They are black wasps with translucent wings. The male is characterized by having antennae in diapason. Neither sex is quick-moving and can be easily picked up. They lay eggs approximately 10 days later. of transformation into adults. were not observed postures in cases where females were reared separately from males, which allows us to suppose

that, unlike another Tentredinoidea, in this species, there is no parthenogenesis. Six generations were verified in the period from October 1992 and April 1993.

Each of the first five generations lasted for 25 to 35 days, while the last one recorded a longer duration since it included winter, which took place in the pupal state. Regarding preferences, food that emerges from that *A. gonagra* would be oligo phytophagous since only *Senna pendula* Willd. Benth. ex Walp (Fabaceae) var. *paludicola* and *Cardamine corymbosa* L. (Brassicaceae) were plant hosts in this assay [26-31].

3.6. Study 6

The term Aculeata is used to refer to a monophyletic lineage of Hymenoptera. The word "Aculeata" is a reference to the group's distinctive feature, the modification of the ovipositor into a stinger. The group is informally named the stinging wasps, although the group also contains ants and bees. In other words, the structure that was originally used to lay eggs has been modified to inject venom. Not all members of the group have the ability to screw, some of which the ovipositor is modified in a different way, others because they have simply lost it.

3.6.1. Taxonomy

The term Aculeata has a long history. Originally it was regarded as an infraorder or division. Due to phylogenetic studies, it is currently known that it is a monophyletic group, that is, that all members of the group descend from a single ancestor. In turn, the sister group, Parasitica, appears to be paraphyletic or an artificial group that brings together phylogenetically unrelated subgroups.

According to Sharkey aculeados have the following superfamilies and families:

- **Superfamily Chrysidoidea:** Family Bethylidae, Family Chrysididae, Dryinidae family, Embolemidae family, Family Plumariidae, Family Sclerogibbidae and Family Scolebythidae.
- **Superfamily Apoidea:** Family Ampulicidae, Family Andrenidae, Apidae family, Family Colletidae, Family Crabronidae, Family Halictidae, Family Heterogynaidae, Family Megachilidae, Family Melittidae, Family Sphecidae and Family Stenotritidae
- **Superfamily Vespoiea**: Family Bradynobaenidae, Formicidae family, Family Mutillidae, Family Pompilidae, Family Rhopalosomatidae, Family Sapygidae, Family Scoliidae, Family Sierolomorphidae, Tiphiidae family and Vespidae family [32].

3.7. Study 7

The most used classification of Hymenoptera includes two suborders: Apocrita and Symphyta. However, these suborders are being abandoned in the most recent texts in favor of the use of superfamilies, considering that the Symphyta are the paraphyletic basal group of the Apocrita that is, exclusively, monophyletic. Molecular phylogenetic analyses and morphology covering more than 112 characteristics of Apocrita and Symphyta give evidence that this last suborder comprises the most primitive representatives of Hymenoptera.

The Symphyta can be found on all continents, with the exception of Antarctica, and has about 8,000 identified species. About 1,100 species of Symphyta are from North America with the families Diprionidae, Tenthredinidae, and Cephidae being the most abundant. On the European continent, 1366 species are found in 11 families with the most common members of the Argidae, Diprionidae, and Tenthredinidae families while in Australia the Pergidae family contains the most abundant members adding native and introduced species exotics.

Around 1960 747 species of Symphyta were described in China and India, respectively. Pergidae, Tenthredinidae, and Argidae are the families with the largest number of individuals in the Neotropical region. Although they are not on the list of the richest Hymenoptera on a global scale, like the Ichneumonidae, which have about 30,000 species, the Symphyta have individuals with the most diverse life histories in addition to serve as model organisms in studies on biodiversity, ecology, and evolution in various parts of the world.

However, about the entomofauna of Symphyta that does not live in regions with an exclusively temperate climate, it is believed that most of the basic aspects of its populations such as life history, ecology, use of host plants, and registration of new species have not yet been unveiled, especially in the tropics, which has attracted the attention of specialists around the world. The proof of this is that most of the records of new species of Symphyta in the last ten years were those native to tropical and subtropical climates.

Arge beckeri Tournier (Hymenoptera: Argidae) demonstrates potential as a natural killer of *Euphorbia esula* L. (Euphorbiaceae) while several Symphyta native to China have been selected for the control of Kudzu, *Pueraria montana* (Leguminosae), which is a Chinese legume introduced to the United States to serve as an ornamental plant, livestock fodder, prevent erosion, and restore soil fertility, but which today is present in an uncontrolled manner on almost half a million hectares from Florida to the Pacific Northwest.

The suborder Symphyta, according to the most recent classifications, is divided into eight superfamilies: Xyeloidea with one family (Xyelidae) and 50 extant species; Pamphilioidea with one family (Pamphiliidae) and 250 species; Tenthredinoidea, the superfamily with the highest number of existing species and with six families (Blasticotomidae, Cimbicidae, Diprionidae, Pergidae, Argidae, and Tenthredinidae); Cephoidea with one family (Cephidae) and 80 species; Anaxyeloidea with a family (Anaxyelidae) and only one species: *Syntexis libocedrii* Rohwer, 1915 that lives in the western part of North America; Siricoidea with one family (Siricidae) and 95 species; Xiphydroidea with one family (Xiphydriidae) and 100 species and Orussoidea with one family (Orussidae) and 75 extant species Adults in Symphyta show an absence of abdominal constriction between the first and second segments, unlike the suborder Apocrita being one of the first auxiliary criteria for differentiation and identification, mainly in the field.

The ovipositor, devoid of venom glands, has the shape of a serrated blade and is adapted to sawing plant tissues that are superimposed in rows under the eggs as with *Haplostegus nigricrus* Conde, 1936 (Hymenoptera: Pergidae) on guava leaves Psidium guajava (Myrtaceae). However, species from the families Xiphydriidae, Anaxyelidae, Siricidae, and Orussidae have a clearly elongated ovipositor, as in *Urocerus gigas* L., 1758 (Hymenoptera: Siricidae) and are able to easily perforate woody material for oviposition and feeding.

Adults in Symphyta have no abdominal constriction between the first and second segments, unlike the suborder Apocrita, which is one of the first auxiliary criteria for differentiation and identification, mainly in the field. The ovipositor, devoid of venom glands, has a serrated blade shape (named, therefore, “sawflies”) and is adapted to sawing plant tissues that are superimposed in rows under the eggs as occurs with *Haplostegus nigric*rus Conde 1936 (Hymenoptera: Pergidae) on guava leaves *Psidium guajava* L. (Myrtaceae). However, species from the Xiphydriidae, Anaxyelidae, Siricidae, and Orussidae families have a clearly elongated ovipositor, as in *U. gigas,* and are capable of easily piercing woody material for oviposition and feeding.

Symphyta larvae have a well-sclerotized head, three defined segments on the thorax, nine to 10 abdominal segments, and an exclusively herbivorous habit, except for representatives of the superfamily Orussoidea, which are entomophagous. They have an eruciform appearance (similar to Lepidoptera) with five or more abdominal legs without hooks (caterpillars never have more than five and with hooks) and with rather restricted vision because they have a single lateral eyelet (stemmata) on each side of the head (caterpillars have six on each side).

Another characteristic that morphologically differentiates Symphyta herbivorous larvae from immature moths and butterflies is that, generally, the coloration of the head in larvae of that suborder is totally different from the rest of the body, which may be related to the optimization of its aposematic appearance. However, larvae of Symphyta with a miner or galling habit, which feed internally in the host, have atrophied or absent eyes and legs, as in Cephoidea, Siricoidea, and Xiphydrioidea.

Symphyta larvae are demonstrably responsible for economic losses to human beings in livestock and in agricultural, forestry, and ornamental systems in various regions of the world. In addition, several species of Symphyta have been recorded in areas where they do not occur naturally, transforming It is a matter of phytosanitary and environmental concern. In Australia, for example, it is estimated that of the eight recorded species of Tenthredinidae, five are exotic. Therefore, most of the knowledge about bioecological parameters described in Symphyta refers to the herbivore representatives due to the great need to promote information that can be used as tools in integrated pest management and environmental preservation programs [33-44]

4. Conclusion

Despite the various success stories reported, research on the biological control of weeds with arthropods of the suborder Symphyta needs, in general, to generate more robust and reliable information to avoid indirect effects of this type of biological control, as it rarely happens when there is introduction of exotic insects in endemic areas. Aspects involving the use of hosts, biology, and ecology of Neotropical populations of Symphyta-Argidae are little known and disproportionate to the need for information about their representatives.

References

[1] Kouki J, Niemela P, Viitasaari M. Reversed latitudinal gradient in species richness of sawflies (Hymenoptera, Symphyta). Annales Zoologici Fennici. 1994; 31: 83-88.

[2] Smith DR, Middlekauff WW. Symphyta immature insects. In: Stehr FW, eds. 1st ed. Dubuque: Kendall Hunt Publishing Company: 1987. p. 618–649.

[3] Vélez-Azañero A, Lizárraga-Travaglin A, Acosta C. Contributions to the understanding the Argidae (Symphyta) of Peru. Biologist. 2015; 13(2): 249-256.

[4] Kimsey LS, Smith DR. Two new species, larval descriptions, and life history notes on some Panamanian sawflies (Hymenoptera: Argidae, Tenthredinidae). Proceedings of the Entomological Society of Washington. 1985; 87: 191-201.

[5] Smith DR. A synopsis of the sawflies (Hymenoptera: Symphyta) of America south of the United States: Argidae. Memoirs of the American Entomological Society. 2012: 39: 1-196.

[6] Wäckers FL, Romeis J, Rijn P. Nectar and pollen feeding by insect herbivores and implications for multitrophic interactions. Annual Review of Entomology. 2007; 52: 301–323.

[7] Smith DR. A synopsis of the sawflies (Hymenoptera: Symphyta) of America south of the United States: Argidae. 1st ed. Philadelphia: Memoirs of the American Entomological Society. 1992.

[8] Jean-Luc B, Diego F, Dominguez D, Smith DR. Sawflies from northern Ecuador and a checklist for the country (Hymenoptera: Argidae, Orussidae, Pergidae, Tenthredinidae, Xiphydriidae). Journal Hymenoptera Research. 2018; 64: 1-24.

[9] Iberfauna. Family Argidae [Internet]. Madri: The iberian fauna data bank. National Museum of Natural Sciences (CSIC); © 2005 [cited 2023 Mar 23]. Available from http://iberfauna.mncn.csic.es/showficha.aspx?rank=J&idtax=3440.

[10] Boevé J, Marin-Armijos S, Dominguez DF, Smith DR. Sawflies (Hymenoptera: Argidae, Pergidae, Tenthredinidae) from southern Ecuador, with a new record for the country and some ecological data. Journal of Hymenoptera Research. 2016; 51: 55–89.

[11] Jervis M, Vilhelmsen L. Mouthpart evolution in adults of the basal, 'Symphytan', hymenopteran lineages. Biological Journal of the Linnean Society. 2000; 70(1): 121–146.

[12] Costa JT. The other insect societies. 1st ed. Cambridge: Harvard University Press. 2006.

[13] Kingsley KJ. Arthropods (Arthropoda) Invertebrates of Organ *Pipe Cactus* National Monument, Arizona. Geological Survey Technical Report. 1998; 60.

[14] Monroe L, Monroe G. Arthropods (Arthropoda) desert insects and kin of southern California: Anza-Borrego Desert State Park. 1st ed. Lyons: Merryleaf Press. 2013.

[15] Price PW, Denno RF, Eubanks MD. Arthropods (Arthropoda) insect ecology: Behavior, populations, and communities. 1st ed. Cambridge: Cambridge University Press. 2011.

[16] Whitney C, Thomas C, Kondratieff B, Walker G. Arthropods (Arthropoda) life in a Colorado Water Garden: The insects and other invertebrates associated with water features. 1st ed. Boulder: Colorado State University. 2010.

[17] Smith DR, Adis J. Notes on the systematics and natural history of *Dielocerus fasciatus* (Enderlein) and key to species of the genus (Hymenoptera: Argidae). Proceedings of the Entomological Society of Washington; 1984; 86: 720–721.

[18] Taeger A, Liston AD, Prous M, Groll EK, et al. [Internet]. Nuremberg: Electronic world catalog of Symphyta (Insecta, Hymenoptera). German Entomological Institute: © 2005 [cited 2023 Mar 23]. Available from https://www.argentinat.org/taxa/201415-Pergidae.

[19] Schmidt S, Smith DR. An annotated systematic world catalogue of the Pergidae (Hymenoptera). Contributions of the American Entomological Institute. 2006; 34(3): 1-207.

[20] Schmitt DR. A synopsis of the sawflies (Hymenoptera, Symphyta) of America south of the United States: Pergidae. Revista Brasileira de Entomologia. 1990; 34: 7-200.

[21] Liston A, Knight G, Sheppard D, Broad G, Livermore L. Checklist of British and Irish Hymenoptera - Sawflies, 'Symphyta'. Biodiversity Data Journal; 2014; 2: e1168.

[22] van Noort S. WaspWeb [Internet]. Hymenoptera of the Afrotropical region; © 2023 [cited 2023 Mar 15]. Available http://from ww.waspweb.org.

[23] Koch F, Goergen G, van Noort S. The sawflies of Namibia and the Western parts of South Africa (Symphyta, Hymenoptera). ABC Taxa. 2015; 15: 1-262.

[24] Liston AD, Goergen G, Koch F. Revisions of the Afrotropical genera of Argidae and species of *Pampsilota* Konow, 1899 (Hymenoptera, Tenthredinoidea). German Entomological Journal. 2017; 64(1): 1-25.

[25] Koch F, Liston AD. Notes on Afrotropical sawflies of Arge Schrank, 1802, with the description of a new species (Hymenoptera: Symphyta, Argidae). Entomological Journal. 2012; 122: 177-181.

[26] Liston AD. Taxonomy of European Arge related to nigripes (*Retzius*) (Hymenoptera, Symphyta: Argidae). Entomological Reports Lucerne. 1992; 27: 135-140.

[27] Liston A, Knight G, Sheppard D, Broad G, Livermore L. Checklist of British and Irish Hymenoptera - Sawflies, 'Symphyta'. Biodiversity Data Journal. 2014 2: e1168.

[28] Arge. Sawflies Arge (Symphyta) of Britain and Ireland [Internet]. London: A review of the status of the sawflies of Great Britain (Report); © 2021 [cited 2023 Mar 23]. Available from https://www.sawflies.org.uk/resources/.

[29] Watson L, Dallwitz MJ. Onwards. Insects of Britain and Ireland: the families of Hymenoptera.14th ed. Dublin: delta-intkey.com. 2003.

[30] Russo GMS, Lalanne MM. Bioecology and host plants of *Adurgoa conagra* (Klug) (Hymenoptera: Argidae). Magazine of the Faculty and Agronomy. 1994; 14(2): 145-148.

[31] Calmasur O. Checklist of the family Cimbicidae of Turkey and some biological observations (Hymenoptera: Symphyta). Munis Entomology & Zoology. 2011; 6(2): 779-784.

[32] |Sharkey MJ Phylogeny and classification of Hymenoptera. Zootaxa. 2007; 1668: 1–766.

[33] Smith DR. Symphyta. In: Krombein KV, Hurd J PD, Smith DR, Burks BD, eds. Catalog of Hymenoptera in America North of Mexico. 1st ed. Washington: Smithsonian Institution Press. 1979. p. 1-137.

[34] Akutsu K, Khen CV, Toda MJ. Assessment of higher insect taxa as bioindicators for different logging-disturbance regimes in lowland tropical rain forest in Sabah, Malaysia. Ecological Research. 2007; 22: 542–550.

[35] Silveira Neto S, Monteiro RC, Zucchi RA Moraes RCB. Use of faunal analysis of insects in the assessment of environmental impact. Scientia Agricola. 1995; 52: 9-15.

[36] Úradník M, Kulfan J. Structure of sawfly pseudo caterpillar (Hymenoptera: Symphyta) assemblages feeding on Norway Spruce and their seasonal changes. Acta Zoologica Comenian University. 2001; 44: 57-62.

[37] Schulmeister S. Review of morphological evidence on the phylogeny of basal Hymenoptera (Insecta), with a discussion of the ordering of characters. Biological Journal of the Linnean Society. 2003; 79: 209–243.

[38] Gullan PJ, Cranston PS. The insects: An outline of Entomology. 3rd ed. New Jersey: Blackwell Publishing. 2005.

[39] Goulet H. Sawflies (Hymenoptera: Symphyta). 1996.

[40] Schmidt S, Walter GH, Grigg J, Moore CJ. Sexual communication and host plant associations of Australian pergid sawflies (Hymenoptera, Symphyta, Pergidae). In: Blank SM, Schmidt S, Taeger A, eds. Recent Sawfly Research: Synthesis and Prospects. 1st ed. Keltern: Goecke & Evers; 2006. p. 173-193.

[41] Roller L, et al. Contribution to the knowledge of sawfly fauna (Hymenoptera, Symphyta) of the Low Tatras National Park in central Slovakia. Protection of Nature. 2006; 10: 57-72.

[42] Resh VH, Cardé RT. Encyclopedia of insects. 1st ed. Cambridge: Academic Press. 2003.

[43] Jewett D, Britton KO, Sun JH. Developing an integrated management program for kudzu. In: Cullen JM, Briese DT, Kriticos DJ, Lonsdale WN, Morin L, Scott JK. Proceedings of the International Symposium on Biological Control of Weeds. 1st ed. Weeds: CSIRO Entomology; 2003. p. 474-474.

[44] Kouki J, Niemela P, Viitasaari M. Reversed latitudinal gradient in species richness of sawflies (Hymenoptera, Symphyta). Annales Zoologici Fennici. 1994; 31: 83-88.