

Study of the family Cimbicidae (Insecta: Hymenoptera)

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Abstract

Larvae of *Cimbex quadrimaculata* (Müller 1766) (Hymenoptera: Cimbicidae) are grayish and black markings. The larval head capsule is black in the first larval instars. It is a pest mainly on almonds but also feeds on apricots, peaches, pears, and cherries in Turkey. There has been no documentation of this species causing severe defoliation in areas where it has been observed. Observations were continued in the orchard until the end. The larvae fed on the edges of the leaves by consuming the whole leaf laminae or leaving only the midrib. The aim of this mini-review was to describe the distribution, life history, and biology of the almond sawfly (Hymenoptera Cimbicidae). Indexed articles, scientific book chapters, theses databases, university dissertations, national and international scientific articles, scientific journals, documents, and academic and scientific journals are available online ResearchGate, HAL, SSRN, Scielo, and Qeios were used. The present work uses the reference of bibliographical research, understood as the act of inquiring and seeking information on a certain subject, through a survey carried out in national and foreign databases, with the objective of detecting what exists of consensus or controversy.

Keywords: *Cimbex quadrimaculata*; Damage; Larvae; Management; Pests

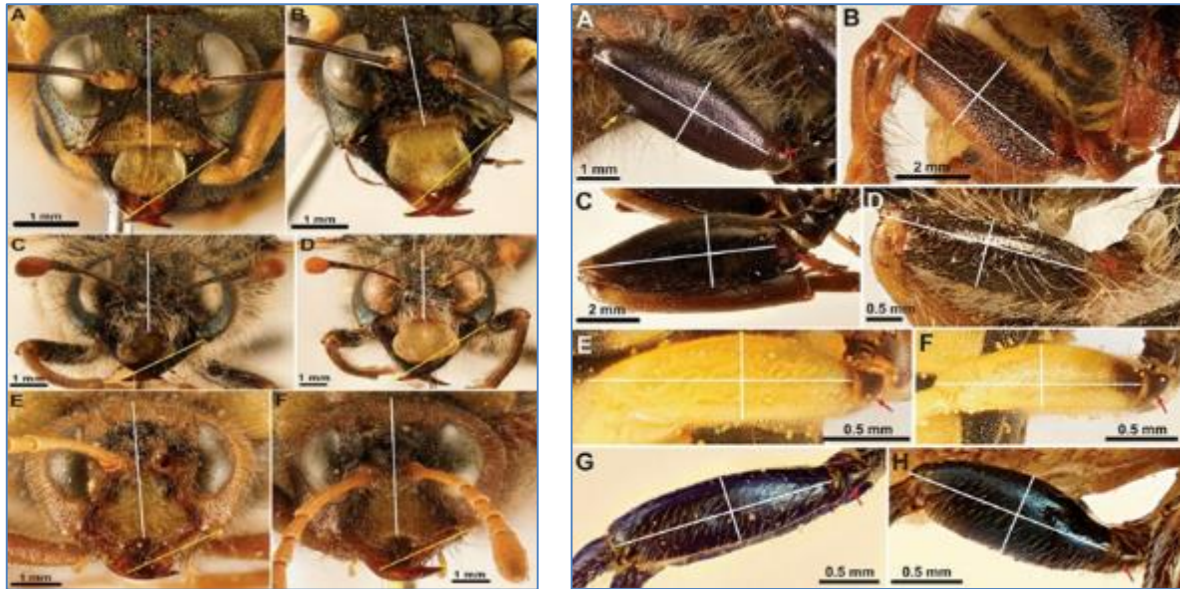
1 Introduction

Cimbicidae is a family of symphytic wasps in the order Hymenoptera. There are more than 20 genera and 200 described species. The family is distinctive in having capitate (club-like) antennae with six or seven segmented antennae. The adults of some species are among the largest and heaviest Hymenoptera [1,2,3].

1.1 Description

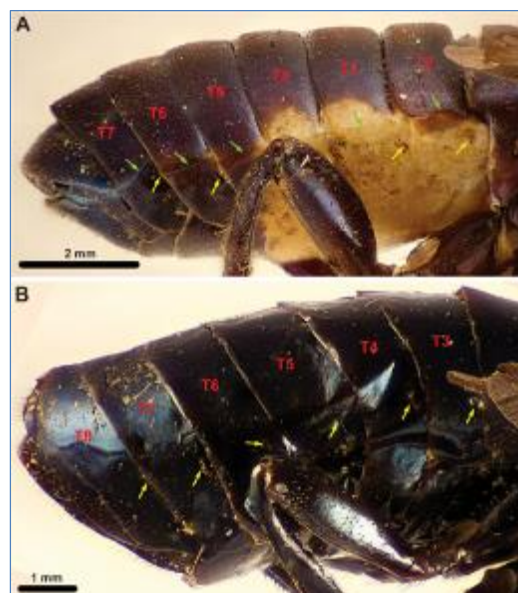
The characteristic feature of the family is the antennae with a prominent apical club. The antennae have seven segments or less. The adults measure from 12 to 25 mm in general, and those of some species get to measure more than 3 cm in length; They are robust and are among the heaviest among the Hymenoptera. Some look like bumblebees (Figures 1A-3) [5,6,7].

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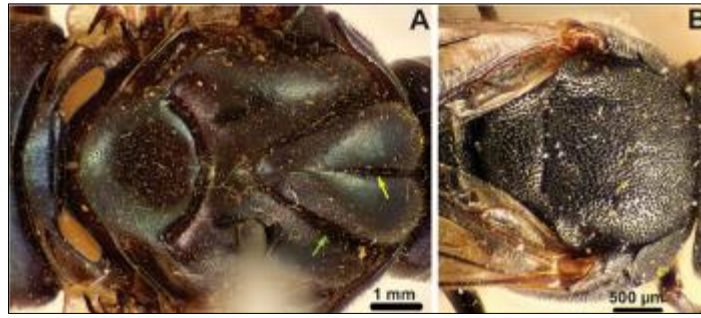
Sources: https://www.researchgate.net/figure/Anterior-view-of-head-of-Cimbicinae-females-to-the-left-males-to-the-right-A_fig2_353039305 and https://www.researchgate.net/figure/Hind-femora-of-Cimbicidae-in-lateral-view-ATrichiosoma-latreilli-Leach-1817-male_fig3_353039305

Figure 1A Anterior view of the head of Cimbicinae, females to the left, males to the right. (A,B) *Leptocimbex allantiformis* (Mocsáry, 1909). (C,D) *Pseudoclavellaria amerinae* (Linné, 1758). (E,F) *Cimbex quadrimaculatus* (Müller, 1766). Measurements of head height (white line) and left mandible length (yellow line) are indicated. Figure 1B Hind femora of Cimbicidae in lateral view. (A) *Trichiosoma latreilli* Leach, 1817, male. (B) *C. quadrimaculatus* male. (C) *Odontocimbex svenhedeni* Malaise, 1934, male. (D) *Pseudoclavellaria amerinae* (Linné, 1758), female. (E), (F) *Corynis dusmeti* (Konow, 1905), female and male. (G), (H) *Pseudopachylosticta subflavata* (Kirby, 1882), female and male. Measurements of femur length and width (white lines), trochantellus (red arrow), and spur (yellow arrow) indicated



Source: <https://www.semanticscholar.org/paper/A-review-of-the-South-American-genera-of-Cimbicidae-Vilhelmsen-Smith/d66df5e52e4c472d57912e0d3e214005f39bb8fe/figure/2>

Figure 2 Abdomen, lateral. (A). *Pachylosticta albiventris* Klug, 1824, ♂ (NHMD). (B). Pergidae, Parasyzygoniinae: *Parasyzygonia cyanoptera* (Klug, 1824), ♀ (NHMD). Abbreviations: T[n] = abdominal terga [n]. yellow arrow = spiracle; green arrow = separation between median and lateral parts of abdominal terga



Source: <https://www.semanticscholar.org/paper/A-review-of-the-South-American-genera-of-Cimbicidae-Vilhelmsen-Smith/d66df5e52e4c472d57912e0d3e214005f39bb8fe/figure/3>

Figure 3 Thorax, dorsal. (A). *Pachylosticta albiventris* Klug, 1824, ♂ (NHMD). (B). *Corynis obscura* (Fabricius, 1775), ♀ (NHMD). Abbreviations: yellow arrow = median mesoscutal sulcus; green arrow = notaulus

1.2 Biology

The adults of some species are among the largest and heaviest Hymenoptera. Larvae are solitary herbivores and feed on plants of the families Rosaceae, Betulaceae, Fagaceae, Salicaceae, Caprifoliaceae, and Dipsacaceae. The larvae are solitary and herbivorous and resemble lepidopteran caterpillars. They feed on trees or shrubs, such as elms or cherry trees (Figure 6) [8,9].



Source: <https://gd.eppo.int/taxon/CIMBQU/photos>

Figure 4 *Cimbex quadrimaculata* (Müller 1766) (Hymenoptera: Cimbicidae), egg and larvae

1.3 Taxonomy

- Family Cimbicidae
- Subfamilia: Cimbicinae
- Tribus: Cimbicini
 - Genus: *Cimbex* (=Palaeocimbex) Olivier, 1790. *Cimbex connatus* (Schrank 1776); *Cimbex femoratus* (Linnaeus, 1758); (Linnaeus 1758).
 - Genus: *Agenocimbex*, Rohwer, 1910.
 - Genus: *Allocimbex*, Rohwer, 1910.
 - Genus: *Neocimbex*, Malaise, 1937.
 - Genus: *Odontocimbex*, Malaise, 1935.
 - Genus: *Praia*, Wankowitz, 1880. *Praia taczanowskii* Wankowicz 1880.
- Tribus: Trichiosomini
 - Genus: *Trichiosoma*, Leach, 1817.

Trichiosoma laterale Leach, 1817; *Trichiosoma lucorum* (Linnaeus, 1758); *Trichiosoma vitellinae* (Linnaeus, 1761); *Trichiosoma sibiricum* Gussakovskij, 1947; *Trichiosoma tibiale* Stephens, 1835; *Trichiosoma sorbi* Hartig, 1840; *Trichiosoma villosum* (Motschulsky, 1859); *Trichiosoma aenescens* Gussakovskij, 1947; *Trichiosoma malaisei* Saarinen, 1950; *Trichiosoma kontuniemii* Saarinen, 1950.

- Genus: *Leptocimbex*, Semenov, 1896.
- Genus: *Pseudoclavellaria*, Schulz, 1906.
- *Pseudoclavellaria amerinae* (Linnaeus 1758)
- Subfamilia: Abiinae
 - Genus: *Abia* (= *Aenoabia*, Zareae), (Leach 1817).
Abia candens Konow, 1887; *Abia sericea* (Linnaeus 1767); *Abia fasciata* (Linnaeus 1758); *Abia mutica* Thomson 1871; *Abia aenea* (Klug 1829).
 - Genus: *Allabia*, Semenov & Gussakovskij, 1937.
 - Genus: *Orientabia*, Malaise, 1935.
 - Genus: *Parabia*, Semenov, 1891.
- Subfamilia: Coryninae
 - Genus: *Corynis*, Thunberg, 1789.
Corynis obscura (Fabricius, 1775).
- Subfamilia: Pachylostictinae
 - Genus: *Pachylosticta*, Klug, 1824.
 - Genus: *Brasilabia*, Conde, 1937.
 - Genus: *Lopesiana*, Smith, 1988.
 - Genus: *Pseudabia*, Schrottky, 1910
 - Genus: *Pseudopachylosticta*, Mallach, 1929.
Pseudopachylosticta subflavata (Kirby, 1882)
Pseudopachylosticta leucogaster Mallach, 1929 [10,11,12].

Objective

The aim of this mini-review was to describe the distribution, life history and biology of the almond sawfly (Hymenoptera: Cimbicidae).

2 Methods

Indexed articles, scientific book chapters, theses databases, university dissertations, national and international scientific articles, scientific journals, documents and academic and scientific journals are available online ResearchGate, HAL, SSRN, Scielo and Qeios were used. The present work uses the reference of bibliographical research, understood as the act of inquiring and seeking information on a certain subject, through a survey carried out in national and foreign databases, with the objective of detecting what exists of consensus or controversy.

3 Selected articles

3.1 Study 1

3.1.1 *Species: Abia fulgens* Zaddach, 1863.

Abia fulgens can reach a length of between ten and twelve millimeters. Imagos have a black body, with a rounded, obese abdomen that is conspicuously green-gold or bronze. The thorax is black, slightly downy, and with a soft bluish sheen. The wings are translucent but have a dark brown marking in the middle, below the stigma, which has a blackish-brown base and a yellow apical half.

The club-shaped antennae are reddish-yellow with a black or dark brown base and tip, which makes it possible to distinguish this species from other similar ones in which the antennae are entirely yellow or entirely black. The legs are yellowish, with the base of the femur black. The larva, up to three centimeters in length, is sand-colored with yellow and black spots.

This species can be found in central and southern Europe, where it occurs mainly in wet grasslands and open forests. The imagos can be seen from May to October on the flowers whose nectar they feed on, especially those of Umbelliferae, Asteraceae, and Dipsacaceae. The larva feeds only on the foliage of Dipsacaceae (*Dipsacus* L., *Knautia* L., *Scabiosa* L., *Succisa* Haller, and *Succisella* Beck) [13,14,15].

3.2 Study 2

3.2.1 *Specie: Abia nitens* (Linnaeus, 1758).

- **Morphological features:** Body green, antennae and legs yellow. Body length - 10-12 mm.
- **Taxonomic affiliation:** Class - Insecta (Insecta), row - Hymenoptera (Hymenoptera), family - Cimbicidae sawflies (Cimbicidae).
- **Conservation status:** Rare.
- **Distribution:** The range of the species and its distribution in Ukraine: Distributed in the Middle and South. Europe (France, Spain, Germany, Switzerland, Hungary, Greece), in the Baltic States (Lithuania). In Ukraine, it was found in the Transcarpathian, Ivano-Frankivsk, Khmelnytskyi, Zhytomyr, Kyiv, Cherkasy and Kharkiv regions.
- **Habitat and Ecology:** Number and reasons for its change Insignificant (single individuals). The reasons for the change in numbers are not clear. Perhaps due to the destruction of fodder plants during excessive grazing and continuous mowing of grass on the edges and forest glades.
- **Biology:** Features of biology and scientific significance: Years of imago from the end of May to the end of July. Feeds on pollen and nectar of umbelliferous flowers. Larvae on Chersakov.
- **Conservation:** Mode of conservation of populations and protection measures: Thoroughly study the characteristics of the biology of the species, find out the places where populations exist, and take them under protection.
- **Reproduction and breeding in specially created conditions:** No information.
- **Economic and commercial importance:** No information [16,17,18].

3.3 Study 3

3.3.1 *Abia sericea* (Linnaeus, 1767).

This is the type of species of the thirteen that make up the genus *Abia*. It reaches a length of between ten and twelve millimeters and is of a showy golden-green or metallic bronze color. The thorax is black with a bluish metallic sheen and has a faint downy covering. The abdomen, as in the other species of the genus, is narrower in the male, which has a contrasting black patch on the posterior half of the back (occupying the fourth to seventh segments), and much more inflated in the female, which lacks said patch.

The antennae are club-shaped, made up of five segments, and are orange throughout, unlike other species in the genus with partially or entirely black antennae. The legs are yellow, with the femora black on the basal part, the first segment of the tarsi is as long as the second and third together (it is shorter in *Abia loniceræ* (Linnaeus, 1758), and the tarsal claws each end in a pair of teeth. subequal. The wings are transparent, with a long diagonal brown marking starting from the apex, and another brown marking halfway down the wing.

The caterpillar-like larva is about 3 centimeters long at maturity and leaden-grey in color, dark above and light below, with a row on each side of contrasting lemon-yellow spots on top of black spots, one on each side. each body segment.

This species can be found in most of Europe. It lives, above all, in humid meadows and on forest edges and clearings, wherever its food plants grow: any species of the Dipsacaceae family, including *Scabiosa*, *Succisa*, *Knautia*, and even *Dipsacus*. This food adaptability, greater than that of other *Abia* species, makes it the most frequent and well-known species of its genus; in the British Isles, it is in fact the most abundant species of the entire Cimbicidae family.

The adults appear from May to October and feed on the nectar of flowers, with a certain predilection for those large umbellifers such as *Ferula* L., *Heracleum* L., (Apiaceae), and *Ferulago* Koch Apiaceae). Males guard small territories against low perches. The possibility of introducing this species to North America as a biological control agent for *Dipsacus fullonum* L., (Caprifoliaceae) an invasive species in various parts of the United States, has been evaluated [19,20,21].

3.3.2 *Biological Control of the Sawfly*

Biological control agents that can be used to control sawflies include the entomopathogenic fungi *Beauveria bassiana* (Balsamo) Vuillemin, 1912 (Basidiales: Basidiomycota): which infect larvae by contact. The bacterium named *Bacillus thuringiensis* (Berliner, 1915) (Bacillales: Bacillaceae): can also be used for biological control of the sawfly.

3.3.3 Chemical Control of the Sawfly

In the chemical control of the active ingredient endosulfan and neem extract are used. In choosing the active ingredient to use to control the sawfly, the history of active ingredients applied, the population density of the insect and the particular conditions must be considered. Products that have the respective legal registration for their use in the crop and the pest should always be used [22,23,24].

3.4 Study 4

This paper aims to catalog all the data of Cimbicidae, Megalodontesidae, Orussidae, Pamphiliidae, Siricidae, and Xiphydriidae (Hymenoptera: Symphyta) from Iran.

- Family Cimbicidae Kirby, 1837
- **Subfamily Abiinae Benson, 1951**
- Genus *Abia* Leach, 1817

3.4.1 *Abia candens* Konow, 1887.

Distribution in Iran: General distribution: Austria, Belarus, Belgium, Bulgaria, China, Croatia, Czech Republic, Estonia, Finland, France, Germany, Great Britain, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Romania, Slovakia, Switzerland and Ukraine.

Host plants: *Knautia maxima* (L.), *Knautia arvensis* L., (Caprifoliaceae) [25,26].

3.4.2 *Abia sericea* (Linnaeus, 1767)

Distribution in Iran: General distribution: Austria, Belgium, Bosnia and Herzegovina, Bulgaria, China, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Hungary, Ireland, Italy, Latvia, Macedonia, Netherlands, Poland, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, and Ukraine

Host plants: *Dipsacus* sp. *Succisa pratensis* Moench, *Knautia arvensis* L., (Caprifoliaceae), *Fragaria* sp. (Rosaceae).

Subfamily Cimbicinae Leach, 1817.

Genus *Cimbex* Olivier, 1790.

3.4.3 *Cimbex femoratus* (Linnaeus, 1758).

General distribution: Austria, Belgium, Bulgaria, China, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Hungary, Ireland, Italy, Japan, Korea (North and South Korea), Latvia, Luxembourg, Macedonia, Netherlands, Poland, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, and Ukraine.

Host plants: *Betula davurica* Pall., *Betula ermanii* Birch), *Betula pendula* Roth, *Betula pubescens* Ehrh. (Betulaceae).

Subfamily Coryninae Benson, 1938.

Genus *Corynis* Thunberg, 1789

General distribution: Bulgaria, former Yugoslavia, Iran, Southeast Europe, Transcaucasia, and Turkey.

Host Plants: *Geranium* spp. (Geraniaceae).

Corynis obscura (Fabricius, 1775)

General distribution: Albania, Austria, Belgium, Bulgaria, Croatia, Czech Republic, Estonia, Finland, France, Germany, Greece, Hungary, Iran, Italy, Latvia, Macedonia, Norway, Poland, Romania, Russia, Slovakia, Spain, Sweden, Switzerland, Turkey and Ukraine.

Host Plants: *Geranium silvaticum* L., *Geranium sanguineum* L., (Geraniaceae).

Corynis krueperi (Stein, 1876)

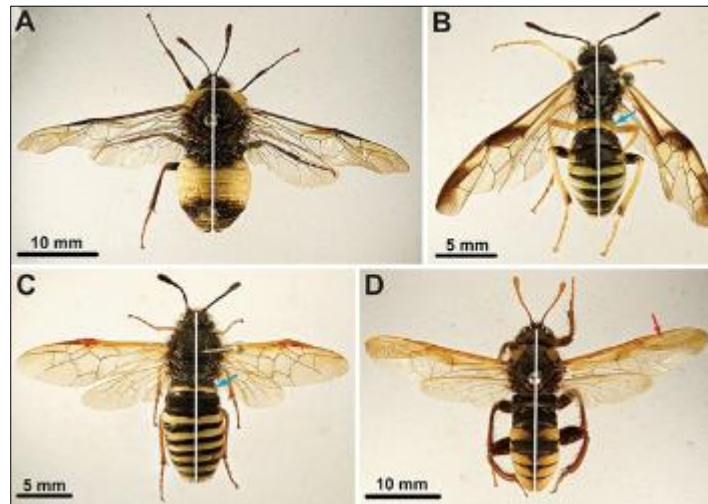
General distribution: Crete, Cyprus, Greece, Israel, Jordan, Lebanon, Syria, and Turkey.

Host Plants: *Papaver* sp. (Papaveraceae) [27,28,29].

3.5 Study 5

3.5.1 Hymenoptera or mimic - Intrasexual competition.

Odontocimbex is the result of a further increase in body size, coupled with an increase in hind femur width/length ratio in males. Black and yellow body coloration and other potential mimicry patterns are observed in a number of genera of Cimbicinae but are probably not ground-plan features of the subfamily. Outside Cimbicinae, black and yellow body coloration is most frequent but it cannot be decided if it is a ground plan trait of this subfamily. Intrasexual competition seems to be more likely to have influenced size increase in Cimbicinae than adaptations to mimicry (Figure 5).



Source: https://www.researchgate.net/figure/Examples-of-potential-mimicry-in-Cimbicidae-Habitus-dorsal-Aodontocimbex-svenhedeni_fig1_353039305

Figure 5 Examples of potential mimicry in Cimbicidae. Habitus dorsal. (A) *Odontocimbex svenhedeni* Malaise, 1934, female; (B) *Leptocimbex allantiformis* (Mocsáry, 1909), female; (C) *Praia ussuriensis* Malaise, 1939, female; (D) *Cimbex quadrimaculatus* (Müller, 1766), male. Blue arrows = partly or completely pale tergum 1; red arrow = band of infuscation along the anterior margin of fore wing. Body length measurement indicated (white line). the family is mapped on an existing phylogeny, and some potential drivers of body size increase are explored: intrasexual competition between males, and mimicry patterns

Cimbex americana Leach (1908), is the largest blue-black adult who is sexually dimorphic. Females have thickened femurs on the second and third pair of legs, and they usually have pale, wrap-around stripes on the abdomen that don't quite touch the midline. Males' legs are massive, and they may have red or black abdomen. Both have smoky wings, orange antennae, and a white spot at the base of the thorax.

Adults have sturdy jaws that they use to pierce and even girdle the bark of twigs so they can feed on the sap. Larvae are attacked by a number of parasites/parasitoids, and larvae and pupae are eaten by mice and shrews. Populations can be somewhat cyclical, and the larvae may be minor forest pests in peak years, but harm is minimized because they're feeding late in a tree's growing season [30,31,32,33].

3.6 Study 6

3.6.1 Biocontrol

Larvae of *Cimbex quadrimaculata* (Müller 1766) are grayish and black markings. The average length of these larvae can reach about 20 millimeters (0.79 in), with a maximum of about 50 millimeters (1.9 in) in the last larval instars. The larvae are big and full-bodied. The larval head capsule is black in the first larval instars. It is a pest mainly on almonds but also feeds on apricot, peach, pear, and cherry in Turkey (Figure 6).



Source: <http://agronomyjournal.usamv.ro/pdf/2016/Art37.pdf>

Figure 6 The first larval instars and the last larval instars of *Cimbex quadrimaculata* (Müller 1766)

Larvae of *Cimbex quadrimaculata* (Müller 1766) are grayish and black markings. The average length of these larvae can reach about 20 millimeters (0.79 in), with a maximum of about 50 millimeters (1.9 in) in the last larval instars. The larvae are big and full-bodied. The larval head capsule is black in the first larval instars. It is a pest mainly on almonds but also feeds on apricot, peach, pear, and cherry in Turkey.

These completely leafless almond trees where can leave their high population during the period. Therefore, in heavily infested areas of the orchard, the gardener applied various control measures, particularly collecting and killing the larvae by hand.

Two parasitoid species, *Opheltes glaucopterus* (Linnaeus, 1758) and *Phobetes nigriceps* (Gravenhorst, 1829) in the subfamily Ctenopelmatinae (Hymenoptera: Ichneumonidae) were defined as a larva–pupa parasitoids from *C. quadrimaculata* [33,34,35].

3.7 Study 7

3.7.1 Classification of World Hymenoptera.

- **Subfamilies:** Abiinae, Cimbicinae, Corynidinae and Pachylostictinae.
- **Distribution:** Nearctic, Neotropical, and Palaearctic. Most diverse in the temperate regions of the Northern Hemisphere with one subfamily (Pachylostictinae) restricted to South America.
- **Biology:** Phytophagous. Larvae of Cimbicinae feed mainly on trees, and larvae of the three other subfamilies feed mainly on shrubs and herbs. The biology of Pachylostictinae is poorly known. Larvae occur at low density, feeding externally, and construct cocoons either on the food plant or in the soil.
- *Abia* Leach, 1817 and *Allabia* Semenov & Gussakovskij, 1937
- **Distribution:** Nearctic and Palaearctic.
- **Biology:** Phytophagous. Larvae feed mainly on shrubs and herbs. Larvae occur at low density, feeding externally, and construct cocoons either on the food plant or in the soil.
- **Some species:** *Abia koreana* Takeuchi, 1927 Palaearctic; *Abia fasciata* (Linnaeus, 1758) Palaearctic, *Abia formosa* Takeuchi, 1927 Oriental, *Abia fulgens* Zaddach, 1863 Palaearctic, *Abia gribodoi* Konow, 1895, Palaearctic, *Abia imperialis* Kirby, 1882 Oriental, *Abia infernalis* (Semenov, 1896) Palaearctic, *Abia inflata* (Norton, 1861) Nearctic, *Abia iridescens* Marlatt, 1898 Oriental and *Abia japonica* Cameron, 1887 Palaearctic.
- **Distribution:** Oriental, Nearctic, and Palaearctic.
- **Biology:** Phytophagous. Larvae feed mainly on shrubs and herbs. Larvae occur at low density, feeding externally, and construct cocoons either on the food plant or in the soil [36,37,38].

3.8 Study 8

3.8.1 *Cimbex femoratus* (Linnaeus, 1758)

Can reach a length of 17–23 millimeters (0.67–0.91 in). The head is large, with large, strong jaws. Wings are smoky brown with brown margins. The thorax is glossy black. The shiny black abdomen shows a whitish band and a large reddish-brown band, especially in males. The antennae are black at the base and yellow-orange at the tip. Even the last leg segments are yellowish (Figure 7).



Sources: https://www.galerie-insecte.org/galerie/image/dos68/big/ath10_07_28_002.jpg, <https://inpn.mnhn.fr/photos/uploads/webtofs/inpn/2/205452.jpeg> and <https://www.sawflies.org.uk/wp-content/uploads/2020/06/Cimbex-femoratus-yellow-form-Credit-John-Robotham.jpg>

Figure 7 *Cimbex femoratus* (Linnaeus, 1758)

Adults fly from May to August. The larvae are light blue-green, about 45 mm long and look very much like caterpillars. On the back, they usually have a narrow dark bluish longitudinal stripe. They can be found between June and September and feed exclusively on birch leaves (*Betula* sp.)

- **Colors:** Brown, Black, Yellow, Red, White, and Orange
- **Habitat:** These butterflies prefer areas where birch trees can
- **Pollinator:** *Cimbex femoratus* is usually near the corolla, where the hairs are easily covered with pollen, which can help pollinate the plant [39].

3.9 Study 9

- Order: Hymenoptera
- Suborder: Symphyta
- Infra-order:
- Superfamily: Tenthredinoidea
- Family: Cimbicidae
- Subfamily: Cimbicinae
- Genre: *Cimbex* Oliver, 1790
- Species: *C. quadrimaculatus*

Identification: The Red-shouldered Hornet (*C. quadrimaculatus*) is an insect that actually has nothing to do with a hornet. It certainly belongs to the same order, but not to the same suborder. It does not have a stinger (neither the female nor the male) and therefore cannot sting. On the other hand, its coloring and its large size evoke at first glance a European hornet (Figure 8).



Sources: <https://biodiv-occitanie.fr/espece/231776> and <https://insecterra.forumactif.com/t25588-cimbex-quadrimaculata-vespa-crabo>

Figure 8 Larva and adult *Cimbex quadrimaculatus* (Müller, 1766)

His body is stocky. The pronotum is light yellow, contrasting with the black, densely pitted mesonotum. The abdomen is yellow with 1 and 3 black tergites, and a median series of triangular black spots. There is a yellowish stripe along the forewing costa. The antennae are yellow-orange and swollen in a club.

The sexes are similar.

- Size: 16 to 22mm.
- Geographic distribution: Central and Southern Europe.
- Overwintering: cocoon.
- Host plants: Hawthorns (*Crataegus* spp.), Pear trees (*Pyrus* spp.), *Prunus* spp.
- Larva: It is white, with a midodorsal series of round black spots. It has a laterodorsal series of black spots in the form of dashes, embellished with a few regularly spaced orange spots.
- Similar species: The other *Cimbex* do not have such a bright yellow pronotum but rather orange-brown [40].

4 Conclusion

Despite their eye-catching appearance, little are known. There is not much reliable information about their lifestyles, and the correct systematization of females and males into the same species is problematic because few suitable taxonomic characters have been found. To date, a little less than 170 species of barnacles have been described.

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