George MELIKA

GALL WASPS OF UKRAINE
CYNIPIDAE

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ІНСТИТУТ ЗООЛОГІЇ ім. І.І.ШМАЛЬГАУЗЕНА НАН УКРАЇНИ

ГОРІХОТВОРКИ УКРАЇНИ

CYNIPIDAE

Частина 1

Ж. Г. МЕЛІКА

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Горіхотворки України. Cynipidae. Ч. 1-2 / Меліка Ж.Г. – Київ: Вестник зоологии, 2006. – 644 с.

В монографії подається перше зведення по горіхотворкам фауни України (Hymenoptera: Cynipidae). Загальна частина містить короткий вступ до морфології імаго і преімагінальних стадій розвитку, біології і екології, філогенезу і еволюції групи. У спеціальній частині детально описано 183 види Cynipidae (55 видів Aylacini, 6 Diplolepidini, 1 Pediaspidini, 30 Synergini і 91 Cynipini), з яких 167 видів знайдено в Україні, 16 видів (позначені *) відомі з сусідніх територій, ймовірно поширені і в Україні. Описано один новий рід Aylacini, *Diakontschukia*, синонімізовано 4 роди і 16 видів, запропоновано 8 нових видових назв. Вперше подано детальні описи і діагнози видів, а також таблиці для визначення всіх видів на основі дорослих комах, а не галів.

Ключеві слова: цинініди, горіхотворки, таксономія, фауна, Україна.

Ілюстрації: 211 таблиць; бібліографія: 809.

Орехотворки Украины. Cynipidae. Ч 1-2 / Мелика Ж.Г. – Киев: Вестник зоологии, 2006. – 644 с.

Монография представляет первую сводку по орехотворкам фауны Украины (Hymenoptera: Cynipidae). Общая часть содержит краткое вступление к морфологии имаго и преимагинальных стадий развития, биологии и экологии, филогенеза и эволюции группы. В специльной части детально описаны 183 вида Cynipidae (55 видов Aylacini, 6 Diplolepidini, 1 Pediaspidini, 30 Synergini и 91 Cynipini вид), из которых 167 видов найдены в Украине, 16 видов (обозначены *) известны с соседних территорий и, вероятно, встречаются в Украине. Описано один новый род Aylacini, *Diakontschukia*, 4 роды и 16 видов синонимизированы, установлены 8 новых видовых комбинаций. Впервые даны детальные описания и диагнозы видов, составлены таблицы для определения всех видов на основе взрослых насекомых, а не галлов.

Ключевые слова: цинипиды, орехотворки, таксономия, фауна, Украина.

Иллюстрации: 211 таблиц; библиография: 809.

Gall Wasps of Ukraine. Cynipidae. Vol. 1-4. / Melika, G. – Kyiv: Vestnik zoologii, 2006. – 644 p.

The first monograph of the gall wasps (Hymenoptera: Cynipoidea, Cynipidae) of the fauna of Ukraine. The general part contains a brief introduction to the morphology of adults and premature stages, biology and ecology, phylogeny and evolution of Cynipidae. 183 species of the Cynipidae (55 Aylacini, 6 Diplolepidini, 1 Pediaspidini, 30 Synergini and 91 Cynipini species) are described in details; of them, 167 species have been recorded from Ukraine and 16 species (marked with *) are known from the neighbouring territories and presumably occur in the Ukrainian fauna, however, have not been found yet. One new genus of Aylacini, *Diakontschukia*, is described, four genera and 16 species are synonymized, 8 new species name combinations are given. Detailed descriptions, diagnoses and keys to adult wasp species are given for the first time.

Key words: cynipid, gall wasp, taxonomy, fauna, Ukraine.

Illustrations: 211 plates with figures; bibliography: 809 references.

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Foreword

Cynipid gall wasps (Hymenoptera, Cynipoidea, Cynipidae, Cynipinae) induce some of the most structurally complex plant galls, and with ca. 1400 described species, they are the second most species-rich group of gall inducers after the gall midges (Diptera: Cecidomyiidae). The six tribes of gall wasps include five tribes of gall inducers, and one tribe of obligate inquilines that predominantly attack the galls of other cynipids. The most species-rich tribe (Cynipini) is characterised by possession of complex, cyclically parthenogenetic lifecycles and the ability to induce a wide diversity of highly complex species-specific galls on oaks and other Fagaceae. Less species-rich radiations are associated with herbs (the paraphyletic gall-wasp tribe Aylacini), roses (the Diplolepidini), mimosoid Fabaceae (the Eschatocerini), and sycamores (*Acer*) and southern beech (*Nothofagus*) (the Pediaspidini).

Our knowledge on cynipid fauna of Ukraine is fragmentary and incomplete. The most studied gall wasps are those of the tribe Aylacini in which there were many species recently described, mainly from the steppe zone of Ukraine (Diakontschuk, 1980b, 1981b, 1981c, 1982, 1983b, 1987b, 2003). Short reviews on the gall wasp fauna of Ukraine (Diakontschuk, 1981d, 1986; Diakontschuk & Melika, 1994; Shevchenko, 1955; Zerova, Diakontschuk & Ermolenko, 1988), Crimea (Pliginskij, 1890; Diakontschuk, 1987b), Transcarpathian Region (Bahanych, 1984, 1989; Csóka & Melika, 1993; Melika & Csóka, 1994; Melika, Diakontschuk & Csóka, 1993) and Dnipropetrovsk Region (Bochenko, 1989) exist; however, they are incomplete.

A faunistic review of gall wasps (Hymenoptera: Cynipoidea, Cynipidae) occuring in Ukraine is given for the first time. 183 species of Cynipidae (55 Aylacini, 6 Diplolepidini, 1 Pediaspidini, 30 Synergini and 91 Cynipini species) are described in details, which from 167 species were found in Ukraine and 16 species (marked with *) are known from the neighbouring territories and presumably occur in the Ukrainian fauna, however, not yet found. One new eastern palaearctic genus of Aylacini, *Diakontschukia* is described, four generic and 16 species names are synonymized, 8 species names are placed in new combinations with genus names.

This Fauna Ukraine volume is written in English, detailed descriptions and diagnoses are given to all species for the first time. Earlier descriptions of many cynipid species are by far incomplete and insufficient for species identification purposes, very often they lack even the main diagnostic characters, e.g. the last catalogue (Dalla Torre & Kieffer, 1910). All published European national Cynipidae fauna: Hungary (Ambrus, 1974), Poland (Kierych, 1979), Romania (Ionescu, 1957, 1973), Scandinavian countries (Coulinos & Holmåsen, 1991), the Netherlands (Docters van Leeuwen, 1957), European territory of the USSR (Zerova et al., 1988) were based on galls only, keys to adults, descriptions and diagnoses of adult wasps were lacking. The first work with the descriptions and keys to adult wasps was the monograph on the cynipid fauna of the Iberian Peninsula (Nieves-Aldrey, 2001a), however, this volume mainly deals with the Mediterranean species and only a few of included species occur in the remaining part of Europe. Numerous nomenclatorial changes were omitted in this work or they were made after the publication of that book.

A brief review of all palaearctic Aylacini species is given; many species described by L.A. Diakontschuk (1980a, 1981a, 1981b, 1981c, 1982, 1983a, 1983b, 1984, 1987a, 1988, 1990, 2001, 2003) are revised for the first time. As the result one new genus, *Diakontschukia*, is described, new synonyms and new name combinations are established, keys to all palaearctic Aylacini species are given for the first time.

Distribution of many cynipid species depends on the distribution of their host plants. The Cynipini and Synergini fauna richest of the Transcarpathian Region of Ukraine due to its geographic position. This is the only region in Ukraine where *Quercus cerris* L. natural stands can be find (Rafajlovo forest, Beregovo district; Julijivsky Hory, Vynohradiv district) and many oak gall wasp species, the sexual generations of which develop exclusively on *Q. cerris*, and species trophically associated only with *Q. cerris* can be find only here. Also the Carpathians are a barrier for many species (Csóka & Melika, 1993; Diakontschuk & Melika, 1994; Melika & Csóka, 1994; Melika, Diakontschuk & Csóka, 1993). Many Aylacini species described by L.A. Diakontschuk are restricted in their distribution only to the steppe zone of Ukraine and have not been found yet in other countries.

I am very thankful to Dr. M.D. Zerova for her constant encouraging and supporting to write this book and also for the possibility to study the cynipid collection of the Schmalhausen Institute of Zoology, Ukrainian National Academy of Sciences (SIZK, Kiev, Ukraine), which together with the cynipid collection of the Systematic Parasitoid Laboratory (SPL, Tanakajd, Hungary), formed the base of this faunistic review. I am also grateful to Dr. M.D. Zerova and Dr. L. Papp (Hungarian Natural History Museum, Budapest, Hungary) for their detail and useful critical comments on the manuscript, Drs. V.A. Korneyev and P.V. Putshkov (Schmalhausen Institute of Zoology, Kiev, Ukraine), for their constructive comments and criticism to the monograph. Special thanks to curators of many Hymenoptera collections of different institutions for loaning material and given opportunity to study many types and materials deposited in different museums of Europe, USA, Canada, and China, especially to Dr. L.A. Diakontschuk for working with the Cynipidae collection of SIZK. I am also very thankful to my colleagues cynipidologists, Dr. G.N. Stone (Edinburgh Universiry, Scotand), Dr. J. Pujade-Villar (Barcelona University, Spain) and Dr. György Csóka (Forest Research Institute, Mátrafüred, Hungary) for their many years' fruitfull cooperation in the research of gall wasps and my assistant, Ms. Maria Bechtold, who prepared all the drawings and photographs and also helped in the technical preparation of this book.

Introduction: Cynipoidea and Cynipidae

The gall wasps (Cynipidae) belong to the superfamily Cynipoidea of the Hymenoptera which includes approximately 3000 described species (Fergusson, 1995; Ronquist, 1999a). However, the true species richness of this group remains uncertain for two reasons. First, the species-level taxonomy remains poorly resolved and a high proportion of current names are probably synonyms, resulting in an overestimate of species richness. Second (though with an opposing effect on species richness), new species continue to be discovered even in well-studied regions and many cynipoid species remain undescribed (Melika & Abrahamson, 1997a, 1997b, 2000a; Melika, Stone & Csóka, 1999; Melika & Stone, 2001; Azizkhani et al., 2006; Sadeghi et al., 2006a, and many others). Nordlander (1984) has estimated that there may be as many as 20000 cynipoid species. With the exception of the Cynipidae and a group of gall-inhabiting inquiline genera in the family Figitidae, the cynipoids are all cenobiont endoparasitoids (Gauld & Bolton, 1988) of holometabolous insect larvae, suggesting that the gall wasps too have evolved from parasitoid ancestors (Ronquist, 1995a, 1999a).

As a group, cynipoids share several autapomorphies, five of which together convincingly demonstrate cynipoid monophyly: a) the radicle in antennae absent (Ronquist, 1995b); b) the basalis vein (M) of the forewing displaced anteriorly, approaching the posterior end of the marginal cell, distinctly angled and not running parallel to the posterior wing margin (Ronquist, 1995b); c) abdominal sternum 2 (petiolar) and 3 (postpetiolar) abutting or fused (Ronquist, 1999a); d) metasoma distinctly laterally compressed (Königsmann, 1978); and e) forewing costa absent (Königsmann 1978). The cynipoids share the following diagnostic characters: a) they are small wasps with a black, brown or reddish body, without metallic sheen; b) the pronotum reaches tegula; c) antenna filiform, with 12-16 antennomeres, without clava; d) the metasoma laterally compressed; e) tarsi with 5 tarsomeres; f) typically show reduced venation in the forewing (including the absence of the pigmented pterostigma found in many other Hymenoptera). However, there is a considerable morphological variation within the superfamily. In the past, the superfamily was subdivided into 4 families - Ibaliidae, Liopteridae, Figitidae and Cynipidae (Weld, 1952a), 5 families - the Ibaliidae, Liopteridae, Figitidae, Eucoilidae and Cynipidae (Quinlan, 1979) or even 6 families: Ibaliidae, Liopteridae, Figitidae, Charipidae, Eucoilidae and Cynipidae (Fergusson, 1982). Recently, several alternative classifications have been proposed, and here follow that proposed by Ronquist (1999a) who subdivided the superfamily into 7 families, 2 extinct and 5 extant (Table 1), all of which can be classified into two groups: macrocynipoids and microcynipoids (Ronquist, 1995a).

<u>Macrocynipoids</u>. Austrocynipidae, Ibaliidae and Liopteridae, are larger insects (usually 4.0 to 20.0 mm long), parasitoids of wood-boring and cone-inhabiting insect larvae (Table 1.). As adults, they show several apparent adaptations for boring into wood, including strongly sclerotized mandibles, modifications of the thorax allowing them to grip the walls of a tunnel (a transversely ridged mesoscutum and distinct transverse pronotal crest) and a generally elongate body (Quinlan, 1979; Ronquist, 1995b; Ronquist & Nordlander, 1989).

<u>Microcynipoids</u>. Cynipidae and Figitidae, are smaller insects (1.0 to 10.0 mm long), clearly differentiated into two trophic groups (Table 1): a) gall inducers and inquilines, and b) parasitoids of Hymenoptera, Neuroptera and Diptera. Generally, the microcynipoids are fully winged, although some species in the tribe Cynipini (Cynipidae)

and subfamilies Charipinae and Eucoilinae (Figitidae) are wingless or brachypterous. Microcynipoids share two diagnostic traits of the mesosoma: the pronotum extends back as far as the insertions of the wings (tegulae), and the scutellum of the mesosoma is almost as large as the propodeum. As in all cynipoids, the forewing venation is reduced, with no pterostigma, and there is a distinctive triangular radial cell. Many microcynipoids are more or less spherical in shape; the mesosoma and metasoma are higher and shorter than in macrocynipoids, probably as a result of adaptation to pupation in a confined spherical gall chamber (Ronquist, 1995b). Within the microcynipoids, the Cynipidae can be distinguished from the sister group Figitidae by the characteristically triangular shape of the radial cell of the forewing, and by the fact that forewing Rs+M vein or its projection joins the basal vein (M) at least half way along its length, measuring from the posterior limit of the vein.

Table 1. Classification and diversity of the Cynipoidea
(modified from Ronquist, 1999a; Csóka, Stone & Melika, 2004; numbers of extinct groups (*) are not included into the total)

Family (Subfamily)	**Genus**	**Species**	**Biology**
Austrocynipidae	1	1	Parasitoids of oecophorid moth larvae mining in *Araucaria* cones
Ibaliidae	3	20	Parasitoids of siricid woodwasp larvae in wood
Liopteridae	10	170	Parasitoids of buprestid, cerambycid and curculionid beetle larvae in wood
Rasnicynipidae*	2*		Extinct
Gerocynipidae*	1*		Extinct
Cynipidae			
Hodiernocynipinae*	1*		Extinct
Cynipinae	61	*c.*1370	Phytophagous gall-inducing and gall-associated (inquiline) cynipoids
Figitidae			
Palaeocynipinae*	2*		Extinct
Parnipinae	1	1	Parasitoid in *Barbotinia oraniensis* on *Papaver* (Barbotin, 1964; Ronquist & Nieves-Aldrey, 2001)
Thrasorinae	5	11	Parasitoids or inquilines in cynipid and chalcidoid galls
Charipinae			
Alloxystini	5	128	Parasitoids of braconid and chalcidoid larvae in aphids
Charipini	2	9	Parasitoids of psyllids (Homoptera)
Anacharitinae	8	63	Parasitoids of Neuroptera
'Figitinae'	13	138	Parasitoids of Diptera
Aspicerinae	8	99	Parasitoids of syrphid Diptera
Emargininae	5	15	Predators of the larvae of Hemerobiidae and Chrysopidae
Pycnostigminae	3	3	Parasitoids of aphid-predating larvae of Syrphidae and Chamaemyiidae
Eucoilinae	82	944	Parasitoids of many families of schizophoran Diptera
TOTAL	**207**	ca. **3000**	

A Historical Review of Cynipid Classification

The first author to establish the causal link between the cynipid wasp and its gall was Marcello Malphighi (1679); the second volume of his work „*Anatomia plantarum*" was entirely dedicated to galls. From the publication of 10th edition of „*Systema Naturae*" (1758), untill the middle of the XIX century, cynipid systematics and classification was confused, species from the superfamilies Cynipoidea and Chalcidoidea were mixed up. The genus *Cynips* Linnaeus, 1758, contained eight gall-inducing species, attacking both oaks and roses. The rest of his *Cynips* species were actually chalcid wasps. Without doubt, Linnaeus erected *Cynips* to separate these gall-inducing wasps from "Tenthredo", where they were placed originally along with larger Hymenoptera (Linnaeus, 1746). The genus *Tenthredo* Linnaeus in its modern sense belongs to symphytan sawflies. Various chalcids were also placed under the name *Cynips* because of their morphological similarity to cynipids rather than to other macrohymenopterans. Later, Geoffroy (1762) erected the genus *Diplolepis* for the true cynipid gall-inducing wasps, and applied the name *Cynips* to parasitic species.

In all editions of Linnaean "*Systema Naturae*", the genus *Cynips* began with gall-inducing cynipids and also included the parasitoids of gall inducers. Unlike Geoffroy's *Diplolepis*, Linnaeus never used it to differentiate gall-inducers from parasitoids. Fourcroy (1785), Olivier (1790, 1791) and Latreille (1805, 1810) followed Geoffroy by placing gall-inducers into *Diplolepis* and parasitoids into *Cynips*, while Fabricius (1804), Panzer (1806) used the name *Cynips* for gall-inducing cynipids, and *Diplolepis* for chalcid parasitoids. Westwood (1829) strongly criticised the cynipid-chalcid classification, particularly the placement of chalcids and cynipids in the same genus.

Förster (1869), Mayr (1881) and Ashmead (1903a, 1903b, 1903c, 1903d) did not mention *Diplolepis*. Dalla Torre (1893) considered *Diplolepis* as a synonym of *Cynips*, however, this was not accepted and Dalla Torre & Kieffer (1910) restored *Diplolepis* as a valid genus. Rohwer & Fagan (1917) synonymised *Rhodites* with *Diplolepis*, while Belizin (1961) and Kinsey (1930) considered *Diplolepis* as a synonym of *Cynips*. *Rhodites* was described by Hartig (1840) and Förster (1869) later designated *Cynips rosae* Linnaeus as the type species. All the species inducing galls on roses were placed into this genus, while Kinsey & Ayres (1922) were the first to use *Diplolepis* for rose gall-inducing cynipids. Given this convoluted history, the validity of the name *Diplolepis* must be carefully considered and requires special study (Melika & Abrahamson, 2000b).

Westwood (1840) was the first author to separate the genus *Biorhiza* from *Cynips*. Hartig (1840, 1841) described eight new genera of gall-inducing cynipids: *Andricus, Aylax, Diastrophus, Neuroterus, Rhodites, Spathegaster, Teras* and *Trigonaspis*, as well as two genera of inquilines, *Ceroptres* and *Synergus*. Giraud (1859) erected *Dryocosmus*, Förster (1869) established several other new genera from Europe, whereas Fitch (1859), Reinhard (1865) and Ashmead (1881, 1887, 1897a, 1897b) described 14 new genera of oak cynipids (Cynipini) from North America.

The Cynipidae have three different forms of reproduction: the sexual, parthenogenetic and heterogonous. The alternation of generations in the oak cynipids (Cynipini) was discovered independently and almost simultaneously by Bassett (1873) and Riley (1873) in the USA, and by Adler (1877, 1881) in Europe. It necessitated a taxonomic revision of genera, because different species, sometimes even described in different genera, were shown to be the alternate generations of the same species. Mayr (1881) made a key to 29 genera of Cynipidae, including 14 genera of oak gall inducers and descriptions of seven new genera. Dalla Torre (1893) systematised the classification of cynipids in his "Catalogue Hymenopterorum - Cynipidae." Later, Ashmead (1903a, 1903b, 1903c, 1903d) provided a key to 33 genera of oak cynipids (Cynipini) and a synopsis of world Cynipidae, dividing them into tribes that remain valid today. "Das Tierreich - Cynipidae" was completed by Dalla Torre and Kieffer (1910) and, although part of their classification has stood the test of time, a large number of taxonomic changes have subsequently been made to their work. Many of these changes to the generic classification of the oak cynipids were made by Kinsey (e.g. 1930, 1936, 1937a, 1937b, 1937c) and Weld (e.g. 1921, 1951, 1952a, 1952b, 1957a, 1957b, 1959, 1960). However, the taxonomic approach of these two workers was antipodal: Kinsey was a 'lumper' at both the generic and specific levels, while Weld tended to split taxa. For instance, Kinsey's concept of *Cynips* (Kinsey, 1930, 1936) was treated by Weld as eight distinct genera. The generic classification of world Cynipini followed Weld (1952a). However, Weld's classification was artificial and in need of substantial alteration, given that very little was known about the alternation of generations in North American cynipids at that time.

Detailed studies of the alternation of generations have been completed during the past several decades for the North American cynipids (Doutt, 1959, 1960; Dailey, 1969; Dailey & Sprenger, 1973a, 1973b; Dailey et al., 1974; Evans, 1967, 1972; Lyon, 1959, 1963, 1964, 1969a, 1969b, 1970), and European species (Folliot, 1964; Barbotin, 1972, 1975; Pujade-Villar 1985c, 1992a, 1993b; Pujade-Villar et al., 2003; Rokas et al., 2002; Walker, 1992, 2002). These works increased our understanding of gall-inducing cynipids and provided a solid background for the establishment of more natural classification of the oak cynipids, particularly for taxa restricted to North America, which were previously less examined than the palaearctic fauna (Melika & Abrahamson, 2002). But even so, the primary difficulty in the classification of oak gall wasps (Cynipini) is the clear definition of genera (Dailey & Menke, 1980; Melika & Abrahamson, 1997a, 1997b, 2000b; Pujade-Villar et al., 2001a). The presence of alternating asexual and sexual generations in many genera creates considerable morphological variation among adults that markedly complicates the assessment of generic limits and hence classification. The assessment of generic limits requires that generic characters is defined to include the character states of both generations. However, life cycles (alternation of generations) remain unknown for more than 90% of described Cynipini (Pujade-Villar et al., 2001a), and thus many or even most of the species included in a particular genus are known only from one generation. The diagnosis and limits of some genera are known to be incomplete or unreliable. For example, 9 genera of Cynipini - *Aphelonyx*, *Atrusca*, *Eumayriella*, *Holocynips*, *Odontocynips*, *Phylloteras*, *Pseudoneuroterus*, *Trichagalma* and *Zopheroteras*, are currently known only from their asexual generations. While it is possible that these genera have lost the sexual generation from a cyclically parthenogenetic lifecycle, but this is extremely rare in the Cynipini (Pujade-Villar et al., 2001; Stone et al., 2002). It is quite possible that future research will show that some of these apparently purely asexual genera are in fact the alternate generations of sexual species known and described in other genera. Recent phylogenetic studies (Pujade-Villar & Arnedo, 1997; Pujade-Villar & Ros-Farré, 1998a; Liljeblad et al., 2002) also showed that many adult cynipid characters evolved convergently (homoplasies), and this complicates the definitions of genera. Such characters cannot be used in the definition of natural, monophyletic taxonomic groups. For example, the main diagnostic character used by Weld (1952a) to separate groups of genera was the presence or absence of basal lobe on the tarsal claw, and this is now known to be homoplasious. One of the main diagnostic characters used to separate

Plagiotrochus from other Cynipini genera was the presence of a median propodeal carina. The same character is also present in some nearctic species of *Loxaulus* and *Bassettia* (Melika & Bechtold, 2001b; Melika & Abrahamson, 2002). Other homoplasious characters in the genera *Andricus, Bassettia, Callirhytis, Dryocosmus, Neuroterus* and *Plagiotrochus* are discussed by Melika & Bechtold (2001b) and Pujade-Villar et al. (2003a, 2003b). In addition to the problems posed by convergent evolution, some of the characters previously used to define genera by Weld (1952a) are now known to vary within genera and even within species.

Challenges raised by the use of adult morphological characters have lead to the use of biological characters, such as gall characteristics and/or host-plant associations, in cynipid taxonomy. For example, some species in the large genera *Andricus* and *Callirhytis* are almost impossible to distinguish using only adult morphological characters. It is much easier to identify these species on the basis of the galls they induce or, in many cases, characters of both gall and the adult insect. This use assumes that these biological characters rarely evolve convergently. While the majority of species have unique, distinctly structured galls, many gall traits certainly have evolved convergently (Stone & Cook, 1998; Cook et al., 2002). This is particularly true among nearctic species that induce stem-swelling galls. For example, the nearctic genus *Heteroecus* was established on the basis of its association with *Quercus chrysolepis* Liebm., thus assuming gall structure and/or host-plant association were unique features (Kinsey, 1922). While this is the case for many species, our research shows that different species can induce galls with similar structure, especially for those that cause catkin, bud and stem swelling-like galls. Many North American species of *Callirhytis*, e.g. *C. quercus-cornigera* (Osten Sacken), *C. quercusclavigera* (Ashmead) and *C. quercuspunctata* (Bassett), induce stem swelling-like galls that are similar in size and shape, although the species can be separated on their adult morphology (Melika & Abrahamson, 2000b). Many *Atrusca* species in south-western USA and Mexico (e.g. *A. brevipennata* (Gillette), *A. bella* (Bassett), *A. capronae* (Weld) and *A. catena* (Kinsey)) induce similar leaf galls on the same species of oaks (Kinsey, 1936; Weld, 1960). Furthermore, the structure of galls caused by the same species can vary markedly as a function of the host oak species attacked or their geographic location. Thus, gall characters can be used only as an additional source of data useful for separation of species.

Cynipid genera are characterized not by single diagnostic characters, but by a set of distinct characters. Diagnostic characters used for the separation of different taxa of Cynipidae are given in the special part of the book. The world genera of oak cynipids have recently been reviewed by Melika & Abrahamson (2002); revisions have recently been made of Western-European Aylacini (Nieves-Aldrey, 1994b), parts of the palaearctic Cynipini genera, particularly *Chilaspis* and *Dryocosmus* (Pujade-Villar et al., 2003a, Ács et al., 2006), the *Andricus kollari* species-group (Bellido et al., 2003), *Neuroterus* and *Pseudoneuroterus* (Pujade-Villar et al., 2004), inquilines (Synergini) distributed in Europe (Pujade-Villar et al., 2003), and some others. All these nomenclatorial changes were used in this book.

Chapter 1. Material and Methods

This study is based on the examination of the cynipid collection of the Schmalhausen Institute of Zoology, Ukrainian National Academy of Sciences (SIZK, Kiev, Ukraine) and the collection of the Systematic Parasitoid Laboratory, Plant Protection and Soil Conservation Service of County Vas (SPL, Tanakajd, Hungary). During 1992-1996 the author had emphasized his studies on the cynipid fauna of Ukraine and collecting trips to different parts of Ukraine were made. The cynipid fauna of the Transcarpathian Region was studied in details, especially that of Cynipini and Synergini. All the cynipid material deposited in SIZK also was examined. In the species by species list, the number of examined specimens are given for rare species only, without mentioning label data. In the case of many common species, widespread all over the territory of Ukraine, we do not mention the examined material (deposited in SIZK, SPL and other institutions), because it would be space-consuming and not really essential for species with contiguous distribution. A paragraph „Material examined" with detail label data is given for those species only, which for the type series examination was made for the first time. These are mainly Aylacini species described by L.A. Diakontschuk and which were in urgent need of revision. Recent taxonomic (Nieves-Aldrey, 1994a, 1994b, 2001a) and phylogenetic (Liljeblad, 2002; Liljeblad & Ronquist, 1998; Nylander, 2004; Nylander et al., 2004; Ronquist, 1999a, 1999b; Ronquist & Liljeblad, 2001) works on Aylacini were published after some species were described by Diakontschuk or they were neglected by the author. As the result, the generic and species concept in some cases had to be updated. Moreover, generic limits of some Aylacini genera (*Aulacidea*, *Aylax*, *Isocolus*, *Phanacis* and *Timaspis*, *Panteliella* and *Vetustia*) were revised and changed by the author in this book. It is essential for the establishment of a better classification of aylacine gall wasps and without the examination and revision of some genera and species described from territories neighbouring with Ukraine and from the Eastern Palaearctic Region as well, particularly those described by Belizin (1959, 1968, 1973), Diakontschuk (1980b, 1981a, 1981b, 1981c, 1983a, 1983b, etc.), Kovalev (1982), Kovalev & Diakontschuk (1986), it was impossible to do. Thus, in this book, the author deals with some genera and species which are not distributed in Ukraine. In the „Material examined" paragraphs to many Aylacini species, all the type and non-type specimens deposited in SIZK were mentioned. We operated with the collection and the effective numbers of paratypes deposited in SIZK collection (designated by L.A. Diakontschuk with a red label „Paratype") are given, which sometimes disagree with the numbers of paratypes gave by the author in the relevant paper. A key to the holarctic genera of Aylacini and keys to all known palaearctic species of Aylacini are given for the first time.

Material (type and non-type specimens (adults and galls)) was examined also from the following institutions: American Museum of Natural History (New York, USA, J. Carpenter); Canadian National Collection of Insects (CNCI, Ottawa, Canada, G. Gibson, J. Huber & L. Masner); Hope Entomological Collections (OUM, University Museum, Oxford, UK, C. O'Toole & G. McGaven); Hungarian Natural History Museum (HNHM, Budapest, Hungary, S. Csösz, J. Papp & L. Zombori); Institute of Zoology, Chinese Academy of Sciences (Beijing, China, Ch.-D. Zhu); Institut royal des Sciences naturalles de Belgique (Bruxelles, Belgium, M. Peeters & P. Grootaert); Lund University, Zoological Institute, Department of Systematics (Lund, Sweden, C. Hansson); Martin Luther Universitat (MLU, Halle-Wittenberg, Germany, K. Schneider); Museo Nacional de Ciencias Naturales (Madrid, Spain, J.-L. Nieves-Aldrey); Muséum National d'Histoire

Naturelle (MNHN, Paris, France, C. Villemant); Museum of the Institute of Zoology of the Bulgarian Academy of Sciences (Sofia, Bulgaria, T. Ljubomirov), Nationaal Natuurhistorisch Museum, Afdeling Entomologie (Leiden, The Netherlands, C. van Achterberg); National Museums of Scotland, Department of Geology and Zoology (Edinburgh, Scotland, M. Shaw); Natural History Museum (BMNH, London, UK, J. Noyes, D. Notton, N.D.M. Fergusson & S. Lewis); Natural History Museum, Department of Invertebrates (Bern, Switzerland, H. Baur); Naturhistorisches Museum (NHMW, Vienna, Austria, S. Schödl & B. Mayerl); Naturhistoriska Riksmuseum (Stockholm, Sweden, T. Pape & L.Ø. Janson); Natuurhistorisch Museum Maastricht (MHME, Maastricht, The Netherlands, F.N. Dingemans-Bakels); Niederlausitzer Heidemuseum, Spremberg, Germany, E. Kwast); Plovdiv University (Plovdiv, Bulgaria, A. Stojanova); Research Institute of Forests and Rangelands (Tehran, Iran, E. Sadeghi); Tel-Aviv University, Department of Zoology, (TAU, Tel-Aviv, Israel, O. Manheim); Tiroler Landesmuseum Ferdinandeum (Innsbruck, Austria, P. Heumer); University of Barcelona (Barcelona, Spain, J. Pujade-Villar); University of Edinburgh, Institute of Evolutionary Biology (Edinburgh, Scotland, G.N. Stone); University of Oslo, Zoological Museum (Oslo, Norway, H.L. Öve); U.S. National Museum of Natural History, Smithsonian Institution (USNM, Washington DC, USA, A. Menke & D. Smith); Zoologisches Forschungsinstitut und Museum Alexander Koenig (ZFMK, Bonn, Germany, K.-H. Lampe); Zoological Institute (St. Petersburg, Russia, O. Kovalev & S. Belokobylskij); Zoologisches Museum Humboldt-Universitat (ZMB, Berlin, Germany, F. Koch); Zoologische Staatssammlung des Bayerischen Staaates (ZSMC, Munich, Germany, S. Schmidt & E. Diller). The author highly appreciate all the help given by all the mentioned collection curators.

Photographs of wasp structures were taken by a digital camera NiconCoolpix 4500 attached to a Leica MZ6 stereomicroscope, followed by processing in Adobe Photoshop 6.0. Line drawings were then prepared from hard copy printouts. Ratios were carefully checked. We gave more or less a same set of structures for nearly all species, except those, where it was unnecessary. A surface sculpture for many wasp structures (head, scutum, scutellum, mesopleuron, propodeum, etc.) is given, however, only for those species where the sculpture is an important diagnostic character. If the sculpture was uniform on a particular structure (head, scutum, etc.), than the sculpturing is given for the half surface of the structure or even in a form of a patch only. The scutum and scutellum usually lays in slightly different planes (the mesosoma of a cynipid wasp is humped in lateral view) and thus, for a more precise picture, with adequate proportions, these two structures usually were photographed separately and separate drawings were prepared. Sometimes placodeal sensilla (Figs 3.1-2) on the antenna are indistinct and we often used a word „visible" instead of „present". Drawings of head, head appendages, mesosoma, wings and metasoma are not scaled. However, within main body parts (head, mesosoma and metasoma), separate structures are given proportionally. For example, pronotum, scutum, scutellum, mesopleuron, and propodeum in one set of drawings are proportional.

For each genus of Cynipidae (and both alternating generations, if so exist) a set of photographs was prepared to give an idea on the general appearance and habitus of the wasp. Photographs were taken by a digital camera Nicon Coolpix 4500 attached to a light microscope Olympus BH2 and then a series of photographs were prepared by focusing the sharpness on different levels of the structure. Pictures were processed by Combine 5Z software (Alan Hadley) and a number of pictures taken from one structure were combined into one sharp digital picture.

We follow the current terminology of morphological structures (Gibson, 1985; Ronquist & Nordlander, 1989; Fergusson, 1995; Ronquist, 1995b). Abbreviations for wing venation follow Ronquist & Nordlander (1989). Measurements and abbreviations used here include: F1–F12, 1st and subsequent flagellomeres; POL (post-ocellar distance) is the distance between the inner margins of the posterior ocelli; OOL (ocellar-ocular distance) is the distance from the outer edge of a posterior ocellus to the inner margin of the compound eye; LOL, the distance between lateral and frontal ocellus. Measurements of the forewing radial cell length (lrc) and width (wrc) are showed on Fig. 9.1. The measured width is the largest width of the radial cell. When the radial cell is opened than the width is measured from the margin of the wing to the Rs vein; in the case of closed radial cell, the width is a distance between marginally running R1 and Rs (without including the width of veins). So, the measurements of the width and length of the forewing radial cell slightly differs from that used in many other works, where the width is measured along the 2r vein.

This volume consists of two main parts. The general part with an introduction and four chapters which are brief overviews on the material and methods we used, morphology of adult wasps and immature stages, biology and ecology, evolution and phylogeny of the group. The general part on Cynipidae is given in a very brief way and the special part with species to species list is emphasized. Biology, ecology, gall formation, inquiline and parasitoid communities, evolution, phylogeny and phylogeography are given in details in Stone, Melika & Csóka (in press) and earlier were presented in Askew (1984), Shorthouse & Rohfritsch (1992), Ronquist (1999a), Ronquist & Liljeblad (2001), Csóka, Stone & Melika (2004), Nylander et al. (2004). Special part which includes data on tribes, genera and species of cynipid wasps occur or presumably occur (marked with *) in the fauna of Ukraine. Synonyms and name combinations, a short morphological diagnosis to each tribe is given with data on the distribution, host associations, following with generic keys. The same kind of information is given to each genus. Each species description contains all available synonyms and name combinations, a detail morphological description of an adult, usually female (for a male only those characters were given, which are differ from those of a female) and galls (for both alternating generations, if so exist). In the „Diagnosis" diagnostic characters are given additionally to the species keys, which are useful for a more precise separation of closely related species. In the „Distribution" a general distribution data is given, following by distribution peculiarities within Ukraine. In the „Biology" brief characteristics are given: the number of generations, data on phenology, host associations and some peculiarities concerning the gall development or other important species-specific characteristics. The special part includes some species which were not find yet on the territory of Ukraine and are known from the neighbouring territories only, but presumably occur in Ukraine also.

Abbreviations for countries are used as follows: AD, Andorra, AL, Albania, AM, Armenia, AT, Austria, AZ, Azerbaijan, BA, Bosnia-Herzegovina, BE, Belgium, BG, Bulgaria, BY, Byelorussia, CH, Switzerland, CZ, Czech Republic, DE, Germany, DK, Denmark, DZ, Algeria, EE, Estonia, ES, Spain, FI, Finland, FR, France, GB, Great Britain, GE, Georgia, GR, Greece, HR, Croatia, HU, Hungary, IE, Ireland, IL, Israel, IR, Iran, IT, Italy, JO, Jordan, LB, Lebanon, LT, Lithuania, LV, Latvia, MA, Morocco, MD, Moldavia, MK, Macedonia, NL, the Netherlands, NO, Norway, PL, Poland, PT, Portugal, RO, Romania, RU, Russia, SE, Sweden, SI, Slovania, SK, Slovakian Republic, SY, Syria, TN, Tunisia, TR, Turkey, UA, Ukraine, YU, Yugoslavia (Serbia, Kosovo, Vojvodina).

Chapter 2. Morphology

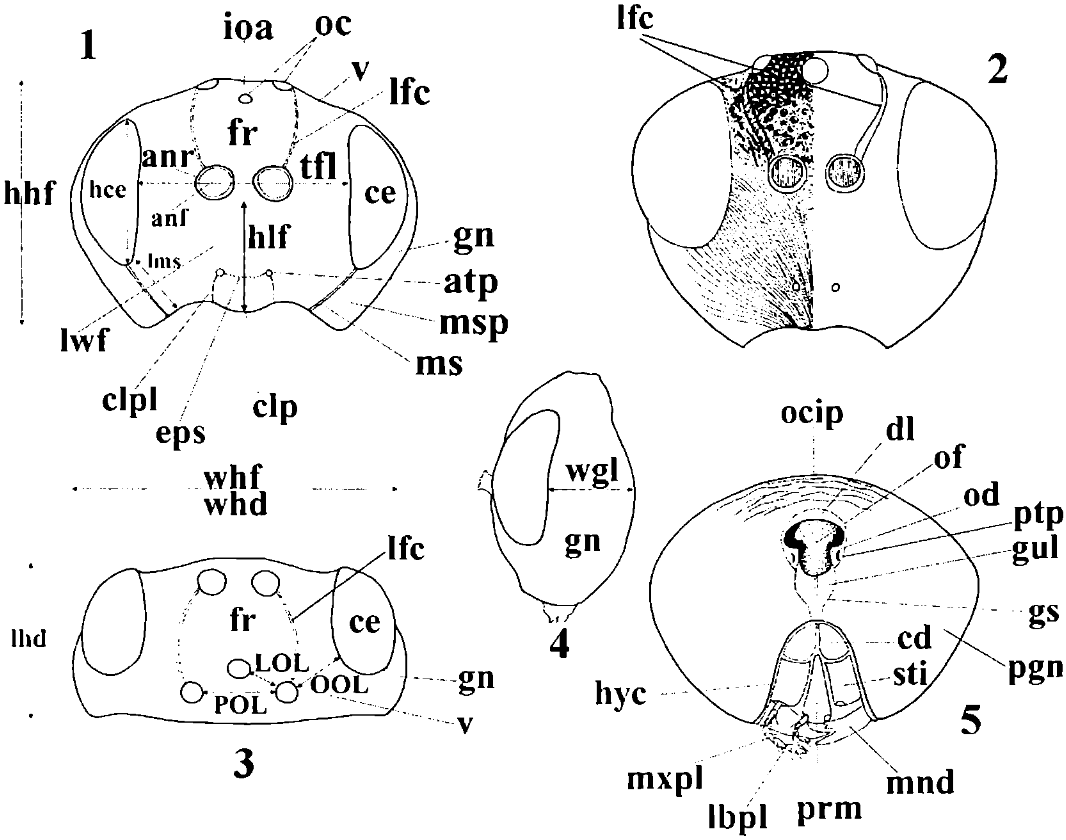
As a group, cynipoids (Cynipoidea) share several diagnostic characters which were given in the introductory part. This chapter introduces the general morphology of all the life stages of gall wasps (Cynipidae) only. Morphological descriptions are rich in potentially confusing terminology, and consistent and correct use of anatomical terms, and terms used to describe the surface sculpturing of structures, is essential for efficient taxonomic work. Inaccurate or misleading original descriptions often contribute to subsequent misidentifications and to the abundance of synonymies. The problem lies not in the lack of suitable terms, more that there are too many unnecessary and incorrect terms in use, and that these are frequently misapplied. To avoid any misunderstanding we use current morphological terminology and particularly that used in the recent cynipoid literature (Gibson, 1985; Pujade-Villar & Arnedo, 1997; Liljeblad & Ronquist, 1998; Ronquist & Nordlander, 1989; Ronquist, 1995a, 1995b, 1999a, 1999b; Liljeblad et al., 2002). In the first part below we provide explanations and illustrations of all morphological terms used in this book for descriptions of genera and species and in the keys to cynipid wasp taxa. For more details of adult Cynipidae morphology and their phylogenetic implication see Ronquist & Nordlander (1989) and Liljeblad & Ronquist (1998). We give also a critique of morphological characters used in the past to discriminate Cynipinae genera, and then review the main characters we use in this monograph. The second part provides a short overview of cynipid immature stages, from egg to pupa (for more details see Vårdal, 2004; Nieves-Aldrey et al., 2005; Stone, Melika & Csóka, in press).

The morphology of adult cynipid wasps

All members of the subfamily Cynipinae of the Cynipidae share an easily recognisable and rather uniform, characteristic structure. The body is rather short and globular, and not typically wasp-like. The Cynipinae are small insects (1-10 mm in body length), usually fully winged, rarely brachypterous or apterous, ranging in colour from black through reddish brown to dull yellow. The body surface is usually sculptured. The antenna is filiform, with 12-16 antennomeres, F1 is usually modified in males (Figs 3.1-2). On the forewing, vein Rs+M, if present, extends to the middle or more of the basal vein (Fig. 9.1). The mid- and hindtibiae bear two spines (Figs 9.2-4). The metasoma of females is usually compressed laterally and the largest metasomal tergite is usually the second, rarely the third, or metasomal tergites 2 and 3 are fused (in Synergini) (Fig. 10.1). The ventral spine of the hypopygium varies across species from very short to quite long (Figs 11.1-6).

Head (Figs 1.1-5)

The **head** is hypognathous, with powerful mandibles (**mnd**) (Fig. 2.1) that allow the wasp to chew an exit tunnel from its gall. The head is usually transversely oval or rounded, and sometimes trapezoid, in front view. The head sometimes bears scattered short white setae, but in the asexual generation females of the genera *Andricus* and *Cynips* in particular the head is covered with dense white setae. There is often extensive surface sculpturing on the head that is important taxonomically, ranging from glabrous (smooth), alutaceous to dull rugose, and striate. Different parts of the head are very often differently sculptured. The compound eye (**ce**) is large and located on the dorso-lateral margin of the head, is usually twice as high as broad, with or without very short sparse setae. The inner margins of eyes are either parallel or sometimes subparallel, converging towards genae (**gn**). The frons (**fr**), or upper face, extends from the frontal ocellus (**oc**) down as far as the rims of the antennal sockets (**anr**). The frons is usually coriaceous to alutaceous, but is glabrous and smooth in some species (e.g. *Dryocosmus nitidus*, many *Neuroterus*).



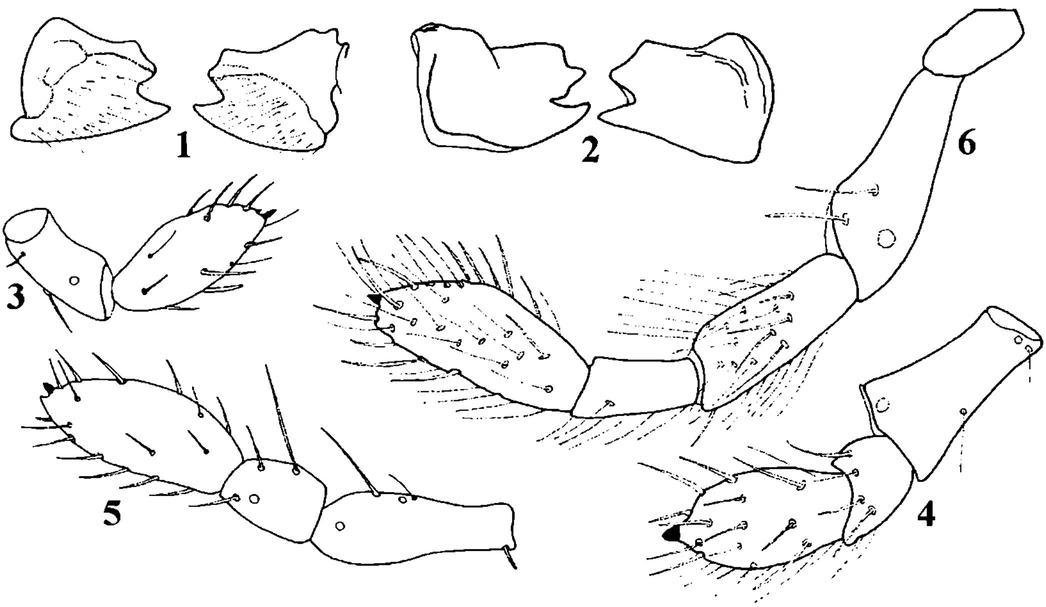
Figs 1.1-.5. Head: 1-2, front view, 3, dorsal view (from above), 4, lateral view, 5, posterior view. 1, 3-5, *Andricus kollari*, asexual female; 2, *Synergus umbraculus*, female. Abbreviations: **anf** antennal foramen, **anr** rim of antennal socket, **atp** anterior tentorial pit, **cd** cardo of maxilla, **ce** compound eye, **clp** clypeus, **clpl** clypeo-pleurostomal line, **dl** dorsal lobe of cranial margin, **eps** epistomal sulcus, **fr** frons, **gn** gena, **gs** gular sulcus, **gul** gula, **hce** height of the compound eye, **hhf** frontal height of the head, **hlf** height of the lower face, **hyc** hypostomal carina, **ioa** interocellar area, **lbpl** labial palp, **lfc** lateral frontal carina, **lhd** length of the head, **lms** length of the malar space, **LOL** the distance from the outer edge of a lateral ocellus to the edge of the anterior ocellus, **lwf** lower face, **mnd** mandible, **ms** malar sulcus, **msp** malar space, **mxpl** maxillary palp, **oc** ocellus, **ocip** occiput, **pgn** postgena, **POL** post ocellar distance, **prm** prementum, **ptp** posterior tentorial pits, **sti** stipes of maxilla, **tfl** transfacial line (distance), **v** vertex, **wgl** lateral width of the gena, **whd** dorsal width of the head, **whf** frontal width of the head.

In many inquilines, especially in *Synergus* species, the surface of the frons is dull rugose, with or without deep punctures and with two lateral frontal carinae (**lfc**) delimiting a slightly elevated central area. The lateral frontal carinae are sometimes branched near the posterior ocelli. In many asexual *Andricus* and especially in the asexual females of *Dryocosmus* and *Plagiotrochus* species there is a more or less deep depression on the frons just under the frontal ocellus. Sometimes this depression has a central longitudinal carina, which is only rarely found in cynipids and serves as an important diagnostic character (e.g., some *Plagiotrochus* species).

The antennal foramen (**anf**), surrounded by a narrow antennal rim (**anr**) and usually on the level of the middle of the compound eye. The distance between the antennal foramens, and the transfacial distance (**tfl**) (the distance between the inner margins of compound eyes measured through the antennal foramens) are important characters. The lower face (**lwf**) is extends from the antennal sockets down as far as the epistomal sulcus (**eps**), a faint suture between the anterior tentorial pits (**atp**) at the base of the clypeus (**clp**). The lower face is bordered laterally by the inner margins of compound eyes, usually coriaceous or rugose, with the central portion from the clypeus to the antennal sockets slightly to strongly elevated. In some Cynipini and Aylacini genera (*Andricus, Aulacidea, Dryocosmus, Plagiotrochus*, etc.), a few delicate carinae (striae) radiate from the clypeus towards the antennal sockets, and this is an important diagnostic character for separation of some genera in these tribes. The radiating striae are more pronounced in Synergini, extending from the mouthparts up to the antennal rims. In some *Synergus* species, there is a pronounced central longitudinal carina. The clypeus in gall-inducing wasps is usually small, but well delimited dorsally by the anterior tentorial pits and the epistomal sulcus and laterally by the clypeo-pleurostomal line (**clpl**). Gall wasps of the genus *Trigonaspis* have the clypeus strongly emarginated ventrally and projecting over the mouthparts. In the Synergini, the clypeus is very small and indistinctly delimited from the lower face. The space behind the compound eye on the side of the head, and between the base of the compound eye and the mouthparts, is termed the gena (**gn**). The gena is usually coriaceous, and strongly broadened behind the eyes in asexual female gall-inducers, but are not or only very slightly broadened in sexual females and males. Posteriorly the gena extends into the postgena (**pgn**). The malar space (**msp**) is the lower part of the gena from the mouthparts to the ventral margin of the compound eye. This region is usually coriaceous or striate like the lower face. In some gall-inducers the malar space is traversed dorso-ventrally by a groove, the malar sulcus (**ms**).

The three ocelli (**oc**), a single frontal (or anterior) ocellus, and two posterior (or lateral) ocelli, are located on the top of the head, or vertex (**v**). The ocelli form a triangle that delimits the interocellar area (**ioa**). Behind the lateral ocelli, the vertex is either rounded or with a sharp ridge, (the occipital carina) continuing into the occiput (**ocip**), a smooth or transversely striate area between the top of the head and the insertion of the head onto the thorax. The neck enters the head capsule via the occipital foramen (**of**), which is bordered by the cranial margin. This margin is developed into two groups of posteriorly projecting lobes - dorsally, the dorsal lobe (**dl**), and ventrally the ventral lobes bearing on each side the odontoidea (**od**). Two small pits on the back of the head, the posterior tentorial pits (**ptp**), are located laterally to the odontoidea. The cranial area ventral to the posterior tentorial pits is termed the gula (**gul**), and delimited laterally by two grooves, the gular sulci (**gs**). The shapes of the gula and gular sulci are very important diagnostic characters for the separation of tribes within the Cynipidae. The gular sulci extend ventrally towards a pronounced ridge, the hypostomal carina (**hyc**), which forms the upper margin of the rear of the mouthparts termed the hypostomata. In Synergini the gula is reduced to a long, narrow median strip and the gular sulci are united well before reaching the hypostomal carina, while in gall-inducing cynipids (e.g. some Cynipini and Aylacini), the gular sulci remain separate until close to the hypostomal carina. The **mouthparts** (Figs 1.5, 2.1-6). The labrum is small, very weakly sclerotized and hidden by the clypeus. The mandibles (**mnd**) usually bear 3 teeth on the right and two on the left. In the posterior view of the head, the cardo (**cd**), stipes (**sti**) and the 4-5-segmented maxillary palp (**mxpl**) are easily visible on the maxilla. The prementum (**prm**) and 2-3-segmented labial palp (**lbpl**) are also easily visible on the labium.

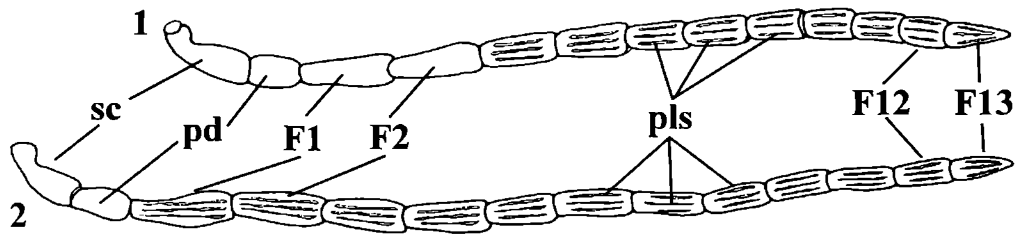
The following measurements of the head are used in the keys: a) height of the head in anterior (front) view (**hhf**); b) width of the head in anterior view (**whf**); c) width of the head in dorsal view (from above) (**whd**); d) length of the head in dorsal view (**lhd**); e) the post-ocellar length or distance (**POL**), the distance between the inner margins of the posterior ocelli; f) the ocellar-ocular distance (**OOL**), the distance on the top of the head from the outer edge of either lateral (posterior) ocellus to the inner margin of the neighbouring compound eye; g) the distance from the outer edge of a lateral ocellus to the edge of the anterior ocellus (**LOL**); h) the width (diameter) of the lateral ocellus, measured dorsally; i) the height of the compound eye (**hce**); j) the length of the malar space (**lms**) on the face, the distance from the edge of the compound eye to the tip of the gena, measured along the malar space; k) the transfacial distance (**tfl**), the distance between the inner margins of compound eyes, measured across the face through the antennal sockets; l) the height of the lower face (**hlf**), the distance from the lower rim of the antennal socket to the tip of clypeus; m) the width of the gena (**wgl**) in lateral view; n) the distance from the inner edge of the compound eye to the antennal socket; o) the diameter of the antennal foramen; p) the distance between the inner edges of the two antennal sockets.



Figs 2.1-6. Cynipid mouthparts. 1-2, mandibles: 1, *Andricus kollari*, sexual female, 2, *Neuroterus numismalis*, asexual female. 3-4, labial palp: 3, *N. numismalis*, asexual female, 4, *A. kollari*, sexual female. 5-6, maxillary palp: 5, *N. numismalis*, asexual female, 6, *A. kollari*, sexual female.

The **antenna** (Figs. 1.3.1-2) is long, threadlike (filiform), and pubescent (with setae), consists of a basal scapus (scape) (**sc**, a single segment, radiculus is not delimited (separated) in cynipoids), followed by a short globose, subglobose or slightly elongated pedicellum (**pd**, pedicel) and the flagellum (a collective term for the remaining segments (antennomeres), which are structurally relatively uniform). The flagellum comprises 10-

13 flagellomeres in females, typically with one more flagellomere in males. There is no angled bend in the antenna or differentiated terminal club or clava. In females the first flagellomere (F1) is similar in form to the others (except in some *Plagiotrochus* sexual and asexual females, in which it is slightly curved) while in males it is very often modified: curved, excavated, incised medially and sometimes broadened apically. The relative lengths and widths of flagellomeres F1–F12 are important in the classification of some groups. Elongated hair-like sense organs, called placodeal sensilla (**pls**) occur on all flagellomeres or from F2-F4 till F11-12 of both female and male antennae. F1 of males has structures (micropores) on its excavated interior surface that are associated with the secretion and recognition of sexual pheromones (Isidoro et al., 1999).



Figs 3.1-2. Cynipid antennae, *Andricus kollari*, sexual generation (pd pedicel; sc scape; pls placodeal sensilla): 1, female antenna, 2, male antenna.

The mesosoma (Figs 5.1-3, 7.1-4)

The mesosoma comprises the thorax (the pronotum, mesonotum and metanotum) and the propodeum (**prop**, the first abdominal segment), which is fused to the thorax and functionally part of it. The mesosoma is short and more or less arched dorsally, especially in Cynipini. The shape and form of the **pronotum (pro)** (Figs 5.2-3) provides some important diagnostic characters, particularly its length measured mid-dorsally. In all gall-inducers on *Rosa* and *Quercus* (Diplolepidini and Cynipini), the pronotum lacks a truncation and/or pits (or with pits fused into a transverse and superficial furrow) and mid-dorsally the pronotum is 1/7 or less as long as it is along the outer lateral margin. In all cynipid inquilines (Synergini) and in gall-inducers of the tribes Aylacini and Pediaspidini, the pronotum mid-dorsally is at least 1/6, usually 1/3 as long as the greatest length on the outer lateral margin. In the latter case, the pronotum frequently bears truncations and bilaterally symmetrical submedian pronotal pits (**prp**), which define the lateral margins of a pronotal plate (**prpl**). The presence or absence of sharp pronotal lateral carinae (**prnlc**) is also a very important diagnostic character. The pronotum extends anteriorly into the dorsal propleuron (**prple**) and the ventral prosternum (**prst**), and partially conceals these structures laterally. The propleuron is striate or coriaceous, with dense setae in asexual Cynipini, more sparse setae in sexual females and males of Cynipini and other tribes. The cervical prominences (**cvpr**) are a pair of narrow ridges on the upper surface of the propleuron. The profurcal pit (**fp**) lies at the junction of the propleura and the prosternum. Behind the pronotum is the mesonotum, which in dorsal view consists of the mesoscutum (**mss**) and the scutellum (**sct**). The mesoscutum („scutum" further in the special part) is convex dorsally and usually coriaceous, microreticulate or alutaceous in gall-inducers and transversely striate in some gall-inducers and inquilines (Synergini). The mesoscutum is usually slightly longer than broad or subequal (approximately equal in length and breadth), with a bilaterally symmetrical pair of grooves, the notauli (**no**). The notauli may extend the entire length of the mesoscutum (notauli complete), or fail to reach the pronotum (in which case they are termed incomplete). Lateral to the notauli a bilaterally symmetrical pair of parapsidal lines (**psl**) extends forward from the scutellum. Between the notauli, a bilaterally symmetrical pair of short anterior parallel lines (**apl**) (or anteroadmedian signa) extend back from the anterior margin of the mesoscutum, and a median mesoscutal line (**msl**) or impression extends forward from the posterior margin. Laterally the scutum is often delimited by the parascutal carina, which is more or less developed (e.g., strong in many *Neuroterus*, indistinct in many Aylacini).

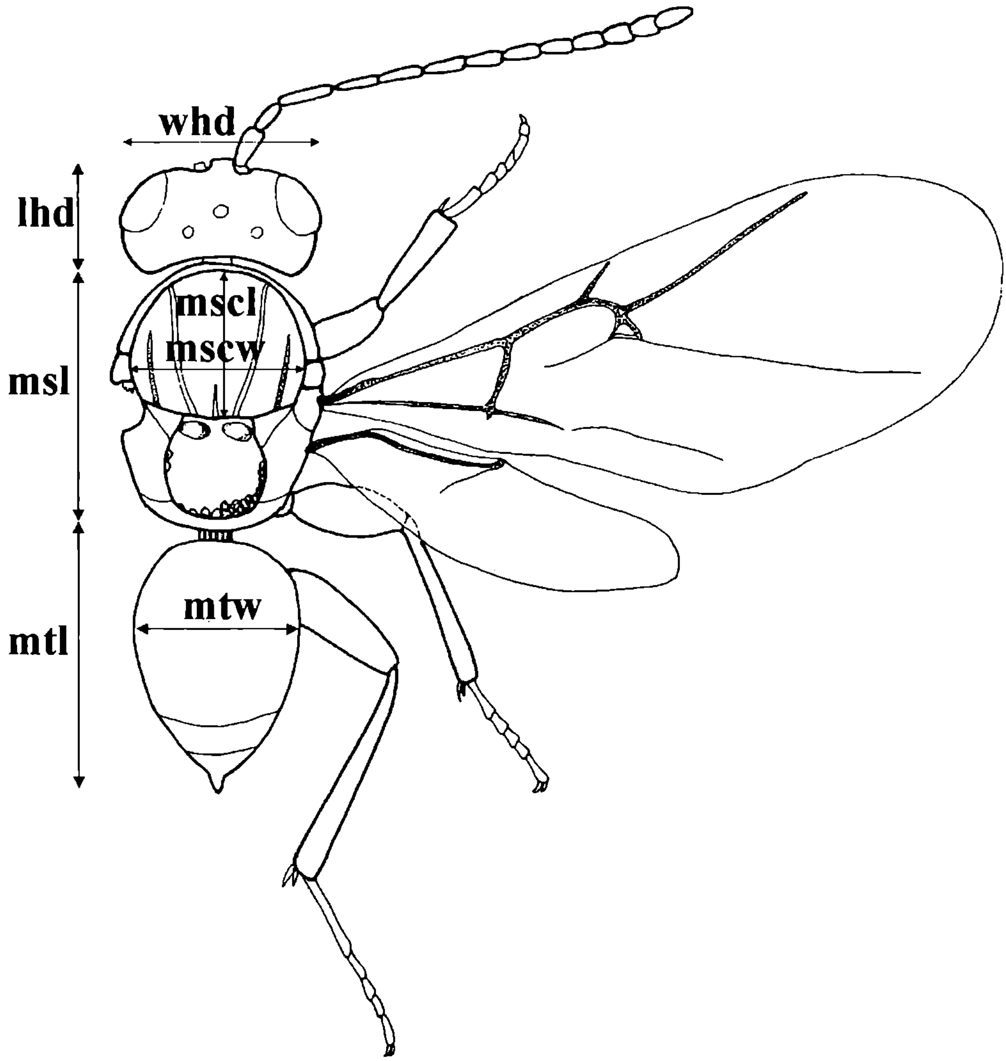


Fig. 4.1. General habitus, dorsal view: **lhd** length of head, **mscw** width of mesoscutum, **mscl** length of mesoscutum, **msl** length of the mesosoma, **mtl** length of metasoma, **mtw** width of metasoma; **whd** width of head.

The rounded scutellum (**sct**) is located posterior to the mesoscutum, and separated from it by the transscutal fissure (**tsf**) and/or transscutal articulation. The transscutal articulation is a moveable place where two parts or segments are joined; in our case the transscutal articulation situated behind the transscutal fissure, between mesoscutum

(scutum) and scutellum. The transscutal articulation (or we can talk about the transscutal fissure) is absent or indistinct medially only in the Cynipini genera *Neuroterus* and *Pseudoneuroterus*, resulting in apparent fusion of the scutum and the scutellum (Figs 6.1-3). In all other genera of Cynipidae the scutum is separated from the scutellum by a distinct transscutal articulation. The only exceptions to these rules are *N. anthracinus*, in which the transscutal articulation is present (Pujade-Villar et al., 1998), and the mediterranean species, *Plagiotrochus cardiguensis* (Tavares, 1928), in which the articulation is absent (Pujade-Villar et al., 2003b). Confidence that these species are genuinely included within their genera despite unusual states of this character is provided for *N. anthracinus* by a phylogenetic analysis that places this species near or within *Neuroterus* (Pujade-Villar et al., 1998). The alternative classification of *P. cardiguensis* would require placing it in the genus *Neuroterus*, but the sculpture of the mesopleuron and its oak host associations clearly separate this species from *Neuroterus*.

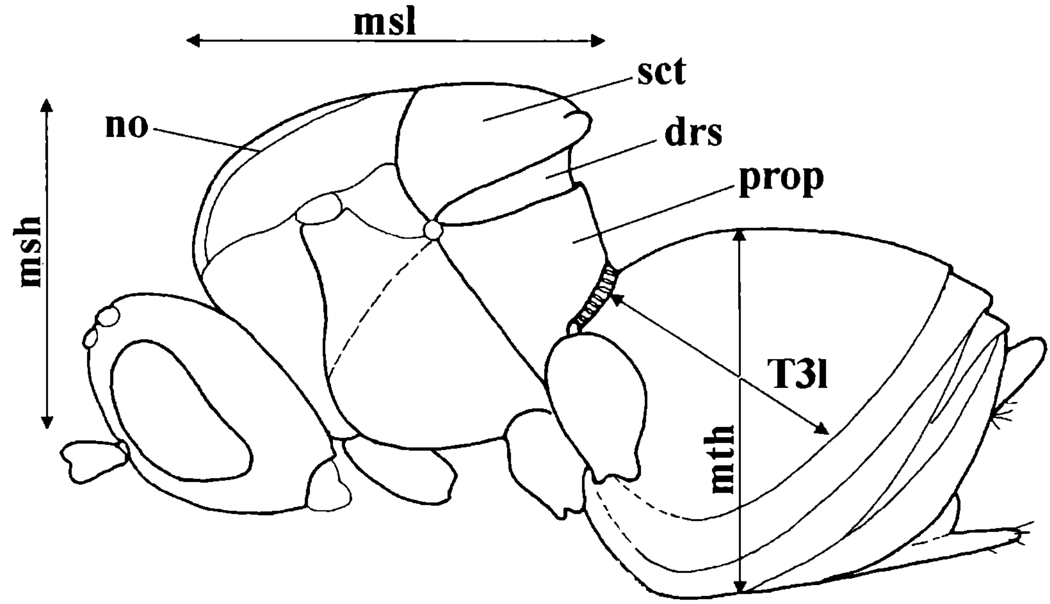
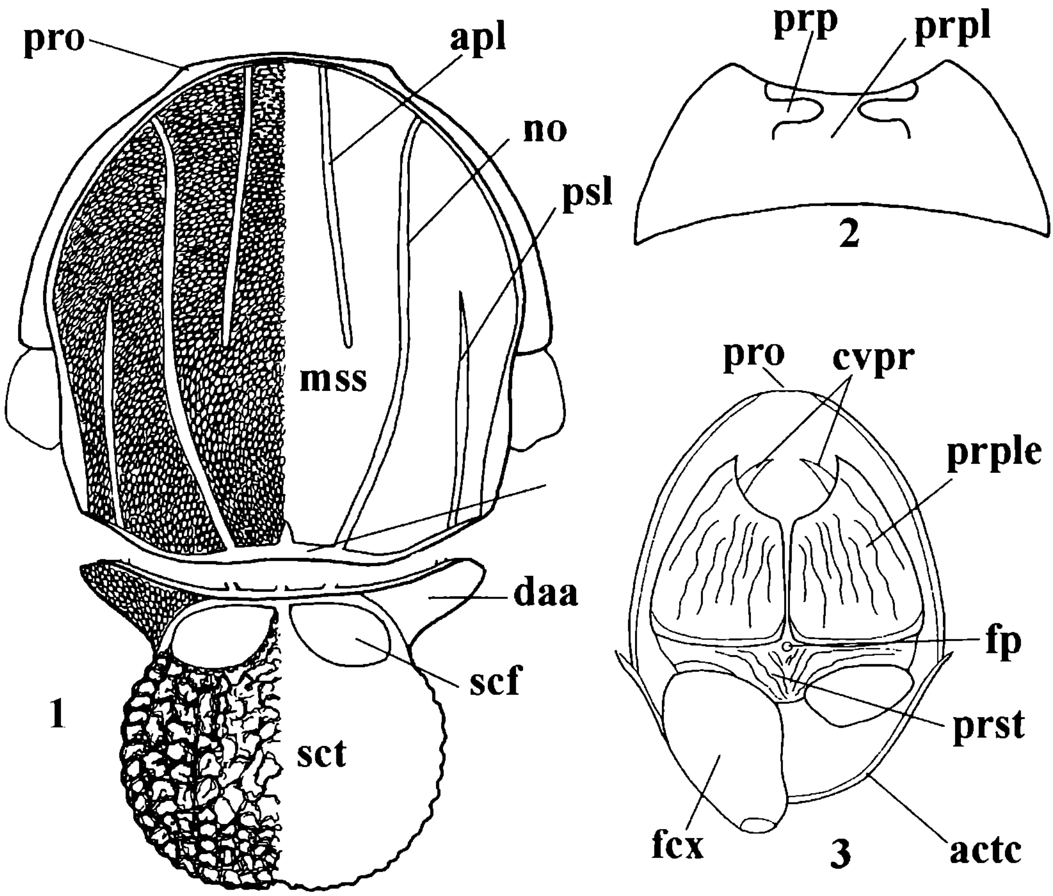


Fig. 4.2. General habitus, lateral view: **drs** dorsellum, **msh** height of the mesosoma, **msl** length of the mesosoma, **mth** dorso-ventral depth of the metasoma, **no** notaulus, **sct** scutellum, **prop** propodeum, **T3l** length of metasomal tergite 3.

At the front of the scutellum there are two depressions, called scutellar foveae (**scf**), which may or may not be separated by a ridge, or median (central) carina; the depth, shape and size of the scutellar foveae varies within the group and provides important characters for the separation of species. Sometimes the foveae are fused into a single region (e.g., some asexual *Cynips* females, representatives of *Phanacis*, etc.), absent (*Pediaspis*) or both the foveae and the transscutal articulation are absent or interrupted medially (*Neuroterus*). The scutellar foveae and the axillulae (**axi**) (regions of dorsal cuticle anterior to the scutellum and lateral to the posterior of the mesonotum) together form an impressed area termed the scutellar-axillar complex.

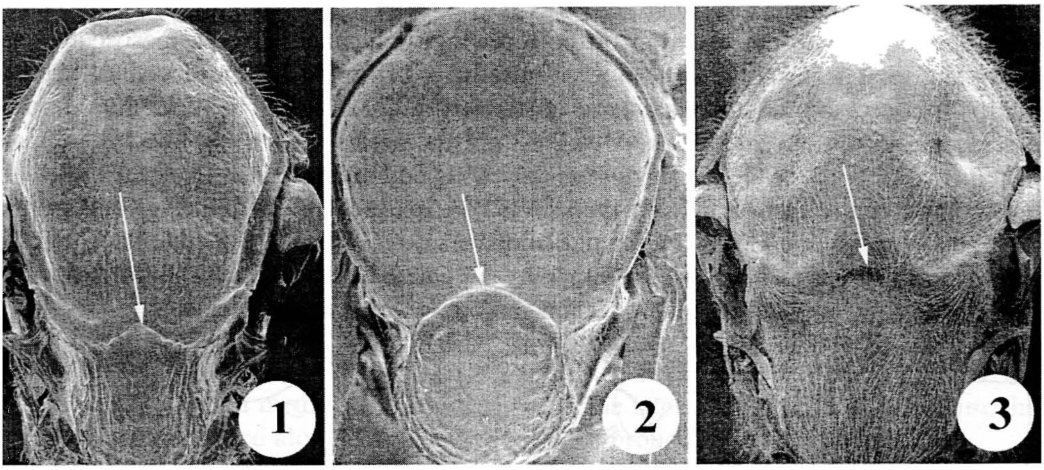
The anterior and lateral parts of this complex, delimited anteriorly from preaxilla (**pax**) by the transscutal fissure and visible from above to either side of the scutellum are termed the dorsal axillar area (**daa**). Laterally the axillar carina (**axc**) separated the rest of



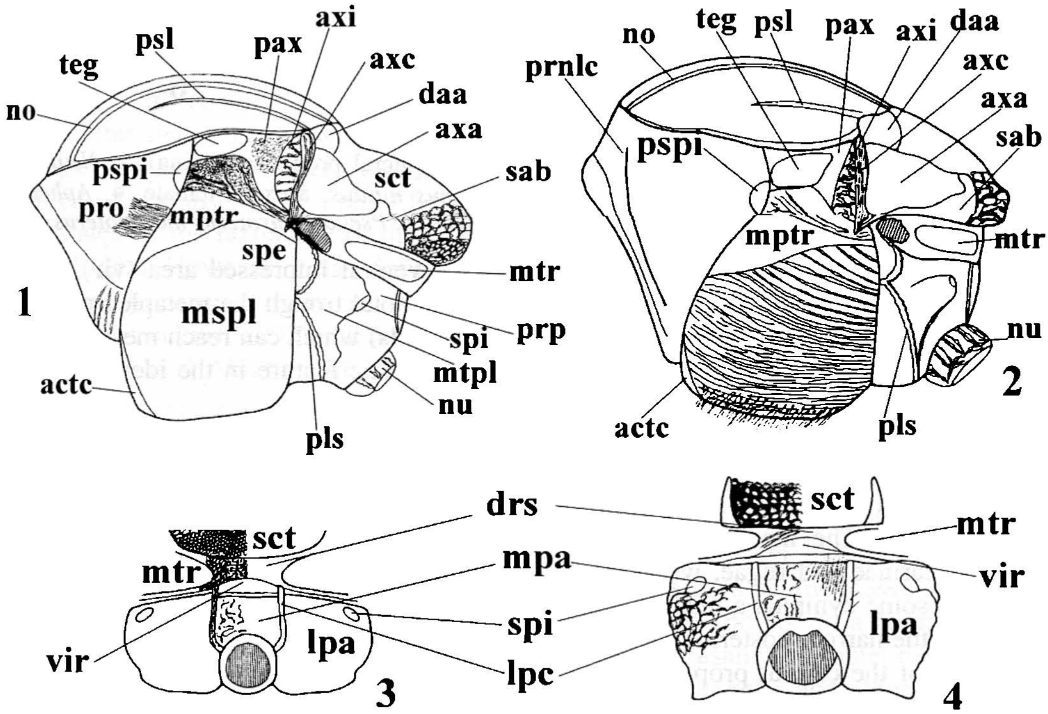
Figs 5.1-3. Mesosoma. 1, thorax (scutum and scutellum), dorsal view, *Andricus kollari*, asexual female. 2, pronotum, dorsal view, *Aulacidea diakontschukae*, female. 3, pronotum and propleura, anterior view, *Andricus kollari*, asexual female (left coxa cut away to show the acetabular carina behind it). Abbreviations: **actc** acetabular carina, **apl** anterior parallel line, **cvpr** cervical prominence, **daa** dorsal axillar area, **fcx** coxa of the first leg, **fp** profurcal pit, **mss** mesoscutum, **msl** median mesoscutal line, **no** notaulus, **pro** pronotum, **prp** pronotal pits, **prpl** pronotal plate, **prple** propleura, **prst** prosternum, **psl** parapsidal line, **scf** scutellar fovea, **sct** scutellum, **tsf** transscutal fissure.

axilla, the lateral axillar area (**axi**), from the lateral, usually ovate or triangular and impressed part of scutellum which named axillula (**axa**); ventrally to axillula a smooth, shining subaxillular bar (**sab**) separates the scutellar-axillar complex from metanotum. The central disk of the scutellum is usually coriaceous or rugose, and the sculpture is usually stronger than on the mesoscutum. Scutellum always more or less overhanging metanotum.

The mesopleuron and metanotum (Figs 7.1-4). The mesopleural triangle (**mptr**) and mesopleuron (**mspl**) are located laterally to the mesoscutum, below preaxilla and lateral axillar area. The mesopleuron is coriaceous, glabrous or, in many Synergini, transversely

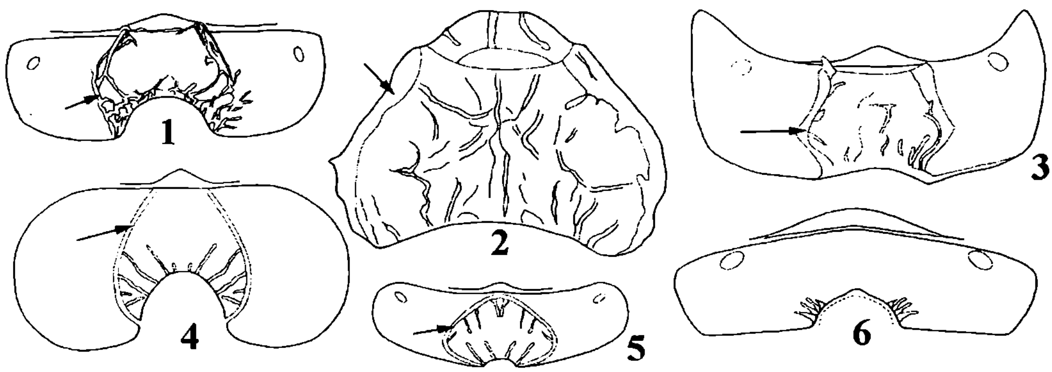


igs **6.1-3.** Scutum and scutellum (arrows show the transscutal fissure): 1, *Neuroterus numismalis*, asexual female, 2, *Neuroterus politus*, sexual female, 3, *Pseudoneuroterus macropterus*, asexual female.



igs **7.1-4.** Mesosoma. 1-2, mesosoma, lateral view. 3-4, propodeum, dorsal view. Abbreviations: **actc** acetabular carina, **axa** axillula, **axc** axillar carina, **axi** lateral axillar area, **daa** dorsal axillar area, **drs** dorsellum, **lpa** lateral propodeal area, **lpc** lateral propodeal carina, **mpa** median propodeal area, **mptr** mesopleural triangle, **mspl** mesopleuron, **mtpl** metapleuron, **mtr** metanotal trough, **no** notaulus, **nu** nucha, **pax** preaxilla, **pls** metapleural sulcus, **pspi** pronotal spiracle, **prnlc** pronotal lateral carina, **pro** pronotum, **psl** parapsidal line, **sab** subaxillular bar, **sct** scutellum, **spe** speculum, **spi** propodeal spiracle, **teg** tegula, **vir** ventral impressed rim (area) of the dorsellum. 1, 3, *Andricus quercuscalicis*, asexual female. 2, 4, *Synergus umbraculus*, female.

striate; the dorso-posterior, usually convex part is named as speculum (**spe**). The tegula (**teg**), the location of the insertion of the forewing, is located between mesoscutum and mesopleuron. The mesopleuron antero-ventrally is delimited by the acetabular carinae (**actc**). The metanotum (**mtn**) is located posteriorly and laterally to the scutellum. It forms part of the dorsal and lateral plates of the third thoracic segment (the metathorax), and contains a pair of bilaterally symmetrical elongated depressions (foveae) called the metanotal troughs (**mtr**). These troughs vary in texture and sculpturing, and may be glabrous, with setae and/or longitudinal (transverse) wrinkles. The metanotal troughs on each side are separated from each other by a central zone called the dorsellum (**drs**), which is rugose, coriaceous, glabrous, and smooth, with or without setae.



Figs 8.1-6. Propodeum, dorsal view (arrows show the lateral propodeal carina): 1, *Neuroterus politus*, 2, *Plagiotrochus marianii*, 3, *Dryocosmus nitidus*, asexual female, 4, *Aphelonyx cerricola*, 5, *Dryocosmus cerriphilus*, sexual female, 6, *Pseudoneuroterus macropterus*.

The metanotum is delimited posteriorly by a ventral impressed area (**vir**), located dorso-posteriorly to the dorsellum. Laterally to metanotal trough the metapleuron (**mtpl**) is located, usually with a strong metapleural sulcus (**pls**) which can reach mesopleuron in different height and, thus can be an important diagnostic feature in the identification of wasps (Figs 7.1-2).

The propodeum (**prop**) (Figs 7.3-4) usually bears a characteristic pattern of ridges, or carinae. It may be partially pubescent and bears a pair of propodeal spiracles (**spi**). Dorsally a central (or median) propodeal area (**mpa**) is delimited by two lateral propodeal carinae (**lpc**). The median propodeal area is usually smooth, without setae, with or without carinae and rugae, while the lateral propodeal area (**lpa**) is usually with dense setae. In some cynipids a median propodeal carina (**mpc**) is present. The nucha (**nu**), or 'neck', is the narrow posterior part of the propodeum that joins the petiole. The shape and structure of the central propodeal area is an important diagnostic character in Cynipini and really of no diagnostic value in other tribes. In a small number of genera (*Loxaulus*, *Plagiotrochus*, some *Callirhytis* species) this region is traversed by a median propodeal carina and a very indistinct, incomplete, and fragmented median propodeal carina is sometimes visible in some *Bassettia* and *Andricus* species. This carina is absent in all other genera of Cynipini. In *Aphelonyx*, *Biorhiza*, *Dryocosmus*, *Plagiotrochus*, *Trigonaspis* and some *Neuroterus* species the lateral propodeal carinae are strongly curved and usually the central area is sculptured with interior carinae or rugae (Figs 8.2-5). In *Andricus*, the lateral propodeal carinae are usually almost parallel, subparallel or only weakly curved outwards. Finally, in most of the palaearctic species of *Neuroterus* and *Pseudoneuroterus* propodeal carinae are very indistinct or fragmented laterally or lacking (Figs 8.1, 8.6).

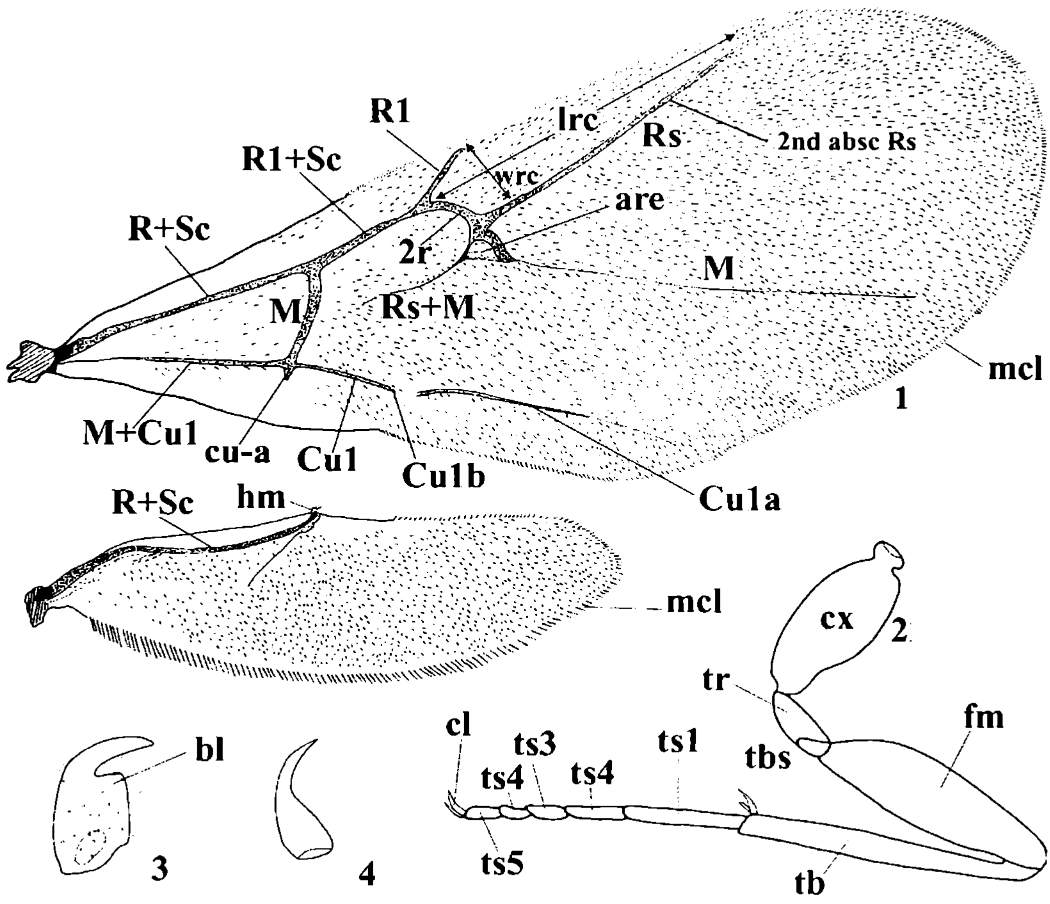
The following measurements of the mesosoma (Figs 4.1-2) are used in the taxonomic key: a) the height of the mesosoma (**msh**), the distance from the dorsal edge of the mesoscutum to the ventral edge of the mesopleuron in lateral view; b) the length of the mesosoma (**msl**), the distance from the anterior edge of the pronotum to the posterior edge of the propodeum in dorsal or lateral view; c) the width of the mesosoma (**mscw**), the distance between the inner margins of the tegulae in dorsal view; d) the length of the mesoscutum (scutum) (**mscl**), the distance from the anterior edge of the scutum to the transscutal articulation; e) the length of the scutellum, the distance from the transscutal articulation to the posterior edge of the scutellum in dorsal view; f) the length of the mesoscutum, measured medially in dorsal view; g) the lateral length of the pronotum, the greatest length measured along the lateral edge of the pronotum in lateral view.

The legs (Figs 9.2-4)

The legs consist (from base to apex) of coxa (**cx**), trochanter (**tr**), femur (**fm**), tibia (**tb**) and tarsus (**ts**), each of which are with more or less dense setae. With the exception of the acacia *Eschatocerus* gall wasps, the mid- and hindtibiae bear two tibial spurs (**tbs**). The foretibia typically bears dense setae or short and appressed setae (an important character for the separation of some *Andricus* species groups). All tarsi consist of 5 tarsomeres, with tarsomere 1 (basitarsus) the longest. The basitarsus of the foreleg has rows of setae that, together with the foretibial spurs, are used for cleaning the antennae. The leg ends in two claws (**cl**), which either do or do not have a basal lobe (**bl**) or tooth. The presence or absence of a basal lobe on the claw was once a diagnostic character on which much of the taxonomy of the Cynipidae, and especially the Cynipini, was based (Weld, 1952a). However, it has since been shown that a basal lobe or tooth has evolved independently several times in different cynipid groups (Ronquist, 1999a, 1999b; Liljeblad & Ronquist, 2002) and the role of this feature in cynipid taxonomy is now much reduced (Melika & Abrahamson, 2002).

The wing (Fig. 9.1)

The fore- and hindwings are hyaline or densely setose, with or without marginal cilia (**mcl**). The forewings in some taxa have darkly pigmented spots or stripes. Some gall-inducing cynipids (e.g., *Acraspis, Biorhiza, Trigonaspis, Phanacis*) either has short wings (brachypterous) or lack wings entirely (apterous), particularly in the females of the asexual generation. The wing venation and names of veins used follow Ross (1936) and Ronquist & Nordlander (1998). In the forewing, vein Rs+M 'points' to a point midway along the length of vein M (also called the basal vein, or basalis) or sometimes into its lower half. In Cynipidae, the radial cell (**rc**) is typically triangular and elongate. When vein Rs does not reach the anterior margin of the wing, the radial cell is called **opened,** and where this vein reaches the anterior margin of the wing and extending along the margin, the radial cell is termed **partially closed,** or entirely **closed** when Rs reaches R1. This is a very important character for the separation of genera. In all oak gall inducers the radial cell is always open, while in the tribes Aylacini and Synergini it may be open, partially closed or entirely closed. The ratio of the length (**lrc**) and width (**wrc**) of the radial cell is also an important diagnostic character used in the separation of species or species groups. The areolet (**are**) is a small, approximately triangular area of the forewing bounded by veins M, Rs+M and 2r. This structure is usually present, and varies from open (not fully enclosed by veins) to closed, from distinct to indistinct. In the hindwing, three hook-like hamuli (**hm**) are located laterally to vein R+Sc. The hamuli engage with the forewing to create a single aerofoil surface from the two wings. Where wing veins are used as diagnostic characters in the keys, vein names are abbreviated as in Fig. 1.9.1. The apical half of vein Rs, termed the 2nd abscissa of Rs (**2nd absc Rs**) can vary in its curvature towards the anterior wing margin, and this is sometimes an important character used in the keys. The following structures and measurements of the wing used in taxonomy are illustrated in Fig. 9.1: a) the length of the forewing (**fwl**); b) the length of the radial cell (**lrc**), the distance from the conjunction of R1 with 2r to the marginal end of Rs or its projection when the vein doesn't reach the margin of the wing; c) the width of the radial cell (**wrc**), the distance between the anterior margin of the forewing to the conjunction of Rs with 2r.

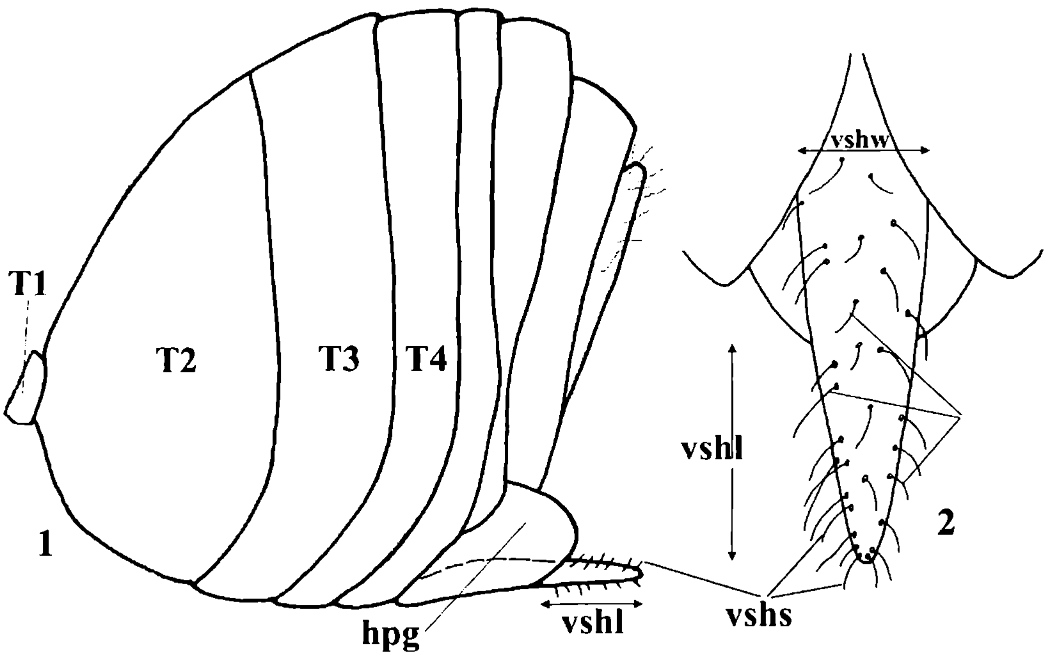


Figs. 9.1-4. Cynipidae. 1, fore and hind wings. 2, hindleg. 3-4, tarsal claws. Abbreviations: **are** the areolet, **bl** basal lobe of claw, **cl** claw, **cx** coax, **fm** femur, **hm** hamuli, **lrc** length of the radial cell, **mcl** marginal cilia, **tb** tibia, **tbs** tibial spurs, **tr** trochanter, **ts1-5** tarsomeres 1 (=basitarsus) to 5, **wrc** width of the radial cell. 1-3, *Andricus kollari*, asexual female. 4, *Neuroterus lanuginosus*, asexual female.

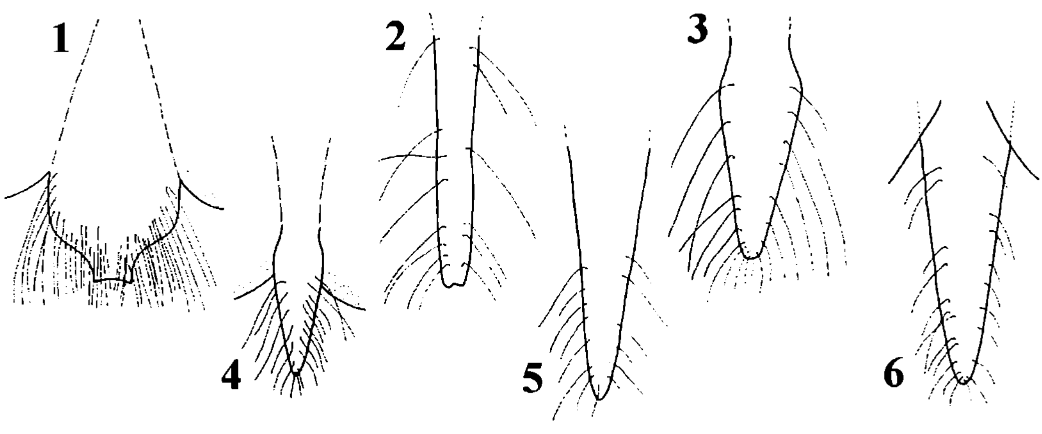
The metasoma (Figs 10.1-2)

The abdomen consists of the metasoma and the propodeum (the first abdominal segment, which is fused to the thorax and functionally is a part of it, and together with the thorax forms the mesosoma). The abdomen and the metasoma are different terms and refer morphologically to different parts of the wasp. The metasoma is the main part of the abdomen, posterior to the petiole or waist. Thus, the petiole is the first metasomal tergite (**T1**), but the second abdominal tergite. Metasomal tergite 2 (**T2**) is the first obvious tergite and is equivalent to the third abdominal tergite. The metasoma of cynipids is laterally compressed, and very narrow in dorsal view. It includes at most seven visible segments. The petiole or metasomal T1 is smooth or sulcate. The largest tergite of the female metasoma is either tergite 2, or in some cynipid inquilines the fused tergites 2 and 3 (T2+T3). Fusion of T2+T3 is sometimes incomplete, and the two tergites are separated by a faint suture (males of *Xestophanes*, *Periclistus*, males and females of *Ceroptres*, etc.). The tergites are usually smooth or microreticulate, bearing a more or less extensive band of dense white setae. In some cynipids metasomal tergite 2 (T2) has a basal ring of very dense setae, or a lateral patch of setae. Abdominal sternite 7 in females forms the hypopygium (**hpg**). This extends into a well-developed ventral spine of the hypopygium (**vsh**). The ratio of length (**vshl**) to width (**vshw**) of the prominent (protruding) part of the ventral spine is an essential diagnostic character in the identification of species. In the majority of oak cynipid species, the prominent part of the ventral spine of the hypopygium is slender and several times as long as broad, but this is not universally true. In the asexual females of the genus *Cynips*, for example, the ventral spine is shorter than broad, and broadens towards the apex. In all Aylacini the prominent part of the ventral spine of the hypopygium is very short, usually as long or very slightly longer than broad in ventral view. The ventral spine of hypopygium is covered with white subapical setae (sometimes termed apical setae) (**vshs**), the length and number of which can also be an important diagnostic character. Sometimes the subapical setae form a dense apical tuft and reaching or not behind the apex of the spine. Three principal states of the ventral spine of the hypopygium can be differentiated: a) ventral spine short, broadest at the apex or equally broad through its entire length; the prominent portion of the spine shorter or equal to its width; subapical setae dense and long, directed backward and reaching far beyond the apex of the spine, and in some genera forming a dense truncate tuft (Fig. 11.1); b) ventral spine thin, slender, needle-like, or if short then tapering gradually but distinctly to a point; prominent portion longer than broad; subapical setae long and reaching beyond the apex of the spine (Figs 11.2-3); c) ventral spine long, needle-like; prominent portion much longer than broad; subapical setae sparse, short, more perpendicular to the long axis of the spine, usually present only on the ventral surface of the spine. Only those setae on the spine apex, and not the subapical setae, extend beyond the apex of the spine (Figs 11.4-6). State (a) characterizes asexual *Cynips* and brachypterous and/or apterous forms of *Biorhiza*. State (b) is typical for nearly all Aylacini, Synergini, Diplolepidini, Pediaspidini and some asexual forms of *Andricus*.and *Aphelonyx*. State (c) is typical for sexual forms of *Cynips*, *Trigonaspis*, *Biorhiza*, many sexual and some asexual females of *Andricus* and *Trigonaspis*, and all other palaearctic Cynipini genera.

The following structures and measurements of the metasoma used in taxonomic keys are shown in Figs 4.1-2 and 10.1-2: a) the length of the metasoma (**mtl**), the distance from the anterior edge of the metasomal petiole to the anterior of the metasoma in dorsal view; b) the dorso-ventral depth of the metasoma (**mth**); c) the width of the metasoma (**mtw**); d) the length of the prominent (posteriorly protruding) part of the ventral spine of the hypopygium (**vshl**); e) the width of the ventral spine of the hypopygium(**vshw**) measured at the base of the prominent part (posteriorly protruding).



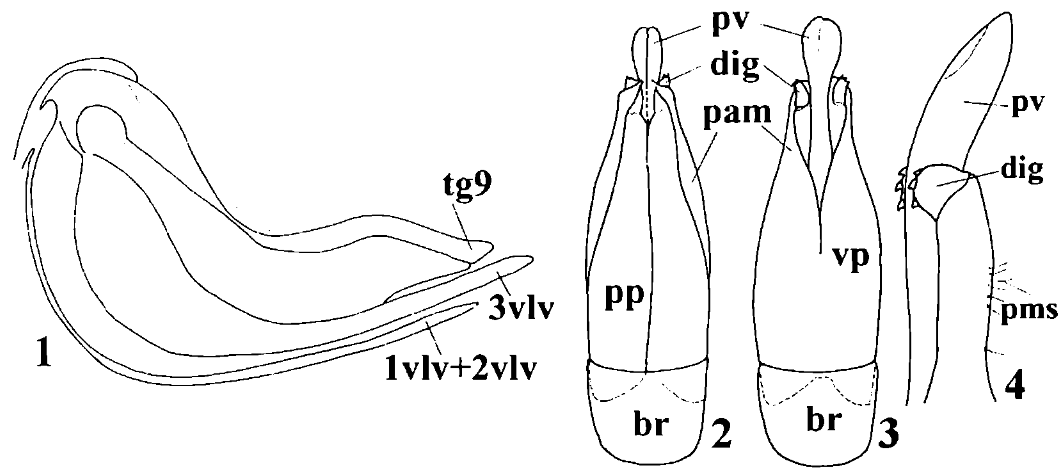
Figs 10.1-2. Metasoma, *Andricus kollari*, asexual female. 1, metasoma, lateral view. 2, ventral spine of hypopygium, ventral view. Abbreviations: **hpg** hypopygium; **vshl** length of the prominent part of the ventral spine; **vshs** apical setae; **vshw** width of the prominent part of the ventral spine.



Figs 11.1-6. Prominent part of ventral spine of female hypopygium: 1, *Cynips quercusfolii*, asexual female, 2, *Neuroterus numismalis*, sexual female, 3, *Neuroterus laeviusculus*, sexual female, 4, *Cynips longiventris*, sexual female, 5, *Neuroterus quercusbaccarum*, asexual female, 6, *Andricus solitarius*, asexual female.

The genitalia

The female genitalia. The ninth metasomal tergite in females consists of a pair of lateral plates that conceal the ovipositor (Fig. 12.1). The ovipositor is almost completely hidden inside the metasoma, and the only externally visible parts are the 3rd valvula (**3 vlv**) and the 1st and 2nd valvulae (**1vlv+2vlv**). The 3rd valvula is tubular, sclerotized and pubescent laterally. The male genitalia. The ninth and the tenth abdominal tergites and sternites are reduced and fused in males, surrounding the phallus. The male genitalia are protected ventrally by the 8th sternum, termed the subgenital plate. The phallus (Figs 12.2-4) consists of a weakly sclerotized basal ring (**br**), which surrounds the basal part of the parameral plates (**pp**). The parameres (**pam**), parameral plates (**pp**) and volsellar plates (**vp**) are fused to form a single apparent structure (synscleritous). The left and right parameral plates are separated dorsally by a median line (Fig. 12.2) and the volsellar plates are separated from each other ventrally by a membrane. The paramere bears a group of parameral setae (**pms**) apically. The digitus (**dig**) is well developed. The vertical penis valves (**pv**) are joined dorsally.



Figs 12.1-3. Genitalia, *Andricus kollari*, sexual generation: 1, female genitalia, ovipositor, lateral view. 2-4, male genitalia: 2, dorsal view, 3, ventral view, 4, lateral view. Abbreviations: **br** basal ring; **dig** digitus; **pam** paramere; **pms** parameral setae; **pp** parameral plate; **pv** penis valve; **1 vlv** and **2 vlv** first and second valvulae; **vp** volsellar plate; **tg9** metasomal tergite 9.

In the identification of cynipid wasps the surface sculpture of the head, mesoscutum, mesopleuron, and elsewhere can all be significant and it is important to understand the sense in which all terms are used. Below we provide a brief overview of some frequently used general terms and surface sculpture types for different structures of adult cynipid wasps, following Harris (1979). General terms frequently applied to sculpturing include the following: carinate – bearing more or less parallel narrow raised ridges, keels or carinae; confused – markings with indefinite outlines, without definite pattern; excavated – with a scooped out depression; superficially, with a hollowed out area (e.g., antennomere F1 in male antennae, Fig. 3.2); hyaline – a structure that is optically clear, transparent or partly so, used for characterizing the transparency of wings; impressed – having shallow, depressed areas or markings; interspace (interval) – the space between two structures or sculptures; obscure – dark, not readily seen, not well-defined; sculptured – superficially marked with elevations or depressions or both, arranged in some definable pattern; setose – a surface or a structure covered with setae, hairs or stiff bristles; sparse – scattered, irregularly spread and some distance apart.

The main types of surface sculpturing in cynipids on the head, mesoscutum, scutellum, etc.) and those used in the descriptions and identification keys are as follows:

-- alutaceous, coriaceous, leathery, covered with minute cracks like human skin and leathery in texture; this is a regular and nonparallel sculpturing. In alutaceous sculpturing the cells are poligonal and irregular, usually elongated, while in coriaceous is a sculpturing the cells are more or less regular.

-- punctate (punctuate), surface with fine, impressed points or punctures appearing as pinpricks. This is a superficial and impressed nonparallel sculpturing. Cynipids usually have distinct punctures on the head and mesoscutum and a seta is located in each such puncture.

-- reticulate (microreticulate), sculpture superficially net-like or made up of a network of lines; meshed; netted; this is a regular and nonparallel sculpturing.

-- rugose, wrinkled; this is an irregular and nonparallel sculpturing.

-- striate, marked with parallel, fine, longitudinal impressed lines or furrows.

-- sulcate, groove-shaped, groove-like; a surface with deep furrows or grooves, e.g. the 1st metasomal tergite in many cynipid inquilines.

For more details on the surface sculpture of cynipoids see Stone, Melika & Csóka (in press).

The morphology of the immature stages of cynipids

The Egg (Figs 13.1-4)

Egg development, oogenesis, is generally poorly known within the Hymenoptera (Büning, 1994; Quicke, 1997) and most of the few existing studies on parasitoid wasps concern ichneumonoids. Hogben (1920), however, carried out a major study of oogenesis in the Hymenoptera as exemplified by the gall wasp *A. kollari*, mainly describing the phases of cell divisions during egg development. Krainska (1961) described the development of the ovaries and oocytes from their origin in the larval stages to the maturity of the egg in *C. quercusfolii*, the gametogenesis in *N. quercusbaccarum* also discussed in a series of papers (Doncaster, 1910, 1911, 1916).

The gall wasp egg body is generally oval, slightly elongate, and carries a peduncle that is normally longer than the egg body. The peduncle forms a thin stalk with a terminal expansion at the distal end. According to several authors (Beyerinck, 1883; Riedel, 1910; Frühauf, 1924), the length of the peduncle correlates positively with the depth of insertion of the egg in the host tissue, but the peduncle can be very variable in length even among the eggs of a single individual female (Stone, Melika & Csóka, in press). The peduncle was once thought to have a respiratory function (Cameron, 1889; Adler, 1881). In other hymenopteran eggs (commonly in those of ectoparasitoids) another function of the peduncle is attachment. A work on *Diplolepis* and *Biorhiza* gall wasps suggests that its main function in cynipid eggs is probably to aid the passage of the egg through the very narrow ovipositor (Frühauf, 1924; Bronner, 1985).

The external morphology of oak gall wasp eggs has been described and illustrated for some species, including the sexual generation of *C. quercusfolii* (Riedel, 1910; Krainska, 1961), *B. pallida* (Frühauf, 1924), *Andricus mayeti* (Berland, 1951), *P. suberi* (Diaz, 1972) and *Andricus quercusradicis* (Vårdal et al., 2003). The eggs have rounded, sometimes almost circular egg bodies in most species. The egg bodies of *B. pallida* (Frühauf, 1924), *P. suberi* (Diaz, 1972) and *A. quercusradicis* (Vårdal et al., 2003) are ca. 94, 148 and 121 μm long respectively. The peduncle lengths varied rather more, at 376, 352 and 778 µm long respectively. Evans (1965) described the egg of *Synergus pacificus* McCracken & Egbert, 1922, an inquiline of oak gall cynipids in North America, as oval in shape and a pale cream colour, also with a long peduncle. It is slender and smooth and is slightly narrower in the posterior end. The external morphology of the egg of *Synergus pallipes* is very similar to that of *S. pacificus* (Vårdal et al., 2003) in shape and measurements, at between 100-110 µm long and 40- 47 µm wide, with the peduncle of the latter ca. 353 µm long. The egg of *Synophrus politus*, a presumed inquiline in oak galls for which the life history is still not clear, has basically the same shape as the *Synergus* eggs (Berland, 1951), but the size is not known.

The surface of the egg is normally smooth and devoid of any specialized regions such as the aeropyles and respiratory appendages reported for insect eggs in other orders. The micropyle, which is thought to allow sperm to enter the egg in most ectognathe insects (Büning, 1994), is possibly associated with the peduncle in cynipoids (Leuckart, 1855; Wishart & Monteith, 1954). Leuckart (1855) undertook a comprehensive examination of insect eggs and identified the micropylar apparatus in various insect orders. He claimed to have found 3 very fine micropyles in the egg of *Cynips quercus* in the peduncle close to the transition zone between the egg body and the peduncle. Wishart & Monteith (1954) showed that the micropyle of the egg of the eucoiline *Trybliographa rapae* (Westwood, 1835) (belonging to the sister group of the Cynipidae, the Figitidae) is situated at the apex of the peduncle. A recent study of the eggs of a number of cynipoid wasps, however, failed to detect the micropyle using scanning and transmission electron microscopy (Vårdal et al., 2003). The function of the micropyle is not obvious in eggs of parthenogenetic species (although males may appear occasionally in these, as in *Diplolepis rosae* (Schröder, 1967; Nordlander, 1973), or of the parthenogenetic generations of cyclically parthenogenetic species.

The woody-rosid gallers and particularly the asexual generations of the oak gall wasps, normally carry a large egg load (Cameron, 1889; Frühauf, 1924; Schröder, 1964) compared to other cynipoid groups: a single gall wasp female commonly carries more than 1000 eggs, while female cynipids in other groups carry between 40 and 200 eggs (Vårdal et al., 2003). The large egg load of woody rosid females indicate that this group is pro-ovigenic, meaning that all the eggs are mature as the female emerges from the gall. Other studies have found cynipid females to emerge with fully mature eggs and to start laying as soon as they emerge (Adler, 1881; Frühauf, 1924). Another possibility may be that females emerge with a large number of mature eggs, but are also able to mature more eggs as the original supply becomes depleted, a strategy termed pro-synovigeny (Quicke, 1997). This has been observed for the rose galler *D. rosae*, for which more eggs were counted in 5-7 day old females than in newly emerged females (Schröder, 1967).

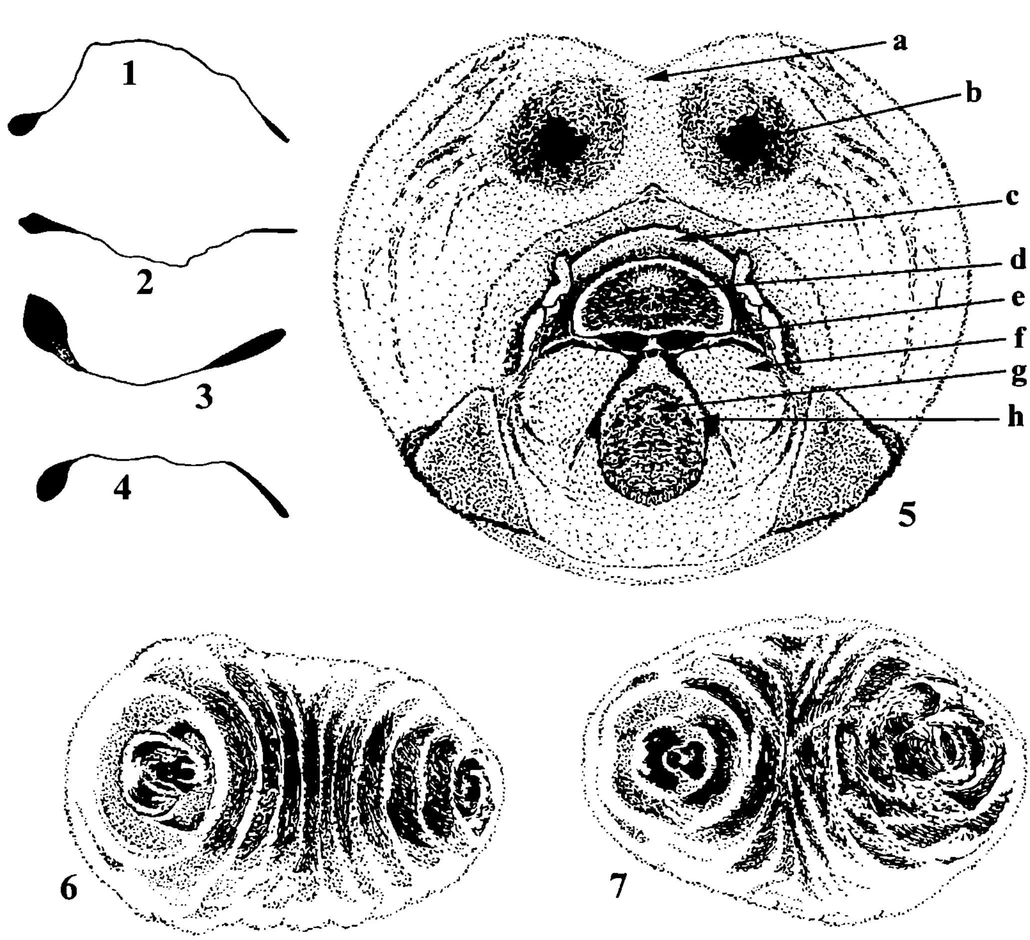
Preliminary data indicate that the egg load differs between the asexual and sexual generations of cyclically parthenogenetic oak gall wasps (Stone, Melika & Csóka, in press), being at least an order of magnitude lower in the sexual generation females of some species (*Andricus kollari, A. quercuscalicis)*. The sexual generation females are commonly smaller than the asexual generation females, and the difference in egg load concurs with that found by Quicke (1997), within a species, the egg load carried by a female is often positively correlated with her size. Female size in gall wasps can thus probably be used as an estimator of reproductive potential or quality (Quicke, 1997). An egg count for a female of *Synergus pallipes* revealed a very low number of 35 eggs (Vårdal et al., 2003). In the specimens dissected, the ovaries also appeared to contain immature eggs, indicating that this species is possibly pro-synovigenic.

A great variation is observed in the duration of the egg stage, even within a single cynipid species (Adler, 1881; Magnus, 1914; Riedel, 1910; Schröder, 1967). This is probably because the insect may enter diapause in any of the immature stages, and although this does not appear to be well studied for Cynipinae, there is an indication in the literature that the egg stage also varies in duration within this group (Riedel, 1910). In the few cases where the time between oviposition and hatching of the larva has been recorded, the egg stage lasts between 7 and 14 days (Adler, 1881; Magnus, 1914; Schröder, 1967, G.N. Stone, personal communication).

The Larva (Figs 13.5-7)

The shape of the typical Cynipini larva has been termed hymenopteriform (Clausen, 1940), which means that it has clear segmentation and no appendages. The Cynipinae larva has 12 (Rössig, 1904; Roth, 1949; Berland, 1951) or 13 (Cameron, 1889) body segments and a well-developed head. The larva is normally ventrally curved and has a smooth integument with no or very few setae concentrated on the head (Nieves-Aldrey et al., 2005). Larval size varies considerably within and among species, but based on measurements of 37 cynipid species of which 33 belong to the Cynipini, Roth (1949) reported that the newly hatched larva is 300-400 μm long and grows to reach a final length of 3000 μm (3 mm) or more. The mature larvae of some large *Andricus* species, for example, reach 7 mm in length and almost 3 mm in diameter at their widest point. The Cynipinae larva probably has five instars, as for most other cynipoids, except *Ibalia leucospoides*, for which only four are reported (Chrystal, 1930; Spradbery, 1970). Beijerinck (1883) believed that the cynipid larva never moulted as he never found cast larval skins inside the galls, but it was later shown that the larval skins are eaten by the larva after moulting and can be found in the gut (Roth, 1949). There is no hypermetamorphosis in the larvae of Cynipinae, in contrast to that seen in the parasitoid cynipoids (Kelin & Baume-Pluvinel, 1913; Haviland, 1921; James, 1928; Huzimatu, 1940; Clausen, 1940; Jenni, 1951; Simmonds, 1952; Wishart & Monteith, 1954; Ovruski, 1994). Slight changes may, however, occur between early and later larval instars, as seen in *B. pallida*, where the segments in the thoracic region are larger than the more posterior segments in the younger, but not in the older larva (Roth, 1949). The final instar larva of *P. suberi*, which induces stem galls in the cork oak *Quercus suber*, is described by Diaz (1972). This larva possesses protuberances in the thoracic region that have not been reported for many gall wasp larvae. Similar thoracic protuberances are found in the larvae of *Callirhytis glandium* and *Andricus foecundatrix*. A recent electron microscope study found enlargement of entire thoracic segments in the final instar larvae of *P. quercusilicis* and *N. quercusbaccarum* (Nieves-Aldrey et al., 2005).

A comparative study of terminal instar cynipoid larvae (Nieves-Aldrey et al., 2005), including 9 Cynipini species (*Andricus foecundatrix, A. panteli, A. quercusradicis, B. pallida, C. glandium, C. divisa, P. quercusilicis, N. quercusbaccarum* and *Trigonaspis mendesi*) allows the following generalizations about the larval head to be made. The typical head of a terminal-instar Cynipini larva is shown in Fig. 13.5. The head bears very few setae. The large dorsal part of the head, the vertex is often divided in two lateral parts. One antennal area can be seen on each of the two parts of the vertex. In the Cynipinae larva, the antennal areas are very conspicuous and consist of a flat disc surrounded by a wide antennal socket. The mouth is surrounded by a set of four sclerites and a pair of mandibles of varying shape. The clypeus is mostly inconspicuous, whereas the labrum varies considerably in shape from almost rectangular to round and the apical margin may be straight or incised. In most cases only the bases of the mandibles are visible underneath the labium. The number of teeth on each mandible varies between 1 and 5. Species such as *B. pallida* and the sexual generation of *N. quercusbaccarum* have mandibles with a single tooth, while *A. quercusradicis* and the sexual generation of *Neuroterus politus* have 4-5 teeth. In the latter cases, the second and third teeth are usually further divided into smaller teeth. The maxillae lie each side of the mouth and are often well defined and rounded or triangular in shape. The labium situated between the maxillae, is typically divided into two parts, the prelabium and the postlabium (Vance & Smith, 1933; Short, 1952), but in the cynipids these two regions are difficult to distinguish. The prelabium bears the orifice through which silk is normally extruded in those Hymenoptera that spin cocoons. The function of this orifice in Cynipinae is not clear, since the Cynipinae larva apparently does not spin a silk cocoon. The orifice probably functions as the opening of the salivary glands, which produces secretions involved in food processing.



Figs 13.1-7. Eggs and larvae: 1-4, eggs: 1, *Andricus quercuscalicis*, asexual, 2, *Neuroterus numismalis*, asexual, 3, *Cynips quercus*, asexual, 4, *Synergus pallipes*. 5, head of the larva of *Andricus panteli*, anterior view (a, vertex, b, antennal area, c, clypeus, d, labrum, e, mandible, f, maxilla, g, salivary orifice, h, labium). 6-7, larva, ventral view: 6, *Callirhytis glandium*, asexual, 7, *Biorhiza pallida*, asexual.

Some studies have focussed on the internal anatomy of the Cynipinae larva, as it is generally believed that the larval stage is responsible for gall induction and development (Roth 1949). According to Roth, spiracles are present on segments 2 to 10, but Beijerinck (1883) noted that spiracles were only present on nine body segments, being absent on segments 2, 3, 12 and 13. It is still not clear what kind of interaction the larva and the plant have, but Rössig (1904) believed that the gall was induced after injection of larval secretions into the surrounding plant tissue. Roth (1949) examined in detail all larval organs that could possibly produce these secretions, including the salivary glands, oenocytes, malpighian tubules and hindgut epithelium. These organs were examined in the larvae of 33 cynipid species, of which 27 belong to Cynipini. More details on the internal anatomy of Cynipini larvae are given in Stone, Melika & Csóka (in press). The duration of the larval stage is even more prone to prolongation by diapause than the egg stage, and reports of the length of the larval stages vary from 2 weeks to 8 years (Cameron, 1889; Riedel, 1910; Schröder, 1967; Stone et al., 2002). Five larval stages have been described for *Synergus pacificus* (Evans, 1965). The general appearance of the *Synergus* larva is similar to that of other cynipid larvae. The development time from egg to mature larva in this species is about eight weeks, and it grows from a length of 120-150 μm in the first instar to 1240-2400 μm in the fifth and terminal instar. Although gross morphology is more or less similar among final instar cynipid larvae, some diagnostic features were found in the head structure and especially in the mandibles of the inquiline larvae (for details see Nieves-Aldrey et al., 2005; Stone, Melika & Csóka, in press).

The Pupa

Pre-pupal stages have been reported in the parasitoid cynipoid *Ibalia leucospoides* (Chrystal, 1930) and are probably also present in Cynipinae: two different phases were observed close to pupation in *P. quercusilicis* and *N. quercusbaccarum*. The presumed eonymphal stage is almost indistinguishable from a larva except that the segmentation is less clear and the imaginal genitalia have started developing and are visible on the ventral side of the posterior segments. At least one prepupal stage was observed in *P. suberi* (Diaz, 1972) before the skin of the terminal-instar larva had been shed. Antennae, legs and wings were visible, suggesting that this stage corresponds to the pronymphal stage described from ichneumonids and at least the pronymphal stage has been reported in some eucolines (Huzimatu, 1940; Jenni, 1951) and in the rose galler *Diplolepis triforma* (Shorthouse & Leggo, 2002).

Appendages such as legs and wings are free from the body and not protected inside the pupa, although a thin membrane may envelope them (Beijerinck, 1883; Cameron, 1889; Riedel, 1910). At first, the pupa is white like the larva, but it changes colour gradually, starting with the eyes and the anterior part of the body (Diaz, 1972) until the whole pupa is dark brown or black. According to Riedel (1910), the pupal stage lasts from a few days to some weeks, or presumably longer if the pupa enters diapause (Stone et al., 2002). The inquiline pupa is similar to that of their gall wasp hosts in general appearance. Pupal size varies according to the space occupied in the host gall. The inquiline is typically smaller than their host gall wasp (though *Synophrus* species are probably an exception), and several inquilines may thus develop in a single gall. If not prolonged by diapause, the inquiline pupal stage lasts for a few weeks. For *Synergus pacificus*, it lasts for about two weeks (Evans, 1965). According to Roth (1949), small sacks or cocoons are present around inquiline pupae, but it seems likely that these structures are not distinct from the thin pupal skin enveloping other cynipid pupae.

Chapter 3. Biology and Ecology of Cynipidae

Gall wasps (Hymenoptera; Cynipidae) induce some of the world's most structurally complex plant galls. With ca. 1400 described species, they are the second most species-rich group of gall inducers after the gall midges (Cecidomyiidae) (Ronquist & Liljeblad, 2001; Csóka, Stone & Melika, 2004). The diversity of cynipid life cycles – including cyclical parthenogenesis and host plant alternation – is rivalled only by the aphids. The galls themselves support species-rich and ecologically closed communities of inquilines (including cynipids, gall midges, moths, and beetles) and hymenopteran parasitoids (predominantly Chalcidoidea) that have become important model systems in the study of community structure. Although the most familiar cynipid galls are probably those induced on oaks and roses, gall wasps attack a wide diversity of other plants.

In this chapter the gall wasp life cycles and current knowledge of the process of gall induction and cynipid inquilines are summarized. We briefly discuss the composition and structure of communities centred on cynipid galls. This chapter builds on existing reviews of cynipid biology by Askew (1961a, 1984), Shorthouse & Rohfritsch (1992), Stone et al. (2002b), and Csóka, Stone & Melika (2004). Detailed data on gall induction, life cycles, gall community structure are considered by Stone, Melika & Csóka (in press).

Species richness, host plant associations, distribution and zoogeography are given in details to each Cynipidae tribe and genus below, in the special part of the book, thus they are not discussed in this chapter.

Cynipid Gall Wasp Life Cycles

Life Cycles of Aylacini and Diplolepidini

The life cycles of many rose and herb gall wasps consist of a single, sexually reproducing generation each year. Sexual reproduction in these gall wasps occurs by facultative (or generative) arrhenotoky (Suomalainen et al., 1987; Cook & Butcher, 1999): unfertilized eggs develop into haploid males and fertilized eggs develop into diploid females (haplodiploidy). Males are rare or absent from populations or entire species (Askew, 1984; Brooks & Shorthouse, 1997; Dailey & Campbell, 1973; Folliot, 1964; Plantard et al., 1998a; Schröder, 1967; Stille, 1985a, 1985b), and in these cases females produce diploid daughters by parthenogenesis from unfertilized eggs. The mechanism involves meiosis followed by gamete duplication, and results in wholly homozygous offspring (Sanderson, 1988; Stille, 1985b; Stille & Dåvring, 1980). Recent work suggests that the probable cause of parthenogenesis in these gall wasps is infection with *Wolbachia* (Plantard et al., 1998b, 1998c, 1999). These endosymbiotic bacteria are maternally inherited, and have a range of phenotypic effects in their hosts (Cook & Butcher, 1999). In a range of Hymenoptera, *Wolbachia* infection induces gamete duplication following meiosis, such that all offspring are homozygous and diploid (Plantard et al., 1998b). Because of the haplo-diploid sex determination mechanism present in gall wasps (and most other Hymenoptera), these offspring can only be female (Cook & Butcher, 1999). *Wolbachia* infection is widespread in herb and rose gall wasp groups, with 12 of 19 rose gall wasps and 4 of 8 Aylacini gall wasps found to be infected (Plantard et al., 1999). The life cycles of many of these gall wasps have been examined independently (Folliot, 1964), and in every instance pure parthenogenesis correlates with *Wolbachia*-infection, while those possessing males are *Wolbachia*-free. The genetic consequences of *Wolbachia* infection are identical to the automixis identified by Stille & Dåvring (1980) in *D. rosae*, and it is probable that the populations they sampled were infected with *Wolbachia*. It was shown that french populations of *D. spinosissimae* include populations both with or without *Wolbachia*. In all cases, infected populations are purely parthenogenetic, while populations free of infection contain males (Plantard et al., 1998a). The same case may explain geographic variation in the frequency of males recorded in populations of other herb and rose gall wasps (Askew, 1984; Shorthouse, 1993; Stille & Dåvring, 1980). It is believed that this symbiont is the major cause of life cycle variation in the herb and rose gall wasps.

Alternation of Generations in Cynipini and Pediaspidini

The life cycles of oak cynipids (Cynipini) and Pediaspidini provide a rare example of cyclical parthenogenesis (or heterogony) in the Metazoa (Askew, 1984; Folliot, 1964; Hebert, 1987). Heterogony involves alternation between sexually and asexually reproducing generations, and outside the oak cynipids is known only from six other taxa – monogonont rotifers, digenean trematodes, cladoceran crustaceans, and in three insect lineages: the cecidomyiid gall midges (Diptera), adelgids and aphids (Homoptera), and one species of beetle (Coleoptera) (Hebert, 1987; Suomalainen et al., 1987). In most cyclically parthenogenetic animals, including aphids and cladoceran 'waterfleas', reproduction is predominantly asexual, with a single sexual generation each year triggered by a change in environmental conditions (Hebert, 1987; Moran, 1992; Suomalainen et al., 1987). Cyclical parthenogenesis in oak cynipids differs from this pattern in that the two reproductive modes are strictly alternating and there is a maximum of just a single generation of each per year. Although exceptions exist, oak cynipids also commonly complete a sexual–asexual cycle in a single year, and are effectively bivoltine (Askew, 1984). The wasps of the two generations often differ dramatically in size – the sexual generation adults are usually smaller and carry fewer eggs than their asexual generation counterparts (Sanderson, 1988), and develop far more rapidly within structurally different, and usually much smaller galls (Schönrogge et al., 1999; Stone et al., 1995).

The complex alternation of generations in the Cynipini and Pediaspidini has only been revealed by detailed rearing experiments involving the tracking of the offspring of individual females for several generations. The life cycle structure shown for *N. quercusbaccarum* in Fig. 14.1 has been demonstrated for several European members of *Andricus*, *Cynips*, and *Neuroterus*, and seems to represent the most highly derived state in the Cynipini (Askew, 1984; Folliot, 1964). The life cycle involves two different types of asexually reproducing females – androphores and gynephores (Fig. 14.1). Androphores produce haploid eggs by meiosis that give rise only to sons, while gynephores produce diploid eggs that give rise only to sexual females (Folliot, 1964). Unlike females in arrhenotokous life cycles, the sexual generation females cannot produce sons from unfertilized eggs, and must mate to produce the next generation of asexual females. The sexual females can also be divided into two types: one produces only androphores, while the other produces only gynephores (Fig. 14.1). However, this specific form of life cycle is not universal in oak gall wasps. Departures from the life cycle described above are of three types:

1) *Biorhiza pallida* and some *Andricus* species show departures from the strict androphore/gynephore dichotomy, and the asexual generation females produce both males and females from unfertilized eggs (deuterotoky) (Suomalainen et al., 1987). In most instances, the departure from producing offspring of a single sex is slight, but some

sexual females of *Biorhiza pallida* (termed gynandrophores) produce males and females n a ratio close to 1:1 (Askew, 1984; Folliot, 1964).

2) In contrast to the life cycle of *N. quercusbaccarum*, the sexual generation females f *B. pallida* (and also of the sycamore gall wasp *Pediaspis aceris*) are able to produce mall numbers of viable offspring without mating. These offspring are not haploid males as they would be in typical hymenopteran arrhenotoky), but diploid asexual females.

3) Some sexual generation females of *B. pallida* and *A. quercusradicis* mated to a ingle male give rise to both androphores and gynephores.

The genetic mechanism underlying cynipid heterogony is completely unknown. Explanatory hypotheses fall into two types: those involving the genesis of two types of exual female by gynephores (Fig. 14.2) and those involving the genesis of two types of nale by androphores (Fig. 14.3) (Atkinson et al., 2003; Folliot, 1964) (for details see Csóka, Stone & Melika (2004) and Stone, Melika & Csóka (in press).

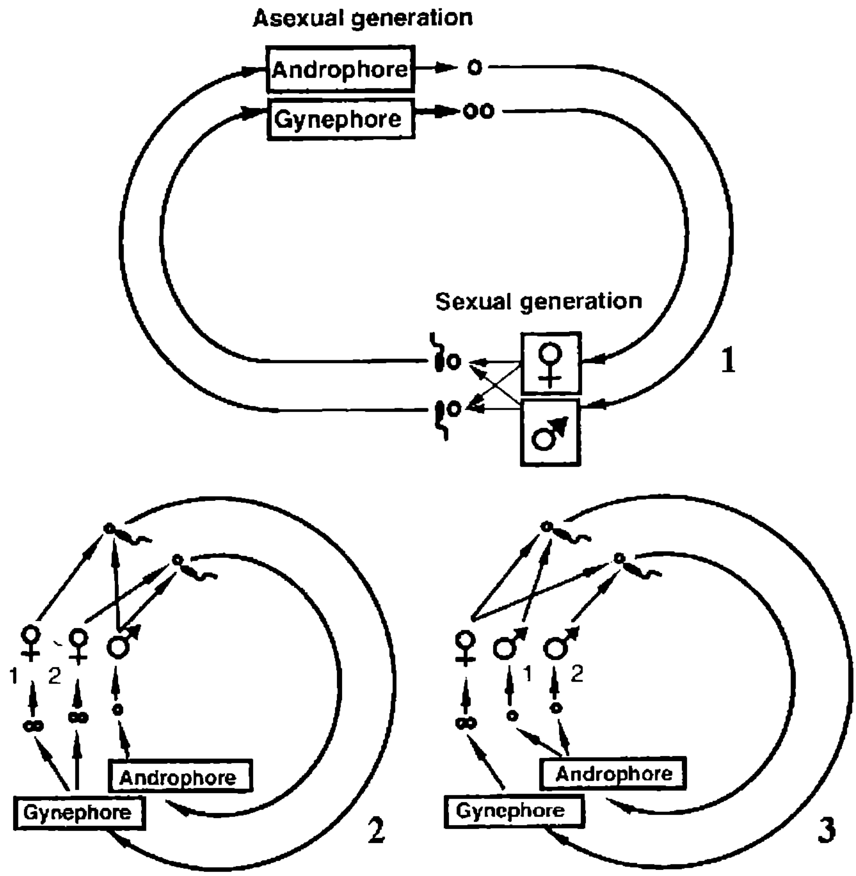


Fig. 14.1-3. 1, life cycle of *Neuroterus quercusbaccarum* (after Folliot, 1964; Askew, 1984). 2-3, mechanisms for the maintenance of the cynipid life cycle based on: 2, two different types of sexual generation female, and 3, two different types of male (after Folliot, 1964).

Of ca. 1000 known Cynipini species, alternation of generations is known for at most 100 species only (Pujade-Villar et al., 2001; Stone, Melika & Csóka, in press) (Table 2). Burks (1979) listed 485 species of Cynipini for the United States and Canada, whereas over 150 species have been described from Mexico, mainly by Kinsey (Houard, 1933;

Kinsey, 1936, 1937a, 1937b, 1938). The Nearctic Region as a whole probably supports at least 700 species in 29 genera (Kinsey, 1937a, 1937b, 1938; Weld, 1957a, 1959, 1960), and for only 36 species the alternation of generations is shown. No doubts, of other described nearctic species known from asexual or sexual generation only, many will be "paired" and so species richness will fall. The palaearctic fauna is less species-rich, with 200 species, of them some 25% are known to have alternating generations. Total of 134 oak gall wasp species are recognized in the Western Palaearctic Region, of them the alternation of generations is known for 50 species (Table 2).

Table 2. Life cycles in Pediaspidini and Cynipini (modified after Pujade-Villar et al., 2001; Stone, Melika & Csóka, in press). Authors who closed the life cycles for a certain species are indicated. Valid names are given in bold if both, asexual and sexual forms were nominated. (*) – asexual and sexual generations "pairing" must revised, alternation of generations is uncertain, do not closed experimentally.

Asexual form	Sexual form	References
PEDIASPIDINI		
Pediaspis		
sorbi (Tischbein)	***aceris*** (Gmelin)	Mayr (1881), Adler (1881), Folliot (1964)
CYNIPINI		
Acraspis		
erinacei Beutenmueller	*bicolens* (Kinsey)	Triggerson (1914), Kinsey (1920a)
gemula Bassett	unnamed	Kinsey (1930)
Amphibolips		
confluenta (Harris)	unnamed	Osten Sacken (1861)
globus Weld	unnamed	Weld (1952b)
Andricus		
unnamed	***chrysolepidicola*** (Ashmead)	Burdick (1967)
alniensis Folliot	*rupellensis* Folliot	Folliot (1964)
aries (Giraud)	unnamed	Walker (2001)
atrimentus (Kinsey)	unnamed	Dailey & Sprenger (1973a)
autumnalis Hartig	***quercusramuli*** (L.)	Adler (1881)
bocagei Kieffer	***pseudoinflator*** Tavares	Tavares (1919), Pujade-Villar (1993b)
callidoma (Hartig)	*cirratus* Adler	Adler (1881), Folliot (1964)
collaris Hartig	***curvator*** Hartig	Adler (1881)
corruptrix (Schlechtendal)	unnamed	Folliot et al. (2004)
crenatus Weld	***gigas*** Kinsey	Dailey & Sprenger (1973b)
crystallinus Bassett	unnamed	Doutt (1960)
dentimitratus (Rejtő)	unnamed	Pujade-Villar (1994), Pujade-Villar et al. (2000)
foecundatrix (Hartig)	*pilosus* Adler	Adler (1881)
gallaeurnaeformis (Fonsc)	*sufflator* Mayr	Mayr (1882), Folliot (1964)
gemmeus (Giraud)	unnamed	Pfützenreiter 1962
giraudianus Dalla Torre & Kieffer	***amenti*** Giraud	Folliot (1964)
glandulae (Schenck)	*xanthopsis* Schlechtendal	Schlechtendal (1884), Niblett (1939)
globuli Hartig	***inflator*** Hartig	Adler (1881)
hispanicus (Hartig)	unnamed	Pujade-Villar (1992)
hystrix Kieffer	unnamed	Folliot & Pujade-Villar (2003)
kashiwaphilus Abe	unnamed	Abe (1998)

kingi Bassett	unnamed	Rosenthal & Koehler (1971), Dailey & Menke (1980)
kollari (Hartig)	*circulans* Mayr	Beijerinck (1902), Folliot (1964)
lignicolus (Hartig)	*vanheurni* Leeuwen & Dekhuijzen-Maasland	Docters van Leeuwen & Dekhuijzen-Maasland (1958)
lucidus (Hartig)	*aestivalis* Giraud	Walker (2002)
malpighii Adler	*nudus* Adler	Adler (1881)
mayri Wachtl	***grossulariae*** Giraud	Walker (2002)
mukaigawae (Mukaigawa)	unnamed	Abe (1986, 1988), Kovalev (1965)
opertus (Weld)	*fimbrialis* Weld	Evans (1972)
paradoxus (Radoszkowsky)	*barbotini* Folliot	Folliot (1964)
pattersonae Fullaway	*dumosae* Weld	Evans (1972), Dailey & Menke (1980)
quadrilineatus Hartig	*kiefferi* Pigeot	Folliot (1964)
quercuscalicis (Burgsdorf)	*cerri* Beijerinck	Beijerinck (1897)
quercuscorticis (L.)	*gemmatus* Adler	Adler (1881), Folliot (1964)
quercusradicis (Fabricius)	*trilineatus* Hartig	Adler (1881), Folliot (1964)
sieboldi Hartig	*poisoni* Folliot	Folliot (1964), Pujade-Villar (1986)
solitarius (Fonscolombe)	*occultus* Tschek	Docters van Leeuwen (1934)
symbioticus Kovalev	unnamed	Kovalev (1965), Abe (1986)
Bassettia		
ligni Kinsey	unnamed	Rosenthal & Koehler (1971)
Belonocnema		
treatae Mayr	*floridanus* (Ashmead)	Ashmead (1882)
unnamed	*kinseyi* Weld	Lund, Ott & Lyon (1998)
Biorhiza		
aptera (Bosc)	***pallida*** (Olivier)	Adler (1881), Folliot (1964)
nawai (Ashmead)	unnamed	Asmead (1904a, 1904b), Monzen (1954), Yasumatsu & Matsuda (1955), Kovalev (1965)
Callirhytis		
erythrocephala (Giraud)	*hartigi* Förster	Nieves-Aldrey (1992)*
glandium (Giraud)	*aestivalis* Nieves-Aldrey	Nieves-Aldrey (1992)
glandulosa Weld	***rufescens*** (Mayr)	Nieves-Aldrey (1992)
grumatus Weld	*serricornis* Kinsey	Lyon (1970)
milleri Weld	***flora*** Weld	Dailey, Perry & Sprenger (1974)
eldoradensis (Beutenmüller)	unnamed	Dailey, Perry & Sprenger (1974)
quercusagrifoliae (Bassett)	unnamed	Lyon (1964)
quercuscornigera (O. S.)	unnamed	Melika & Buss (2002)
operatola (Bassett)	***quercusoperator*** (Osten Sacken)	Bassett (1873)
quercuspomiformis (Bassett)	unnamed	Lyon (1959)
quercussuttoni (Bassett)	unnamed	Lyon (1969)
radicicola (Dalla Torre)	***quercusfutilis*** (Osten Sacken)	Osten Sacken (1861), Bassett (1889)*
Cynips		
agama Hartig	*mailleti* Folliot	Folliot (1964)
disticha Hartig	*indistincta* Niblett	Niblett (1948)
divisa Hartig	*verrucosus* Schlechtendal	Adler (1881)
douglasii (Ashmead)	*lobata* McCracken & Egbert, *Dryophanta*	McCracken & Egbert (1922), Kinsey (1930), Weld (1951), Burks (1979)
longiventris Hartig	*similis* Adler	Adler (1881), Kinsey (1930)
mirabilis Kinsey	unnamed	Evans (1967)
quercusechinus (Osten	*ribes* (Kinsey)	Kinsey (1922), Melika & Abrahamson

Sacken)		(2002)*
qeurcusechinus var.***schulthessae*** Kinsey	*atrata* Kinsey	Kinsey (1930)
qeurcusechinus var. ***vicinum*** Kinsey	*incepta* (Kinsey)	Kinsey (1930)
quercusfolii L.	*taschenbergi* Schlcht.	Adler (1881)
Disholcaspis		
cinerosa Bassett	unnamed	Frankie *et al.* (1984)*
eldoradensis (Beutenmüller)	unnamed	Evans (1972)
Dryocosmus		
attractans (Kinsey)	*uvellae* Weld	Dailey (1969)
bicornis McCracken & Egbert	***dubiosus*** Fullaway	Doutt (1959)
cerriphilus Giraud	*nervosus* Giraud	Ács et al. (2006)
nitidus (Giraud)	*loewi* Wachtl	Schlechtendal (1888), Kieffer (1897-1901)
israeli Sternlicht	unnamed	Sternlicht (1968a)
Heteroecus		
dasydactyli (Ashmead)	unnamed	Rosenthal & Koehler (1971)
pacificus (Ashmead)	unnamed	Lyon (1963)
Loxaulus		
trizonalis Weld	unnamed	Weld (1926)
Neuroterus		
abundans Kinsey	***tectus*** Bassett	Kinsey (1920)
anthracinus (Curtis)	*furunculus* Beijerinck	Beijerinck (1897)
contortus Weld	*principalis* Kinsey	Kinsey (1923)*
fumipennis Hartig	***tricolor*** (Hartig)	Adler (1881)
hiemalis Kinsey var., *niger* Gillette	***pattersoni*** Kinsey var., ***niger*** Gillette	Kinsey (1923)*
laeviusculus Schenck	***albipes*** (Schenck)	Adler (1881), Pujade-Villar (1985a)
lenticularis (Olivier)	***quercusbaccarum*** (L.)	Adler (1881)
numismalis (Fourcroy)	*vesicatrix* Schlechtendal	Adler (1881)
quercusbatatus (Fitch)	*bisexualis* Kinsey	Kinsey (1923)
saliens (Kollar)	*glandiformis* (Giraud)	Barbotin (1972)
saltatorius (Edwards)	*decipiens* Kinsey	Rosenthal & Koehler (1971)*
politus Hartig	*petioliventris* (Hartig)	Schlechtendal (1884), Folliot (1964)
unnamed	*washingtonensis* Beutenm.	Evans (1972)
Plagiotrochus		
cabrerae Kieffer	***australis*** (Mayr)	Barbotin (1985)
razeti Barbotin	unnamed	Melika, Ros-Farré & Pujade-Villar (2001)
Trigonaspis		
renum Hartig	***megaptera*** (Panzer)	Adler (1881)
synaspis (Hartig)	*megapteropsis* Wriese	Kieffer (1897-1901)

The Duration of Cynipid Life Cycles

In most oak gall wasps the gall containing the sexual generation develops in the spring or early summer, whereas the asexual generation gall develops through the summer and autumn of the same year. Asexual generation females emerge from their galls in autumn and lay eggs that remain dormant until the following spring, or overwinter in the gall. There are many deviations from this general pattern and most cynipid species show considerable plasticity in response to environmental fluctuation (Schönrogge et al., 1994a, 1999). Many cynipids have life cycles in which the asexual generation obligately or facultatively requires more than one year to develop (e.g., *B. pallida*) (Askew, 1984), whereas in others the sexual and asexual generations each take a year. In *A. kollari* the life cycle is annual in the south of its range (Asia Minor and southern Europe) (Folliot, 1964; Stone et al., 2001), but takes two years in northern Scotland (Schönrogge et al., 1999).

Evidence for Loss of Sex from Oak Cynipid Life Cycles

Many oak cynipids are known only from a single generation (Cook et al., 2002; Melika et al., 2000; Rokas et al., 2003b), and in most cases the known generation is asexual. This raises the question of whether some or many oak cynipids have lost the sexual generation from their life cycle and become obligately parthenogenetic. Many oak gall wasps are known only from an asexual generation, but in many cases this may reflect our ignorance of their sexual generation rather than true loss of sex. Secondary loss of sex has been shown to occur in five of the six taxa of cyclically parthenogenetic animals, repeatedly in some groups (Hebert, 1987; Little & Hebert, 1997; Moran, 1992; Simon et al., 1999), and is thus perhaps to be expected in oak cynipids. To date, ability to bypass the sexual generation has been demonstrated experimentally in only three oak cynipids. *Andricus targionii* (Abe, 1986) and *Dryocosmus kuriphilus* (Kato & Hijii, 1993, 1997) are both only known from an asexual generation. *Andricus quadrilineatus* is a European species that may represent an intermediate step in the loss of the sexual generation (Folliot, 1964), with asexual females that are able to produce both sexual and asexual offspring. The impact of *Wolbachia* in the life cycles of rose and herb cynipids raises the question of whether this symbiont could play a role in loss of sex in oak gall wasps. While some oak cynipids are infected with *Wolbachia*, in contrast to rose and herb cynipids the infected populations still produce males (Rokas et al., 2001, 2002; Abe & Miura, 2002). The phenotypic impact of *Wolbachia* in oak cynipids remains unknown. Demonstration that oak cynipids can sustain purely asexual life cycles raises the question of how many of the species known only from parthenogenetic generations are genuinely obligately parthenogenetic. Until recently, rearing experiments have been the only technique available to resolve this issue (e.g., Folliot, 1964; Lund et al., 1998; Pujade-Villar, 1992a). This approach is extremely time-consuming and labor intensive, and difficult to apply to whole communities. Two alternatives, based respectively on population genetic analysis and DNA sequencing, provide alternatives applicable to large numbers of species (Csóka, Stone & Melika, 2004).

Gall Induction

Cynipid gall development can be divided into three phases: initiation, growth, and maturation (LeBlanc & Lacroix, 2001; Shorthouse & Rohfritsch, 1992). Initiation begins with oviposition by the female gall wasp. It determines the host plant, gall location on the host, and the number of larvae developing in the resulting gall. It is widely accept that cynipids need meristematic or otherwise omnipotent cells to initiate gall growth (LeBlanc & Lacroix, 2001; Schönrogge et al., 1998a, 2000a; Shorthouse & Rohfritsch, 1992). Plant cells neighboring the egg lyse to produce a small chamber. After hatching, the larva enters this chamber, and controls all subsequent tissue differentiation. Each larva develops in its own chamber (Fig. 15), and galls induced by a specific gall wasp species are usually either single-chambered (monolocular) or many-chambered (multilocular).

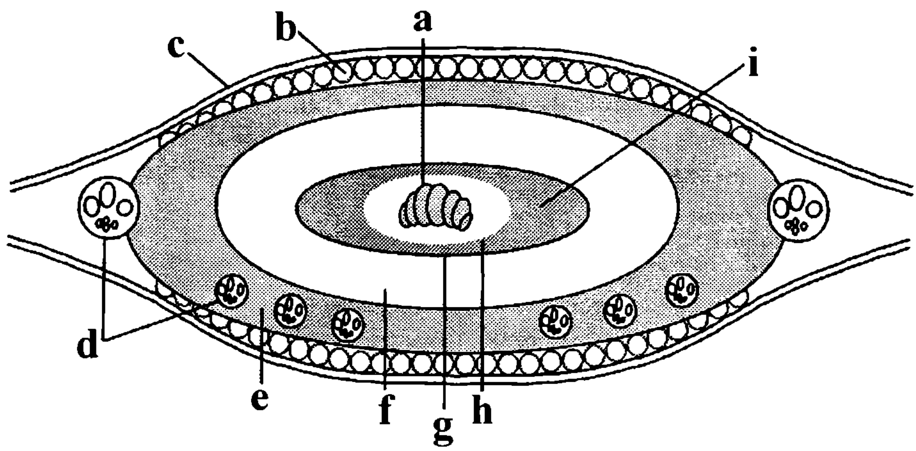


Fig. 15. Cross-section of the leaf gall induced by a rose gall wasp *Diplolepis rosaefolii* (modified from Le Blanc & Lacroix, 2001): a, cynipid larva, b, outer gall parenchima, c, leaf epidermis, d, vascular bundles, e, layers of sclerenchyma, f, inner parenchyma, g, sclerenchymatous wall of larval chamber, h, lining of nutritive tissue, i, vasculate parenchyma, destined to become nutritive tissue.

The next phase – gall growth – begins in at least some species before the egg hatches, and in most species takes place while the gall wasp larva remains very small (Bagatto et al., 1996). The larval chamber enlarges, a network of vascular bundles develops that joins those supplying the host organ, and layers of outer parenchyma develop around the larval chamber (LeBlanc & Lacroix, 2001; Shorthouse & Rohfritsch, 1992). In virtually all cynipid galls, the larval chamber is lined with nutritive cells, bounded externally by a layer of vacuolate parenchyma and a thin shell of sclerenchyma (Fig. 15). The nutritive tissue is characteristic of cynipid galls, and to date only galls induced by the chloropid fly *Lipara lucens* are known to have similarly specialised gall tissue (Shorthouse & Rohfritsch, 1992; Tscharntke, 1994). Nutritive tissue consists of large thin-walled cells whose chromosome structure, protein content, and physiology are similar to seed tissue (Hartley, 1998; Hartley & Lawton, 1992; Schönrogge et al., 2000a). These cells represent the gall wasp's sole source of food throughout development (Shorthouse & Rohfritsch, 1992). The larval chambers are morphologically similar in all cynipid galls, and species-specific gall structures result from variation in the development of the outer parenchyma and epidermis (LeBlanc & Lacroix, 2001; Shorthouse & Rohfritsch, 1992). The complexity of these outer tissues varies enormously across gall wasp tribes, among species, and between the generations of cyclically parthenogenetic species (Shorthouse & Rohfritsch, 1992; Stone & Cook, 1998). During the growth phase, the gall acts as a major sink for mineral nutrients and photoassimilates (Bagatto & Shorthouse, 1994; Bagatto et al., 1996; Paquette et al., 1993). The outer gall tissues also synthesize tannins and phenolics (Hartley, 1998), which were originally thought to be a deterrent against free-feeding insect larvae (Abe, 1995, 1997b; Schönrogge et al., 1994a). However, these compounds are now known to be feeding stimulants for some larvae (Schultz & Baldwin, 1982), and an additional function as a fungicide has been proposed (Taper & Case, 1987; Wilson & Carroll, 1997). Manipulation of plant metabolites is achieved through several routes. Galls on leaves are able to elevate photosynthetic rates on the affected leaf, and to intercept the resulting photoassimilate (Bagatto et al., 1996; Fay & Hartnett, 1991; Fay et al., 1993). Galls on leaves and other tissues are also able to concentrate nutrients and photoassimilate through mobilisation of these resources from neighboring regions of the plant (Bagatto et al., 1996; Paquette et al., 1993).

The maturation phase is characterized by decreased rates of cell division and the gall ceases to be a major sink for host plant resources. The cynipid larva now grazes the nutritive cells lining the larval chamber, and the action of feeding triggers the conversion of neighbouring vacuolate parenchyma into further nutritive cells (Shorthouse & Rohfritsch, 1992). Feeding continues until the sclerenchymatous shell of the larval chamber is reached. In many oak galls the tissues surrounding the larval chamber become lignified, and, in some instances, localized tissue death results in internal air spaces (Bagatto & Shorthouse, 1994; Bagatto et al., 1996; Shorthouse & Rohfritsch, 1992; Stone et al., 1995; Stone & Cook, 1998). Lignification makes the tissue unusable for other herbivores. The timing of lignification is under larval control, and may have important consequences, particularly in deciduous galls that overwinter. Many oak galls fall slightly before leaf fall in the autumn, so ensuring a covering of leaves and a more suitable microclimate in which to pupate or enter diapause.

Host-plant Associations

Gall-inducing cynipids in general have narrow host specificity, and with few exceptions almost all cynipid gall-wasp species attack host plants in a single or phylogenetically very closely related genera (Askew, 1984). There has been relatively little work on the significance of host plants for the genetic structure of associated gall wasps, but work on an oak gall wasp, *A. kollari*, has shown that populations associated with different (but closely related) oak species represent genetically discrete ecotypes (Stone et al., 2001) and probably separate species (Bellido et al., 2003). There are, of course, exceptions, e.g., in the herb cynipid genus *Diastrophus*, which usually galls *Rubus, Potentilla, Fragaria* (Rosaceae), and has also been recorded from *Hieracium* (Asteraceae) (Melika & Klymenko, 2005), and even a monocot plant, *Smilax* (Smilacaceae) (for more details see the tribe Aylacini in this book, the systematic part). Clear divisions in host plants among the tribes exist, and they are discussed below. A general feature of cynipid host specificity is that shifts between host plants are rare (Cook et al., 2002; Shorthouse & Brooks, 1998; Stone et al., 2001). The evolution of host-plant associations is discussed in more detail later in chapter 4.

Tribes Aylacini, Diplolepidini, and Pediaspidini

The herb gall wasps (Aylacini) have the broadest taxonomic range of host plants of any tribe. The largest number of species are associated with the Asteraceae, and other important host taxa are the Papaveraceae, Lamiaceae, Valerianaceae, and Apiaceae. A few hosts of gall wasps in this group are not herbs: for example, species in *Diastrophus* are associated mainly with *Rubus* spp. One North American species, *Diastrophus smilacis* Ashmead, 1896 induces stem galls on *Smilax rotundifolia* L. and *S. herbacea* L. vines (Schick et al., 2003). This association represents the only known induction of galls on a monocotyledon by a gall wasp. The other two tribes of non-oak gall wasps have narrow host ranges. The Eschatocerini are restricted to mimosoid legumes (*Acacia* and *Prosopis*, Fabaceae), while the Diplolepidini gall only roses (*Rosa*), and the Pediaspidini -- only sycamores (*Acer*).

Tribe Cynipini

The majority of oak gall wasps induce galls on oaks (*Quercus*) (Fagaceae: Fagoidea). A few cynipids induce galls on hosts in the other subfamily of the Fagaceae, the Castanoidea, including chestnuts (*Castanea*), chinquapins (*Castanopsis, Chrysolepis*), and tanbark oaks (*Lithocarpus*) (Weld, 1957a; Cornell & Washburn, 1979). For example, *Dryocosmus kuriphilus* (Yasumatsu) is the only gall wasp known to attack *Castanea.* Outbreaks of this species caused serious damage to the chestnut industries of Japan and Korea (Kato & Hijii, 1993, 1997), and it is now an important pest after introduction to the United States (Payne et al., 1975) and Europe (Brussino et al., 2002). *Dryocosmus castanopsidis* (Beutenmüller), known from Oregon and California, induces galls on catkins of *Castanopsis chrysophylla* (Dougl. ex Hook.) and *C. sempervirens* (Kell.) Dudley ex Merriam (Burks, 1979).

The distribution of oaks within the Western Palaearctic Region has been shaped by the repeated cycles of glaciations throughout the Pleistocene to the present day. During the glacials oaks were restricted to isolated refugia (the three main refugia in Europe appear to have been Iberia, Italy and the Balkans (Huntley & Birks, 1983; Hewitt, 1996), with additional areas in Turkey and the Caucasus that were important for species with distributions including the Near and Middle East (Hewitt, 1999). There is evidence that there has been no mixing of individuals between these refugia since the beginning of the Pleistocene. As a result of the isolation, both oaks and gall wasps in each of these areas evolved independently. The current distribution of each oak species is a reflection of its ability to move out of the refugial areas in the present interglacial (the Holocene) (Huntley & Birks, 1983). Only a few oak species have expanded their ranges appreciably and it is unclear what is factors are restricting the majority of species.

Quercus is divided into two subgenera, the strictly Asian subgenus *Cyclobalanopsis*, and the more widespread subgenus *Quercus* (Nixon, 1993). Little is known about the cynipids associated with *Cyclobalanopsis* oaks. The subgenus *Quercus* is divided into four sections (Manos et al., 1999). nearctic oaks belong to three sections – *Quercus* s. str. (white oaks), *Lobatae* (red oaks), and *Protobalanus* (golden cup oaks); while palearctic oaks include members of both, the section *Quercus* s. str., and an endemic eurasian taxon, the section Cerris. Cynipids induce galls on hosts in all sections within the subgenus Quercus and with the exception of the host-alternating species, oak gall wasps attack only closely related members of a single oak section with similar secondary plant chemistry, physiology, and phenology (Abrahamson et al., 1998a, 1998b, 2003). In North America, for example, the cynipid faunas of white and red oaks are completely distinct, and no gall wasps are known to attack species in both groups (Cornell, 1985, 1996). With the exception of the host-alternating species described below, the same pattern is seen on the two oak sections (Cerris and Quercus s. str.) native to the Western Palaearctic Region (Stone et al., 2002b). Ambrus (1974) and Kelbel (1996) described the colonisation of introduced American oaks (e.g., *Q. rubra* L.) by European gall wasps, however, it needs confirmation.

Alternation of hosts in cynipids

Host alternation in cynipids is known only for some western palaearctic species in the genera *Andricus* and *Callirhytis*. In both genera, host alternation is between the two oak sections Cerris and Quercus s. str. (Askew, 1984; Folliot, 1964; Nieves-Aldrey, 1992; Stone et al., 2001, 2002b). In *Andricus* the asexual females oviposit on hosts belonging to the section Cerris and the sexual females lay eggs on section Quercus hosts. In *Callirhytis* the alternation is usually reversed (Nieves-Aldrey, 1992), but is less consistent and often facultative. The geographic distributions of cynipids with host-alternating life cycles are restricted to areas where oaks of both sections occur together, a fact which has had significant effects on geographical patterns in cynipid species richness in the Western Palaearctic Region.

Organ specificity

In addition to host specificity, gall-inducing cynipids usually show strong fidelity to particular organs of their host plants, such that only a small minority are able to induce a gall on more than one organ type (e.g., male flowers, female flowers, fruits, buds, leaves, shoots, roots) on the host. The sexual generation of the sycamore gall wasp *P. aceris* (Pediaspidini) can induce galls either on the leaves or flowers of its host. The sexual generation of *A. testaceipes* (Cynipini) can induce its galls either on the midrib of the leaf or on young shoots, and while the asexual generation of *A. lucidus* most commonly induces galls on buds, it is also sometimes found on acorns. The sexual generation gall of *N. quercusbaccarum* (Cynipini) is found both on catkins and on leaves. Phylogenetic studies of oak gall wasps show that shifts between plant organs within a host plant taxon are generally more common than shifts among host plant taxa (Cook et al., 2002).

Communities Associated with Cynipid Galls

Cynipid galls support species-rich communities of organisms in addition to the gall-inducing cynipid. The foodweb, based on gall tissue, supports the gall inducer, phytophagous inquilines, parasitoids and hyperparasitoids, and a diversity of opportunist predators. A single asexual generation gall of *A. kollari* may contain up to 50 insects in addition to a single gall-inducing larva, while the large multichambered galls induced by the sexual generation wasps of *B. pallida* may yield hundreds of insects (Folliot, 1964; Atkinson et al., 2003). Oak gall communities have become important model systems in understanding the structuring of trophic webs focussed ultimately on a single resource. The best-known components of cynipid galls are the inquilines and parasitoids, which together often inflict heavy mortality on the gall inducer. The extent to which natural enemies regulate cynipid population sizes remains an issue of debate; the most detailed population dynamic studies in cynipid communities have been carried out on European oak galls (Wiebes-Rijks & Shorthouse, 1992; Stone et al., 2002b).

The animals associated with oak galls can be divided into two categories: obligate inhabitants (inquilines and parasitoids), and those that exploit cynipid galls opportunistically (herbivorous larvae feeding on gall tissue, true predators, and arthropods using galls as shelter).

Obligate Inhabitants of Cynipid Galls

Inquilines. Inquilinism is usually considered to represent a unilaterally beneficial relationship that benefits only the inquiline (Askew, 1984), and represents a form of cleptoparasitism (termed agastoparasitism by Ronquist (1994)). However, the host–inquiline relationship in cynipid galls can sometimes be much more than a simple unilateral interaction. The obligate inquilines of cynipid galls belong to four different insect orders: Hymenoptera, Diptera, Lepidoptera and Coleoptera.

Inquiline gall wasps (Tribe Synergini). The cynipid inquilines are currently classified within the tribe Synergini (see taxonomic details below in the special part, tribe

Synergini). Most important works on palaearctic inquiline Cynipidae include Hartig (1840, 1841, 1843), Mayr (1872), Kieffer (1901), Dalla Torre & Kieffer (1910), Tavares (1920), Ross (1951), Eady (1952), Eady & Quinlan (1963), Nieves-Aldrey & Pujade-Villar (1985, 1986), Pujade-Villar (1992), Pujade-Villar & Nieves-Aldrey (1990, 1993), Pujade-Villar & Ros-Farré (1998b), Abe (1998b), Pujade-Villar et al. (2002) and some others. The species of the Western Palaearctic Region were recently revised by Pujade-Villar et al. (2003), a *Ufo* genus was described from Japan (Melika et al., 2005) and new species of *Synergus* and *Saphonecrus* were described from China (Melika et al., 2004) and Iran (Sadeghi et al., 2006a). Much less has been published on the nearctic fauna (Osten Sacken, 1861, 1862, 1863, 1865; Walsh, 1864; Ashmead, 1885, 1896, 1899, 1903a, 1903b; Gillette, 1890, 1896; Fullaway, 1911; McCracken & Egbert, 1922; Weld, 1926, 1952a; Ritchie & Shorthouse, 1987b; Díaz & Gallardo, 1998); the most comprehensive study of the inquiline cynipid fauna which includes a world catalogue of species and a review of *Synophromorpha* is those written by Ritchie (1984) and Ritchie & Shorthouse (1987a). Only one cynipid and inquiline genus, *Rhoophilus* Mayr, 1881, with a single species, *R. loewi* Mayr, 1881, is restricted to the Afrotropical Region (South Africa). It has been shown to be a true inquiline in the galls of a moth (Lepidoptera: Cecodisidae) (van Noort et al., in press).

Although inquiline cynipids (Synergini) occur worldwide, the majority are found in the Holarctic Region. Representatives of five genera, *Ceroptres, Saphonecrus, Synergus, Synophrus* and *Ufo* are known to live as inquilines in oak cynipid galls, one genus, *Periclistus*, was found only in *Diplolepis* rose galls, and the nearctic genus *Synophromorpha* only in *Diastrophus* galls. The palaearctic inquiline fauna is relatively well known, especially in western and central Europe (Pujade-Villar et al., 2003), while southern and southeastern regions, such as Italy, the Balkan peninsula and Greece, are less studied. Other regions are ocassionally examined: North Africa (Kieffer, 1901; Mimeur, 1949), Israel (Sternlicht, 1968a, 1968b), Iran (Chodjai, 1980; Sadeghi et al., 2006a), and the Transcaucasus (Belizin & Maisuradze, 1965). The inquiline faunas of most of southern Russia, Kazakhstan and some of the eastern Mediterranean area virtually unknown. Most recent estimation of the entire world fauna of Synergini comprise 8 genera and 151 species (Csóka, Stone & Melika, 2004). However, many of these species are only known from the original descriptions and have not been ever recorded since then. Pujade-Villar et al. (2003) revised the Synergini of the western Palaearctic Region and synonymised 29 species bringing the number of species recognised in the western Palaearctic Region to 38. Most cynipid inquiline species are widespread in Europe, following the distributions of their host galls, which in turn follow the ranges of their host oak species. The inquilines with the most extensive geographic ranges are generalists associated with widespread oak species. The most extreme example in the Palaearctic Region is *Synergus gallaepomiformis*, which attacks 45 different oak cynipid hosts (Stone, Melika & Csóka, in press) and is found from western Europe to the far east of Russia (Kovalev, 1965).

Most of the ca. 1400 described species of Cynipidae are gall inducers, but around 10-15% do not induce galls and develop as inquilines inside the galls of other cynipids (Ronquist, 1999a; Stone, Melika & Csóka, in press). As a potential descendants of true gall wasps, inquiline cynipids retained the ability to modify the gall tissue directly surrounding them into the characteristic nutritive tissue also found in the larval chambers of the gall inducer, and all are wholly phytophagous. Inquilines can also modify gall structures outside the nutritive tissues, and the entire gall can be either enlarged

(Shorthouse, 1973, 1980) or stunted (Washburn & Cornell, 1981; Wiebes-Rijks, 1982) depending on the number of larvae in the gall, and how the inquiline larvae interact with the gall wasp larva. Inquiline gall wasps are known predominantly from cynipid galls on roses (Askew, 1980, 1984; Brooks & Shorthouse, 1997; Judd, 1959; Nordlander, 1973; Schröder, 1967; Shorthouse, 1973; Shorthouse & Brooks, 1998; Stille, 1984) and oaks (e.g., Askew, 1984; Nieves-Aldrey, 2001a; Nieves-Aldrey & Pujade-Villar, 1985, 1986; Pujade-Villar & Nieves-Aldrey, 1990, 1993; Schönrogge et al., 1994a, 1994b, 1996a, 1996b; Washburn & Cornell, 1981; Pujade-Villar et al., 2003). In contrast, among the herb gall wasps (tribe Aylacini) only some Nearctic and Japanese *Diastrophus* species host cynipid inquilines (*Synophromorpha* species developing in *Diastrophus* cynipid galls on *Rubus* (Ritchie & Shorthouse, 1987b)) and none are known from galls induced by *Eschatocerus* (tribe Eschatocerini) or *Pediaspis* (tribe Pediaspidini). In addition to cynipid hosts, cynipid inquilines are also known to attack galls induced by cecidomyiid gall midges (Diptera, Cecidomyiidae) on *Quercus cerris*: Giraud (in: Houard, 1911) recorded *Synergus variabilis* in galls of *Janetia cerris* (Kollar), whereas Mayr (1872) and Pujade-Villar & Ros-Farré (1998b) recorded *Saphonecrus haimi* from *Janetia cerris* and *S. variabilis* from *Dryomyia circinnans* Giraud and *J. cerris*. One North American species, *Ceroptres inermis* (Walsh, 1864), develops also in the galls of a gall midge, *Cincticornia pilulae* (Osten Sacken) (Diptera: Cecidomyiidae) (Burks, 1979).

A remarkable feature of cynipid inquilines is that they are generally more specific to a particular plant taxon than to a certain host gall inducer. Many *Ceroptres* and *Synergus* species attack a wide range of oak cynipid galls (Askew, 1984; Nieves-Aldrey, 2001a; Nieves-Aldrey & Pujade-Villar, 1985, 1986; Pujade-Villar & Nieves-Aldrey, 1993; Pujade-Villar & Ros-Farré, 1998a, 1998b; Pujade-Villar et al., 2003).

Although inquiline cynipids have lost the ability to induce their own galls de novo, they are nevertheless able to induce the development of larval chambers lined with nutritive tissue inside their host galls, and are apparently wholly phytophagous. Some inquiline cynipids substantially modify the size and/or shape of the host galls on roses (Brooks & Shorthouse, 1997, 1998; Shorthouse, 1980) and oaks (*Synergus clandestinus* in the galls of *Andricus legitimus* (Wiebes-Rijks, 1980)). For example, when the monolocular galls of the rose gall wasp *Diplolepis nodulosa* (Beutenmüller, 1909) are attacked by the inquiline *Periclistus pirata* (Osten Sacken, 1863), the resulting gall is a gall three times the size of one inhabited only by the gall inducer, and containing a mean of 17 larval inquiline larval chambers (Brooks & Shorthouse, 1997).

Depending on their impact on the host galls, inquilines have been classified by Duffett (1968) as lethal inquilines (if they always cause the death of the gall-inducer), non-lethal inquilines (when they never cause the death of the host cynipid) and facultative inquilines. As far as known, inquiline larvae never consume the gall inducer, but feed entirely on gall tissue. Death of the host larva results either from stinging by the ovipositing female (as in *Periclistus* inquilines of *Diplolepis* rose gall wasps (Brooks & Shorthouse, 1997)) or where the host larva is crushed by the developing inquiline larvae (Evans, 1965, 1967, 1972; Weld, 1952a; Shorthouse, 1975; Schönrogge et al., 1994b, 1996a, 1996b). Closely related inquilines may have quite different impacts on their host: For example, in the asexual generation galls of the oak gall wasp *A. kollari*, *Synergus reinhardi* is a lethal inquiline in the larval chamber, while *Synergus umbraculus* develops in the outer wall of the gall and has no obvious negative effect on the gall inducer (Askew, 1984; Schönrogge et al., 1998b, 1999, 2000b). The host larval chamber is a highly competitive environment for inquilines too: *Synergus pallipes* attacks the asexual generation galls of *Cynips quercusfolii* early in their development, causing the death of the gall inducer. Several eggs are laid, and the resulting larvae compete amongst themselves until only one remains (Wiebes-Rijks, 1982).

A detailed catalogue of cynipid inquilines in oak galls from the Western Palaearctic Region is given (Stone, Melika & Csóka, in press).

Figitid inquilines of cynipid galls (Thrasorinae, Figitidae). Kinsey (1920) regarded all cynipoid inquilines as members of the Figitidae. This family consists predominantly of species with a parasitoid life cycle, and he thus believed that none of the inquilines belonged to the same lineage as the true gall wasps. In contrast, Weld (1952a) recognised 10 genera of inquilines within the Cynipidae: *Ceroptres*, *Euceroptres*, *Myrtopsen*, *Periclistus*, *Poncyia*, *Rhoophilus*, *Saphonecrus*, *Synergus*, *Synophromorpha* and *Synophrus*. Ronquist (1994) supported the inclusion of most of these genera within the Cynipidae, but moved *Euceroptres* and *Myrtopsen* back towards the Figitidae. He included them in a group he named the "figitoid inquilines", which he considered to form part of a basal group of the Figitidae "sensu lato". The figitoid inquiline group also includes the genera *Thrasorus*, *Plectocynips*, *Pegacynips*. Further study of cynipoid phylogenetic relationships led Ronquist to place all the genera of "figitoid inquilines" in a separate subfamily, the Thrasorinae, within the Figitidae (Liljeblad & Ronquist, 1998; Ronquist, 1999). Recently described *Parnips* associated with the aylacine gall wasp *Barbotinia oraniensis* on *Papaver* was included in its own subfamily, the Parnipinae (Ronquist & Nieves-Aldrey, 2001). The biology of the figitids associated with cynipid galls is little known (Csóka, Stone & Melika, 2004), and none are associated with oak cynipid galls in Europe. The three known species of *Euceroptres* from North America (Burks, 1979) and one Japanese species (Ashmead, 1904a) are inquilines in oak cynipid galls. The genera *Pegacynips* (with one known species) and *Plectocynips* (with 2 described species) are known only from South America, and were reared from unidentified galls (perhaps induced by the cynipid of the genus *Paraulax*) on southern beech, *Nothofagus* (Ros-Farré & Pujade-Villar, 2002). Most of the figitoid inquilines may in fact be parasitoids of hosts in the galls from which they reared, rather than true inquilines. At least one species, *Parnips nigripes* Ronquist & Nieves-Aldrey, 2001, has been demonstrated to be a parasitoid of *Barbotinia oraniensis* and not an inquiline (Ronquist & Nieves-Aldrey, 2001).

There are also some dipteran, lepidopteran and coleopteran inquilines feed obligately in or on oak cynipid galls (Abe, 1995, 1997a; Csóka, 1997; Eliason & Potter, 2000; Schönrogge et al., 1994b; Skuhravá et al., 1998).

Parasitoids. Approximately 200 species of hymenopteran parasitoids of cynipid galls are known in the Western Palaearctic Region (mainly Europe) (Askew, 1961a; Graham & Gijswit, 1998; Fulmek, 1968; Stone, Melika & Csóka, in press), North America (Felt, 1965; Grissell, 1973a, 1973b, 1976, 1995; Krombein et al., 1979; Peck, 1963) and the Palaearctic Region in general (Graham, 1987, 1991). All known parasitoids that attack cynipid hosts (rather than opportunist gall inhabitants, or weevil or lepidopteran inquilines) are members of Ichneumonidae, Braconidae, and (most importantly in terms of species richness and mortality inflicted on their hosts) families in the superfamily Chalcidoidea.

Almost all the parasitoids reared from cynipid galls are specific to cynipid galls. The few exceptions to this rule are parasitoids (such as *Eupelmus urozonus* and *E. vesicularis* (Eupelmidae), both known to act as secondary parasitoids in the larvae of a range of

Lepidoptera, Diptera and Coleoptera) that also have the broadest range of host cynipids (Noyes, 1998). A few chalcid parasitoids that attack leaf mining moths also occasionally attack structurally similar cynipid galls. For example, the eulophids *Closterocerus trifasciatus* Westwood, 1833 and *Cirrospilus* species (Eulophidae) usually attack leaf mining *Phyllonorycter* moth species on oaks, but also sometimes attack asexual generation 'spangle' galls induced by the oak gall wasps *N. numismalis* and *N. quercusbaccarum* (Askew & Shaw, 1974, 1979). Certain parasitoid species generally only attack cynipid galls induced by members of one gall wasp tribe. Exceptions are *Eupelmus urozonus* Dalman, 1820, *Sycophila biguttata* (Swederus, 1795), *S. flavicollis* (Walker, 1834), *Mesopolobus sericeus* (Förster, 1770), and *Aulogymnus skianeuros* (Ratzeburg, 1844), all of which have been recorded from both oak and rose cynipid galls (Askew, 1984), and *Eupelmus vesicularis* (Retzius, 1783) attacking both herb and oak cynipid galls. However, gall wasps belonging to different tribes are commonly attacked by parasitoids of the same genera: herb, rose and oak gall wasps are all attacked by *Eurytoma*, *Sycophila* (Eurytomidae), *Ormyrus* (Ormyridae), *Torymus* (Torymidae), and *Aprostocetus* (Eulophidae). *Diastrophus* galls (Aylacini) and rose galls are both attacked by ichneumonids in the genus *Orthopelma* (Jones, 1983).

Most parasitoids in cynipid galls are solitary idiobiont ectoparasitoids. The larvae of some species also feed on gall tissue; examples include *Eurytoma longavena* Bugbee, 1951 (Eurytomidae) and *Glyphomerus stigma* Fabricius (Torymidae) in *Diplolepis* rose galls (Wiebes-Rijks & Shorthouse, 1992), *Torymus cyaneus* Walker, 1847 (Torymidae) and *Eurytoma brunniventris* Ratzeburg, 1842 (Eurytomidae) in oak cynipid galls, and *Dichatomus acerinus* Förster in the sexual generation galls of *Pediaspis aceris* (Pediaspidini) (Askew, 1961a, 1984). *Eurytoma brunniventris* can develop to maturity by feeding entirely on gall tissue (Askew, 1999b). Facultative phytophagy allows parasitoid larvae to migrate between insect food sources (as *Eurytoma* larvae do in *Diplolepis* rose galls (Blair, 1944), and also provides an alternative food source when insect hosts are too small to allow complete development (Wiebes-Rijks & Shorthouse, 1992). *Torymus cyaneus* (Torymidae) attacks young host galls, but the larvae feed initially only on gall tissue. This allows the gall wasp and the gall to grow, providing a larger food resource when the parasitoid finally attacks the host larva, and a tougher gall as protection against hyperparasitoids (Askew, 1961a). There are relatively few endoparasitoids in cynipid galls: examples include the chalcids *Pediobius lysis* (Eulophidae) in asexual *Neuroterus* 'spangle' galls, *S. biguttata* (Eurytomidae), which attacks a range of European oak cynipids, and *Orthopelma* ichneumonids associated with *Diplolepis* rose galls. Females of *S. biguttata* attack early in gall development, and their eggs remain dormant within the host until the gall is fully developed (Askew, 1961a; Schönrogge et al., 1995). Gregarious parasitoids are also rare in cynipid communities: e.g., *Baryscapus berhidanus* Erdös, 1954 (Eulophidae), which attacks the gall inducer in the asexual generation galls of European oak cynipids including *A. quercuscalicis* (Schönrogge et al., 1995).

The main factors determining parasitoid community composition are gall structure, location on the host plant, and its season of growth (Askew, 1984). Galls that develop on the same plant part at the same time, and are of a similar size and structure, tend to have similar communities (Askew, 1961a, 1984). The galls induced by the two generations in most oak cynipid lifecycles commonly differ substantially in structure, and may also be induced on different host plants. The parasitoid communities associated with the two generations of the same species often shows no overlap (Askew, 1961a). Species common to both generations may occupy different niches in the two generations. For example *Cecidostiba fungosa* Geoffroy, 1785 (Pteromalidae) attacks the gall inducer in the sexual *A. quercuscalicis* galls, however, in the asexual galls, it attacks inquilines in the outer gall tissue. At a community level, the hosts available to parasitoids in the spring are individually smaller and develop more rapidly than those available later in the summer/autumn asexual generations. Perhaps as a result, some of the larger parasitoids (such as *Megastigmus stigmatizans* (Fabricius, 1798)) only have a single generation each year, while many of the smaller parasitoids and inquilines attack a different host range in two or more generations through the year.

Parasitoids associated with Aylacini. The parasitoid communities of herb cynipid galls are relatively poorly known, and are apparently less species rich and diverse than those associated with rose and oak gall wasps. In addition to those genera shared with other gall wasp tribes, aylacine galls are attacked by other genera absent from oak and rose gall communities, including *Idiomacromerus*, *Pseudotorymus* (Torymidae), *Homoporus*, *Trichomalus*, *Pteromalus*, *Stinoplus* (Pteromalidae), and *Calosota* (Eupelmidae). Aylacine gall communities associated with *Diastrophus* galls on *Rubus* are the best studied: *D. rubi* in Europe (Pujade-Villar, 1992c; Zerova, 1995; Nieves-Aldrey, 2001a) and *D. kincaidii* Gillette, 1893 in the USA and Canada (Wangberg, 1976; Jones, 1983). The dominant elements of the *Diastrophus* parasitoid complexes are similar on both continents, involving related species of *Eurytoma* (*E. brevivena* Bugbee, 1958 in North America and *E. mayri* Ashmead in Europe), *Torymus* (*T. fagopirum* (Provancher, 1881)) and *T. solitarius* (Osten Sacken, 18710) in North America and *T. rubi* Mayr in Europe), and the transpalaearctic *Eupelmus vesicularis* in both host species. With the exception of *E. vesicularis*, which is also present uncommonly in oak gall communities, the parasitoids in *Diastrophus* gall communities on *Rubus* spp. are specific to these hosts.

Parasitoids associated with Diplolepidini. Parasitoid communities associated with rose cynipid galls have been intensively studied (Askew, 1960a; Nieves-Aldrey, 1980, 1983a, 2001; Nordlander, 1973; Pujade-Villar, 1992c, 1992d, 1993c; Shorthouse, 1973, 1975; Schröder, 1967; Stille, 1984; Zerova, 1995; Zerova & Diakontschuk, 1976), especially those of the European species *D. rosae* and the North American *D. polita* (Ashmead, 1890) and *D. nodulosa* (Brooks & Shorthouse, 1997; Bugbee, 1951; Judd, 1959; Shorthouse, 1973, 1975, 1993; Wiebes-Rijks & Shorthouse, 1992). Parasitoid species composition in rose cynipid galls differs from those in aylacine and oak galls in that ichneumonid parasitoids (particularly *Orthopelma*: Orthopelmatinae) can inflict significant mortality (Schröder, 1967; Stille, 1984; Shorthouse & Brooks, 1998). *Diplolepis rosae* was introduced to North America by the early 1950's and brought with it several palearctic parasitoid species, including *Orthopelma mediator* Thunberg (Ichneumonidae), *Torymus bedeguaris* Linnaeus (Torymidae), and *Pteromalus bedeguaris* (Thomson) (Pteromalidae) (Muesebeck et al., 1951; Judd, 1959).

Parasitoids Associated with Eschatocerini and Pediaspidini. The communities associated with acacia gall wasps are little studied. Six chalcid parasitoids are known to attack the sexual generation leaf-galls of *Pediaspis aceris* in Spain (Pediaspidini) (Nieves-Aldrey, 2001a). Two of these (*Eupelmus splendens* Förster and *Mesopolobus sericeus*) are also known from oak cynipid galls: *E. splendens* is extremely rare in oak galls, while *M. sericeus* is scarce in *Pediaspis* galls. The other three species, *Eurytoma* sp., *Aulogymnus aceris* Förster and *Dichatomus acerinus*) are known only from *Pediaspis* galls. De Santis et al. (1993) reared parasitoids of three pteromalid genera (four *Aditrochus*, two *Espinosa*, 1 *Lanthanomyia*), an *Aprostocetus* sp. (Eulophidae), and an unspecified torymid from *Paraulax* galls on *Nothofagus* in Chile and Argentina. De Santis et al. (1993) also refer to two other pteromalid genera (*Plastobelyta* and *Cecidoxenus*) reared from galls on *Nothofagus* that may have been induced by *Paraulax* (Bouček, 1988).

Parasitoids associated with Cynipini. The best-studied cynipid communities are those associated with oak gall wasps in Europe. (Askew, 1960b, 1961a, 1961b, 1961c, 1961d, 1961e, 1961f, 1965, 1966, 1975, 1980; Askew & Nieves-Aldrey, 1982, 1988; Braune, 1992; Gilbert et al., 1994; Hails & Crawley, 1991, 1992; Melika, 1993; Melika et al., 1997, 2002a, 2002b, 2002c; Nieves-Aldrey, 1983c, 1983d, 1983e, 1983f, 1984a, 1984b, 2001; Nieves-Aldrey & Askew, 1988; Pfützenreiter & Weidner, 1958; Plantard & Hochberg, 1998; Plantard et al., 1996; Pujade-Villar 1989, 1992a, 1992c, 1992d, 1992e, 1992f, 1993c, 1994c, 1994d; Pujade-Villar & Bellido, 1999; Schönrogge & Crawley, 2000; Schönrogge et al., 1994a, 1994b, 1996a, 1996b, 1998b, 1999, 2000b; Sitch et al., 1988; Stone et al., 1995; Wiebes-Rijks, 1982; Zerova, 1995; Zerova & Diakontschuk, 1978). Oak gall communities in general are the most species-rich of any gall wasp group, probably reflecting both the species-richness of the hosts, and the amount of research effort invested in them. European oak cynipids support at least 120 species of chalcid in six families - Pteromalidae (27 species), Eurytomidae (10 species), Torymidae (18 species), Ormyridae (2 species), Eupelmidae (8 species), and Eulophidae (30 species).

Far less is known about the parasitoids and other causes of mortality associated with oak gall wasps in the Eastern Palearctic and Nearctic Regions (Bailey & Stange, 1966; Bugbee, 1967; Fernandes et al., 1999; Grissell, 1973a, 1973b, 1976, 1995; Taper et al., 1986; Washburn & Cornell, 1981; Zuparko, 1996). The exception to this rule is provided by the extensive and detailed work on the chestnut gall wasp, *Dryocosmus kuriphilus* (Yasumatsu). This work has centred particularly on the search by Japanese entomologists for a biological control agent capable of reducing the damage this gall wasp causes to chestnut trees in Japan (Miyashita et al., 1965; Moriya et al., 1989; Murakami, 1981; Otake et al., 1984 and many others) and now in Europe also (Schönrogge et al., 2006, Aebi et al., 2006).

Chapter 4. Phylogeny and Evolution of Cynipidae

Diagnostic features of cynipoids (Cynipoidea) were give in the introductory part and as it was mentioned that cynipoid wasps are fall into two groups: macrocynipoids and microcynipoids (Ronquist, 1995a, 1999a). The phytophagous gall wasps (gall inducers and inquilines) belong to the microcynipoids. During the last decade the Cynipoidea and particularly Cynipidae have been subject to intense phylogenetic research based on morphological characters of adults, gene sequences and gall structures (Cook et al., 2002; Liljeblad, 2002; Liljeblad & Ronquist, 1998; Liljeblad et al., 2002; Rokas, 2001; Rokas et al., 2001, 2002, 2003; Ronquist, 1995a, 1999a; Ronquist & Liljeblad, 2001; Ronquist & Nieves-Aldrey, 2001; Stone & Cook, 1998). The main autapomorphies of the superfamily Cynipoidea are given in the introductory part. The higher phylogeny of Cynipoidea was summarized by Ronquist (1999a) (Fig. 16).

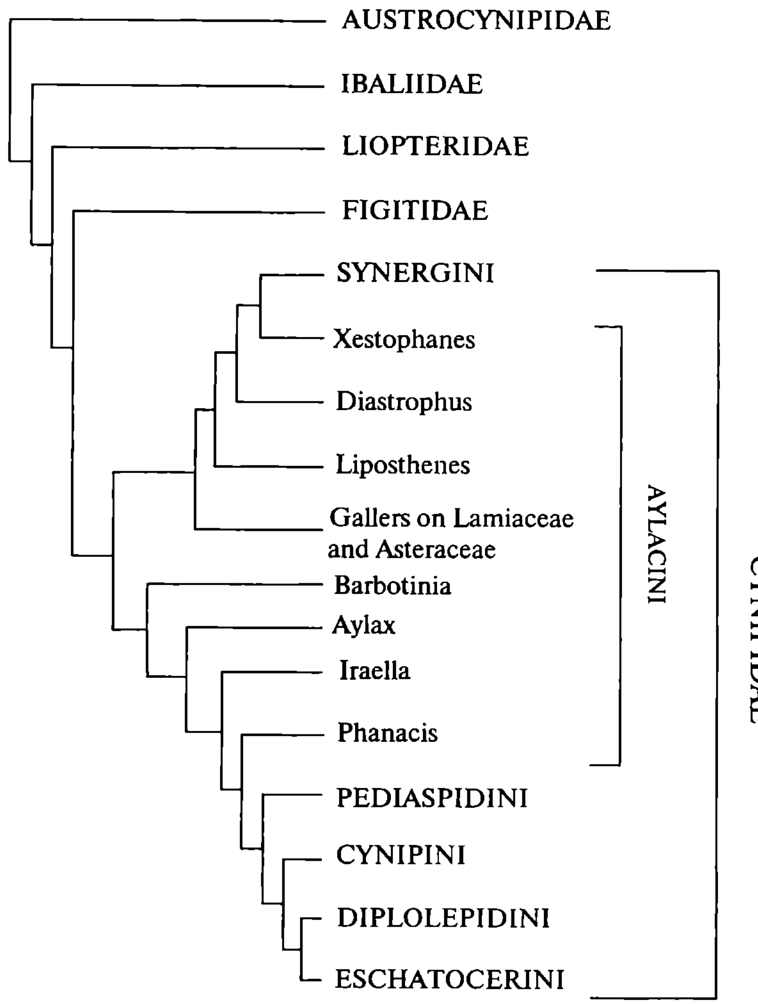


Fig. 16. Relationships among Cynipidae and other Cynipoidea families based on analyses of adult morphology (modified from Nylander, 2004, adapted from Ronquist, 1995a, 1999a; Liljeblad & Ronquist, 1998; Liljeblad, 2002).

The macrocynipoids form a basal paraphyletic grade falling into three lineages, the Austrocynipidae, Ibaliidae, and Liopteridae (Fig. 16). The microcynipoids (Cynipidae and Figitidae) are monophyletic and form two monophyletic sister lineages, the phytophagous Cynipidae and the parasitic Figitidae (s. lato) (Fig. 16). Of the five major cynipoid lineages proposed by Ronquist (1999a), the Figitidae (s. lat.) is the only one whose monophyly is controversial. Ronquist's concept of the family agrees with that of Rasnitsyn (1980) in the inclusion of three taxa of parasitic microcynipoids: Charipinae, Eucolinae and Anacharitinae, earlier treated as separate families. Ronquist (1994) slightly expanded Rasnitsyn's concept by transferring some gall-associated taxa from the Cynipidae to the Figitidae and grouped them with other gall-inhabiting figitids under the name "figitoid inquilines" and put them into Thrasorinae (Ronquist, 1999a) (more details about this group and a sister subfamily Parnipinae see in Chapter 2).

Phylogeny of Cynipidae

The higher phylogeny of the Cynipidae were treated in several recent papers (Ronquist, 1994, 1999; Liljeblad & Ronquist, 1998; Ronquist & Liljeblad, 2001; Nylander, 2004). Immediate ancestors of cynipids were parasitoids of Hymenoptera larvae developing inside galls, perhaps gall-inducing Hymenopteran larvae. This is the biology of extant figitids (subfamilies Thrasorinae and Parnipinae), which are though to form the earliest figitid lineages (Ronquist, 1999a; Nylander, 2004). There were two conflicting views on the origin and early evolution of the gall-inducing cynipids. Kinsey (1920a) suggested that the first cynipids were herb stem gallers on Asteraceae and made cryptic galls without visible affecting the external structure of the plant and regarded them as stem feeders rather than true gallers. Malyshev (1968) suggested that the first cynipid gallers were associated with oaks and roses and made galls inside seeds. Ronquist & Liljeblad (2001) reconstructed the evolution of life-history traits in Cynipidae and showed that the first cynipids induced distinct, monolocular galls in reproductive organs of Papaveraceae or Lamiaceae. They also showed that there has been a general trend towards more complex galls in Cynipidae and the herb-stem "feeders" evolved from ancestors inducing distinct galls. The phytophagous cynipid gall inducers and inquilines are forming a natural group. In addition to their unique phytophagous habit, a number of synapomorphies in their morphology is known (see the Introduction and also Liljeblad & Ronquist, 1998). Liljeblad & Ronquist (1998), Ronquist (1999a, 1999b), Ronquist & Liljeblad (2001) divided Cynipidae into three groups: a) inquilines (the tribe Synergini), b) the herb gallers (tribe Aylacini), and c) the woody rosid gallers (tribes Diplolepidini, Eschatocerini, Pediaspidini and Cynipini) (Figs 16-17). The last group comprises species exclusively associated with trees and bushes, oaks and roses. The herb gallers restricted to herbs, except few species in the genus *Diastrophus* that induce galls on *Rubus* bushes and *Smilax* vines. Externally, the galls of the woody rosid gallers are more complex than those of the herb gallers, however, internally, the galls are fundamentally similar. It has been shown that the inquilines evolved from cynipid gall inducers and that they share a common origin and has subsequently radiated to exploit different cynipid and non-cynipid hosts (Ronquist, 1994, 1999a). Liljeblad & Ronquist (1998), Ronquist (1999a) suggested a basal split in the cynipid phylogeny between one lineage leading to the inquilines and another one (the *Barbotinia-Cynips*) leading to the woody rosid gallers, which form a monophyletic group, and thus, the inquilines represent separate terminal offshoots of a paraphyletic basal assemblage of herb-galling lineages (Fig. 16). The tribe Cynipini (the oak gall wasps) is likely to be monophyletic (Ronquist, 1994; Liljeblad &

Ronquist, 1998; Ronquist 1999a) but a number of intergeneric relationships within the group are still questionable (in details see below).

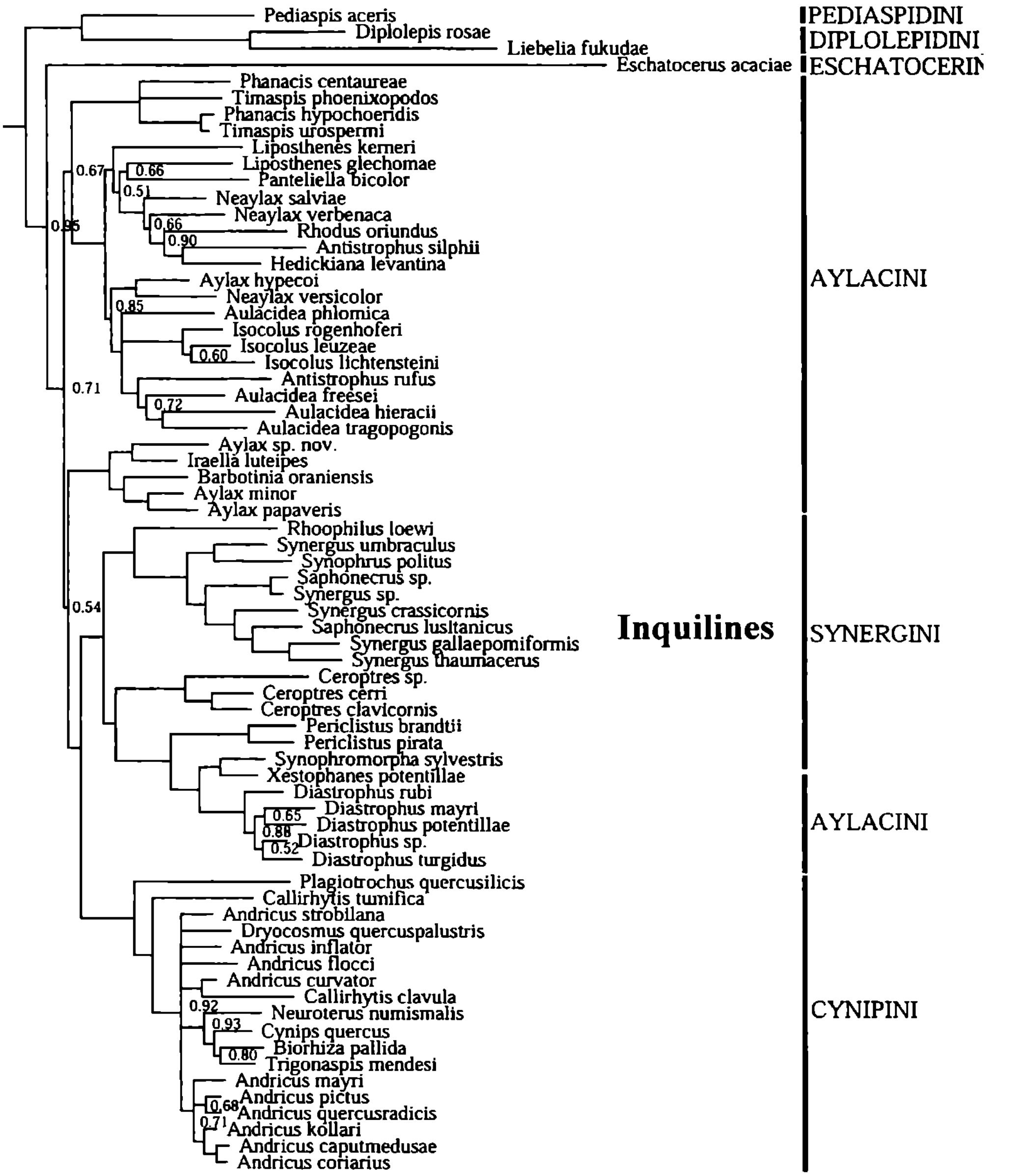


Fig. 17. Majority-rule consensus tree from analysis of three genes (EF1α, COI, 28S) combined with morphology (after Nylander, 2004).

On the basis of the morphological analysis, the Cynipini together with the Eschatocerini, Diplolepidini and Pediaspidini, thought to be form a monophyletic group and within the woody-rosid gallers there was an evidence for sister group relationship between the Diplolepidini and Eschatocerini, and between the Cynipini and Pediaspidini (Liljeblad & Ronquist, 1998). However, a recent molecular analysis arised a conflict concerns the monophyly of the woody-rosid gallers, which all induce galls on woody members of the rosid clade of eudicots (Nylander, 2004). The DNA sequences of the woody-rosid gallers that are not associated with oaks (Diplolepidini, Eschatocerini and Pediaspidini) are distant from each other and from the Cynipini and other cynipids. The non-oak woody-rosid gallers are basal to the rest of the Cynipidae (Fig. 17).

Below we are giving more detailed phylogenetic analyses for the three main tribes of Cynipidae, the Aylacini, Cynipini and Synergini.

Aylacini

It is obvious that the tribe Aylacini is a paraphyletic group. According to the morphological phylogenetic analyses (Liljebald & Ronquist, 1998) the genera in this tribe fall into three main lineages:

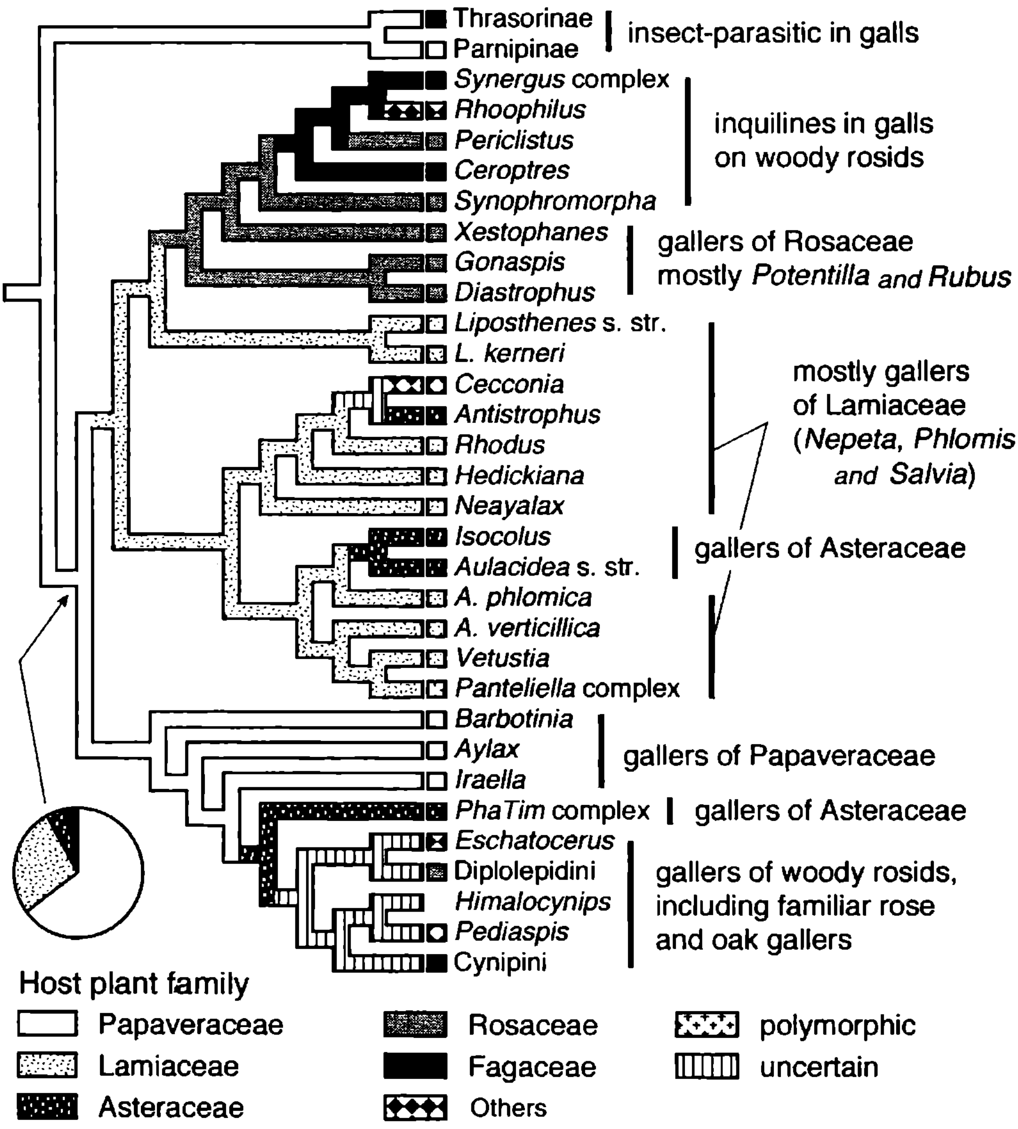


Fig. 18. Inferred ancestral host plants of cynipids (after Ronquist & Liljeblad, 2001). The pie chart indicates the relative probabilities of three alternative ancestral plant families (Papaveraceae, Lamiaceae and Asteraceae).

1) The *Cynips-Barbotinia* lineage. Within this lineage, *Phanacis* (=*Timaspis*), *Asiocynips, Zerovia* (not included into Liljeblad & Ronquist (1998) analyses) and the herein described genus *Diakontschukia* form a monophyletic group. These genera consist of small cynipids that induce inconspicuous stem galls on Asteraceae and occasionally, Lamiaceae and Apiaceae. The *Phanacis* complex is a sister group of the woody rosid gallers (Cynipini, Eschatocerini, Diplolepidini and Pediaspidini) while *Aylax, Iraella* and *Barbotinia*, associated with hosts in the Papaveraceae, form basal branches in this lineage (Fig. 18). *Phanacis* and *Timaspis* were synonymized by Eady & Quinlan (1963), re-established by Nieves-Aldrey (1994b) and again synonymized in this work. It is a distinct genus within Aylacini in several morphological characters, including their elongate metasoma. *Asiocynips, Zerovia* and *Diakontschukia* belong here too.

2) The *Synergus-Liposthenes* lineage. Inquilines were grouped together with the Aylacini genera associated with rosaceous hosts; *Xestophanes* was strongly supported as the sister group of the inquilines. This group also includes some gall inducers on Lamiaceae, particularly those from the genus *Liposthenes* (Fig. 18).

3) The *Isocolus-Neaylax* lineage consists of entirely Aylacini genera, mainly gall inducers on Asteraceae and Lamiaceae, such as *Isocolus* and *Neaylax* (Fig. 18). However, the relationships within the *Isocolus-Neaylax* clade are poorly supported. At the generic level, the genus *Aulacidea* is polyphyletic.

There is much congruence between morphological and molecular phylogenetic analyses of Aylacini. For example, the DNA data and combined analyses support the *Isocolus-Neaylax* clade of gallers on Asteraceae and Lamiaceae, with including the genus *Liposthenes* into it (Nylander, 2004). The DNA and combined analyses further support the monophyly of the *Phanacis* complex of Asteraceae gallers, and the monophyly of a clade of Papaveraceae gallers, previously thought to be a paraphyletic clade (Nylander, 2004).

Cynipini

Morphology and sequence data both strongly support the monophyly of the Cynipini (Ronquist & Liljeblad, 2001; Liljeblad, 2002; Nylander, 2004; Nylander et al., 2004) and morphological (Liljeblad, 2002) and sequence data (Rokas et al., 2002) support the existence of three major lineages within the tribe (Fig. 19): a) the *Neuroterus*-group (*Plagiotrochus, Neuroterus, Pseudoneuroterus* and *Trichagalma* and, in sequence based analyses, *Aphelonyx*), b) the *Cynips* group (*Biorhiza, Trigonaspis, Cynips* and some closely related nearctic genera), and c) a group including the paraphyletic genus *Andricus* and related taxa.

Phylogenetic analyses support *Plagiotrochus* as the sister group of *Dryocosmus*, and these are clearly separated from the other genera (Ács et al., 2006a). The Cytb data also suggest a relationship between the *Dryocosmus* clade and *Trichagalma*. Both results support the association between *Dryocosmus* and the *Neuroterus* lineage proposed by Liljeblad (2002) (consisting of *Plagiotrochus, Neuroterus, Pseudoneuroterus* and *Trichagalma*) on the basis of morphological data. The validity of the *Neuroterus* lineage is supported by a later sequence-based analysis (Rokas et al., 2003b), which supported the existence of an equivalent clade, including *Trichagalma serratae, Neuroterus lanuginosus, N. saliens, Pseudoneuroterus macropterus, Dryocosmus nitidus, Aphelonyx cerricola* and *Plagiotrochus quercusilicis*. This clade consists entirely of gall wasps inducing their galls on section Cerris oaks. The phylogenetic position of *Dryocosmus* thus supports the overall pattern of rarity of shifts between different oak sections in the

Cynipini. The genus *Neuroterus* includes many species that induce galls on oaks outside the section Cerris (western palearctic examples attacking section *Quercus* s. str. oaks include *N. quercusbaccarum*, *N. numismalis*, *N. anthracinus*), and ongoing sequence-based work using 28S, Cytochrome b and opsin gene sequences suggests that these species are distinct from those in the Cerris-associated clade.

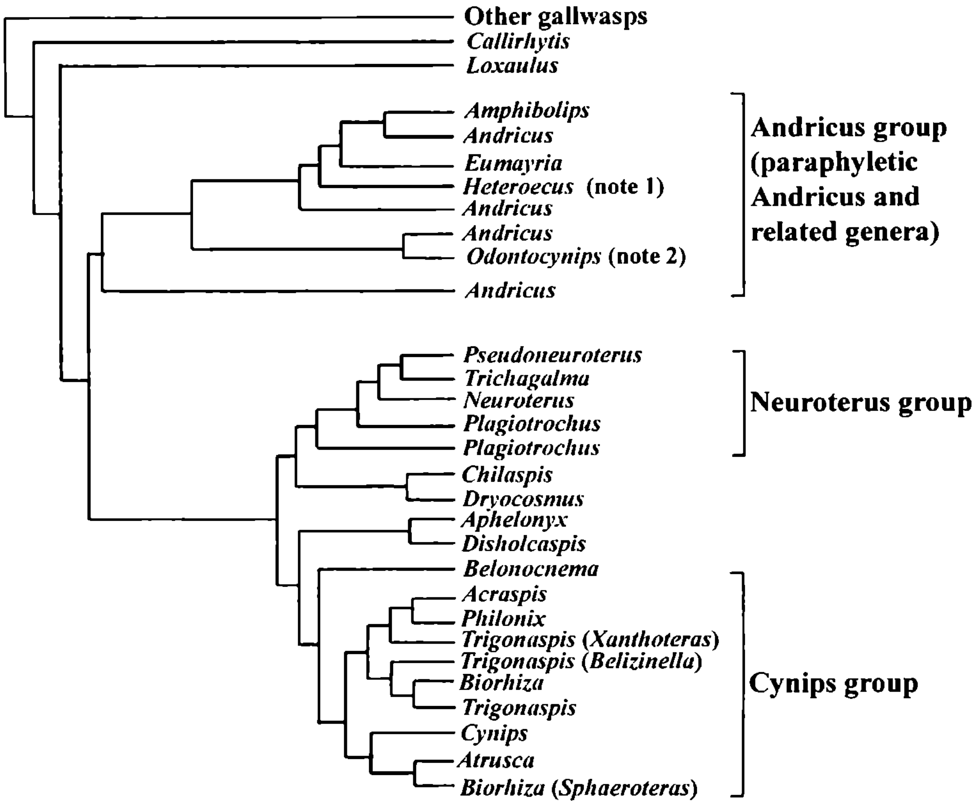
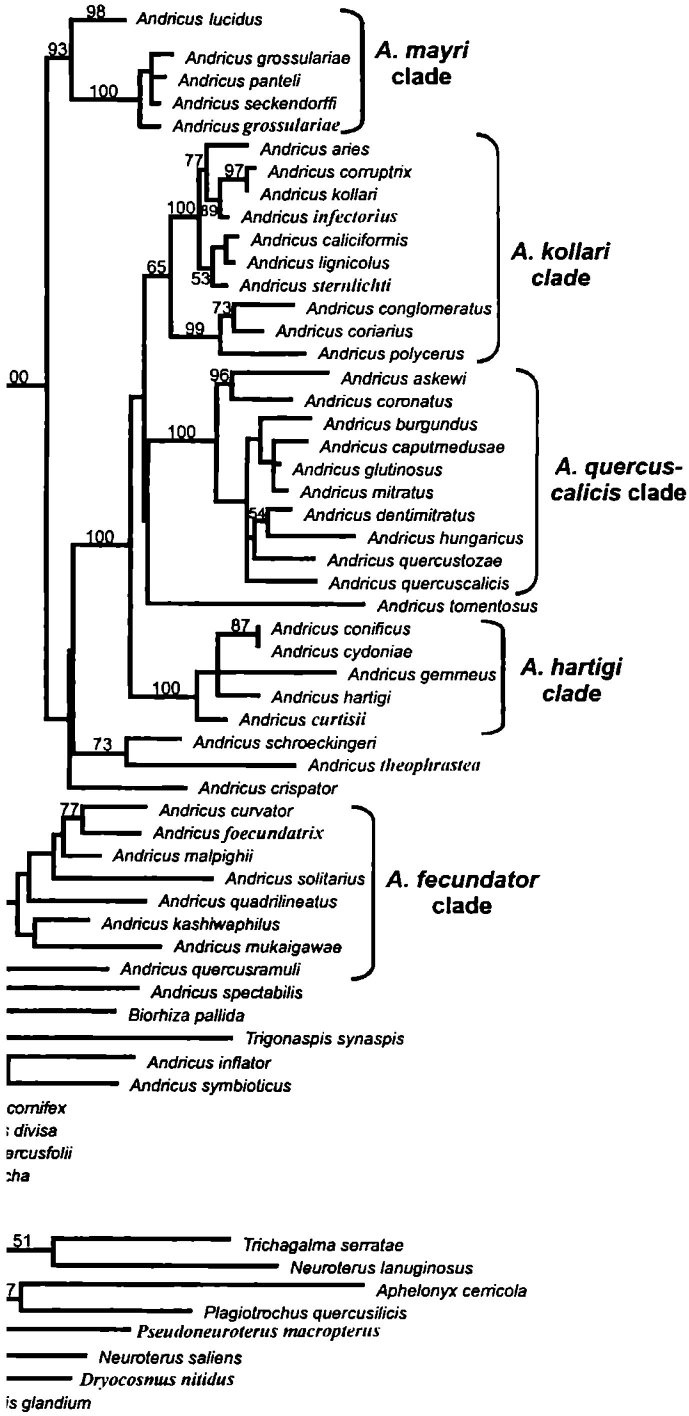


Fig. 19. Phylogenetic relationships among gall wasp genera, based on morphological characters (modified from Liljeblad, 2002, fig. 7; Ács et al., 2006a).

Section Cerris oaks are absent from America and probably evolved at mid-latitudes in Asia. The western palaearctic Cerris oaks are almost certainly derived from Asian species that spread westwards along the foothills of the Himalayas, followed by adaptive radiation in Turkey and the Near East, where the extant species richness is highest (Rokas et al., 2003a). Among the Cerris-associated gall wasps, known species richness is currently highest in the western Palaearctic Region, primarily because of the richness of *Plagiotrochus* in southwestern Europe. This pattern of richness could result either from gall wasps following the westwards dispersal of their oak hosts, followed by adaptive radiation in the Western Palaearctic Region, or a western origin of section Cerris associations, followed by dispersal eastwards. Distinction between these hypotheses requires extensive sampling of eastern palaearctic faunas. Both *Dryocosmus* and *Plagiotrochus* (with a plesiomorphic species, *Plagiotrochus semicarpifoliae* (Cameron, 1902), in Southeast Asia (Bellido et al., 2000) and further unidentified *Plagiotrochus* from South Korea) span the Palaearctic Region (Bellido & Pujade-Villar, 2001), implying longitudinal dispersal events by section Cerris-associated gall



ensus tree based on Cytochrome b from 62 species of oak gall wasps

The phylogenetic relationships within the western palaearctic *Andricus* species were studied on the basis of gall structures' evolution traits (Stone & Cook, 1998) and gene sequences (Rokas, 2001; Rokas et al., 2002). The western palaeacrtic *Andricus* species involved into the analyses dividing into five clades: a) the *Andricus mayri* clade, b) the *A. quercuscalicis* clade, c) the *A. kollari* clade, d) the *A. hartigi* clade, and e) the *A. foecundatrix* clade, and some species (*A. inflator*, *A. solitarius*, *A. hystrix*, *A. gallaeurnaeformis*) are nested on the tree away from the main *Andricus* clade which is subdividing into the five mentioned subclades (Fig. 20). From all *Andricus* species involved into the analyses, two species, *A. gallaeurnaeformis* and *A. hystrix* appeared to be very basal to all five clades and forming a sister group to all other *Andricus* species. The position of these two divergent species suggests that the western palaearctic *Andricus* as currently defined, is at least diphyletic or even triphyletic, if *A. inflator* is genuinely separated from the main clade. The phylogenetic relationships within the *Andricus* genus is even more unclarified if all the holarctic species should be involved into the analyses and also reperesentatives of some nearctic genera, part of which recently was synonymized to *Andricus* (Melika & Abrahamson, 2002). Some apotypic nearctic genera, *Amphibolips*, *Erythres*, *Dros*, *Eumayria*, *Heteroecus*, *Odontocynips* and some *Callirhytis* species are deeply nested within the *Andricus* lineage. The large genus *Andricus* as currently was define, is a paraphyletic group and need a complete research in order to solve its phylogenetic position within Cynipini-Cynipidae.

Synergini

Most of the ca. 1400 described species of Cynipidae are gall inducers, however, around 10-12 % of known species lost their capability to induce galls and they are developing as inquilines inside galls of other cynipids. They are classified within the tribe Synergini, which comprises around 145 species, classified into seven genera (for details see Synergini in the special part of the book). Recent taxonomic and phylogenetic works strongly increased our understanding of this group (Pujade-Villar et al., 2003; Melika et al., 2004, 2005; Sadeghi et al., 2006a, Ács et al., 2006b; Pénzes et al., 2006). The tribe Synergini has until recently been regarded as a monophyletic group, and remains so in formal terms (Ronquist, 1994). The cynipid inquilines supposedly originating within the Aylacini, particularly most closely related to *Diastrophus* and *Xestophanes*. The tribe shares such main synapomorphies as the anterior margin of the clypeus is straight, irradiating striae on the lower face reach antennal foramens, gulae reduced to a long narrow median strip, gular sulci united well before reaching the hypostoma, the third and fourth abdominal terga, at least in females, are fused (Liljeblad & Ronquist, 1998). Adult (Ronquist, 1994; Ronquist & Liljeblad, 2001; Liljeblad, 2002; Fig. 17) and larvae (Nieves-Aldrey et al., 2005) morphology lends strong support to the monophyly of Synergini, although recent DNA sequence data suggests that inquilines have evolved from gall-inducing ancestors several times and split the inquilines into three separate groups: a) the *Synergus* complex, including the afrotropical *Rhoophilus*; b) the genus *Ceroptres* of oak inquilines; c) the *Periclistus* and *Synophromorpha* inquilines in Rosaceae gallers from *Diastrophus* and *Xestophanes* genera, which are nested among them (Nylander et al., 2004, fig. 3). The molecular data obtained by Nylander et al. (2004) were somewhat inconclusive regarding the relationships among the mentioned three lineages but indicated that they might have separate origins, and appear as a grade close to the base of the Cynipidae tree. When the molecular data was combined with morphological data, the three inquiline groups end up in a single monophyletic clade, still with woody-rosid gallers *Diastrophus* and *Xestophanes* nested within this clade (Fig. 17). Nevertheless, molecular work suggests that inquilines might represent 3 distinct evolutionary lineages, diverging within the paraphyletic „Aylacini" assemblage. The conflict between conclusions based on sequence and morphological data is striking. If the signal from sequence data is correct, then there must be very high levels of morphological convergence in some of the traits defining inquiline taxa. Conversely, if morphology is actually telling us the truth, then there must be complex variation in patterns of sequence evolution within the Cynipidae (Nylander et al., 2004).

We used three genes (mitochondrial COI and Cytb, and nuclear 28S) fragments for resolving the phylogeny of the Synergini tribe. These genes were effective in the recent studies on the phylogenetic relationships among other Cynipoidea wasps at the similar taxonomic level. Multiple sequences were obtained for around 50, mainly palaearctic, Synergini species.

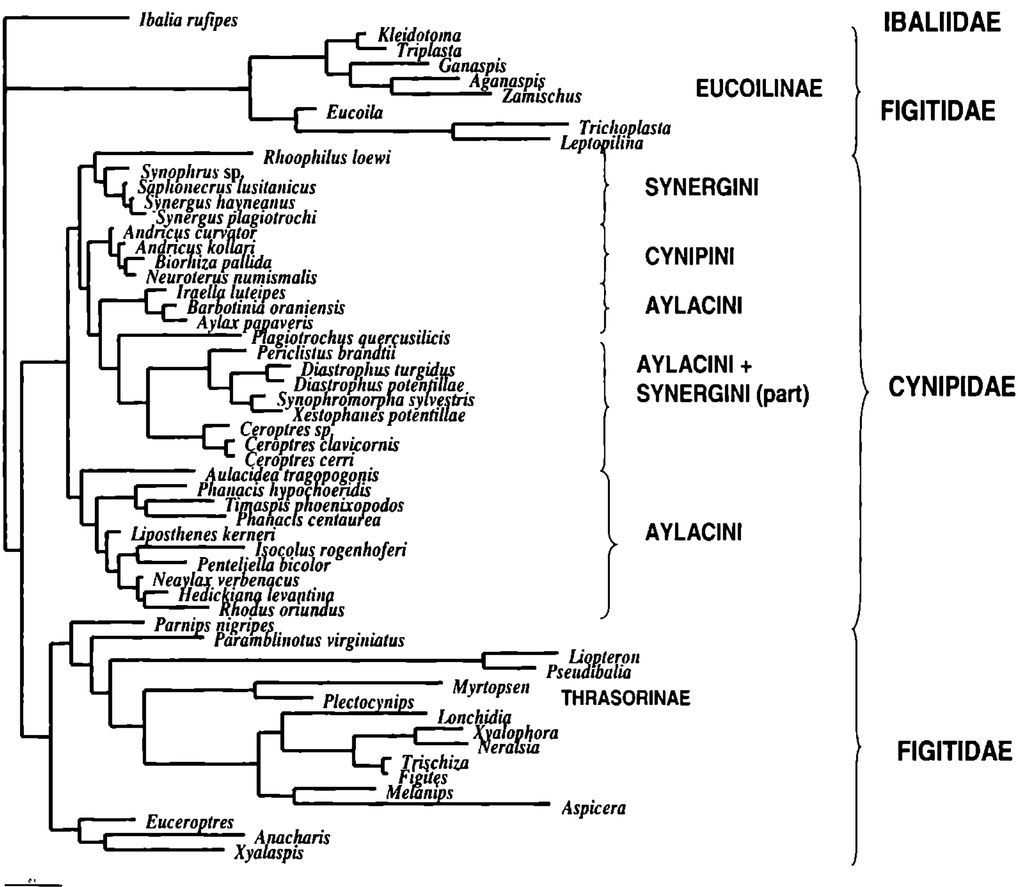


Fig. 21. Majority-rule consensus tree based on 28S rDNA data analyzed under GTRIG model.

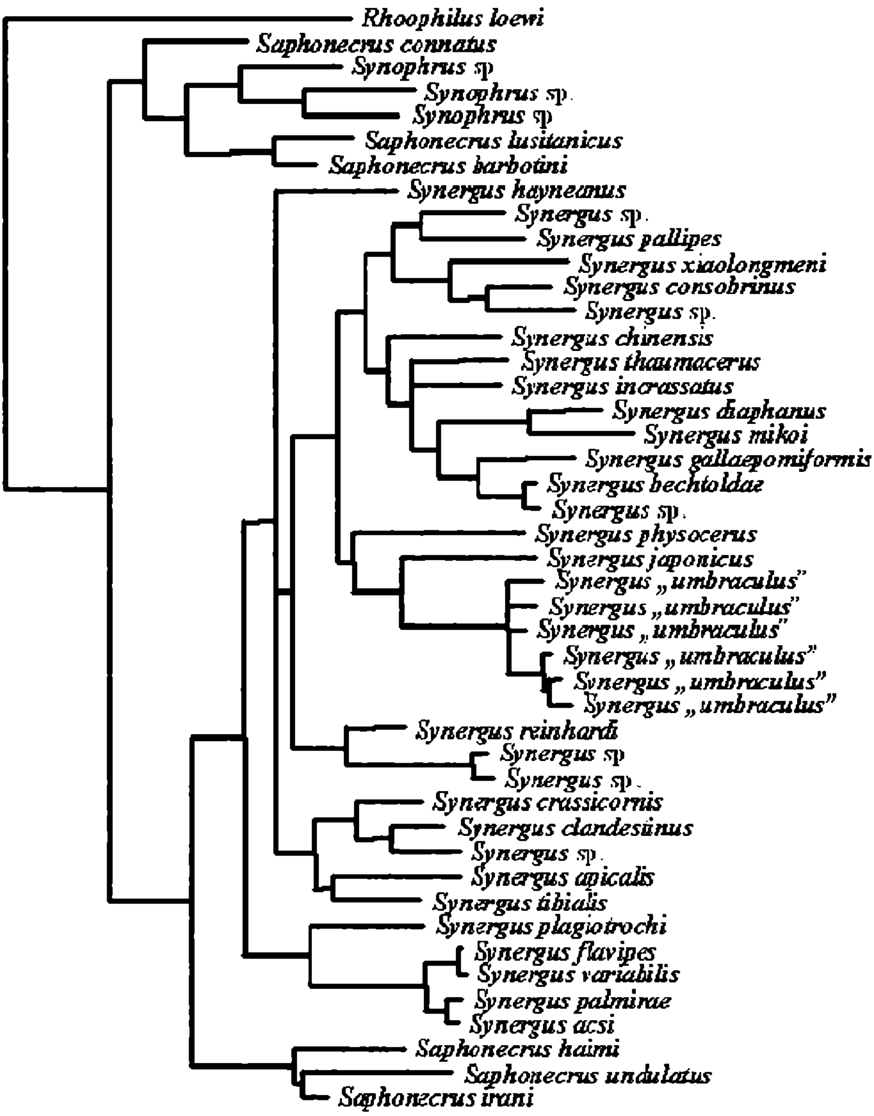


Fig. 22. Majority-rule consensus tree based on nuclear (28S D2) and mitochondrial (COI) data analysed under GTRIG model. The *Synergus/Synophrus/Saphonecrus* lineage.

A large scale analysis, with involving many available sequences of gall inducer and parasitic cynipids from Genbank, support the hypothesis of multiple evolutionary lineages within inquilines, with some modification.

The **first**, *Synophromorpha-Periclistus-Ceroptres* lineage, is related to woody rosid Aylacini line. *Synophromorpha* and *Periclistus* inquilines appeared to be in a close relationship with gall inducers *Xestophanes* and *Diastrophus*. The *Ceroptres* oak cynipid gall inquilines are most closely related to this lineage. Phylogenetic studies by Ronquist (1994), Ronquist & Liljeblad (1998), and Ronquist & Liljeblad (2001) suggested that *Ceroptres* was the most basally diverging lineage among the Synergini associated with cynipid galls on oak. However, our sequence-based analyses challenge this view, and *Ceroptres* may represent an evolution of inquilinism in oak cynipid galls that is independent of the *Synergus/Synophrus/Saphonecrus* clade (Fig. 21).

The **second** distinct lineage, *Synophrus-Saphonecrus-Synergus* (Fig. 22), is divided into four subclades:

1. *Synophrus* spp., *Saphonecrus connatus, S. barbotini,* and *S. lusitanicus*;
2. *Saphonecrus haimi, S. undulatus* and some recently described species from Iran (Sadeghi et al., 2006a);
3. *Synergus plagiotrochi, S. variabilis, S. flavipes* and 2 recently described *Synergus* species from Iran (Sadeghi et al., 2006a);
4. *Synergus* spp. (all other species, except subclade 3).

Monophyly was not been proven for none of the four subclades. The *Synophrus* subclade is one of the basic line in this complex. For a long time it was considered as an gall inducer; later, based on its morphology, it was moved to inquilines, Synergini tribe. The biology of *Synophrus* is still not clear. The adult wasps emerge from spherical, hard, lignified monolocular galls, which occur only on Cerris section oaks. Sequenced *Synophrus* specimens have had rather different haplotypes for those collected in Hungary and another ones from Spain and Algeria. As the result, at least three different sibling species must be exist in Europe and North Africa. The genus *Saphonecrus* splitted into three distinct lineages and thus, do not form a monophyletic group as it was thought earlier (Fig. 22). *Saphonecrus lusitanicus* and *S. barbotini*, known from the Iberian Peninsula only, are very closely related to the *Synophrus* species-group, and form a monophyletic group with *Synophrus* species and presumably must be moved into this genus. The European-wide distributed *Saphonecrus connatus* is also somewhat close to the *Synophrus* complex, however, this species differs from *Synophrus* and two mentioned *Saphonecrus* species, *S. lusitanicus* and *S. barbotini*, by both, DNA sequences and morphological and biological pecularities. It is known to associates with many gall wasp hosts, living on both, Cerris and Quercus section oaks, while species of the *Synophrus* complex restricted to Cerris section oaks only. The rest of the western palaearctic *Saphonecrus* species (*Saphonecrus haimi, S. undulatus and S. irani*) are forming a very distinct, separated line. Based on the genetic and some morphological differences, this line must be handled as a distinct genus, separately from the rest known *Saphonecrus* species (Fig. 22).

Out of all *Synergus* species, the „*S. flavipes*" group (*S plagiotrichi, S. variabilis, S. flavipes* and two species described from Iran, *S. acsi* and *S. palmirae* (Sadeghi et al., 2006a)) forms a distinct separate line -- a sister clade to all other *Synergus* species, and thus, must be also treated as a separate genus (Fig. 22). The „*S. variabilis*" group also forms a monophyletic clade within *Synergus* species. On the basis of morphological peculiarities, Mayr (1872) subdivided the European *Synergus* species into Section I and Section II and most of the subsequent researchers have followed him. This morphological subdivision of *Synergus* do not proven by molecular data. Due to a large scale sampling of *Synergus* inquilines, reared from different oak cynipid galls, five distinct haplotypes were found within the Hungarian material only, which significantly differs from known nominated *Synergus* species. They can be considered as new species. Also a very high genetic variability was found within *Synergus umbraculus* samples and, no doubts, under „*S. umbraculus*" a group of cryptic sibling species can be find.

The basal clades of *Synergus* complex, *Synophrus*, *Saphonecrus*, „*Synergus flavipes*" and „*Synergus variabilis*" groups are associated with cynipid galls on Cerris section oaks only. Within mentioned basal groups, only three inquiline species: *Saphonecrus connatus*, *Synergus thaumacerus* and *S. physocerus*, are associated with both, Cerris and Quercus s. str. sections of oaks. Cerris section oaks are restricted to the Palaearctic

Region, thus the *Synergus* complex probably originate there from. The host shift from the Cerris section to Quercus s. str. section oaks was proposed (Ács et al., 2006b). Considering the high diversity of *Synergus* species, these inquilines made a quick radiation onto Quercus section during their evolution what might be explained by a much higher diversity of galls' morphology and phenology on Quercus section oaks.

The **third** lineage is *Rhoophilus* known only from South Africa. *Rhoophilus loewi* Mayr, 1881 was originally described as a gall inducer and reared from galls on a woody shrub, *Rhus lucida* L. (Anacardiaceae) (Mayr, 1881; Kieffer, 1910). However, adult morphology clearly indicated a close phylogenetic relationship with inquiline cynipids (Weld, 1952a; Ronquist, 1994; Ronquist & Liljeblad, 2001; Melika & Bechtold, 2001). Later, the gall inducer, a moth, *Scyrotis* sp. (Lepidoptera: Cecidosidae) was reared (van Noort et al., in press). Both phylogenetic reconstructions based on morphology (Ronquist, 1999a; Ronquist & Liljeblad, 2002; Vårdal, Sahlén & Ronquist, 2003; Nieves-Aldrey, Vårdal & Ronquist, 2005) and DNA sequence data (Nylander et al., 2004; Ács et al., 2006b) grouped *Rhoophilus* with the *Synergus* group of inquiline genera (which also includes *Synophrus* and *Saphonecrus*). The elucidation of the intricate and unique life history of *R. loewi* has raised new issues in research on the evolution of cynipid lineages and emphasises the probable origin of inquilinism in cynipids from an ancestral inquilinism condition rather than an ancestral state of gall induction. Work on taxa related to *Rhoophilus* is required to determine whether this species represents an extant surviving representative of a basal transitional life history state in the evolution of a major lineage of oak cynipid inquilines, or an evolutionary experiment in association with lepidopteran gall inducers. The biology of *Rhoophilus*, together with its inferred phylogenetic position, have important implications for the evolution of inquilinism in gall wasps. Ronquist (1994) and Ronquist & Liljeblad (2001) originally hypothesized that cynipid inquilines in oak galls are derived from gall inducing cynipids close to *Diastrophus*, via an intermediate evolution of inquilinism in rose cynipid galls. This hypothesis would place the oak cynipid inquilines close to the rose cynipid inquilines, represented by species of the genus *Periclistus*. Recent phylogenetic evidence, based on combined morphological and molecular data, has nullified this hypothesis (Nylander et al., 2004; Ács et al., 2006b). The inquilines represent a polyphyletic or paraphyletic assemblage, in which species associated with rose cynipids are distinct from those associated with oaks. Instead, *R. loewi* is a sister group of a lineage leading to a group of three genera of inquiline cynipids (*Saphonecrus, Synergus, Synophrus*) attacking oak galls (Figs 21-22). This pattern allows two alternative hypotheses for the evolution of this oak cynipid lineage. One is that *Rhoophilus* is the sole known survivor of a once more diverse basal lineage of inquilines attacking a taxonomic diversity of host gall inducers on plants other than oaks. The alternative is that *Rhoophilus* itself represents a southern African offshoot of an ancestral lineage otherwise closer in ecology and host plant association to the extant oak cynipid inquilines (van Noort, in press). In this case, the ecology of *Rhoophilus* is of lower impact in assessing possible ancestral states in inquiline evolution. The biogeographical significance of *R. loewi* is also high. Ronquist & Liljeblad (2002) hypothesized that the gall wasps arose in Europe, around the Black Sea, and that the genera *Eschatocerus* (gall inducers on *Acacia* and *Prosopis*) and *Rhoophilus* apparently spread later to South America and South Africa, respectively. However, recent phylogenetic findings contradict this hypothesis. *Eschatocerus* and *Rhoophilus* belong to older primitive lineages of cynipids and as such the biogeographical history of the basal Cynipidae is still not clear (Nylander et al., 2004, van Noort, in press).

Patterns in Cynipid Evolution

Studies on patterns in the evolution of cynipids have concentrated predominantly on three important features of their biology: a) host-plant associations, b) the location of the gall on the host, and c) the evolution of gall morphology. The first researcher to consider the evolution of gall wasps and their galls was A. Kinsey (1920a, 1929, 1936), long before the techniques of phylogeny construction and character state mapping used today were available. In this regard Kinsey was well ahead of his time. Patterns of evolution, and probable ancestral states, have been inferred by mapping the traits of interest over gall wasp phylogenies (Cook et al., 2002; Ronquist & Liljeblad, 2001; Stone & Cook, 1998). The relationship among the tribes, fundamental to tracing the origin of cynipine traits, has been established (Liljeblad & Ronquist, 1998; Ronquist & Liljeblad, 2001). Recent work has revealed a rich diversity of cynipoid fossils from the Cretaceous and Tertiary (Rasnitsyn & Kovalev, 1988; Kovalev, 1994, 1995, 1996). Majority of fossils belong to macrocynipoids and for the first time were placed in the context of phylogenetic hypotheses and cladistic analysis by Ronquist (1999a). Fossils of adult cynipoids suggest that gall wasps represent a relatively ancient radiation, dating back at least as far as the Cretaceous, some 85 million years ago. Several fossils are phylogenetically nested deep within modern cynipids, *Aulacidea succinea* Kinsey, 1919, for example, described from well-preserved specimen in Baltic amber (Eocene age, about 45 million years) (Kinsey, 1919), is apparently an inquiline belonging to the *Synergus/Saphonecrus* complex (Ronquist, 1999a). Cockerell (1921) described one fossil from the Oligocene (33-23 ma) which may well have been correctly placed in the Diplolepidini. The inquilines diverged from the gall inducers at least 45 million years ago (Ronquist, 1999a; Ronquist & Liljeblad, 2001). Among the gall inducers, the genus whose galls most closely match all the ancestral states is *Barbotinia*, a member of the Aylacini tribe that induces swollen, single-chambered galls inside the seed capsules of Papaveraceae (Ronquist & Liljeblad, 2001). Cynipid gall wasps are thought to have evolved and first diversified in the Western Palaearctic Region, before dispersing into Africa and the Nearctic Region. The oak gall wasps probably diverged initially in the Americas, followed by multiple colonisations of the Palaearctic Region and some reinvasions of the Nearctic Region (Stone et al., 2002b; Liljeblad, 2002).

Patterns in the Evolution of Cynipid–Host Plant Associations

The gall wasps closest to the ancestry of cynipids are thought to be among the paraphyletic herb gall wasp tribe Aylacini (Roskam, 1992; Ronquist & Liljeblad, 2001). The first host plants are thought to have been herbs, most probably *Papaver* species in the family Papaveraceae or *Phlomis* or *Salvia* species in the family Lamiaceae (Ronquist & Liljeblad, 2001) (Fig. 18). From ancestral herbaceous hosts, there are thought to have been at least three independent shifts to woody hosts – by *Diastrophus* in the Aylacini (which galls *Rubus*), by the common ancestor of the woody rosid gallers, and by the inquilines Synergini. Within specific lineages, such as the gall wasp genus *Isocolus* that induces galls on *Centaurea*, there is some evidence that gall wasps have radiated with their plant hosts (Baumann & Brandl, 1993). However, this pattern is not seen over the gall wasps as a whole (Ronquist & Liljeblad, 2001). More generally, the current diversity of hosts is the result of rare host shifts – shifts that are rare even by the standards of other herbivorous insects (Ronquist & Liljeblad, 2001). Some plant taxa have been colonized independently by more than one gall wasp group; this pattern is most common among the herb gall wasps, but also includes the independent arrival from different aylacine lineages of gall-inducing and inquiline cynipids on roses and oaks (Ronquist & Liljeblad, 2001). While the latter pattern makes obvious sense, the former is intriguing: are some hosts more 'gallable' than others? The rarity of host shifts in general is reflected within specific gall wasp radiations. In the Western Palaearctic Region, the large genus *Andricus* includes many species with demonstrated or inferred host-alternating life cycles. Phylogenetic analysis of host use in *Andricus* leads to the strong inference that the host-alternating life cycle evolved only once in this genus, and was followed by a radiation of host alternating species in Asia Minor (Cook et al., 2002; Rokas et al., 2003).

The Evolution of Gall Location on the Host

The first gall wasps are thought to have induced galls in reproductive tissues (fruits, seeds or flowers) (Ronquist & Liljeblad, 2001). While individual species usually induce galls on one specific plant organ, as a group gall wasps have radiated to include species able to gall most plant parts – for example, oak gall wasps are known from roots, shoots, leaves, apical, lateral, and lenticel buds, the main trunk, male flowers, and fruits (Melika et al., 2000; Nieves-Aldrey, 2001a). The specificity of cynipids to host taxa and to specific induction sites on a host plant raises the question: is speciation in gall wasps more commonly associated with shifts between the same plant organ on two different hosts, or between alternative oviposition sites on the same host: which of these has changed more often in gall wasp evolution? The only study that has compared rates of shift concerns *Andricus* on oak (Cook et al., 2002), and found host shifts to be much rarer than shifts between oviposition sites on the same host plant. This suggests that for gall wasps the plant genotype is a more serious constraint to gall induction than tissue-specific patterns of gene expression in the host.

The Evolution of Gall Structure

Each generation of each cynipid species has a highly characteristic gall structure, such that species of gall inducer can usually be identified with certainty from their galls. As a group, gall wasps are able to induce an enormous diversity of gall structures, including many that are highly complex (Stone & Schönrogge, 2003). Mapping of gall traits by Ronquist & Liljeblad (2001) suggests that the ancestral cynipine gall was a distinct swelling without surface structures, containing a single larval chamber that did not dehisce from the host plant. This character state is widespread in the Aylacini, and almost all the diversity in gall morphology is present in the galls induced by the rose and oak gall wasps. Several authors have suggested that the structural diversity seen in these groups may have evolved in response to selection for exclusion of natural enemies. This is the 'enemy hypothesis' (Cornell, 1983; Price et al., 1987; Price & Pschorn-Walcher, 1988; Stone & Cook, 1998; Stone & Schönrogge, 2003). There is good reason to believe that gall traits should be sensitive to selection imposed by natural enemies (predators, parasitoids, and lethal inquilines). Natural enemies inflict high mortality in cynipid galls (Askew, 1984; Plantard & Hochberg, 1998; Schönrogge et al., 1996a, 1996b; Stone et al., 1995) and all interactions between the cynipids and their natural enemies take place via gall tissue. In all the studied groups, gall traits are determined largely by the gall inducer (Crespi & Worobey, 1998; Nyman et al., 2000; Stone & Cook, 1998), and gall traits that confer protection against attack by natural enemies should spread through natural selection. The following are probably important as defences against parasitoid attack:

a) Nectar secretion. *Andricus* (Abe, 1992), *Disholcaspis* (Fernandes et al., 1999; Seibert, 1993; Washburn, 1984), and *Dryocosmus* (Stone & Cook, 1998) include species able to induce galls that secrete nectar. These secretions are harvested by ants, which attack and kill inquilines and parasitoids attempting to oviposit in the gall and significantly reduce the mortality of the gall inducer (Abe, 1992; Fernandes et al., 1999; Seibert, 1993; Washburn, 1984).

b) Gall toughness. Tougher galls are thought to be harder to attack than softer galls, both because of the physical difficulty of drilling into tougher galls with an ovipositor, and the risk of predation associated with prolonged oviposition (Rossi et al., 1992).

c) Gall wall thickness. Parasitoids are restricted to attacking larvae within reach of the ovipositor, and that larvae in thicker-walled galls on average suffer a lower rate of parasitoid attack (Askew, 1965, 1984; Abrahamson & Weis, 1997; Craig et al., 1990; Jones, 1983; Wiebes-Rijks & Shorthouse, 1992). This effect of wall thickness may explain why cynipid larvae do not start to grow until the gall wall is fully developed: if parasitoids halt host growth on oviposition, such a strategy would exclude larger, short-ovipositored parasitoid species through resource limitation (Wiebes-Rijks, 1982).

d) There is evidence that multilocularity may represent a strategy associated with protecting larvae from parasitoid attack through induction of a larger gall (Abrahamson & Weis, 1997; Kato & Hijii, 1993; Stone & Cook, 1998). Although larvae in peripheral chambers remain vulnerable, those deeper within the structure are protected by a thicker shield of gall tissue and the outer larval chambers (Jones, 1983). A similar effect has been observed for inquilines that develop as multiple larvae within a host gall. The inquiline larvae are able to induce increased thickness of host gall tissues, and the more larvae there are, the thicker the gall wall (Askew, 1961a; Brooks & Shorthouse, 1998; LeBlanc & Lacroix, 2001; Wiebes-Rijks, 1982).

e) A number of oak galls contain chambers in addition to that occupied by the gall wasp larva. It has been suggested (Askew, 1984) that such chambers could function as decoys, causing female parasitoids to lay their eggs separated from the host larva by gall tissue. Dissection of galls induced by *C. disticha*, which have a single additional chamber, has recently confirmed that *E. brunniventris* parasitoids do indeed oviposit in the additional chamber (Askew, 1999b).

Some additional morphological traits been suggested as further defensive gall traits, although their effectiveness has not yet been tested and they were discussed in details in Csóka, Stone & Melika (2004).

The oak gall wasps are the only cynipid tribe showing enough structural diversity to allow a phylogeny-based examination of patterns in gall evolution. They show two evolutionary trends: conservation of gall structure within groups of closely related species, and convergent evolution of specific defensive traits such as the secretion of surface nectar, the presence of surface spines, coats of sticky resin, internal air spaces, and the incidence of galls with many larval chambers (Stone & Cook, 1998; Stone & Schönrogge, 2003). While these trends can be explained by non-adaptive scenarios (Stone & Cook, 1998), both are also compatible with selection for exclusion of enemies. Effective countermeasures are likely to be retained both during the radiation of a group from a common ancestor (conservation within groups), and when they evolve independently in separate clades (convergent evolution of specific traits). However, gall inducers as a group support richer parasitoid communities, and suffer higher rates of parasitoid-induced mortality, than other groups of insect herbivores (Hawkins, 1988; Price & Pschorn-Walcher, 1988), and no gall structure provides an absolute refuge. Although parasitoids may not be wholly excluded, specific gall traits have possibly been selectively retained because they reduce, at least temporarily, the mortality inflicted by specific community members. The impact of gall morphology on parasitoid attack remains little studied. The issue is whether parasitoids impose greater or lesser mortality on galls of a given type, rather than whether they can or can not exploit a certain gall morphology (Stone & Schönrogge, 2003).

Family Cynipidae

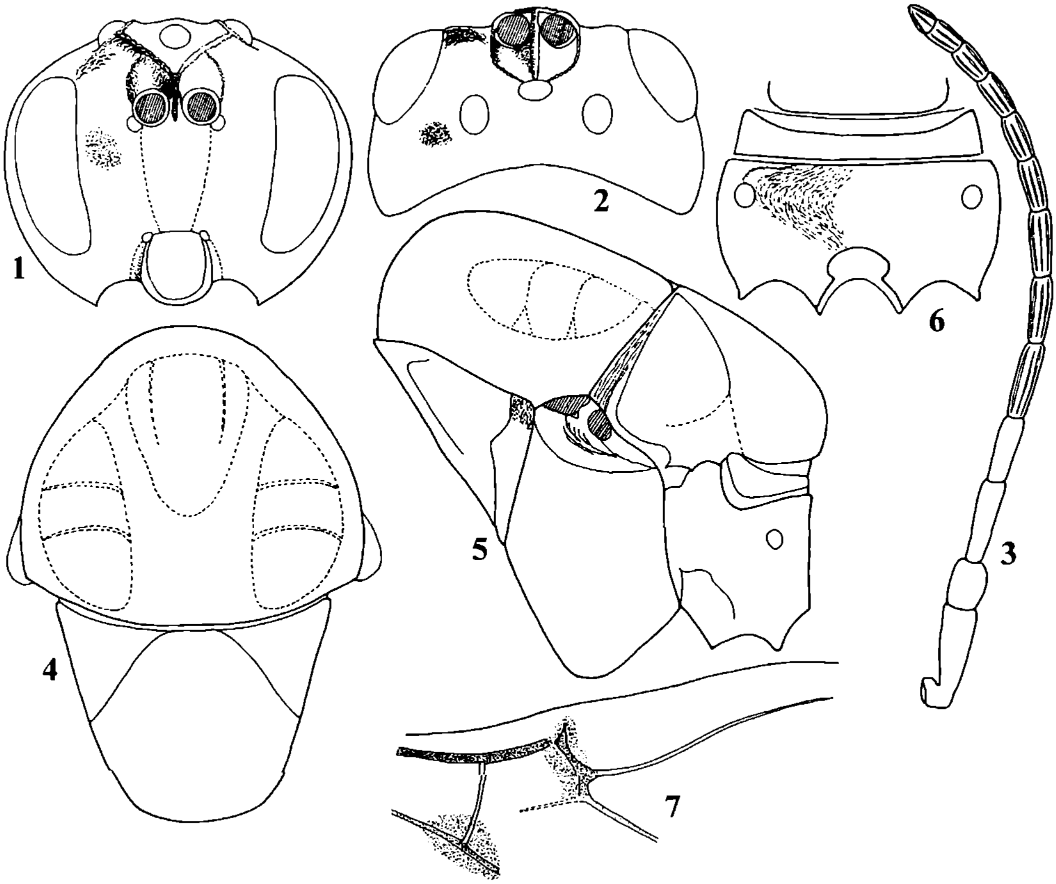
Cynipides Hartig, 1840: 187; Cynipites Newman, 1834: 406; Cynipoidae Förster, 1869: 329; Cynipidae Ashmead, 1903a: 142.

The family Cynipidae was once thought to include several other groups of hymenopteran parasitoids, and within the Cynipidae the gall-inducers and the gall-associated inquilines were grouped into the subfamily Cynipinae. The non-gall wasp genera have since been moved out of the Cynipidae, leaving the Cynipinae as the only extant subfamily within the family. A second, extinct, subfamily has since been added (Table 3). About 1400 gall wasp species are currently recognised (Table 3), although Nordlander (1984) has estimated that the actual number lies between 3000 and 6000. Nevertheless, this may be an overestimate, because the alternate generations of many species remain unknown. Many species may thus have two different names, one for the sexual and one for the asexual generation. Several taxonomic reviews of the Cynipidae/Cynipinae exist, covering the world (Dalla Torre & Kieffer, 1910; Weld, 1952a), America north of Mexico (Burks, 1979), Great Britain (Eady & Quinlan, 1963), Scandinavia (Coulianos & Holmåsen, 1991), the Iberian Peninsula (Nieves Aldrey, 2001a), Hungary (Ambrus, 1974; Melika et al., 2000; Pujade-Villar et al., 2003), Poland (Kierych, 1979), the European part of the USSR (Zerova et al., 1988), Romania (Ionescu, 1957, 1973) , Israel (Sternlicht, 1968a, 1968b) and Iran (Chodjai, 1980). However, as a group the gall wasps are in major need of taxonomic revision, especially those described in the Aylacini tribe and many species known from Ukraine and the Eastern Palaearctic Region. The major failure in the previous taxonomic reviews is the absence of detail morphological descriptions and diagnosis for adults. In this work we are giving detail descriptions for many species for the first time.

Cynipid wasps are known predominantly from holarctic temperate areas of the Northern Hemisphere. Evolutionary analyses of current gall wasp distributions by Ronquist & Liljeblad (2001) suggest that cynipid gall wasps originated in the Western Palaearctic Region, followed by independent range expansion into the Nearctic Region by lineages within all tribes except the Pediaspidini. The current centres of diversity of rose and oak gall wasps in the Nearctic Region are thus proposed to represent secondary radiations. The global distributions and centres of species richness of rose and oak groups follow those of their host plants.

The acacia gall wasp tribe Eschatocerini is restricted to America and attacks *Acacia* and other Fabaceae in only a small proportion of the global range of this genus. This latter pattern suggests colonisation of these hosts after the plants had already become more broadly distributed globally, or extinction of Eschatocerini elsewhere. Morphologically, species in this group are most closely related to the rose gall wasps of the tribe Diplolepidini. There is a single genus, *Eschatocerus*, with three described species (*E. acaciae* Mayr, 1881, *E. myriadeus* Kieffer & Joergensen, 1910, and *E. niger* Kieffer & Joergensen, 1910). All are restricted to the Neotropical Region (Central and South America). *Eschatocerus acaciae* (Figs 23.1-7) was described from Uruguay and induces stem swelling galls on *Acacia* and *Prosopis* (Fabaceae), while *E. myriadeus* and *E. niger* were described from Argentina, where they also induce stem swelling galls on *Prosopis* (Díaz, 1980). An interesting feature of the foodwebs associated with eschatocerine galls is that, in contrast to those induced by other tribes, none of them are known to harbour cynipid inquilines.

The Cynipinae are divided into two main trophic groups: the gall-inducers, and the gall-associated inquilines, which together make up 6 tribes (Table 3). The gall-inducers are divided into 5 tribes. The Aylacini are not monophyletic but represent a basal paraphyletic group. The Aylacini mainly induce galls in herbaceous plants, and gave rise to two main monophyletic lineages (Ronquist, 1995a, 1999a). One lineage consists of four tribes whose members all gall woody rosaceous plants (the 'woody rosid gallers', Ronquist, 1999a): the Diplolepidini (rose gall wasps, ca. 62 species), the Pediaspidini (galling *Acer*, 2 species), the Eschatocerini (galling *Acacia* and *Prosopis*, 3 species) and the Cynipini (oak gall wasps, ca. 1000 species). A second lineage, distinct from the woody rosid gallers, gave rise to the tribe Synergini (159 species), whose members are all



Figs 23.1-7. *Eschatocerus acaciae*, female: 1-2 head: 1, front view, 2, from above. 3, antenna, 4, scutum and scutellum, dorsal view, 5, mesosoma, lateral view, 6, dorsellum and propodeum, dorso-posterior view, 7, forewing, part.

Table 3. Classification, diversity and host associations of Cynipidae
(modified after Liljeblad & Ronquist, 1998; Csóka, Stone & Melika, 2004)

Tribes	Genera	Species	Hosts
"Aylacini"	18	122	Asteraceae, Rosaceae, Lamiaceae, Papaveraceae, Apiaceae, Valerianaceae, Brassicaceae, one species on *Smilax* (Smilaceae)
Diplolepidini	2	62	*Rosa* (Rosaceae)
Eschatocerini	1	3	*Acacia, Prosopis* (Fabaceae)
Pediaspidini	2	2	*Acer* (Aceraceae)
Cynipini	27	ca. 1000	Fagaceae (mostly *Quercus*, also *Castanea, Castanopsis*

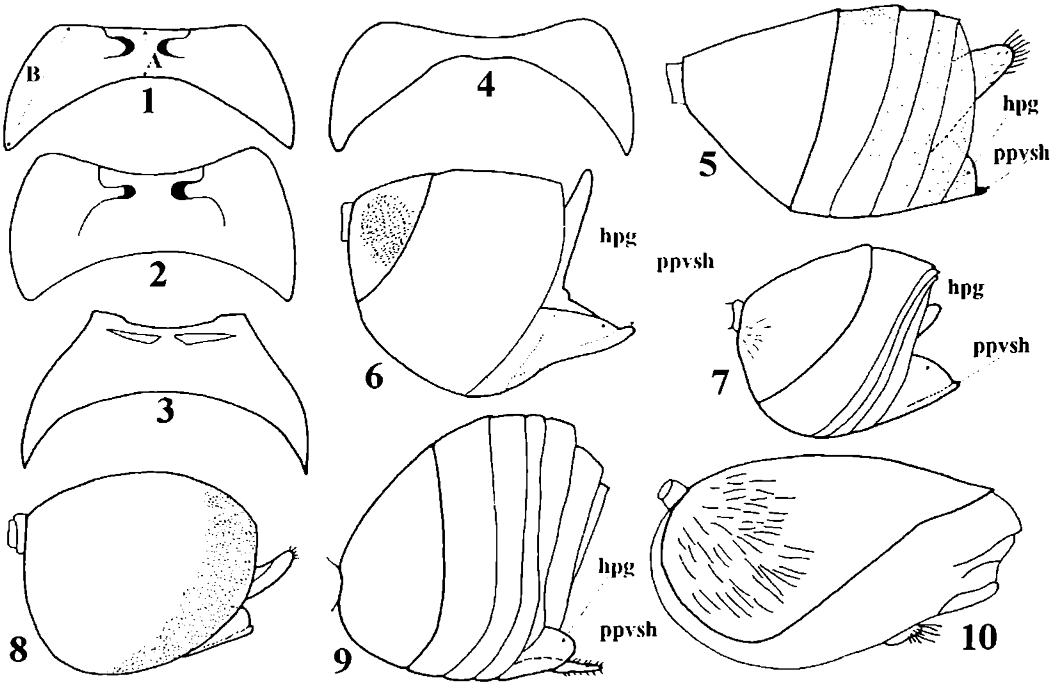
			and *Lithocarpus*)
Synergini	8	159	Inquilines in galls induced by *Diastrophus*, *Diplolepis* and Cynipini
Total	**58**	**ca.1353**	

inquiline inhabitants of the galls of other gall wasps. Though phytophagous, and able to induce the development of nutritive plant tissues within other cynipid galls, they are apparently unable to induce their own galls de novo. The differences between gall-inducing cynipid wasps and cynipid inquilines are thus not only morphological, but also represent an important and obvious biological division of the subfamily.

Key to the Cynipidae Tribes

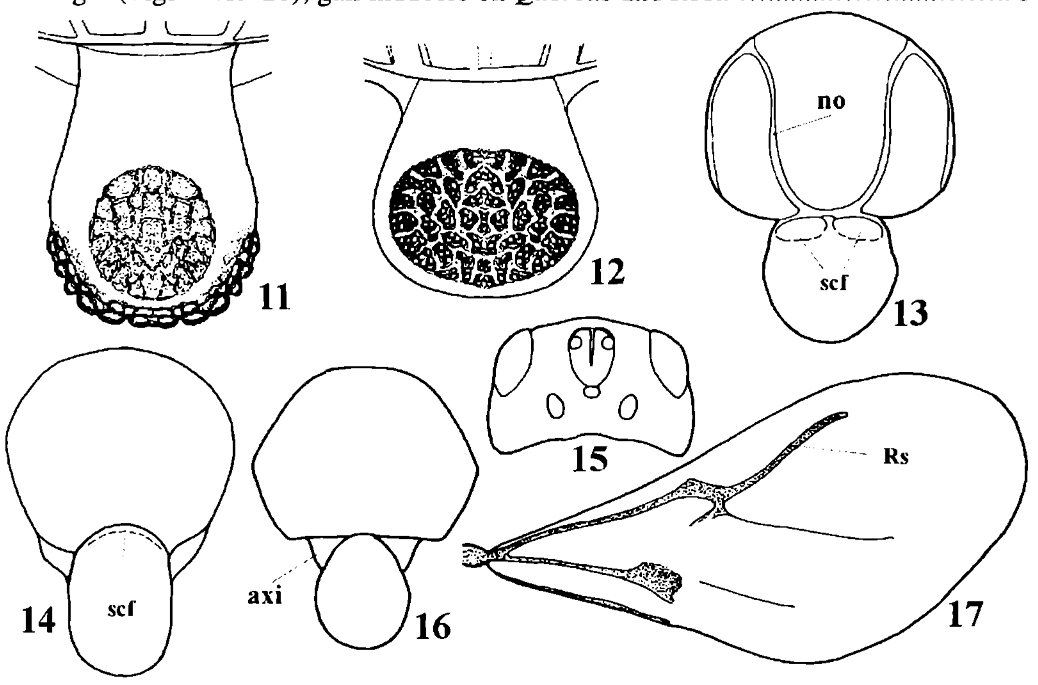
1. Pronotum in median dorsal line at least 1/6, usually 1/3 as long as greatest length on outer lateral margin; with truncation and pits, sometimes forming pronotal plate (Figs 24.1-2), rarely narrow (Fig. 24.3), prominent part of ventral spine of hypopygium usually not or very little projecting behind hypopygium in lateral view (Figs 24.5-8) 2

-- Pronotum in median dorsal line very short, 1/7 or less as long as outer lateral margin; truncation or pits absent (Fig. 24.4), or present only by weak superficial and continuous depression, pronotal plate always absent; prominent part of ventral spine of hypopygium distinctly projecting behind hypopygium in lateral view (Figs 24.9-10) 4

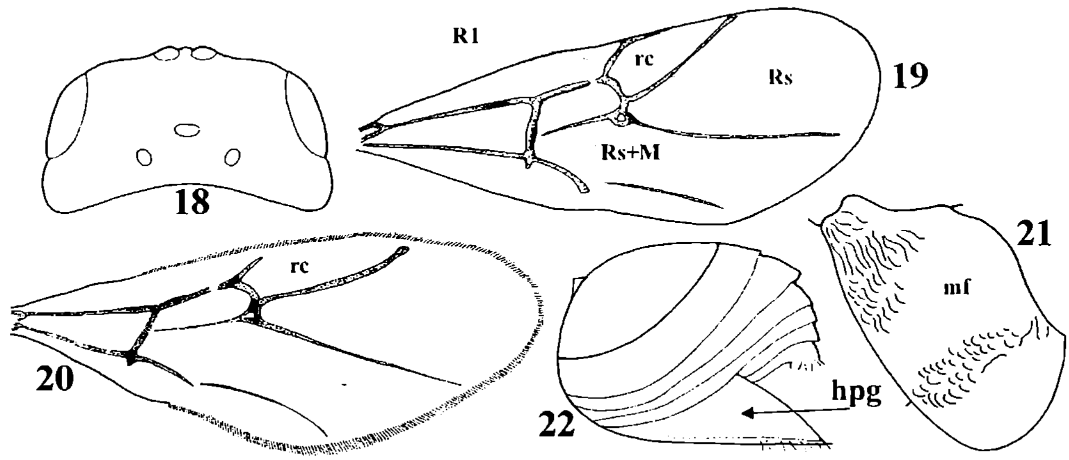


Figs 24.1-10. 1-4, pronotum, dorsal view: 1, *Aylax papaveris*. 2, *Aulacidea hieracii*. 3, *Phanacis phoenixopodos*. 4, *Cynips divisa*. 5 – 10, metasoma, lateral view, female (hpg, hypopygium; ppvsh, prominent part of ventral spine of hypopygium): 5, *Pediaspis aceris*. 6, *Ceroptres clavicornis*. 7, *Cecconia valerianellae*. 8, *Synergus ilicinus*. 9, *Neuroterus numismalis*, asexual. 10, *Cynips agama*, asexual.

2. Scutellum trapezoid, scutellar foveae absent; scutum smooth and shining; scutellum dorsally flat with rounded impression in Palaearctic species (Figs 24.11-12); gall-inducers on *Acer* in the Palaearctic and on *Nothofagus* in South America .... **Pediaspidini**
-- Scutellum ovate or rounded, dorsally convex; scutellar foveae present (Fig. 24.13), sometimes confluent (Fig. 24.14); scutum usually sculptured 3
3. Head and thorax always sculptured; metasomal tergites 2+3 fused into one large segment occupying nearly entire metasoma (Fig. 24.8), sometimes with indistinct and continuous suture between these tergites in either sex (Fig. 24.6); inquilines in galls on *Quercus* and *Rosa* .... **Synergini**
-- Tergites 2-7 free in most cases (Figs 24.5, 7-9); if tergites 2+3 fused in females into one large segment then head and thorax almost smooth and shining; gall-inducers on plants others than *Quercus* and *Rosa* .... **Aylacini**
4. Frons between antennal toruli with strong median carina (Fig. 24.15); notauli and scutellar foveae absent (Fig. 24.16); dorso-axillar area large, triangular and situated in the same plane as scutellum; Rs+M and R1 of forewing not visible, radial cell with Rs quite separate from anterior wing margin (Fig. 24.17); gall inducers in the Nearctic on *Acacia* and *Prosopis* .... **Eschatocerini**
-- Frons without median carina (Fig. 24.18); notauli complete (Fig. 24.13), incomplete or absent (Fig. 24.14); scutellar foveae present (Fig. 24.13) or confluent, forming shallow transverse depression (Fig. 24.14); dorso-axillar area much smaller; Rs+M and R1 of forewing present and visible, Rs reaching or almost reaching anterior wing margin (Figs 24.19-20); gall inducers on *Quercus* and *Rosa* 5



Figs 24.11--17. 11-12, scutellum, dorsal view: 11, *Pediaspis aceris*, asexual female. 12, *P. aceris*, sexual female. 13-14, scutum and scutellum, asexual female, dorsal view (no – notaulus, scf – scutellar foveae): 13, *Andricus paradoxus*. 14, *Neuroterus saliens*, 15-17, *Eschatocerus acaciae*: 15, head, dorsal view. 16, scutum and scutellum, dorsal view (axi – dorso-axillar area). 17, forewing.



Figs 24.18–22. 18, head, dorsal view, *Andricus* sp., asexual female. 19-20, forewing (rc – radial cell): 19, *Diplolepis rosae*. 20, *Cynips quercusfolii*, asexual female. 21-22, *Diplolepis rosae*: 21, mesopleuron, lateral view (mf – mesopleural furrow). 22, metasoma, lateral view (hpg – hypopygium).

5. Mesopleuron with longitudinal furrow (Fig. 24.21); hypopygium of female plough-shaped (Fig. 24.22); radial cell of forewing closed or partially closed (Fig. 24.19); gall-inducers on *Rosa* .... **Diplolepidini**

-- Mesopleuron without longitudinal furrow; hypopygium of female never plough-shaped (Figs 24.9-10); radial cell of forewing always open (Fig. 24.20); gall-inducers on *Quercus*, *Castanea*, *Chrysolepis* and *Lithocarpus* .... **Cynipini**

Tribe *Aylacini* Ashmead, 1903

Aulacini Ashmead, 1903: 147; Aylaxini (Ashmead): Quinlan, 1968: 275 (key to genera); Aylacinae (Ashmead): Kovalev, 1982: 85; Aulacideini (= Aylacini): Fergusson, 1988: 143. Type genus: *Aylax* Hartig, 1840 (= *Aulax* Hartig, 1843, unjustified emendation). Original designation.

Body length 1.0-5.0 mm. Body usually black, brown or red-brown. Head transverse, usually 2.0 times as broad as long from above; slightly broader than high or as broad as high, rounded or trapezoid in front view; gena not or only slightly broadened behind eye; ocelli small. Lower face with weak or moderately strong striae, radiating from clypeus to inner margin of eyes and antennal sockets; median elevated area coriaceous to alutaceous, always without striae. Frons and vertex coriaceous, alutaceous or reticulate; rarely smooth and shining; frontal carina absent, clypeus quadrangular or rectangular, usually broader than high, sometimes projecting onto mandibles. Malar space 0.5-0. 8 times as long as height of eye. Antenna 12-14-segmented in females, 13-15-segmented in males. Pronotum dorso-medially long, usually 0.3-0.4 times as long as greatest length on outer lateral margin (sometimes shorter, but the above ratio always at least one-sixth), often with distinct submedian pronotal pits and pronotal plate; sides of pronotum usually with dense white long setae along anterior margin. Scutum coriaceous, alutaceous or reticulate. Notauli complete to very short; median mesoscutal line reaching at most to half length of scutum, usually in a form of short triangle; parapsidal lines and anterior parallel lines always distinct, visible. Scutellum usually rugose to dull rugose, often with more delicate sculpture towards the center of scutellar disk, always overhanging metanotum. Scutellar foveae usually present, sometimes confluent and not well defined posteriorly; mesopleuron usually transversely uniformly striate, reticulate or rugoso-reticulate. Tarsal claws simple, narrow, only in two genera with acute basal lobe. Wings well developed, except brachypterous males of *Phanacis centaureae*; radial cell of forewing open or closed along margin; wing margin with or without cilia. Metasomal tergites 2 to 6 free; tergite 2 covering 1/3 to 1/8 of metasoma length, with or without a patch of white setae antero-laterally; tergites and hypopygium with or without punctures. Prominent part of ventral spine of hypopygium always very short, never more than 2.0 times as long as broad in ventral view, with very few short white setae, which usually do not reaching behind apex of spine.

Recent phylogenetic studies on this group (Ronquist, 1999a, 1999b) showed that Aylacini are based on symplesiomorphic characters and does not form a monophyletic group like Cynipini, Pediaspidini, and Eschatocerini. The 'Aylacini' is a paraphyletic group, however, because of historical reasons and biological characters, we treated them here as a tribe. This tribe comprises a group of primitive genera of cynipid gall-inducers associated mainly with herbaceous plants. Most of the representatives are associated with species of Asteraceae, and some genera and species with Papaveraceae, Lamiaceae, Valerianaceae and Apiaceae. Representatives of the genus *Diastrophus* associated mainly with *Rubus* and *Potentilla* (Rosaceae), however, one species, *Diastrophus smilacis* Ashmead, 1896, described from USA and known to induce stem swelling-like galls on *Smilax* species. Prolong a century this plant association was thought to be incorrect, however, recent collecting made by the author in Florida, proved this host-plant relationship, and *D. smilacis* galls were collected from *Smilax havanensis* Jacquin, 1760 (Smilacaceae). Another very unusual point in this host-plant association is that all known cynipid galls are on dicots; this gall is the only one known from monocots. Another unusual host association with *Hieracium* sp. (Asteraceae) was found for a recently described species from Ukraine, *Diastrophus hieracii* (Melika & Klymenko, 2005).

Galls of Aylacini are not so complex as in Cynipini or Diplolepidini; they are forming mainly in stems, flower heads, fruits and seeds. All Aylacini species are monovoltine, only sexual generations are known, without heterogeny or alternation of generations (Folliot, 1964; Askew, 1984; Csóka, Stone & Melika, 2004).

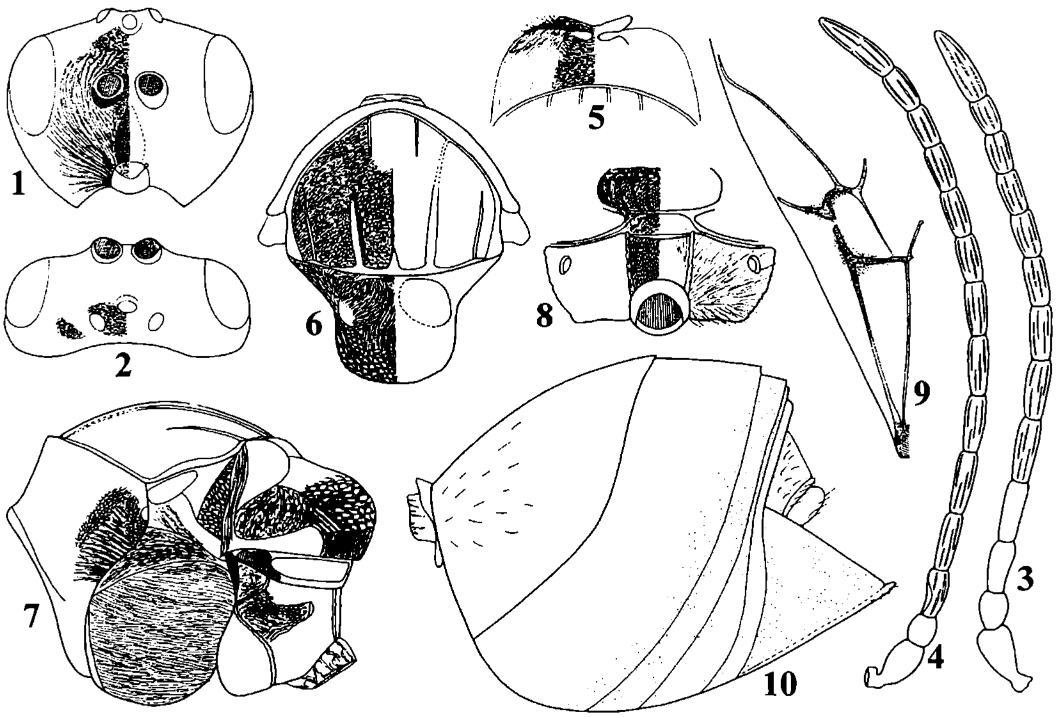
The Aylacini has a holarctic distribution. From 122 currently known Aylacini species, only 30 species are known to be native to the Nearctic Region (*Antistrophus* – 8 species, *Diastrophus* – 14, *Aulacidea* – 7 and *Aylax* –1); other four palaearctic species, *Liposthenes glechomae*, *Aylax papaveris*, *Phanacis hypochoeridis* and *P. taraxaci*, were accidentally introduced to North America. One species, *Phanacis hypochoeridis* was introduced to South Africa (Melika & Prinsloo, in press) and recently the first afro-tropical Aylacini, a new species, *Phanacis* sp. associated with a native South African plant, *Chrysanthemoides monilifera* (L.) T. Nord. (Asteraceae) was described (Melika & Prinsloo, in press). Species richness, host plant associations and distribution of Aylacini genera are given in the Table 4.

Table 4. Species richness, host associations and distribution of Aylacini genera

Genus	**Species No.**	**Host Plant**	**Distribution**
Antistrophus Walsh, 1869	8	*Silphium, Microceris, Lygodesmia, Chrysothamnus* (Asteraceae)	North America
Asiocynips Kovalev, 1982	4	*Cousinia* (Asteraceae)	Tajikistan, Turkmenistan, Uzbekistan
Aulacidea Ashmead, 1897	28	*Lactuca, Arnica, Sonchus, Scorzonera, Tragopogon* (Asteraceae)	Holarctic Region

Genus	Species No.	Host Plant	Distribution
Aylax Hartig, 1840	4	*Hypericum, Papaver* (Papaveraceae)	Europe, North Africa, North America
Barbotinia Nieves Aldrey, 1994	1	*Papaver* (Papaveraceae)	Europe, North Africa
Cecconia Kieffer, 1902	1	*Valerianella* (Valerianaceae)	Europe
Diakontschukia Melika, 2006, **gen. n.**	1	*Saussurea* spp. (Asteraceae)	Far East of Russia
Diastrophus Hartig, 1840	17	*Rubus, Potentilla, Fragaria* (Rosaceae), *Hieracium* (Asteraceae), *Smilax* (Smilacaceae)	Holarctic Region
Hedickiana Nieves Aldrey, 1994	1	*Salvia* (Lamiaceae)	Europe, Israel, Syria, Iran
Iraella Nieves Aldrey, 1994	2	*Papaver* (Papaveraceae)	Europe, Iran
Isocolus Förster, 1869	20	*Centaurea, Serratula* (Asteraceae)	Palaearctic Region
Liposthenes Förster, 1869	3	*Nepeta* (Lamiaceae)	Europe, Turkmenistan, introduced to USA & Canada
Neaylax Nieves Aldrey, 1994	4	*Salvia* (Lamiaceae)	Europe
Panteliella Kieffer, 1902	1	*Phlomis* (Lamiaceae)	Europe, Mongolia?
Phanacis Förster, 1860 (=*Timaspis* Mayr, 1882, **syn. n.**)	23	*Centaurea, Cichorium, Crepis, Heracleum, Hypochoeris, Lactuca, Lampsana, Picris, Taraxacum, Serratula, Sonchus, Urospermum* (Asteraceae)	Palaearctic and Afrotropical Region (South Africa, one species); introduced to USA & Canada and South Africa
Rhodus Quinlan, 1968	1	*Phlomis, Salvia* (Lamiaceae)	Europe, Israel
Xestophanes Förster, 1869	2	*Potentilla* (Rosaceae)	Europe
Zerovia Diakontschuk, 1988	1	*Epilasia* (Asteraceae)	Turkmenistan
Total: 18 genera	**122**		Holarctic Region

The western palaearctic fauna of Aylacini with its 15 genera is the most species rich one and probably because of more numerous studies, rather than that of real species richness. *Rhodus* (= *Salviella* Melika, 2003) is the only genus with Mediterranean distribution (probably occurs also in Transcaucasus, Asia Minor and Iran), currently known from Greece (Quinlan, 1968) and Israel (Zerova et al., 2003), and absent from Central Europe and particularly from Ukraine. Morphologically most closely resembles *Isocolus*, however, the forewing margin without cilia, the scutum is coriaceous, with distinct, well-impressed piliferous punctures; notauli distinct only in the posterior half and the metasoma without lateral patch of setae and without punctures (Figs 25.1-10). The only known species, *R. oriundus* Quinlan, 1968 (= *Salviella kezivi* Melika, 2003 (Zerova et al., 2003)) induces swelling-like multilocular galls on *Phlomis cretica* Presl. and *Salvia fruticosa* Mill. (Lamiaceae).



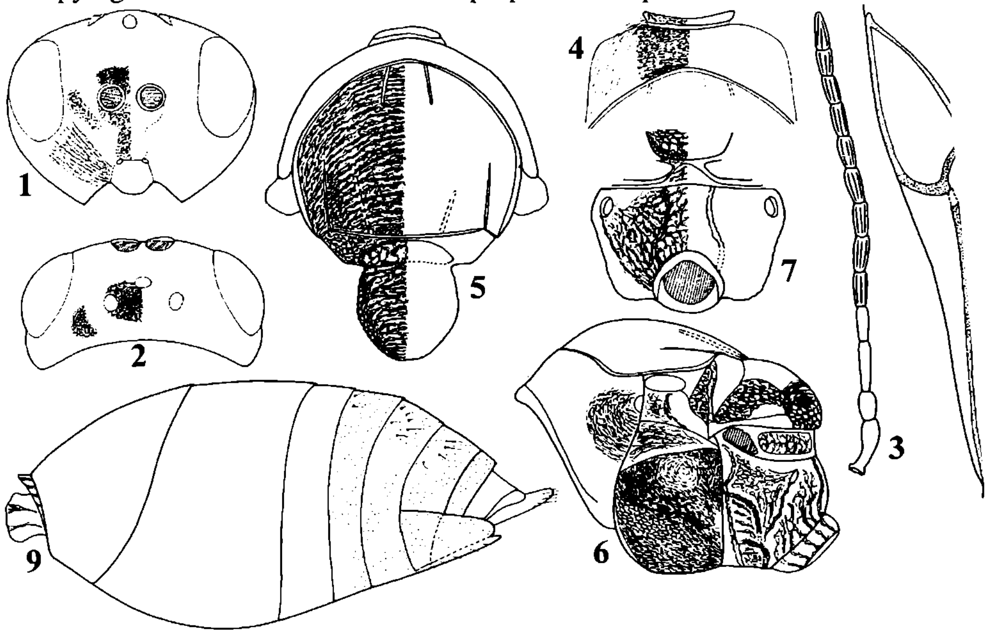
Figs 25.1-10. *Rhodus oriundus*: 1-2, head, female: 1, front view, 2, from above, 3-4, antenna: 3, female, 4, male. 5-10, female: 5, pronotum with submedian pronotal pits, antero-dorsal view, 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part, 10, metasoma, lateral view.

A number of species appeared to be transpalaearctic, widespread from western Europe to Far East of Russia, China and Japan. However, a number of species were described from the Eastern Palaearctic Region only, and particularly two genera: *Asiocynips* and *Zerovia*.

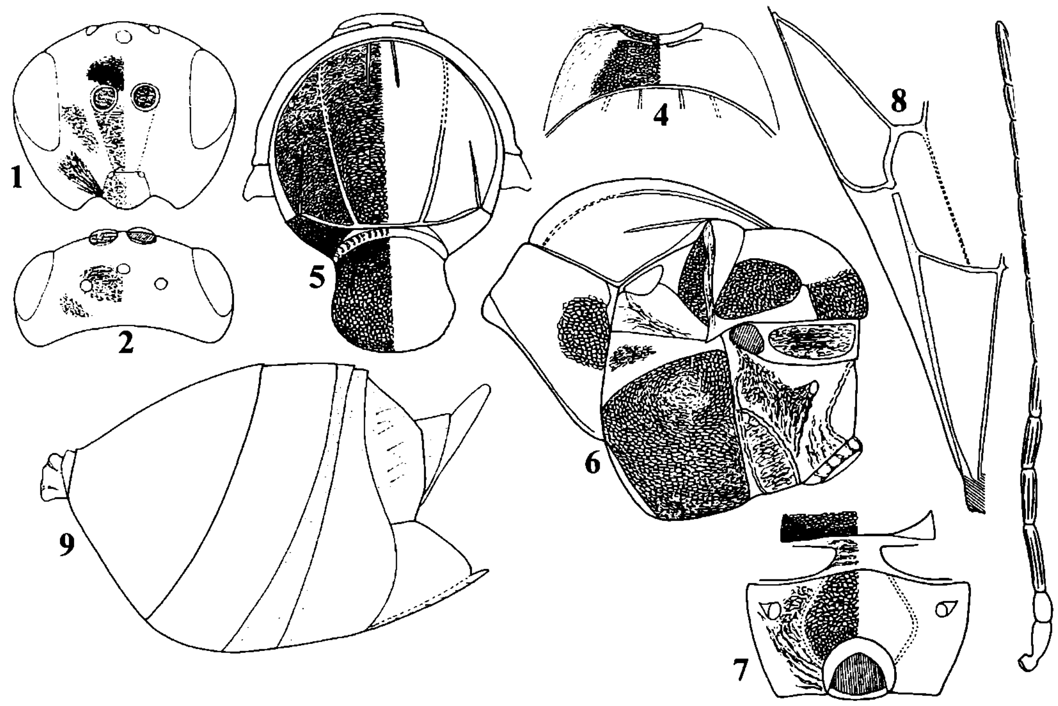
Asiocynips Kovalev, 1982 belongs to the *Phanacis*-lineage of primitive Aylacini (Liljeblad et al., 2002) and closely related to *Phanacis*. However, can be easily distinguished by the absence of even a transverse impression on the anterior margin of the pronotum (submedian pronotal pits absent); strong interrupted transverse rugae on the scutum and scutellum and dull rugose propodeum, with incomplete lateral propodeal carina; the margin of the forewing without cilia; Rs+M nearly reaching the basal vein and projecting into the most posterior end of the basalis (Figs 26.1-9). The genus was divided by Kovalev (1982) into two subgenera: *Asiocynips* and *Asiocynipsella*, with four species described from Kazakhstan, Tajikistan, Turkmenistan and Uzbekistan: *A. caulina* Diakontschuk, 1988, *A. cousiniae* Diakontschuk, 1988, *A. lugubris* Kovalev, 1982 and *A. pannucea* Kovalev, 1982. All species are known to induce stem galls on *Cousinia* species (Asteraceae).

Zerovia Diakontschuk, 1988, with only one species, *Z. asiaemediae* Diakontschuk, 1988 (Figs 27.1-9), known to induce galls in stems of *Epilasia* sp. (Asteraceae) in Turkmenistan (Diakontschuk, 1988), also belongs to the *Phanacis-Asiocynips* complex: notauli present, well-impressed at least in the posterior half of the scutum; the pronotum anteriorly with a transverse impressed narrow area; the scutum, scutellum and meso-pleuron are delicately reticulate; the metasoma only slightly longer than high in lateral view. However, differs from *Phanacis* in that the antenna is longer than the body; lateral

propodeal carinae are strongly curved outwards in the middle; the central pro
occupying at least the half width of the propodeum in postero-dorsal view.

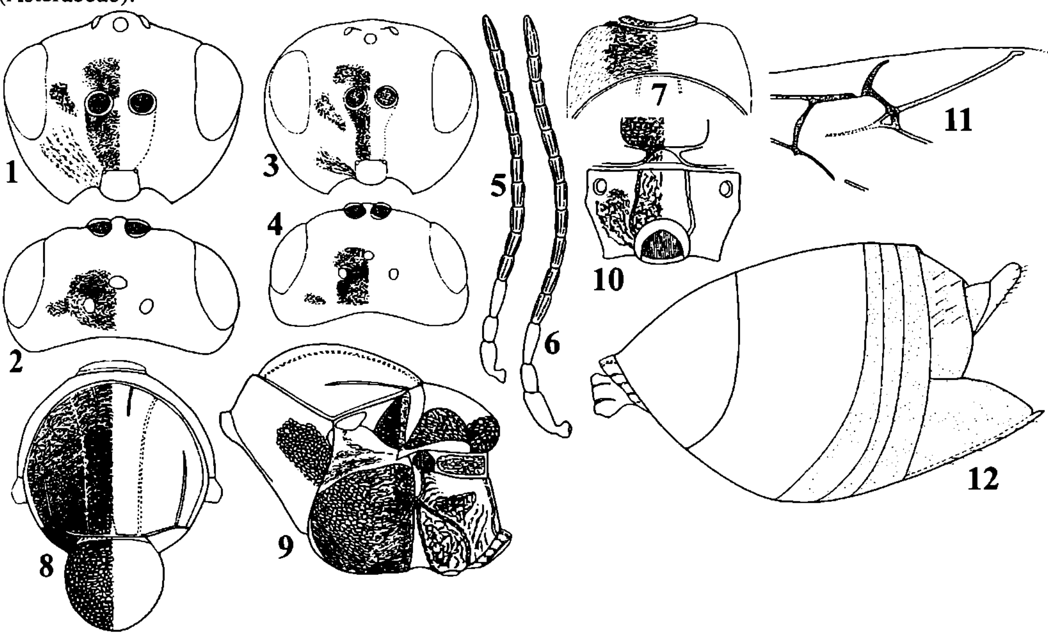


Figs 26.1-9. *Asiocynips caulina*, female: 1-2, head: 1, front view, 2, from above, 3, anter
pronotum, dorsal view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral vi
propodeum and dorsellum, dorso-posterior view, 8, forewing, part, 9, metasoma, lateral



Figs 27.1-9. *Zerovia asiaemediae*, female: 1-2, head: 1, front view, 2, from above, 3, antenna: 4, pronotum, dorsal view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, forewing, part, 9, metasoma, lateral view.

Diakontschukia Melika, **gen. n.** (Figs 28.1-12). Monotypic, type species: *Phanacis saussureae* Diakontschuk, 2001. *Diakontschukia saussureae* (Diakontschuk, 2001), **comb. n.** Material examined: *Phanacis saussureae*: holotype female: Russia, Primorskij Kraj, bukhta Shamora, coll. 15.04.1983, em. 4-6.06.1983. Paratypes: 14 females and 10 males collected at the same site as the holotype; em. 4.04.1984, ex stems of *Saussurea neopulchella* Fish. (Zerova) and *S. pulchella* (Fiscj.) (Zerova). Head alutaceous, with some weak radiating striae on lower face; transverse, 1.25 times as broad as high in front view and 1.8 times as broad as long from above; gena not broadened behind eye in females, broadened in males. POL slightly shorter than OOL and 1.9 times as long as LOL. Transfacial distance 1.5 times as long as height of eye. Malar space long, 0.75 times as long as height of eye. Antennae of female and male 14-segmented; F1 longer than F2, F2 only slightly longer than F3. Pronotum alutaceous dorsally, uniformly microreticulate laterally, with very narrow transverse impression dorso-anteriorly; submedian pronotal pits and pronotal plate absent. Scutum reticulate, with some very short weak transverse rugae; notauli very shallow, indistinctly impressed along entire length; median mesoscutal line in a form of indistinct short triangle or absent; anterior parallel lines short; parapsidal lines reaching slightly above the level of tegulae. Scutellum rounded, nearly as long as broad, uniformly reticulate, with a narrow transverse impression anteriorly, scutellar foveae absent. Mesopleuron, including speculum uniformly reticulate. Axillula coriaceous; subaxillular bar smooth, narrow, 2.0 times narrower than height of metanotal trough; propodeum with wrinkles; lateral propodeal carinae curved outwards in the posterior 1/3; central propodeal and lateral areas with wrinkles. Forewing margin without cilia, radial cell opened, at least 3.0 times as long as broad; areolet small, indistinct. Metasoma slightly longer than high in lateral view, metasomal tergite 2 without antero-lateral patch of setae, without punctures; tergite 3 the longest one, occupying at least 1/3 of metasoma length, without punctures; subsequent tergites and the large hypopygium with dense micropunctures; prominent part of ventral spine of hypopygium very short, with few sparse short white setae. Far East of Russia; known to induce galls in stems of *Saussurea neopulchella* Fish. and *S. pulchella* (Fiscj.) (Asteraceae).



Figs 28.1-12. *Diakontschukia saussureae*: 1-2, head, female: 1, front view, 2, from above. 3-4, head, male: 3, front view, 4, from above. 5-6, antenna: 5, female, 6, male. 7-12, female: 7, pronotum with submedian pronotal pits, antero-dorsal view, 8, scutum and scutellum, dorsal view, 9, mesosoma, lateral view, 10, propodeum and dorsellum, dorso-posterior view, 11, forewing, part, 12, metasoma, lateral view.

Below the first key to all known genera of Aylacini, including the nearctic *Antistrophus*, eastern palaearctic *Asiocynips*, *Zerovia* and the herein described *Diakontschukia* is given.

Key to the holarctic genera of Aylacini

(genera marked with (*) are unknown in the Western Palaearctic Region; those marked with (**) are known from the Mediterannean region only, absent from Ukraine.

1 Tarsal claws with basal lobe; mesopleuron, scutum and vertex smooth and shining 2

-- Tarsal claws simple; scutum and vertex coriaceous or rugose, striate or reticulate; mesopleuron striate or reticulate 3

2. Tarsal claws with weak basal lobe; R1 and Rs reaching wing margin; radial cell partially closed along margin; metasomal tergites 2 and 3 completely fused in females, separated in males .... ***Xestophanes***

-- Tarsal claws with strong, acute basal lobe; R1 and Rs not reaching wing margin; radial cell opened; metasomal tergites 2 and 3 completely free in both sexes .... ***Diastrophus***

3. Mesopleuron transversely striate; pronotum always with two distinct submedian pronotal pits, separated by a carina from one another 10

-- Mesopleuron reticulate, ruguloso-reticulate or ruguloso-striate; pronotum with indistinct submedian pronotal pits or with transverse narrow impression dorso-anteriorly, without median carina separating pits (or transverse impression) 4

4. Forewing margin without cilia, R1 and Rs not quite reaching wing margin 5

-- Forewing margin with distinct cilia; F1 equal or longer than F2; R1 and Rs reaching or not wing margin 6

5. F1 shorter than F2; submedian pronotal pits well-separated, deep; pronotal plate distinct; frons and vertex strongly reticulate; notauli distinct in posterior half; North America .... ***Antistrophus****

-- F1 longer than F2; submedian pronotal pits and pronotal plate absent, pronotum dorso-anteriorly with very narrow transverse impression; notauli very shallow, indistinctly impressed along entire length .... ***Diakontschukia****

6. Submedian pronotal pits distinct, separated by a median carina; pronotum, scutum and mesopleuron reticulate; lower face without striae; F1 equal F2; radial cell opened; galls in fruit capsules of *Papaver* .... ***Iraella***

-- Submedian pronotal pits indistinct, in a form of two rather small indistinctly separated pits or present by indistinct, narrow transverse impression; pronotum and scutum coriaceous or rugose; mesopleuron reticulate or ruguloso-reticulate; lower face always with striae; F1 at least slightly longer than F2; radial cell entirely or at least partially closed 7

7. Scutum and scutellum with strong interrupted transverse rugae; propodeum dull rugose, lateral propodeal carina incomplete; Rs+M projecting into the most posterior end of basalis; galls in stems of *Cousinia* (Asteraceae) .... ***Asiocynips****

-- Scutum and scutellum delicately coriaceous; propodeum coriaceous, lateral propodeal carina complete; Rs+M projecting into lower half (but never into most posterior end) of basalis 8

8. Antenna longer than body; lateral propodeal carinae strongly curved outwards in the middle; central propodeal area occupying at least half width of propodeum in postero-dorsal view, galls in stems of *Epilasia* (Asteraceae) .... ***Zerovia****

-- Antenna much shorter than body; lateral propodeal carina subparallel or very slightly curved outwards in the most posterior part; central propodeal area narrow, occupying at most 1/3 of width of propodeum in postero-dorsal view 9

9. Mesopleuron reticulate; notauli usually faint or absent anteriorly .... ***Phanacis***

-- Mesopleuron ruguloso-reticulate or ruguloso-striate; notauli usually complete .... ***Phanacis*** (=*Timaspis*)

10. Head in female as high as broad and slightly higher than broad in male in front view; malar space at least as long as height of eye in female and longer in male; scutellar foveae shallow and indistinct, not distinctly separated by a median carina; forewing margin with long cilia; galls on *Valerianella* .... ***Cecconia***

-- Head broader than high in front view; malar space shorter than height of eye; scutellar foveae distinct, separated; forewing margin without or very short cilia 11

11. R1 and Rs not quite reaching wing margin; radial cell entirely opened along margin 12

-- Rs almost reaching to anterior margin of wing, R1 touching wing margin or more or less continuing along wing margin; radial cell closed, partially closed or obsoletely closed 15

12. Mesopleuron with transverse striae, interspaces reticulate; metasomal tergite 2 without a patch of white setae antero-laterally; head trapezoid in front view; galls in fruit capsules of *Papaver* (Papaveraceae) .... ***Barbotinia***

-- Mesopleuron with transverse striae, interspaces smooth, shining, never reticulate; metasomal tergite 2 always with a patch of white setae antero-laterally; head rounded in front view, never trapezoid 13

13. Pronotum postero-laterally with strong transverse parallel short rugae, with very dense white setae, especially in antero-lateral half; scutum microreticulate; F1 of female longer than F2; metasomal tergite 2 with a distinct patch of setae antero-laterally; wing margin with moderately long cilia; galls in *Nepeta*, *Hymenocrateris* .... ***Liposthenes***

-- Pronotum without transverse striae postero-laterally, uniformly coriaceous or reticulate, with relatively sparse setae; scutum coriaceous or ruguloso-coriaceous; F1 of female shorter than F2; metasomal tergite 2 with or without patch of setae antero-laterally; wing margin without or with very short cilia 14

14. Wing margin without cilia; scutum coriaceous, with scattered piliferous points (punctures); notauli distinct only in posterior half; metasoma without lateral patch of setae and without punctures; galls on *Phlomis* and *Salvia* .... ***Rhodus*****

-- Wing margin without or with very short cilia; scutum with more or less distinct transverse striae, always without piliferous points; notauli sometimes less impressed anteriorly, but always complete; metasomal tergites, at least beginning from 3rd with distinct punctures; galls mainly on *Centaurea* or other Asteraceae .... ***Isocolus***

15. Radial cell closed or almost closed, R1 always more or less continuing along wing margin; pronotum dorsally always quite long.. 16

-- Radial cell opened along margin, R1 usually not reaching wing margin or if so, than extending to a very small distance along margin; continuing along margin of wing, pronotum dorsally always short 17

16. Mesopleuron uniformly and entirely transversely striate; metasomal tergite 2 with distinct patch of white setae antero-laterally; female antenna 13-segmented; notauli

usually complete, reaching pronotum; wing margin with moderately long cilia; galls mainly on Asteraceae .... ***Aulacidea***

-- Mesopleuron partially transversely striate, partially alutaceous; metasomal tergite 2 without patch of white setae antero-laterally; female antenna 12-segmented; wing margin without cilia; galls on *Salvia* (Lamiaceae) .... ***Hedickiana***

17. Notauli weak, indistinctly impressed even posteriorly; metasomal tergite 2 without patch of white setae antero-laterally; galls on *Phlomis* (Lamiaceae) .... ***Panteliella***

-- Notauli distinctly impressed, at least in posterior half; metasomal tergite 2 with or without patch of white setae antero-laterally; galls on *Salvia* (Lamiaceae) and *Papaver* (Papaveraceae) 18

18. Pronotum dorsally relatively short, submedian pronotal pits strongly transverse, narrowly separated; scutellar foveae small, coriaceous; female antenna 13-segmented; wing margin with relatively long cilia; galls on *Papaver* (Papaveraceae) .... ***Aylax***

-- Pronotum dorsally longer, submedian pronotal pits more rounded, broadly separated; scutellar foveae rounded, large, smooth, without sculpture; female antenna 12-13-segmented; wing margin with very short indistinct cilia; galls on *Salvia* (Lamiaceae) .... ***Neaylax***

Aulacidea Ashmead, 1897

Figs 29.1-10.

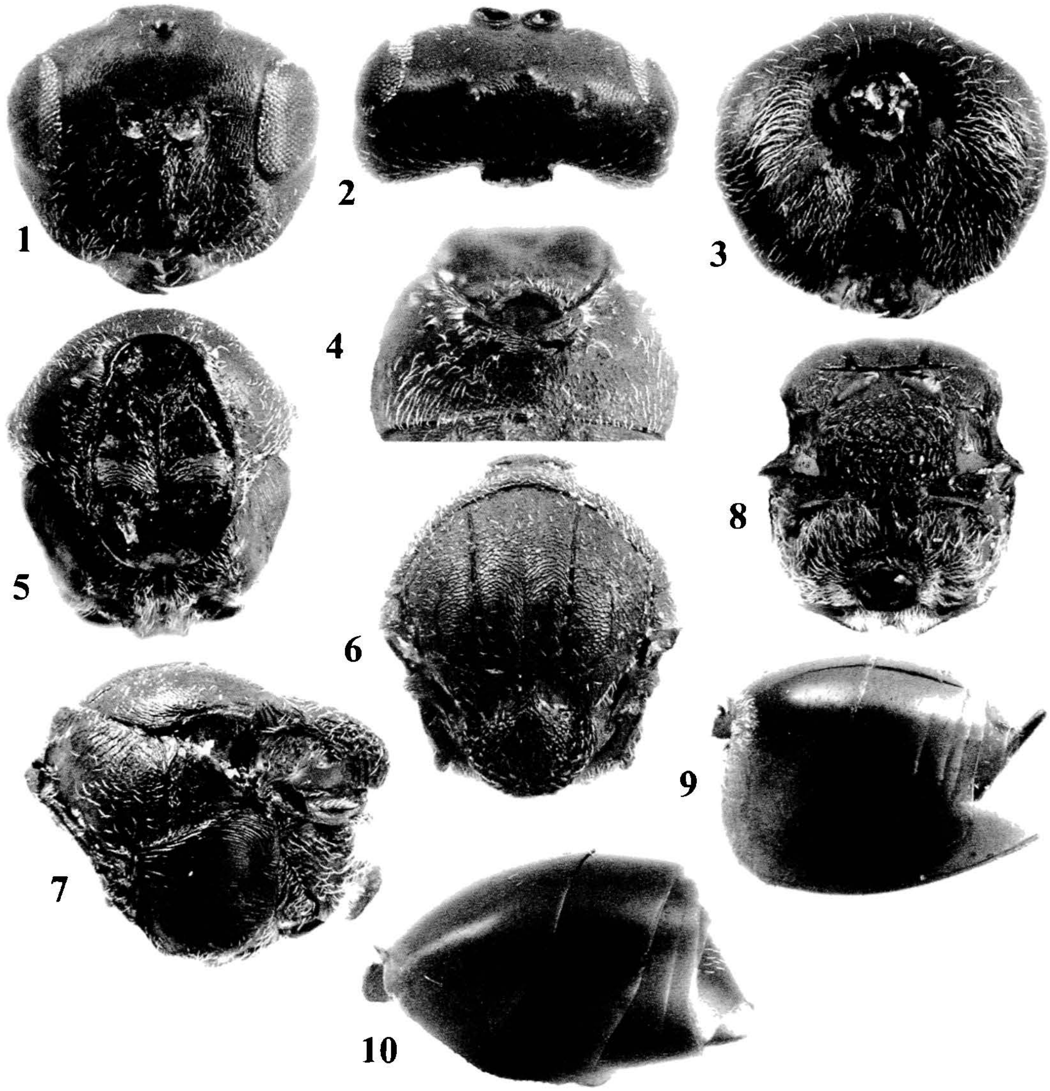
Cynips Linnaeus, 1758: 343, 553 (part); *Aylax* Hartig, 1840: 186, 195; *Aulax* Schenck, 1863: 219, 221; *Pseudaulax* Ashmead, 1903: 213; *Aulacidea* Ashmead, 1897a: 68. Type species: *Aulax mulgediicola* Ashmead, 1896 (= *Aulax harringtoni* Ashmead, 1897).

Head about 2.0 times as broad as long from above; slightly broader than high in front view. Gena not or slightly broadened behind eye. Frons and vertex coriaceous; lower face with striae, radiating from clypeus, median elevated area without striae, coriaceous. Antenna 12-14-segmented in female, 13-14-segmented in male, F1 shorter or equal F2, never longer than F2. Pronotum dorsally long, submedian pronotal pits distinctly impressed, broadly separated; scutum coriaceous, granulate or finely rugulose. Notauli usually complete, sometimes indistinctly impressed and very narrow anteriorly; median mesoscutal line usually in a form of short triangle or extending to 1/3-1/4 or at most to half length of scutum. Scutellum rounded or slightly longer than broad, with coriaceous or rugose sculpture; scutellar foveae distinct, usually large and rounded or even longer than broad, separated by a central carina. Mesopleuron always transversely striate. Radial cell closed along margin; margin with moderately long cilia. Metasomal tergite 2 usually with a patch of white setae antero-laterally, sometimes they absent or inconspicuous; posteriorly punctuate or not; subsequent tergites and hypopygium punctate.

Taxonomic comments. *Aulacidea* easily can be distinguished from all other genera by the closed radial cell of the forewing and transversely uniformly striate mesopleuron. Position of *Aulacidea ascanica* and *A. serratulae* within the *Aulacidea* genus can be questioned. All the characters these two species posses with are more characteristic for *Isocolus* species, however, on the basis of the closed radial cell of the forewing, we leave them in *Aulacidea* till a more detail generic revision of Aylacini will be done. *Aulacidea verticillica* Belizin, 1959 herein is transferred into the *Neaylax* genus (see in *Neaylax*). *Aulacidea lutigea* Diakontschuk, 2003, a recently described species, appeared to be conspecific and, thus synonym of *Cecconia valerianellae* (Thomson, 1877) (see in *C. valerianellae*).

Distribution. Holarctic genus, with 28 world-wide known species. Seventeen species are known from Europe (13 are given below for the Ukrainian fauna); four species: *A. follioti* Barbotin, 1972 (France, Spain), *A. laurae* Nieves-Aldrey, 1992

(Spain), *A. freesei* Nieves-Aldrey, 1995 (France), and *A. arnicae* Hoffmeyer, 1930 (Denmark) are known from Western Europe only. Three *Aulacidea* species are known from the Eastern Palaearctic Region: *A. discolor* Diakontschuk, 1988 (Tajikistan and Turkmenistan), *A. koelpiniae* Diakontschuk, 1988 (Turkmenistan) and *A. parvula* Diakontschuk, 1984 (Tajikistan and Turkmenistan) (Diakontschuk, 1984, 1988), and one species, *A. tobiasi* Melika, 2004, was recently described from the Far East of Russia (Melika, 2004). Seven species are listed for America north of Mexico (Burks, 1979).



Figs 29.1-10. *Aulacidea hieracii*: 1-9, female: 1-3, head, female: 1, front view, 2, from above, 3, posterior view, 4, pronotum with submedian pronotal pits, antero-doral view, 5, pronotum and propleura, antero-dorsal view, 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, metasoma, lateral view. 10, metasoma, male, lateral view.

Key to the palaearctic *Aulacidea* species

1. Forewing margin without cilia 2
-- Forewing margin with moderately long cilia 3

2. Head and entire mesosoma always black, galls on *Arnica montana* (Denmark) .... ***arnicae****
-- Head and mesosoma laterally always reddish to light brown, only scutum black; galls in stems on *Centaurea* and *Echinops* (Tajikistan, Turkmenistan) .... ***discolor****
3. Head higher than broad in front view 4
-- Head always slightly broader or at least as broad as high in front view 5
4. Scutellar foveae very narrow, coriaceous to smooth, indistinctly delimited posteriorly; head and mesosoma always black, galls in stems on *Eryngium*, *Cousinia*, *Echinops* (Turkmenistan, Tajikistan, Georgia) .... ***parvula****
-- Scutellar foveae broader, smooth and shining, deep, well-delimited around, galls in fruits on *Koelpinia linearis* (Asteraceae) (Turkmenistan) .... ***koelpiniae****
5. Female antenna 12-segmented 6
-- Female antenna 13-14 segmented 8
6. Body light reddish brown, except black scutum, scutellum and partially propodeum; galls in stems on *Phlomis tuberosa* .... ***phlomica***
-- Body predominantly black, head and mesosoma always black 7
7. F1 shorter than F2; galls in stems on *Silybum marianum* (Asteraceae) (southern France) .... ***freesei****
-- F1 equal or longer than F2 8
8. POL only slightly longer than OOL; F2 nearly equal F1; dorsellum medially nearly as high as height of ventral impressed area; metasomal tergite 2 without a posterior band of punctures; male antenna 14-segmented; galls in stems on *Serratula xeranthemoides* .... ***ascanica***
-- POL 2.0 times as long as OOL; F2 nearly 2.0 times as long as F1; dorsellum medially 3.0-4.0 times as high as height of ventral impressed area; metasomal tergite 2 with a posterior band of punctures, occupying its half length; male antenna 13-segmented; galls in stems on *Acroptilon repens* .... ***acroptilonica***
9. Notauli incomplete in anterior 1/3, F1 much shorter than F2 10
-- Notauli complete, at least slightly impressed anteriorly; F1 equal or longer than F2 11
10. Scutellar foveae relatively more longer and broad, inner margins nearly reaching one another anteriorly; median mesoscutal line extending to 1/3-1/2 of scutum length; galls in *Scorzonera* (France, Spain) .... ***laurae****
-- Scutellar foveae shorter and narrower; median mesoscutal line absent; galls in *Sonchus asper* (France, Great Britain, Spain) .... ***follioti****
11. Metasomal tergite 2 without a patch of dense white setae antero-laterally; tergite 3 with very weak, indistinct sparse punctures; galls in flower heads on *Phlomis tuberosa* .... ***diakontschukae***
-- Metasomal tergite 2 with a distinct patch of dense setae antero-laterally, tergite 3 with or without punctures; galls different and on other plants 12
12. Metasomal tergite 3 entirely punctate 13
-- Metasomal tergite 3 with posterior band of punctures which usually extending to at most half length of tergite only 15
13. Scutellar foveae transversely ovate, always broader than high, smooth, shining; punctures on metasomal tergite 3 uniformly dense and distinct; hypopygium large; galls in *Scorzonera* and *Serratula* 14

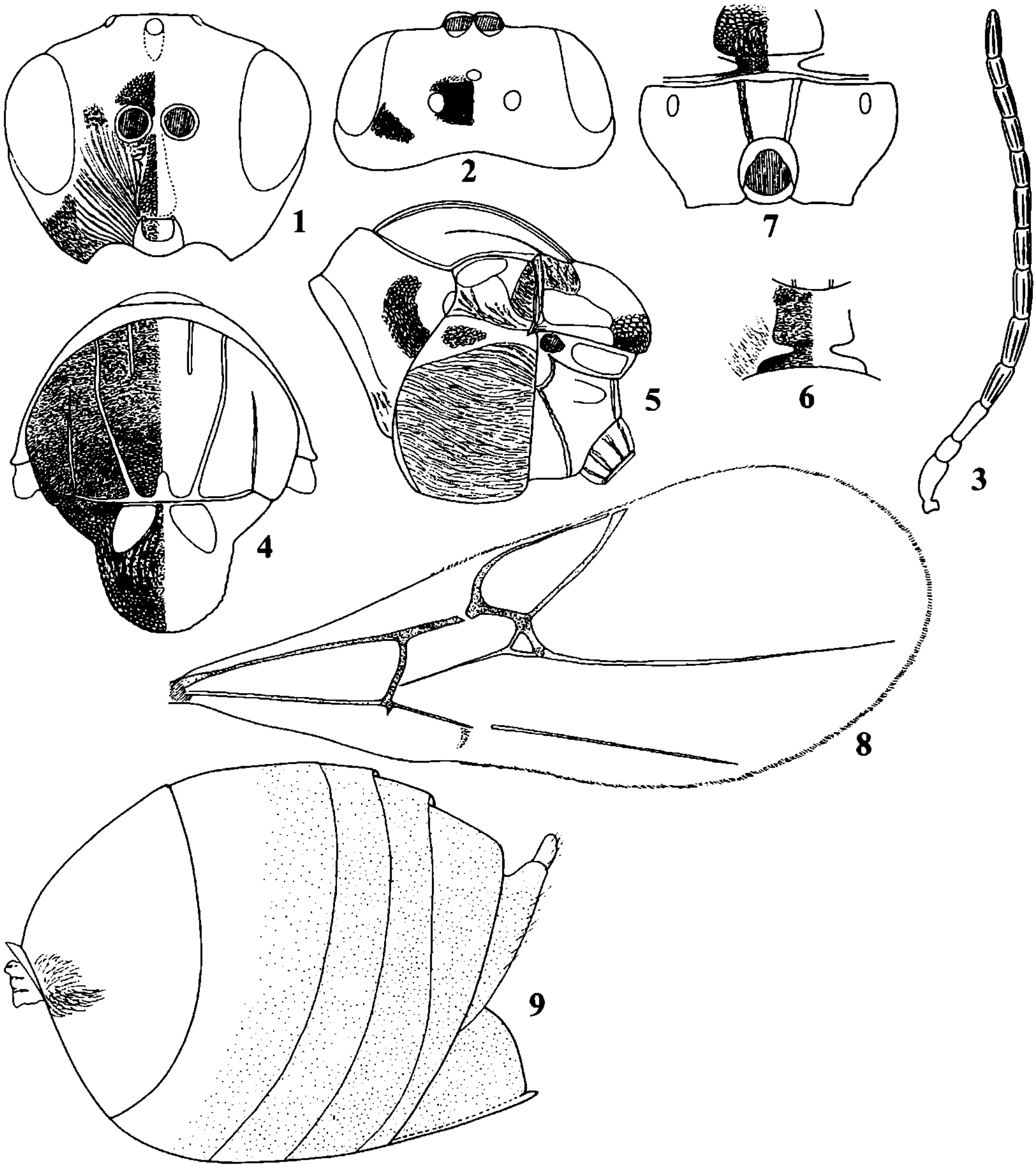
-- Scutellar foveae elongated, longer than broad, with wrinkles; punctures on metasomal tergite 3 more sparse and weak in the anterior half; hypopygium small; galls in stems of *Tragopogon* .... ***tragopogonis***
14. POL 3.0 times as long as diameter of lateral ocellus; female antenna 14-segmented; notauli incomplete, anteriorly absent; scutellar foveae transversely ovate, much narrower; metasomal tergite 2 occupying nearly the half length of metasoma dorsally; galls in stems on *Scorzonera* .... ***scorzoneura***
-- POL at least 4.0 times as long as diameter of lateral ocellus, female antenna 13-segmented; notauli complete; scutellar foveae elongated, nearly as long as broad; metasomal tergite 2 occupying at most 1/3 of metasoma length dorsally; galls in flower heads on *Serratula* .... ***serratulae***
15. F1 of female equal or very slightly longer than F2; pronotum laterally alutaceous to very delicately coriaceous; median mesoscutal line long, in some specimens reaching to pronotum (in a form of a line which is not impressed); punctures on metasomal tergite 3 dorsally nearly reaching anterior margin of tergite; laterally band of punctures narrowing towards ventral margin of tergite 16
-- F1 always slightly shorter than F2; pronotum laterally coriaceous; median mesoscutal line shorter, impressed, never longer than half length of scutum; punctures on metasomal tergite 3 form a band equal in width dorsally and laterally 17
16. Head transversely subrectangulate; anterior margins of scutellar foveae together forming a straight line; galls on leaves of *Hieracium* .... ***subterminalis***
-- Head narrowly trapezoid in front view; scutellar foveae nearly rounded; galls on leaves of *Hieracium* .... ***pilosellae***
17. Antennal toruli very closely located, diameter of torulus at least 6.0 times as large as distance between toruli; scutum distinctly longer than broad; Rs+M of forewing extending to 2/3 length of distance between areolet and basalis; lateral propodeal carinae broad, curved outwards in the middle; galls in stems on *Rubus* .... ***rubi***
-- Antennal toruli are away from one another, diameter of torulus never more than 3.0 times as large as distance between toruli; scutum only slightly broader or equal to width; Rs+M always reaching basalis; lateral propodeal carinae narrow, straight; galls in *Hieracium* and flower heads on *Scorzonera* 18
18. POL at most 2.8 times as long as diameter of lateral ocellus; lower face with distinct striae radiating from clypeus and reaching eyes and antennal sockets; median mesoscutal line in a form of short triangle; galls in *Hieracium* .... ***abdominalis***
-- POL 5.5 times as long as diameter of lateral ocellus; malar space high, 0.8 times as long as height of eye; lower face delicately coriaceous, without distinct striae, radiating of clypeus; median mesoscutal line reach at least to half length of scutum 19
19. Metasomal tergites with punctures, head and mesosoma black; galls in flower heads on *Scorzonera* .... ***hieracii***
-- Metasomal tergites without punctures, head and mesosoma brown to pale brown; galls in *Saussurea grandifolia* (Asteraceae) (Far East of Russia) .... ***tobiasi****

Aulacidea abdominalis (Thomson, 1877)

Figs 30.1-9.

Aulax abdominalis Thomson, 1877: 801 (female); *Aulacidea abdominalis*: Kieffer, 1902d: 95; *Aulacidea macula* Forsius, 1921: (synonym in Nieves-Aldrey, 1995a: 372).

Description. Female. 2.1-2.7 mm. Head and mesosoma black, in some specimens lower face, compound eyes, genae, mesopleuron, sides of pronotum and sometimes metanotum dark brown; metasoma reddish brown, slightly darker dorsally. Antenna light brown, slightly darker than uniformly light brown legs. Mandibles and palpi light brown. Wing veins distinct, brown. Head delicately coriaceous to alutaceous, with uniformly sparse white setae, 1.7-1.8 times as broad as long from above, 1.2-1.3 times as broad as high in front view and slightly broader than mesosoma. Gena delicately coriaceous to alutaceous, slightly broadened behind eye. Malar space coriaceous, with striae radiating from clypeus and nearly reaching eye, 0.5 times as long as height of eye. POL 1.3 times as long as OOL, 1.8-1.9 times as long as LOL and 2.8 times as long as diameter of lateral ocellus. Transfacial distance 1.65 times as long as height of eye and 2.0 times as long as height of lower face (distance between antennal rim and ventral margin of clypeus); diameter of antennal torulus 3.3 times as long as distance between them, and shorter than distance between torulus and eye margin. Lower face with delicate striae radiating from clypeus, laterally nearly reaching eye and antennal sockets and going even further, into area between eye and torulus; median elevated area delicately coriaceous, without striae. Clypeus coriaceous, with indistinct small anterior tentorial pits, with distinct epistomal sulcus and clypeo-pleurostomal line, ventral margin rounded. Frons alutaceous, with weak impression under central ocellus. Vertex and occiput delicately coriaceous to alutaceous. Antenna 13-segmented; pedicel 1.4 times as long as broad; F1 1.7 times as long as pedicel and very slightly shorter than F2; F2 slightly shorter than F3; F11 1.5-1.6 times as long as F10; placodeal sensilla on F2-F11, absent on F1. Mesosoma convex, very slightly longer than high in lateral view, with very few white setae. Pronotum alutaceous dorsally, delicately coriaceous laterally, with some weak wrinkles antero-ventrally, submedian pronotal pits deep, well-separated, distance between them equal to width of a pit; pronotal plate alutaceous, without setae, lateral margins distinct in anterior half of pronotum; pronotum aside of pronotal plate with dense white setae along anterior margin. Scutum uniformly delicately coriaceous, more delicate or even alutaceous in anterior half; broader than long and 1.4 times as long as scutellum; notauli complete, slightly broader posteriorly, well-impressed in all length; median mesoscutal line in a form of very short broad triangle; parapsidal lines distinct and broad, extending to 3/4 of scutum length; anterior parallel lines distinct and extending to 1/3 of scutum length. Scutellum slightly longer than broad, rounded posteriorly, delicately rugose, disk of scutellum with some distinct longitudinal rugae, surface between them coriaceous; slightly overhanging metanotum. Scutellar foveae ovate, elongated, longer than broad, well-delimited around, separated by a broad central carina, with smooth, shining bottom. Dorso-axillar area with few short white setae, uniformly delicately coriaceous. Mesopleuron, including speculum, with delicate interrupted uniform transverse striae, spaces between them smooth, shining; acetabular carina narrow, smooth, without rugae; mesopleural triangle delicately coriaceous. Metapleural sulcus reaching mesopleuron in the upper 1/3 of its height, area delimited by the inferior part of metapleural sulcus with very dense white setae; preaxilla smooth, shining; lateral axillar area with delicate weak transverse wrinkles; axillar carina 3.0 times narrower than width of lateral axillar area, with some delicate longitudinal striae; axillula transversely elongated, at least 2.5 times as long as high, smooth, shining, with few setae; subaxillular bar smooth, shining, slightly narrower than height of metanotal trough; pit over propodeal spiracle shallow, shining, carina along anterior border of propodeal spiracle strongly raised; ventral bar of metanotal trough delicately coriaceous, 2.0 times narrower than height of metanotal trough. Dorsellum uniformly very delicately coriaceous, nearly 2.0 times as broad as height of ventral impressed area; metanotal trough smooth, shining, with few white setae; ventral impressed area of the dorsellum smooth, shining. Propodeum delicately coriaceous, lateral propodeal carinae straight, converging posteriorly, without setae; central propodeal area narrow, broader anteriorly, gradually narrowing posteriorly, smooth, shining, with very few delicate wrinkles and setae; lateral propodeal area uniformly delicately coriaceous, with dense white setae; propodeal spiracle ovate; nucha long, with uniform longitudinal rugae. Forewing with dark brown veins, margin with short cilia; radial cell closed along margin, 2.6-2.8 times as long as broad; areolet distinct, Rs+M reaching basalis in the lower half. Tarsal claws simple. Metasoma longer than head+mesosoma, longer than high in lateral view, metasomal tergite 2 with a small patch of long white setae antero-laterally; posterior half of tergite 3 with a band of punctures; subsequent tergites and hypopygium with uniformly dense distinct micropunctures; prominent part of ventral spine of hypopygium very short, without or with very few short setae, never extending behind apex of spine. Male. 1.6-1.9 mm. Similar to female but antenna 14-segmented; metasoma lighter.



Figs 30.1-9. *Aulacidea abdominalis*, female: 1-2, head: 1, front view, 2, from above, 3, antenna: 4, scutum and scutellum, dorsal view, 5, mesosoma, lateral view, 6, pronotum with submedian pronotal pits, dorsal view, 7, propodeum and dorsellum, dorso-posterior view, 8, forewing, 9, metasoma, lateral view.

Gall in flower heads. As the result of galling, the base of the flower head is usually enlarged; the conglomerate of galls lignified, hard. Larval chamber is round or slightly ovate, developing in seeds which are slightly swollen.

Diagnosis. Most closely related to *A. hieracii*. In *A. abdominalis* POL at most 2.8 times as long as the diameter of lateral ocellus; the lower face with distinct striae radiating from clypeus and reaching eyes and antennal sockets; the median mesoscutal line in a form of a short triangle; scutellar foveae as long as broad, never transverse; galls in *Hieracium*, while in *A. hieracii* POL 5.5 times as long as the diameter of the lateral ocellus; the malar space high, 0.8 times as long as the height of an eye; the lower face delicately coriaceous, without distinct radiating striae; the median mesoscutal line reaching at least to the half length of the scutum; scutellar foveae are transversely ovate, always much broader than long; galls in flower heads of *Scorzonera*.

Distribution. SE (Nieves-Aldrey, 1994b), (Kieffer, 1897-1901), RO (Ionescu, 1973), PL (Kierych, 1979), DK, FI, SE (Coulians & Holmåsen, 1991), RU (Kursk Region - Belizin, 1959). In Ukraine -- Kherson (Chernomorskij Natural Reserve) and Mykolajiv Regions (10 specimens in the collection of SIZK).

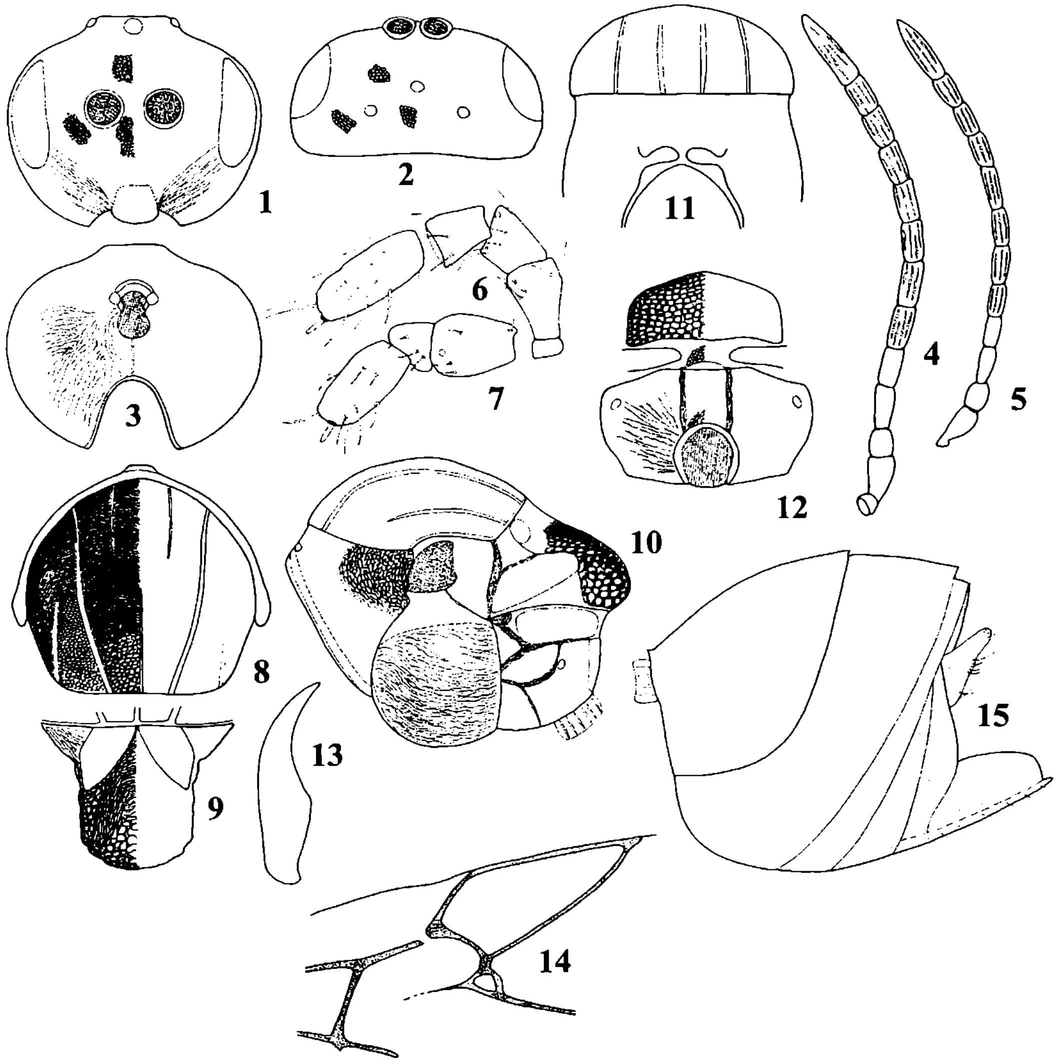
Biology. Monovoltine. Galls mature in June, larvae overwintering in galls and adults emerge next spring. Host plants: *Scorzonera humilis* L., *S. purpurea* L., *S. rosea* W.K. (Kierych, 1979), and *S. parviflora* Jacq. (Asteraceae) (Diakontschuk, 2003).

Aulacidea acroptilonica Tyurebaev, 1972

Figs 31.1-15, Plate 8.1.

Aulacidea acroptilonica Tyurebaev, 1972: 52 (female, male); *Aulacidea acroptilonica*: Kovalev & Diakontschuk, 1986: 16 (female, male and gall redescription).

Description. Female. 2.0-3.6 mm. Head black, mandibles and palpi dark brown. Antenna dark brown, with nearly black scapus and partially pedicel. Mesosoma, including propleura black. All coxae, trochanters, basal 3/4 of femurs dark brown to black, tibiae and tarsi light brown. Metasoma dark reddish brown to black, hypopygium always lighter. Wing veins distinct, dark brown. Head delicately coriaceous to alutaceous, with uniformly sparse white setae, 1.7 times as broad as long from above, 1.1-1.2 times as broad as high in front view and slightly broader than mesosoma. Gena alutaceous, slightly broadened behind eye, visible in front view behind eye. Malar space alutaceous, with delicate striae radiating from clypeus and nearly reaching eyes, 0.5 times as long as height of eye. POL 1.3 times as long as OOL; 1.9 times as long as LOL and 2.8 times as long as diameter of lateral ocellus. Transfacial distance 1.6-1.7 times as long as height of eye and 2.0 times as long as height of lower face (distance between antennal rim and ventral margin of clypeus); diameter of antennal torulus 3.3 times as long as distance between them, slightly shorter than distance between torulus and inner margin of eye. Lower face delicately coriaceous to alutaceous, with some very delicate striae radiating from clypeus in lateral part only; median elevated area coriaceous, without striae. Clypeus quadrangular, alutaceous, with very indistinct small anterior tentorial pits, with indistinct epistomal sulcus and clypeo-pleurostomal line, ventral margin rounded. Frons alutaceous with some sparse indistinct piliferous points. Vertex and occiput delicately coriaceous. Postocciput and postgena alutaceous, with very delicate striae; posterior tentorial pits large, deep, elongated; gula narrow, higher than broad, gular sulci very indistinct; occipital foramen nearly as high as height of gula and 1.5 times shorter than hypostomal foramen. Maxillar and labial palps on figures. Antenna 12-segmented, more or less one-half of body length; pedicel 1.25 times as long as broad; F1 1.5 times as long as pedicel and 0.4 times as long as F2; F2 0.9 times as long as F3; F10 2.3 times as long as F9; placodeal sensilla on F3-F10, absent on F1-F2. Mesosoma convex, nearly as long as high in lateral view, with sparse white setae. Pronotum alutaceous to smooth dorsally, coriaceous laterally to dull coriaceous in front of tegula; with moderately dense white setae along anterior margin, submedian pronotal pits distinct, transversely rounded, deep, separated by a narrow part, which 2-3 times narrower than a pit width. Scutum uniformly delicately coriaceous in posterior part, with more alutaceous surface in anterior half; slightly broader than long and 1.2 times as long as scutellum. Notauli complete, slightly broader posteriorly, well-impressed in all length; median mesoscutal line very narrow, extending to half or less length of scutum; parapsidal line distinct and broad, reaching slightly above tegulae; anterior parallel lines distinct and extending to 1/3 of scutum length. Scutellum quadrangular, with parallel sides, slightly longer than broad, rounded posteriorly, dull rugose along



Figs 31.1-15. *Aulacidea acroptilonica*: 1-3, head female: 1, front view, 2, from above, 3, posterior view. 4-5, antenna: 4, female, 5, male. 6-15, female: 6, palpus maxillaris, 7, palpus labialis, 8, scutum, dorsal view, 9, scutellum, dorsal view, 10, mesosoma, lateral view, 11, pronotum with submedian pronotal pits, dorsal view, 12, propodeum and dorsellum, dorso-posterior view, 13, tarsal claw, 14, forewing, part, 15, metasoma, lateral view.

sides; disk of scutellum with some distinct irregular wrinkles and more delicate sculpture; very slightly overhanging metanotum. Scutellar foveae ovate, longer than broad, deep, well delimited around, smooth, shining, without setae; medially separated by a triangular central carina, so scutellar foveae touch one another anteriorly. Mesopleuron, including speculum, with uniform interrupted transverse delicate striae; mesopleural triangle smooth, shining, with relatively dense short white setae; acetabular carina delimiting a very narrow smooth and shining area. Metapleural sulcus reaching mesopleuron slightly above half or less of its height; axillula transversely ovate, smooth, shining, with few piliferous points; subaxillular bar smooth, shining, as high as height of metanotal trough. Dorsellum delicately coriaceous, nearly 3.0-4.0 times as high as height of ventral impressed area; metanotal trough smooth, shining, with few white setae, ventral impressed area smooth, shining. Propodeum delicately coriaceous to alutaceous, with some interrupted weak striae, radiating from lateral propodeal carina into lateral propodeal area and not reaching sides of propodeum, lateral propodeal carinae straight, parallel, uniformly thick, without setae; central propodeal area delicately uniformly coriaceous to alutaceous, without setae; nucha long, with uniform longitudinal sulci all around. Forewing with distinct veins, margin with relatively long cilia; radial cell closed, 2.6 times as long as broad, areolet distinct, Rs+M indistinct, extending to 1/3-1/2 half of the distance between areolet and basalis. Tarsal claws narrow, simple, without basal lobe. Metasoma nearly as long as head+mesosoma, higher than long in lateral view, metasomal tergite 2 smooth, shining, without micropunctures and lateral patch of setae; tergite 3 with a band of indistinct sparse micropuncture in posterior half; subsequent tergites and hypopygium with dense indistinct micropunctures, hypopygium large, prominent part of ventral spine of hypopygium very short, without or very few short sparse white setae, not reaching behind apex of spine. Male. 2.2-2.3 mm. Similar to female but antenna 12-13-segmented (sometimes suture between F11 and F10 indistinct), F1 1.3 times as long as F2.

Gall (Plate 8.1). Spindle-like, lignified formations on the stem, 25 mm long (maximum 50 mm) and 20 mm in diameter. Galls develop on all parts of the stem, from the ground-surface up to the flower. The size of gall formation depends on the number of larval chambers (from 1 to 30). A single larval chamber nearly rounded, 3.0 mm in diameter, with smooth surface. Galls collected in Ukraine usually smaller than those in Middle Asia (Kovalev & Diakontschuk, 1986).

Diagnosis. Most closely resembles *A. ascanica* (see Diagnosis to *A. ascanica*).

Taxonomic comments. Middle Asian populations differ by much lighter flagellomeres, legs and light brown metasoma. Specimens collected in southern part of Ukraine are characterized by dark brown F1-F2, F1 and proximal flagellomeres usually slightly longer.

Distribution. South of Ukraine, European part of Russia, Kazakhstan, Kyrgyzstan, Turkmenistan, Tajikistan, Uzbekistan (Zerova, Diakontschuk & Ermolenko, 1988; Kovalev & Diakontschuk, 1986); IR (Western Azarbaijan, Urmia, author). In Ukraine -- Kherson Region (Kolonchackij district, 15 examined specimens in the collection of SIZK).

Biology. Monovoltine. Eggs are layed into *Acroptilon* stem and young sprouts; a stem swelling already visible in a few days after ovipositing (Ivannikov et al., 1976). Part of adults emerge at the beginning of summer. Majority of larvae overwintering in the gall, pupate in March-April; adults emerge by the end of April (Middle Asia) – beginning of May (Kazakhstan and Ukraine) (Zerova, Diakontschuk & Ermolenko, 1988). *Acroptilon repens* (L.) DC. (Asteraceae) is the only known host plant, however, probably can induce galls on a closely related species, *A. australe* Iljin. (Kovalev & Diakontschuk, 1986).

Aulacidea ascanica Diakontschuk, 1984

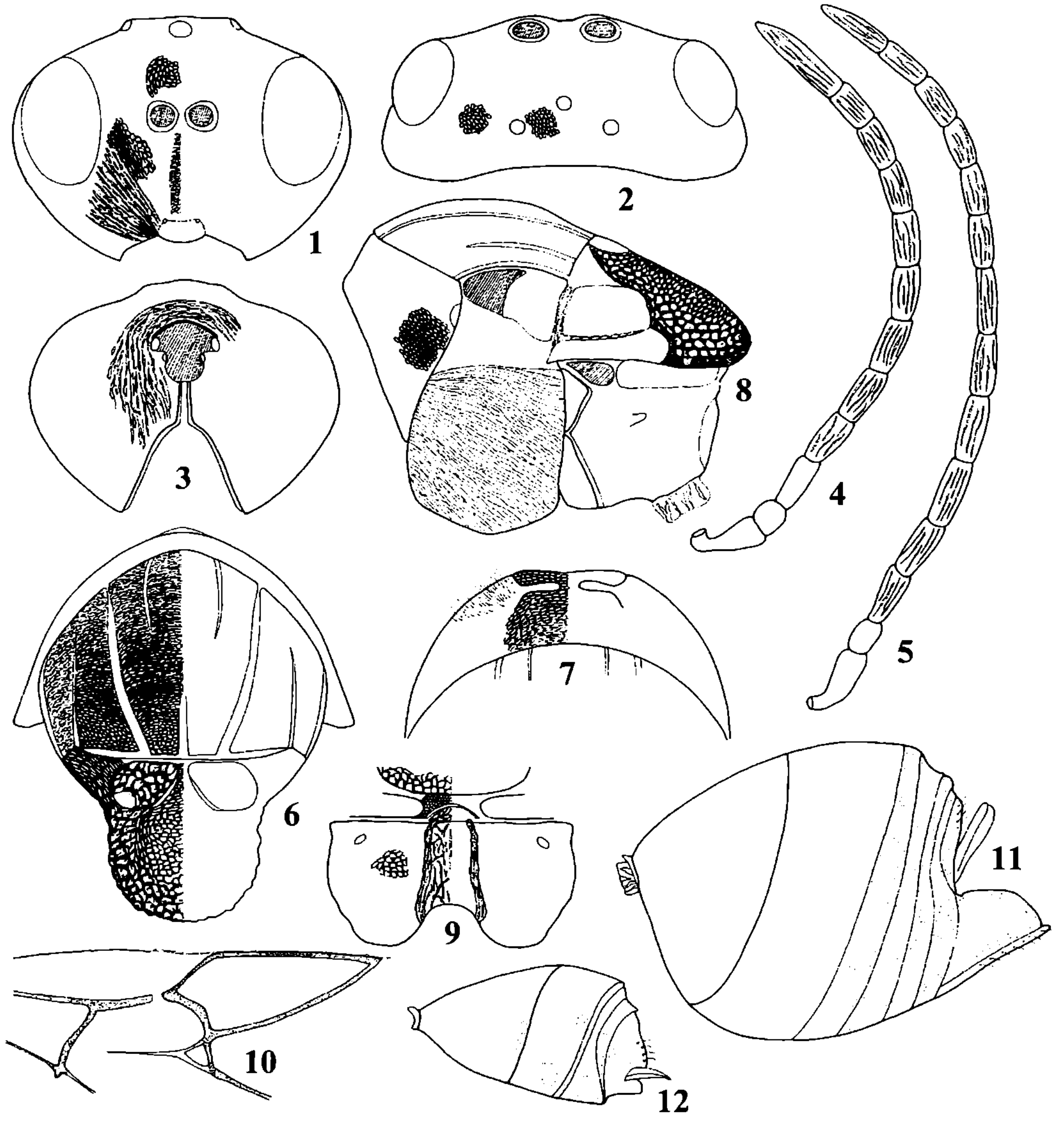
Figs 32.1-12, Plate 8.2.

Aulacidea ascanica Diakontschuk, 1984: 73 (female, male, gall).

Description. Female. 2.5-3.0 mm. Head and mesosoma black; mandibles and palpi dirty brown; antenna, except black scapus uniformly brown. Tegula yellowish brown. All coxae, trochanters and basal 3/4 of femurs dark brown to black; tibiae and tarsi brown to light brown. Metasoma dark brown to black, hypopygium always much lighter. Wing veins distinct, dark brown. Head delicately coriaceous to alutaceous, with uniformly sparse white setae, 2.2 times as broad as long from above, 1.35-1.4 times as broad as high in front view and slightly broader than mesosoma. Gena delicately coriaceous to alutaceous, broadened behind eye, nearly as broad as cross diameter of eye, visible behind eye in fron view. Malar space coriaceous, 0.7 times as long as height of eye, with some delicate interrupted striae, radiating from clypeus and not reaching eye margin. POL 1.1 times as long as OOL, 2.1 times as long as LOL and 5.2 times as long as diameter of lateral ocellus. Transfacial distance 1.25 times as long as height of eye and 1.5 times as long as height of lower face (distance between antennal rim and ventral margin of clypeus); diameter of antennal torulus 5.5 times as long as distance between them, 0.7 times as long as distance between torulus and eye margin. Lower face delicately coriaceous, with some indistinct interrupted striae laterally, radiating from clypeus and not reaching eye; median elevated area without striae, delicately coriaceous. Clypeus small, quadrangular, at least 2.0 times as broad as high; anterior tentorial pits small, indistinct; epistomal sulcus and clypeo-pleurostomal line indistinct, ventral margin slightly rounded. Frons alutaceous, with some indistinct piliferous points; vertex and occiput uniformly delicately coriaceous, without points. Postocciput and postgena costulate; posterior tentorial pits deep, elongated; gula very indistinctly delimited by gular sulci, higher than broad; hypostomal carina is strong, emarginated; occipital foramen higher than gula and 1.5 times shorter than hypostomal foramen. Antenna 12-segmented, shorter than body length; pedicel globose, as long as broad; F1 1.8 times as long as pedicel and equal F2; F2 slightly shorter than F3; F10 2.6 times as long as F9; placodeal sensilla well-visible on F2-F10, absent on F1. Mesosoma convex, very slightly longer than high in lateral view, with uniform sparse white setae. Pronotum alutaceous dorsally, with dense white setae laterally to pronotal plate and along anterior margin of pronotum; delicately uniformly coriaceous laterally. Submedian pronotal pits deep, strongly transverse, separated by a median area which at least 2.0 times narrower than width of a pit; submedian plate well-delimited laterally only in the most anterior part of pronotum. Scutum uniformly delicately coriaceous, slightly broader than long, 1.3 times as long as scutellum. Notauli complete, well-impressed in all length, broad, broader posteriorly; median scutal line broad, shining smooth, extending at least to 1/3 of scutum length; parapsidal line distinct but narrow, extending about 1/2 length of scutum; anterior parallel lines distinct and extending at least to 1/3 of scutum length. Scutellum broad, only very slightly longer than broad, with parallel sides, dull rugose, with more delicate sculpture on the disk; slightly overhanging metanotum. Scutellar foveae nearly as broad as high, deep, well-delimited around, delicately rugose, separated by a central carina. Dorso-axillar area alutaceous to delicately uniformly coriaceous, with sparse setae. Mesopleuron, including speculum, uniformly with very delicate transverse interrupted striae; mesopleural triangle smooth, matt, with some setae; acetabular carina invisible laterally. Metapleural sulcus reaching mesopleuron in the middle of its height; preaxilla and lateral axillar area delicately coriaceous; axillar carina narrow with some longitudinal striae; axillula elongated, at least 2.0-2.5 times as long as high, delicately coriaceous, with few white setae; subaxillular bar smooth, shining, in the most posterior end slightly higher than the height of metanotal trough; metapleuron with some distinct piliferous points; ventral bar of metanotal trough delicately coriaceous, as broad as height of metanotal trough. Dorsellum delicately coriaceous, nearly as high as height of ventral impressed area; metanotal trough smooth, shining, with few white setae; ventral impressed area of the dorsellum smooth, shining. Propodeum delicately uniformly coriaceous, lateral propodeal carinae uniformly thick, without setae, subparallel, slightly curved outwards in the most posterior part; central propodeal area with some irregular weak wrinkles, without setae; lateral propodeal area uniformly coriaceous, with few white setae; nucha with some weak longitudinal rugae. Forewing with dark brown veins, margin with very short cilia; radial cell closed, 2.5-2.7 times as long as broad, areolet distinct, large; Rs+M distinct and extending to 2/3 of distance between areolet and M, projecting slightly below middle of basalis. Metasoma slightly longer than head+mesosoma, longer than high in lateral view, metasomal tergite 2 and 3 without micropunctures, smooth, without lateral patch of setae; subsequent tergites and large hypopygium with dense micropunctures; prominent part of ventral spine of hypopygium very short, with relatively long setae. Male. 1.9-2.2 mm. Similar to female but antenna 14-segmented, F1 1.5 times as long as pedicel and slightly shorter than F2, placodeal sensilla strongly raised, on all flagellomeres; metasomal tergite 2 and 3 with some punctures laterally, subsequent tergites densely punctate.

Gall (Plate 8.2). The gall appears as a lignified but relatively soft stem deformation, differently shaped, what depends on the number of larval chambers. Multilocular. Larval chambers nearly rounded, slightly elongated, dirty grey, 1x2 to 2.4 mm long.

Diagnosis. Most closely resembles *A. acroptilonica*. In *A. ascanica* POL only slightly longer than OOL; F2 nearly equal F1; the median mesoscutal line is broad, deeply impressed, extending at most to 1/3 of the scutum length; scutellar foveae more or less rounded, rugose, separated by a distinct central carina; the dorsellum medially nearly as high as height of the ventral impressed area; metasomal tergite 2 without a posterior band of punctures; the male antenna 14-segmented; galls are in stems on *Serratula xeranthemoides*, while in *A. acroptilonica* POL 2.0 times as long as OOL; F2 nearly 2.0 times as long as F1; the median mesoscutal line is very narrow, indistinct, extending to the half of the scutum length; the scutellum is more elongated, scutellar foveae strongly elongated, longer than broad, smooth, shining, antero-medially reaching one another; the dorsellum medially 3.0-4.0 times as high as height of the ventral impressed area; metasomal tergite 2 with a posterior band of punctures, occupying its half length; the male antenna 13-segmented; galls are in stems on *Acroptilon repens*. Somehow conspecific with *Isocolus serratulae*, except the closed radial cell.



Figs 32.1-12. *Aulacidea ascanica*: 1-3, head female: 1, front view, 2, from above, 3, posteriorly. 4-5, antenna: 4, female, 5, male. 6-10, female: 6, scutum and dorsellum, dorsal view, 7, pronotum with submedian pronotal pits, dorsal view, 8, mesosoma, lateral view, 9, propodeum and dorsellum, dorso-posterior view, 10, forewing, part. 11-12, metasoma, lateral view: 11, female, 12, male.

Material examined. Holotype female: Ukraine, Kherson Region, Askania-Nova Natural Reserve, 25-26.04.1979, coll. L.A. Diakontschuk, ex stems of *Serratula xeranthemoides*, em. 03.05.1979; paratypes: 7 females and 13 males with the same labels as the holotype. Body appendages in preparation № 53-54. All are deposited in SIZK.

Distribution. Ukraine only -- Kherson Region (Askania-Nova Natural Reserve) (Diakontschuk, 1984; Zerova, Diakontschuk & Ermolenko, 1988).

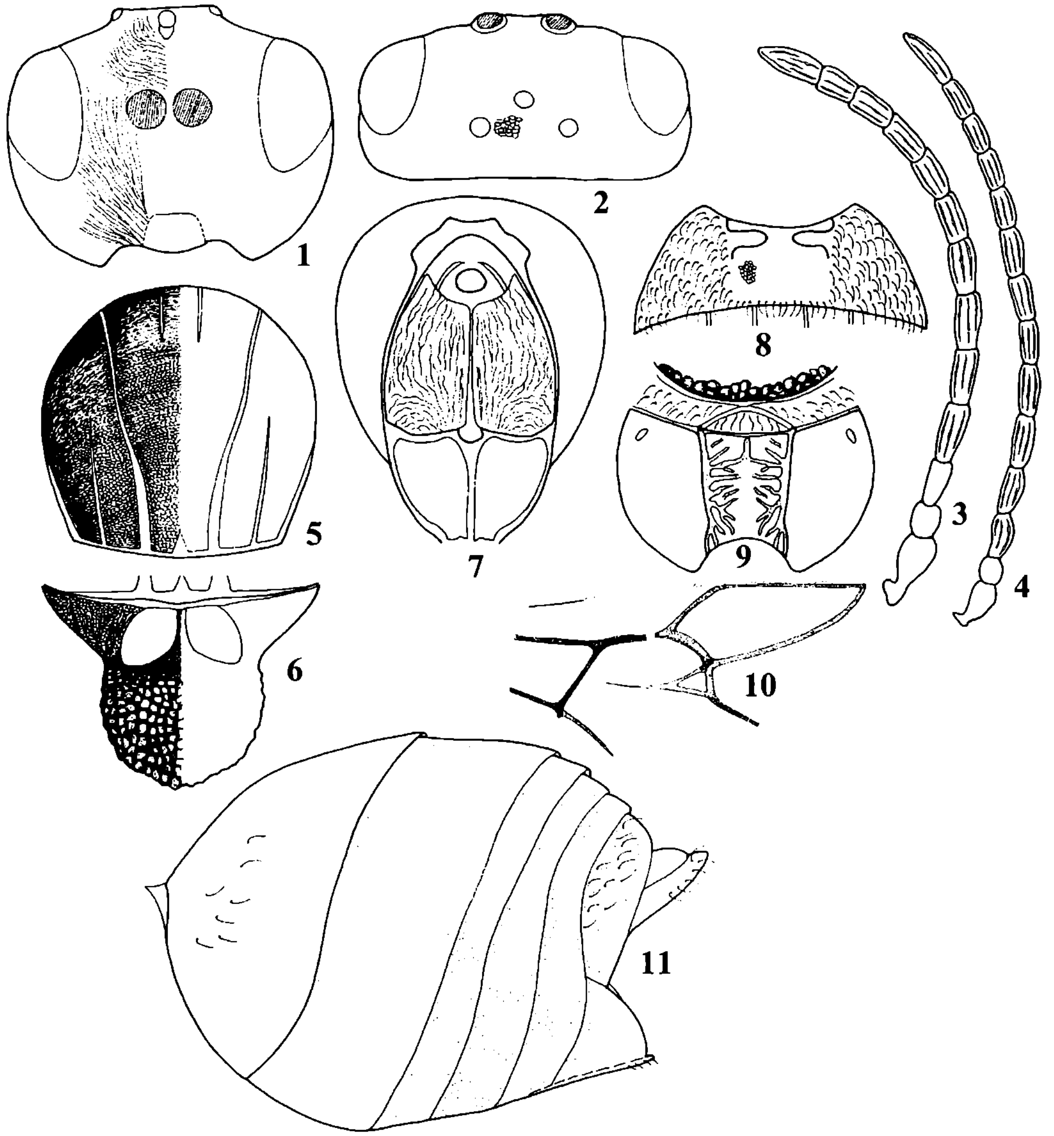
Biology. Monovoltine. Larvae overwintering in the galls, adults emerge next spring, by the end of May (Zerova, Diakontschuk & Ermolenko, 1988). The only known host plant is *Serratula xeranthemoides* M.B. (Asteraceae).

Aulacidea diakontschukae Melika & Klymenko, 2005

Figs 33.1-11.

Aulacidea diakontschukae Melika & Klymenko, 2005: 27 (female, male).

Description. Female. 2.2-2.8 mm. Head and mesosoma black; antennae brown, except black scape and pedicel; legs light brown, except dark brown to black coxae, trochanter and basis of femora. Metasoma black, hypopygium brown. Head nearly rounded, 1.2 times as broad as high in front view; 2.0-2.1 times as broad as long from above; gena not broadened behind eye; POL 1.3 times as long as OOL; frontal ocellus with impression towards frons; interocellar area and occiput delicately coriaceous, without punctures; occipital carina absent, vertex and occiput rounded, last with transverse very minute striation above occipital foramen; area between compound eye and antennal socket longitudinally minutely striate, with short white setae; postocciput and postgena coriaceous, with more dense white setae as the front of head; gular sulci free, well-separated at hypostoma; oral foramen 1.5 times as high as height of occipital foramen, distance between oral and occipital foramena slightly shorter than height of occipital foramen. Transfacial distance 1.4 times as long as height of compound eye; distance between antennal torulus and inner margin of compound eye 3.8 times as short as transfacial distance; distance between compound eye and antennal socket slightly larger than diameter of antennal socket; slightly elevated central area of lower face finely coriaceous; lower face laterally of elevated central area and malar space with radiating minute striae; malar space behind striation and gena behind compound eye finely coriaceous, with more longitudinal orientation of striae. Clypeus very minutely coriaceous; epistomal sulcus distinct, broad, slightly impressed, smooth, shining; anterior tentorial pits indistinct; malar space 1.4 times as short as height of compound eye; POL (in front view of head) 0.6-0.65 times as short as malar space and 0.4-0.5 times as long as height of compound eye. Mandibles dark brown. Antenna 13-segmented, uniformly brown, except black scape and pedicel, F1 0.75 as short as F2, F2 equal F3, pedicel 0.75 times as short as F1, scape only 1.6 times as long as F1, F11 1.7 times as long as F10, F10 equal F9. Mesosoma 1.25-1.3 times as long as high in lateral view. Pronotum dorso-medially 2.3 times as short as the greatest length measuring on outer margin; submedian pronotal pits distinct, transverse, separated by carina which slightly narrower than width of submedian pit; pronotal plate delimited in very anterior 1/3, very finely minutely coriaceous; pronotum with dense setae along anterior margin, less setae laterally; pronotum laterally, in antero-dorsal part coriaceous, antero-ventral edge with transverse parallel striae. Propleuron black, with longitudinal striae, with sparse white setae. Scutum subequal, nearly as long as broad in dorsal view, minutely coriaceous, minute striae longitudinally orientated, giving a view of transverse striation under proper lighting, with very few sparse short scattered setae, especially laterally to notauli and prolong lateral edge. Notauli deeply impressed, complete, reaching pronotum, smooth shining, strongly broadened in posterior 1/3; anterior parallel lines narrow, distinct, extending to 1/4 of scutum length; median mesoscutal line well-impressed and broad in very posterior part, parapsidal lines distinct, extending to 2/3 of scutum length. Scutellum elongated, nearly 2.0 times as long as broad in dorsal view, disk dull rugose. Scutellar foveae ovate, extending to 1/3 of scutellum length, separated by distinct, longitudinally striate carina, smooth, shining. Dorso-axillar area coriaceous, with some longitudinally orientated rugae towards scutellar foveae. Mesopleuron uniformly and entirely transversely striate, area between striae shining, smooth, acetabular carina delimiting a very narrow area laterally. Propodeum black, laterally finely coriaceous, with dense white long setae; lateral propodeal carinae distinct, uniformly thick, subparallel, central propodeal area shining, with strong, mainly transverse irregular rugae, without setae; metanotum coriaceous, matt, with few striae; metanotal trough finely coriaceous, with relatively dense short white setae; metanotal sulcus reaching mesopleuron in anterior 1/3 of mesopleuron; axillula coriaceous, with relatively dense white setae; lateral area of propodeum behind metapleural sulcus dull rugose; nucha black, sulcate. Tarsal claws simple, without basal lobe. Forewing longer than body; marginal cilia long, distinct; radial cell short, 2.5 times as long as broad, distinctly closed, marginal vein weaker; Rs strongly curved in proximal 1/3; areolet triangular, large, distinct, Cu_{1b} not curved outwards wing margin. Metasoma slightly longer than head+mesosoma, slightly compressed laterally, metasomal tergite 2 with sparse white setae antero-laterally, smooth, without punctures, tergite 3 with punctures dorsally and dorso-laterally, in the upper half of tergite; subsequent tergites and hypopygium densely uniformly punctate, prominent part of ventral spine of hypopygium short, with very few short white setae ventrally.



Figs 33.1-11. *Aulacidea diakontschukae*: 1-2, head female: 1, front view, 2, from above. 3-4, antenna: 3, female, 4, male. 5-11, female: 5, scutum, dorsal view, 6, scutellum, dorsal view, 7, pronotum and propleura, front view, 8, pronotum with submedian pronotal pits, dorsal view, 9, propodeum and dorsellum, dorso-posterior view, 10, forewing, part, 11, metasoma, lateral view.

Male. 1.8 mm. Similar to female but scutellum more delicately sculptured, scutellar foveae smaller, median mesoscutal line very indistinct in the very posterior part of scutum; antenna 14-segmented, pedicel 2.0 times as short as F1, F1 slightly curved, nearly equal F2, F12 1.7 times as long as F11, F10 equal F11.

Gall in flower heads. The only *Aulacidea* species known to induce hidden stem galls on *Phlomis* L. (Lamiaceae) is *A. phlomica* Belizin, 1959, however, *A. diakontschukae* strongly differs from it. Some other aylacine species are also induce stem galls on *Phlomis* L.: *Panteliella fedtschenkoi* (Rübsaamen, 1896), *Phanacis phlomidis* Belizin, 1959 and *Rhodus oriundus* Quinlan, 1968. *Aulacidea phlomica*, *Panteliella fedtschenkoi* and *Phanacis phlomidis* induce very similar galls which are nested in the stem of the plant and hard to distinguish, thus, adult wasps are necessary to distinguish which species caused them (Belizin, 1959; Quinlan, 1968). *Rhodus oriundus* Quinlan, 1968 was described from Greece and known to induce swelling-like galls in the apical buds of *Phlomis cretica* Presl.; later was also found on *Salvia fruticosa* Mill. in Israel (Lamiaceae) (Zerova et al., 2003). Within the *Aulacidea* genus, only two species are known to induce galls in flower heads: *A. laurae* Nieves-Aldrey, 1992 in *Scorzonera laciniata* (L.) (Asteraceae) (Nieves-Aldrey, 1992a, 2001a) and *A. serratulae* Diakontschuk, 1984 in *Serratula bracteifolia* (Iljin) Stank. (Asteraceae) (Diakontschuk, 1984). Thus, *A. diakontschukae* is the third *Aulacidea* species known to induce galls in flower heads and the second one, associated with *Phlomis* L. (Lamiaceae).

Diagnosis. Differs from all other species in that the metasomal tergite 2 without a patch of setae antero-laterally, only few short setae present or not; tergite 3 with very weak, indistinct and sparse punctures. Majority of the palaearctic *Aulacidea* species posses a latero-basal patch of dense white setae on the metasomal tergite 2, except two species: *A. acroptilonica* Tyurebajev, 1972 and *A. ascanica* Diakontschuk, 1984, which have only a few white setae latero-dorsally, like *A. diakonstchukae*. The first species induces multilocular stem galls on *Acroptilon repens* (Asteraceae) (Kovalev & Diakontschuk, 1986), while the second one ,induces also multilocular stem galls, but on *Serratula xeranthemoides* (Diakontschuk, 1984). *Aulacidea ascanica* is congeneric with *Isocolus*, except that the radial cell is closed; especially with *Aylax ascanica* Diakontschuk, 1983 (synonym of *Isocolus serratulae* (Mayr, 1882)). In *A. acroptilonica* and *A. ascanica* the frons is with some indistinct punctures, the radial cell of the forewing more elongated and narrower, about 3.0 times as long as broad, areolet small; F1 of the female antenna longer than F2; notauli are much less broadened in the posterior part, the median mesoscutal line narrow and shallow in the most posterior part of the scutum; scutellar foveae more elongated, extending to half of the scutellum length, while in *A. diakontschukae* the frons is without punctures, the radial cell of the forewing shorter, broader, and narrower, 2.5 times as long as broad, the areolet larger, triangular; F1 of the female antenna distinctly shorter than F2, notauli strongly broadened in the posterior part, the median mesoscutal line broad, deeply impressed in the most posterior part of the scutum; scutellar foveae shorter, extending to 1/3 of scutellum length. In *A. ascanica* the female antenna 12-segmented and the scutellum is subequal, nearly as long as broad in dorsal view, while in *A. diakontschukae* female antenna 13-segmented and the scutellum is distinctly longer than broad in dorsal view.

Material examined. Holotype female: "Ukraine, Donetsk Region, Khomutovskyj steppe Natural Reserve, 14-23.IV.2003", "ex flower heads of *Phlomis tuberosa*"; paratypes: 3 females and 1 male with the same labels as the holotype. All are deposited in SIZK.

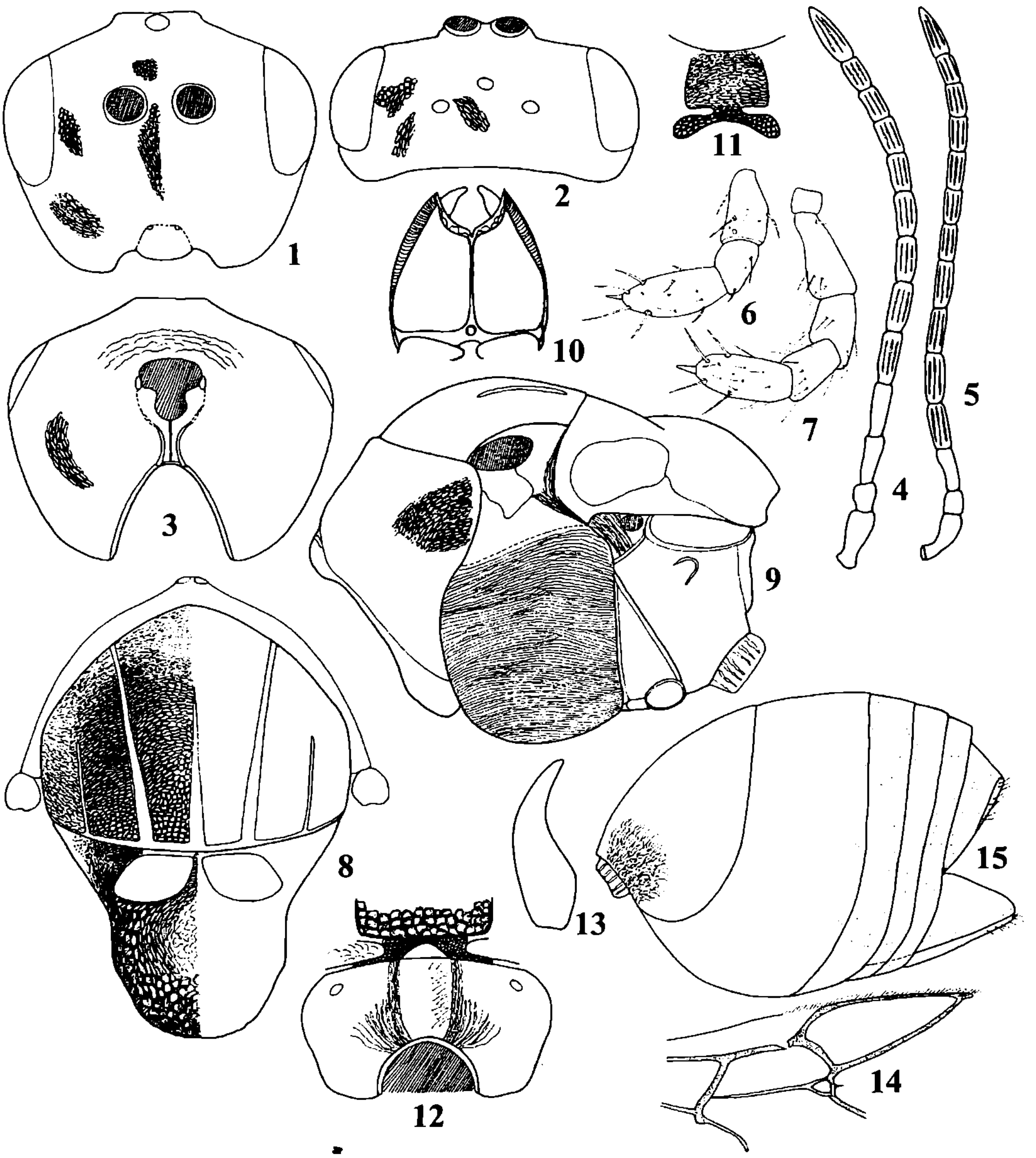
Distribution. Known from Ukraine, Donetsk Region, Khomutovska steppe Natural Reserve, although further sampling in similar habitats is required to establish its true distribution.

Biology. Monovoltine. Induces galls in flower heads of *Phlomis tuberosa* L. (Lamiaceae). Galls mature in autumn; adults emerge in spring next year (Melika & Klymenko, 2005).

Aulacidea hieracii (Linnaeus, 1758)

Figs 34.1-15, Plate 8.3-4.

Cynips hieracii Linnaeus, 1758: 553 (female, male); *Cynips hieracii* Bouché, 1834: 164 (female, gall); *Aylax (Cynips) hieracii*: Hartig, 1840: 195 (female, gall); *Aulax hieracii*: Schenck, 1863: 219, 221, 248 (female, male, gall); *Aulacidea hieracii* Folliot, 1964: 423; *Aulax graminis* Cameron, 1875: 321 (female, male, gall) (synonym in Eady & Quinlan, 1963: 20); *Aulax artemisiae* Thomson, 1877: 802 (synonym in Nieves-Aldrey, 1994a: 154), *Aulax foveigera* Thomson, 1877: 803 (synonym in Nieves-Aldrey, 1994a: 154), *Aulacidea foveiger*: Kieffer, 1902d: 94, *Aulax crassinervis* Thomson, 1877: 803 (synonym in Nieves-Aldrey, 1994a: 154); *Aulacidea crassinervis*: Kieffer, 1902d: 95, *Aylax sabaudi* Hartig, 1840: 13 (female) (synonym in Cameron, 1893: 50); *Aulacidea cacaliae* Belizin, 1959: 671 (on *Cacalia hastata* L., Primorskij Kraj; synonym in Kovalev, 1965: 48).



Figs 34.1-15. *Aulacidea hieracii*: 1-3, head female: 1, front view, 2, from above, 3, posteriorly. 4-5, antenna: 4, female, 5, male. 6-15, female: 6, palpus labialis, 7, palpus maxillaris, 8, scutum and scutellum dorsal view, 9, mesosoma, lateral view, 10, pronotum and propleura, front view, 11, submedian pronotal pits, dorsal view, 12, propodeum and dorsellum, dorso-posterior view, 13, tarsal claw, 14, forewing, part, 15, metasoma, lateral view.

Description. Female. 2.3-3.1 mm. Head and metasoma black; mandibles, palpi and antenna dark brown, tegula yellowish brown; metasoma dark reddish brown, dorsally darker, to black, hypopygium much lighter than tergites. Wing veins distinct, dark brown. Head delicately coriaceous, with uniformly sparse white setae, 1.8 times as broad as long from above, 1.2 times as broad as high and slightly broader than mesosoma. Gena delicately coriaceous, not broadened behind eye, not visible behind eye in front view. Malar space coriaceous, high, 0.85 times as long as height of eye, without striae. POL 1.3 times as long as OOL, 2.0 times as long as LOL and 5.5 times as long as diameter of lateral ocellus. Transfacial distance 1.6 times as long as height of eye and 1.5 times as long as height of lower face (distance between antennal rim and ventral margin of clypeus); diameter of antennal torulus 1.5 times as long as distance between them, and 0.9 times as long as distance between torulus and eye margin. Lower face, including slightly elevated median area delicately coriaceous. Clypeus coriaceous, slightly broader than high; anterior tentorial pits very indistinct, small; epistomal sulcus and clypeo-pleurostomal line indistinct, ventral edge rounded. Frons, vertex and occiput delicately coriaceous, without piliferous points. Postocciput around occipital foramen impressed, with delicate weak striae; posterior tentorial pits small, slightly elongated; gular sulci distinct in the posterior 2/3, lower part of gula narrowed down to strong, emarginated hypostomal carina; occipital foramen as high as gula and 1.5 times shorter than hypostomal foramen. Maxillar and labial palpi on figures. Antenna 13-segmented, pedicel subglobose, 1.3 times as long as broad; F1 1.5 times as long as pedicel and slightly shorter than F2; F2 very slightly longer or equal F3; F10 2.6 times as long as F19; placodeal sensilla on F3-F11, absent on F1-F2. Mesosoma convex, 1.3 times as long as high in lateral view, with uniform sparse white setae. Pronotum alutaceous dorsally; uniformly delicately coriaceous laterally, with moderately dense white setae along anterior margin. Propleuron smooth, shining. Submedian pronotal pits deep, distinct, strongly transverse, at least 3.0 times as broad as high; separated by a distance nearly equal to width of a pit; pronotal plate well-delimited laterally, alutaceous. Scutum uniformly coriaceous, with more delicate sculpture anteriorly, slightly broader than long, 1.35 times as long as scutellum, with very sparse setae. Notauli complete, well-impressed in all length, much broader posteriorly; median mesoscutal line broad, extending at least to half or more of scutum length; parapsidal lines distinct but narrow, extending about 1/2-2/3 of scutum length; anterior parallel lines indistinct. Scutellum rounded, slightly longer than broad, dull rugose; disk more delicately sculptured; very slightly overhanging metanotum. Scutellar foveae transverse, much broader than high, deep, well delimited around, smooth, shining, without setae, medially separated by a central carina. Mesopleuron, including speculum, uniformly densely transversely striate; acetabular carina invisible laterally; ventral edge with more dense setae. Metapleural sulcus reaching mesopleuron in the upper 1/3 of its height; axillula slightly transversely ovate, coriaceous, with few setae; subaxillular bar smooth, shining, nearly as high as height of metanotal trough; metapleuron with dense piliferous points; ventral bar of metanotal trough delicately coriaceous, at least 2.5 times narrower than height of metanotal trough. Dorsellum uniformly very delicately coriaceous, nearly 2.0 times shorter than height of ventral impressed area; metanotal trough smooth or alutaceous, with dense white setae; ventral impressed area smooth, shining. Propodeum coriaceous, lateral propodeal carinae subparallel, slightly curved inwards in the posterior 1/3; central propodeal area smooth, shining, with sparse white setae; lateral propodeal area with some delicate weak irregular striae, radiating of lateral propodeal carina, with moderately dense white setae; nucha long, with some strong irregular sulci. Forewing with dark brown veins, margin with long cilia; radial cell closed, 2.5 times as long as broad; areolet small, indistinct, Rs+M reaching basal vein in the lower half. Tarsal claws without basal lobe. Metasoma nearly as long as head+mesosoma, longer than high in lateral view, metasomal tergite 2 with a patch of dense white setae antero-laterally, without micropunctures; tergite 3 with very narrow posterior band of punctures; subsequent tergites and hypopygium with dense distinct micropunctures; prominent part of ventral spine of hypopygium very short. Male. 1.6-2.3 mm. Similar to female but antenna 14-segmented, F1 slightly excavated medially and slightly broadened apically, F1 1.85 times as long as pedicel, placodeal sensilla on F3-F12, absent on F1-F2.

Gall (Plate 8.3-4). In stems, multilocular, differently shaped, large-sized, hard and fuzzy galls; the stem is malformed. The gall growing on the stem or at the base of the leaf rosette, 40 mm long, 10-15 mm in diameter, usually spindle-like, sometimes rounded. During the development, leaves are coming out from it. The surface of the gall is covered with hairs. The gall loosing its hairs after overwintering and only the bases of hairs are visible on a glabrous epidermis. The parenchyma of the gall soft, spongy-like, with rounded larval cells. The number of larval cells decreasing towards the center of the gall. The gall is green when young and growing, turns brown when mature. The shoot above the gall malformed, abnormally short. Sometimes galls develop on the leaves which are lying on the ground.

Diagnosis. Most closely resembles *A. abdominalis* (see Diagnosis to *A. abdominalis*).

Distribution. SE (Nieves-Aldrey, 1994b), (Kieffer, 1897-1901), PT, ES (Nieves-Aldrey, 1984, 1987, 1988b), RO (Ionescu, 1973), PL (Kierych, 1979), GB (Cameron, 1893; Eady & Quinlan, 1963), SE (Coulians & Holmåsen, 1991), RU (Leningrad, Vologda, Novgorod, Moscow, Kursk, Belgorod, Saratov and Voronezh Regions, Stavropolskij kraj (Belizin, 1928, 1959); Far East of RU (Kovalev, 1965; Primorskij Kraj – specimens examined in the collection of SIZK); Transcaucasus (Zerova, Diakontschuk & Ermolenko, 1988); NO (Belizin, 1959); GE (Rübsaamen, 1895). In Ukraine common everywhere (Diakontschuk, 1981d).

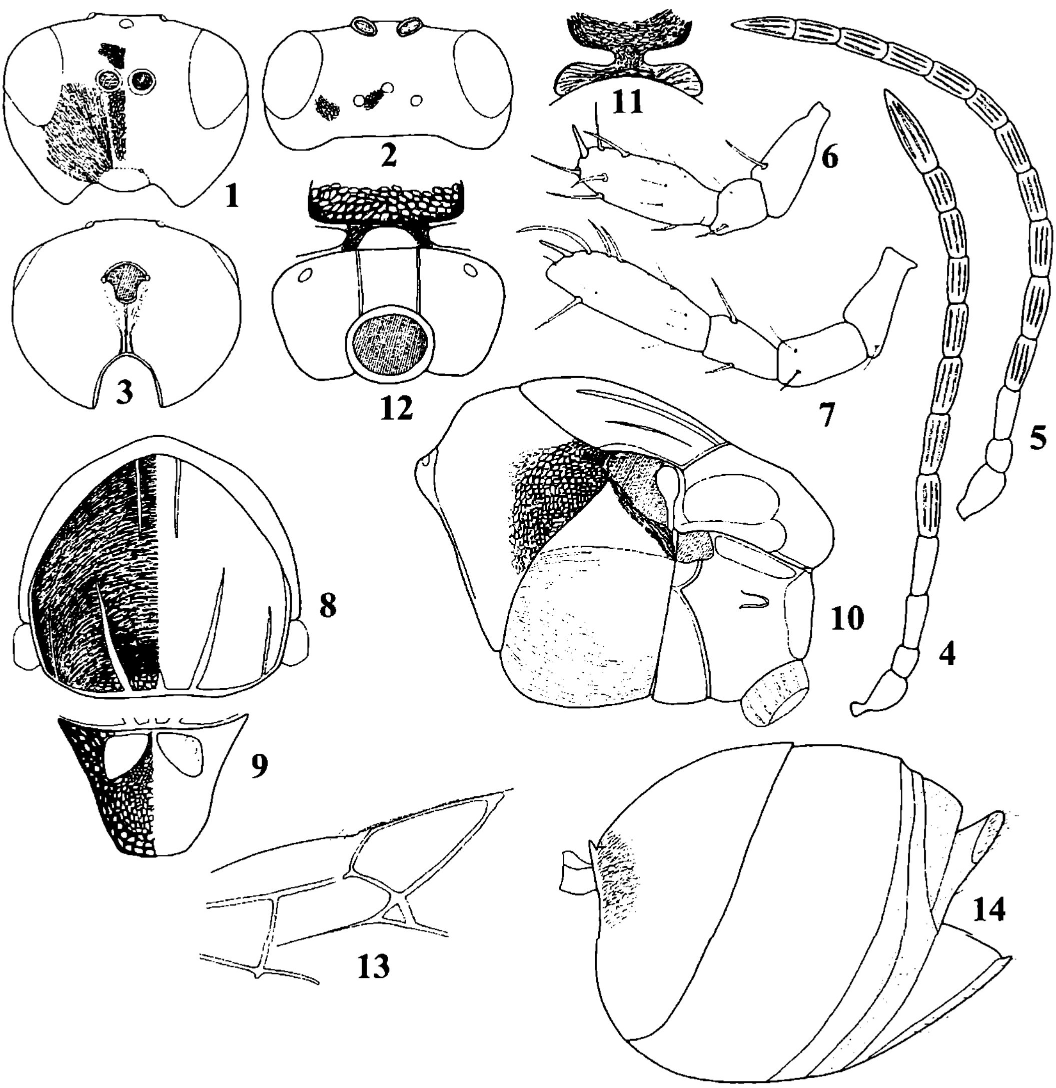
Biology. Monovoltine. Galls mature in autumn, larvae overwintering in the gall, adults emerge next spring, in May (Zerova, Diakontschuk & Ermolenko, 1988). Host plants: *Hieracium vulgatum*, *H. umbellatum* L., *H. murorum* L. and *H. virosum* Pall. Diakontschuk (2001) mentioned this species from the Primorskij Kraj, Far East of Russia, from galls on *Saussurea* spp., however, this is incorrect data and concern a recently described species, *Aulacidea tobiasi* Melika, 2004 (Melika, 2004). Kierych (1979) also mentioned *Linaria vulgatum* Fries. as a host plant in Poland, but it must be confirmed.

Aulacidea phlomica Belizin, 1959

Figs 35.1-14, Plate 8.5.

Aulacidea phlomica Belizin, 1959: 668 (female, male, gall); *Aulacidea phlomica*: Quinlan, 1968: 278 (female, male, gall).

Description. Female. 1.8-2.5 mm. Head, head appendages, mesosoma, except black scutum, scutellum and propodeum, legs uniformly light reddish brown; metasoma reddish brown, much darker dorsally, hypopygium always light reddish brown. Wing veins pale brown. Head delicately coriaceous, with uniformly sparse white setae, 1.8 times as broad as long from above, 1.25 times as broad as high and slightly broader than mesosoma. Gena delicately coriaceous, slightly broadened behind eye, not visible behind eye in front view. Malar space 0.7 times as long as height of eye, with striae radiating from clypeus and reaching eye. POL 1.1 times as long as OOL, 2.3 times as long as LOL and 4.5 times as long as diameter of lateral ocellus. Transfacial distance 1.3 times as long as height of eye and 1.3 times as long as height of lower face (distance between antennal torulus and ventral margin of clypeus); diameter of antennal torulus 5.5 times as long as distance between them and 0.85 times as long as distance between torulus and eye margin. Lower face with striae radiating from clypeus and reaching eyes and antennal sockets; median elevated area coriaceous, without striae. Clypeus quadrangular, alutaceous, at least 2.0 times as broad as high; anterior tentorial pits small, indistinct, epistomal sulcus and clypeo-pleurostomal line indistinct, ventral margin rounded. Frons, vertex and occiput delicately coriaceous to alutaceous. Postocciput and postgena alutaceous, with dense white setae; posterior tentorial pits small, rounded; gula at least 2.0-2.5 times as high as broad, narrowing in ventral half; gular sulci distinct in ventral half; hypostomal carina, narrow, weak; occipital foramen higher than gula and slightly longer than oral foramen. Maxillar and labial palps on figures. Antenna 12-segmented; pedicel 1.4 times as long as broad; F1 1.7 times as long as pedicel and 0.9 times as long as F2; F2 slightly shorter than F3; F10 2.6 times as long as F9; placodeal sensilla on F3-F10, absent on F1-F2. Mesosoma convex, 1.3 times as long as high in lateral view, with uniform sparse white setae. Pronotum alutaceous dorsally, coriaceous laterally; with dense white setae aside of pronotal plate



Figs 35.1-14. *Aulacidea phlomica*: 1-3, head female: 1, front view, 2, from above, 3, posteriorly. 4-5, antenna: 4, female, 5, male. 6-15, female: 6, palpus maxillaris, 7, palpus labialis, 8, scutum, dorsal view, 9, scutellum, dorsal view, 10, mesosoma, lateral view, 11, submedian pronotal pits, dorsal view, 12, propodeum and dorsellum, dorso-posterior view, 13, forewing, part, 14, metasoma, lateral view.

and along anterior margin. Submedian pronotal pits deep, well-delimited, transverse, at least 2.0 times as broad as high; pronotal plate well-delimited only anteriorly, alutaceous, without setae. Scutum with some weak interrupted distinct transverse striae, especially in posterior half of scutum between notauli; interspaces delicately coriaceous; nearly as long as broad and 2.0 times as long as scutellum. Notauli incomplete, extending to 2/3 of scutum length, broader posteriorly; median mesoscutal line in a form of short triangle; parapsidal line narrow, indistinct, extending slightly above tegula; anterior parallel lines distinct and extending to 1/3 length of scutum. Scutellum dull rugose along sides, disk more delicately rugose to coriaceous, very slightly overhanging metanotum. Scutellar foveae deep, indistinctly delimited posteriorly, with some setae on smooth, matt bottom; nearly as broad as high; separated by a median carina. Dorso-axillar area delicately coricaceous, with moderately dense white setae. Mesopleuron, except smooth, shining speculum, with uniform weak transverse striae; acetabular carina invisible laterally; mesopleural triangle delicately coriaceous, with some setae. Metapleural sulcus reaching mesopleuron in the upper 1/3 of its height, area delimited by metapleural sulcus with dense white setae, hidden the sculpture; preaxilla weakly coriceous, lateral axillar area reticulate, axillar carina smooth, very narrow; axillula transversely ovate, at least 2.0 times as long as high, with dense white setae hidden the coriaceous sculpture; subaxillular bar smooth, shining, higher than height of metanotal trough; metapleuron with dense setae; ventral bar of metanotal trough delicately coriaceous, narrower than height of metanotal trough. Dorsellum very delicately coriaceous, medially very narrow and smooth, shining; ventral impressed area nearly reaching scutellum; metanotal trough smooth, with few white setae. Propodeum coriaceous, with moderately dense setae; lateral propodeal carinae uniformly broad, parallel, with setae; central propodeal area with piliferous points; lateral propodeal area uniformly coriaceous, with white setae; nucha long, with uniform strong longitudinal parallel sulci. Forewing with pale veins, margin without or very short, inconspicuous cilia; radial cell closed, 2.4-2.6 times as long as broad, areolet distinct, large; Rs+M nearly reaching basal vein. Tarsal claws narrow without basal lobe. Metasoma nearly as long as head+mesosoma or slightly shorter; nearly as long as high in lateral view; metasomal tergite 2 with elevated plate of dense white setae antero-laterally, interrupted dorsally; tergites 2 and 3 without micropunctures, subsequent tergites and hypopygium with some indistinct punctures; prominent part of ventral spine of hypopygium very short, with some setae which from the apical ones reaching slightly behind apex of spine. Male. 1.8-2.2 mm. Similar to female but antenna 14-segmented, F1 1.6 times as long as pedicel; F1 shorter than F2, F2 equal F3, placodeal sensilla on F3-F12.

Gall (Plate 8.5). Galls are in stems. The empty inside of the stem is filled up with monolocular, thin-walled, white, rounded galls, up to 2 mm in diameter. The same host plant and the same galls are induced also by *Panteliella fedtschenkoi* and *Phanacis phlomidis*.

Diagnosis. Differs from all other western palaearctic species of *Aulacidea* by light colouration; body predominantly light brown to yellowish brown, only the pronotum dorsally and scutum partially are black or dark brown.

Taxonomic comments. Belizin (1959) in the original description erroneously mentioned that the species is closely related to *Aulax rugiscuta* Thomson, 1877 (synonym of *Andricus quercusradicis*, sexual generation (Nieves-Aldrey, 1994b).

Distribution. RU (Kursk and Belgorod Regions – Belizin, 1959). In Ukraine – common in southern part (Diakontschuk, 1981a); very common in Donetsk region, Khomutovskyj steppe and Askania-Nova Natural Reserve (about 200 examined specimens in the collection of SIZK).

Biology. Monovoltine. Larvae overwintering in the gall, adults emerge next spring in May. The only known host plant is *Phlomis tuberosa* L. (Labiatae).

Aulacidea pilosellae (Kieffer, 1901)

Plate 8.6.

Aulax pilosellae Kieffer, 1901: 336 (female); *Aulacidea pilosellae*: Kieffer, 1902d: 95; Folliot, 1964: 436 (female, gall).

Gall (Plate 8.6) on the main vein of leaves and/or on the midrib, monolocular, elliptical, 3.0-4.0 mm long and 1.5 mm in diameter, soft, light green, slightly lignified swelling, with smooth surface; the leaf is not malformed outside. Galls usually located one after another, in a chain, sometimes galls are coalesced. The galling leaves usually dry out earlier than healthy ones.

Diagnosis. Most closely related to *A. subterminalis*. In *A. pilosellae* scutellar foveae are round, the head is narrowly trapezoid in front view, F1 shorter or at most equal F2, while in *A. subterminalis* anterior margins of scutellar foveae together forming a straight line; the head is transversely subrectangular; F1 slightly longer than F2.

Distribution. ES (Pujade-Villar, 1984c; Nieves-Aldrey, 1988b), RO (Ionescu, 1973), HU (Ambrus, 1974), PL (Kierych, 1979), GB (Eady & Quinlan, 1963), FR (Dalla Torre & Kieffer, 1910), IL (Argaman, 1989), RU (Belizin, 1959). In Ukraine –Transcarpathian Region only (near Uzhgorod – few specimens were reared from galls on *H. pilosella*, author).

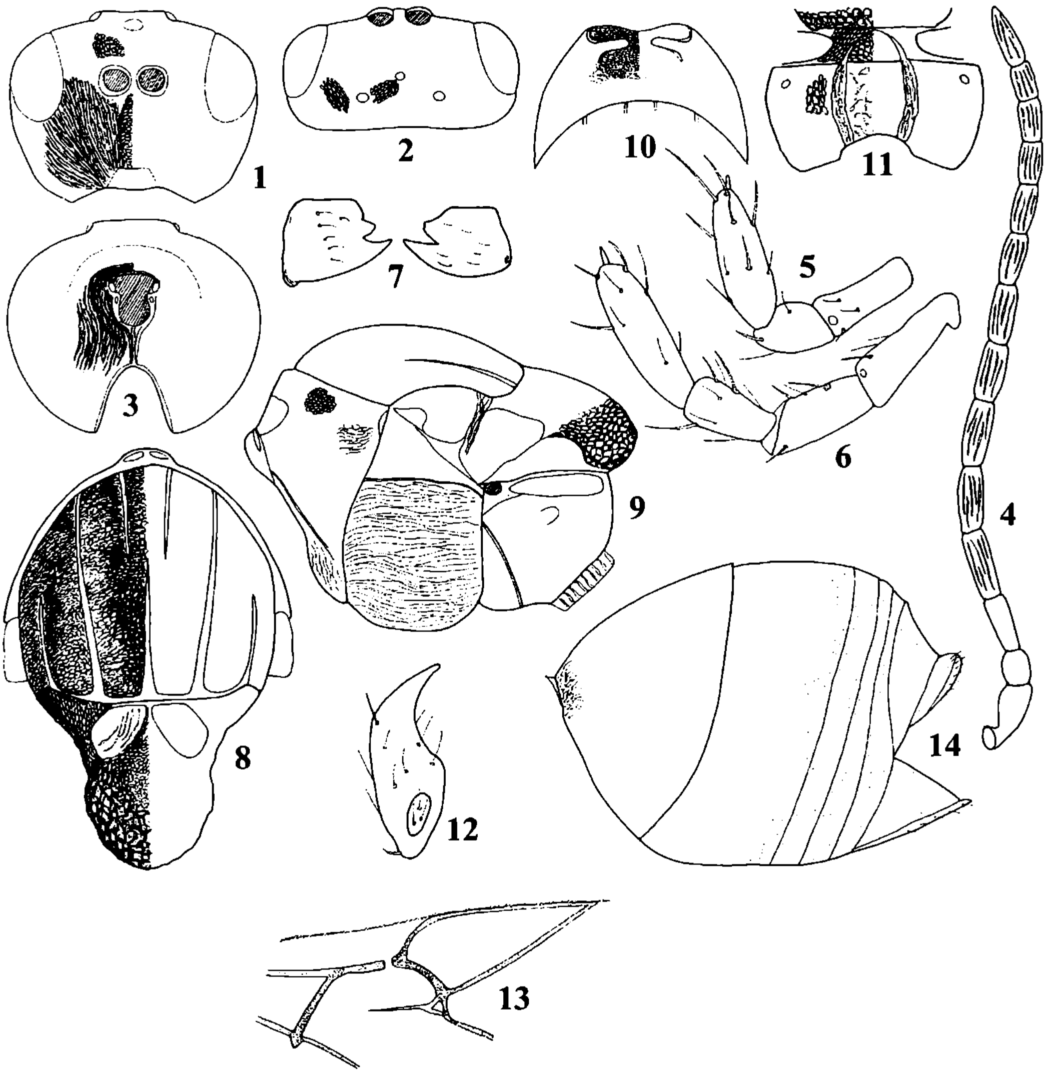
Biology. Monovoltine. The reproduction is a thelytokous parthenogenesis exclusively (Nieves Aldrey, 2001a). Galls are visible on plants from June. Larvae overwintering in the gall and adults emerge next spring, in May (Zerova, Diakontschuk & Ermolenko, 1988). Host plants: *Hieracium pilosella* L., *H. pratense* Tausch., *H. echioides* W. et K., *H. flagellare* L., *H. floribundum* L. and *H. cymosum* L. (Kierych, 1979).

Aulacidea rubi Diakontschuk, 2003

Figs 36.1-14.

Aulacidea rubi Diakontschuk, 2003: 12 (female, male, gall).

Description. Female. 2.2-2.7 mm. Head and mesosoma black to very dark brown; antenna yellow to brown; mandibles and palpi brown; legs uniformly dark dirty brown. Metasoma reddish brown, dorsally darker, hypopygium light brown. Wing veins pale brown. Head delicately coriaceous, with uniformly sparse white setae, 1.8 times as broad as long from above, 1.25 times as broad as high in front view and slightly broader than mesosoma. Gena delicately coriaceous, slightly broadened behind eye, not visible behind eye in front view. Malar space high, 0.9 times as long as height of eye, with delicate densely located interrupted striae, radiating from clypeus and reaching eye. POL 1.4 times as long as OOL, 2.0 times as long as LOL and 5.2 times as long as diameter of lateral ocellus. Transfacial distance 1.6 times as long as height of eye and 1.5 times as long as height of lower face (distance between antennal rim and ventral margin of clypeus); diameter of antennal torulus 6.5 times as long as distance between them and slightly shorter than distance between torulus and eye margin. Lower face with strong interrupted striae radiating from clypeus, reaching eyes and going into area between antennal socket and inner margin of eye; median elevated area without striae, coriaceous. Clypeus rectangular, at least 2.0-2.5 times as broad as high, smooth, with very indistinct small anterior tentorial pits, with indistinct epistomal sulcus and clypeo-pleurostomal line, ventral margin nearly straight; clypeus, in fact, delimited by striae radiating from dorsal part into lower face and malar space. Frons, vertex and occiput delicately coriaceous to alutaceous. Postocciput around occipital foramen impressed, postgena rugose, with longitudinal rugae; posterior tentorial pits deep, elongated; gula very narrow; gular sulci distinct, paralelly running in ventral 2/3 and curved outwards near occipital foramen only; hypostomal carina narrowly emarginated; occipital foramen higher than gula and slightly shorter than hypostomal foramen. Mandibles, maxillar and labial palps on figures. Antenna 14-segmented; pedicel subglobose, only 1.2 times as long as broad; F1 1.6 times as long as pedicel and shorter than F2; F2 slightly longer or equal F3; F12 1.6-1.7 times as long as F11; placodeal sensilla on F2-F12, absent on F1. Mesosoma convex, 1.3 times as long as high in lateral view, with uniform sparse white setae. Pronotum alutaceous dorsally, delicately coriaceous laterally, with alutaceous surface in front of tegula; with some weak longitudinal wrinkles and uniformly distributed relatively sparse white setae. Submedian pronotal pits distinct, deep, at least 3.0 times as broad as high; pronotal plate distinctly delimited only in very anterior part, alutaceous; distance between pits 0.8 times shorter than width of pit. Scutum uniformly coriaceous, slightly longer than broad, 1.4-1.6 times as long as scutellum. Notauli, complete, broader in posterior half, sometimes indistinct and very narrow anteriorly; median mesoscutal line extending at least to half length of scutum, broadened posteriorly; parapsidal line narrow but distinct, reaching slightly above tegula; anterior parallel lines distinct and extending to 2/3 of scutum length. Scutellum distinctly elongated, rounded posteriorly, dull rugose, with more delicate sculptured disk; slightly overhanging metanotum. Scutellar foveae ovate, as broad as high, deep, well-delimited around, with some delicate wrinkles on shining bottom, without setae, medially separated by a narrow central carina (in some specimens scutellar foveae anteriorly nearly reaching one another, but even so, always very narrowly separated). Mesopleuron, including speculum, with uniform transverse interrupted weak striae; mesopleural triangle smooth, with some setae; acetabular carina invisible laterally. Metapleural sulcus reaching mesopleuron in the upper 1/3 of its height, area delimited by metapleural sulcus with relatively dense white setae, hidden the sculpture; preaxilla weakly coriaceous, lateral axillar area reticulate; axillar carina broad, only 2.0 times or less narrower than lateral axillar area, with longitudinal weak striae, axillula ovate, with piliferous points; subaxillular



Figs 36.1-14. *Aulacidea rubi*, female: 1-3, head female: 1, front view, 2, from above, 3, posteriorly. 4, antenna: 5, palpus labialis, 6, palpus maxillaris, 7, mandibles, 8, scutum and scutellum, dorsal view, 9, , mesosoma, lateral view, 10, pronotum with submedian pronotal pits, dorsal view, 11, propodeum and dorsellum, dorso-posterior view, 12, tarsal claw, 13, forewing, part, 14, metasoma, lateral view.

bar smooth, shining, broader than height of metanotal trough; pit over propodeal spiracle deep, smooth, carina along anterior border of propodeal spiracle distinctly raised; ventral bar of metanotal trough delicately coriaceous, slightly narrower than height of metanotal trough. Dorsellum delicately coriaceous, very narrow medially and delicately coriaceous ventral impressed area nearly reaching scutellum; metanotal trough coriaceous, with dense white setae. Propodeum coriaceous, lateral propodeal carinae broad, especially in the middle, where they curved outwards; central propodeal area smooth, shining, with very few delicate wrinkles; lateral propodeal area alutaceous, with moderately dense white setae; nucha short, with uniform longitudinal sulci around. Forewing with distinct dark brown veins, margin with long cilia; radial cell closed, 2.7 times as long as broad, areolet small, indistinct, Rs+M extending nearly to half of distance between areolet and basalis. Tarsal claws narrow, without basal lobe. Metasoma slightly longer than head+mesosoma, longer than high in lateral view, metasomal tergite 2 with small patch of white setae antero-laterally, without micropunctures; tergite 3 with a narrow posterior band of punctures; subsequent tergites and hypopygium with dense micropunctures; prominent part of ventral spine of hypopygium 1.5 times as long as broad in ventral view, with very few short setae, which not reaching behind apex of spine. Male. 2.2 mm. Similar to female, antenna also 14-segmented, however, metasoma uniformly brown, areolet of forewing larger, distinct.

Gall. Swelling-like stem gall on *Rubus idaeus*. The gall closely resembles those of *D. rubi* in their appearance, location, size, multilocularity; larval chambers are also identical in size, scattered in the same way in the spongy-like parenchyma of the gall. The gall cannot be distinguished from the gall of *D. rubi*.

Diagnosis. Together with *A. abdominalis* and *A. hieracii* form a group of species in which F1 always slightly shorter than F2; the pronotum laterally coriaceous; the median mesoscutal line shorter, impressed, never longer than the half length of the scutum; punctures on the metasomal tergite 3 form a band equal in width dorsally and laterally. Differs from *A. abdominalis* and *A. hieracii* in that the antennal toruli very closely located, the diameter of a torulus at least 6.0 times as large as distance between toruli; the scutum distinctly longer than broad; Rs+M of forewing extending to 2/3 of distance between areolet and basalis; lateral propodeal carinae are broad, curved outwards in the middle; galls in stems on *Rubus*.

Material examined. Holotype female: Ukraine, vicinity of Kiev, 20.04.1973, coll. L.A.Diakontschuk, ex stems of *Rubus idaeus* L. em. 03.05.1973; paratypes: 16 females and 3 males: Ukraine, Kiev, Pheophanija, 07.04.1978, coll. L.A. Diakontschuk, ex galls on *Rubus idaeus*, em. 03.1979. Body appendages in preparation № 72-72b. All are deposited in SIZK.

Distribution. Known from Ukraine only, vicinities of Kiev (Diakontschuk, 2003).

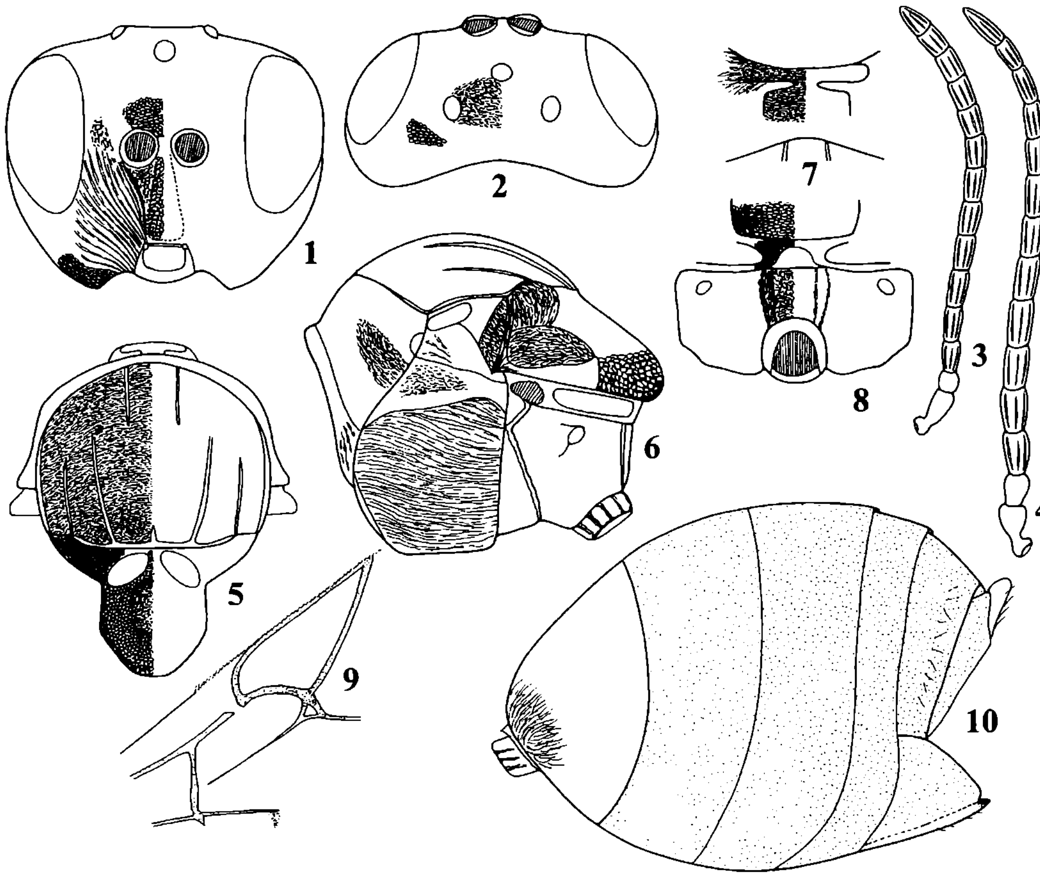
Biology. Monovoltine. Larvae overwintering in galls, adults emerge next spring in May. The only known host plant is *Rubus idaeus* L. (Diakontschuk, 2003). It is possible that the host plant was misidentified and the adults emerged from some other galls on other plants, which were moved for the laboratory rearing together with *Rubus* plant parts, on which *Diastrophus rubi* galls were present. It is a good, distinct species of *Aulacidea*, however, the host association must be confirmed with further rearings.

Aulacidea scorzonerae (Giraud, 1859)

Figs 37.1-10, Plate 8.7.

Aulax scorzonerae Giraud, 1859: 370 (female, male, gall); *Aulacidea scorzonerae*: Kieffer, 1902d: 96.

Description. Female. 2.0-2.6 mm. Head, mesosoma and appendages dark brown, in some specimens head and mesosoma nearly black; metasoma lighter than head and mesosoma Wing veins pale brown. Head delicately coriaceous, with uniformly sparse white setae, 1.7-1.9 times as broad as long from above, 1.2 times as broad as high in front view and slightly broader than mesosoma. Gena delicately coriaceous, only slightly broadened behind eye, not visible behind eye in front view. Malar space 0.5 times as long as height of eye, with delicate interrupted straie, radiating from clypeus and reaching eye. POL 2.0 times as long as OOL, 2.0 times as long as LOL and 3.1 times as long as diameter of lateral ocellus. Transfacial distance equal to height of eye and 1.4 times as long as height of lower face (distance between antennal rim and ventral margin of clypeus); diameter of antennal torulus 3.7 times as long as distance between them and nearly equal to distance between torulus and eye margin. Lower face with striae, radiating from clypeus and reaching eyes and antennal toruli; median elevated area coriaceous, without striae. Clypeus alutaceous, nearly quadrangular, only slightly broader than high; anterior tentorial pits small but distinct, epistomal sulcus and clypeo-pleurostomal line distinct, ventral margin slightly rounded. Frons, vertex and occiput delicately coriaceous to alutaceous, without piliferous points. Antenna 14-segmented; pedicel very short, broader than long; F1 1.6 times as long as pedicel and shorter than F2; F2 shorter than F3, subsequent flagellomeres nearly equal in length; F12 1.25 times as long as F11; placodeal sensilla on all flagellomeres distinctly visible. Mesosoma convex, nearly as long as high in lateral view, with uniform sparse white setae. Pronotum alutaceous dorsally,



Figs 37.1-10. *Aulacidea scorzonerae*: 1-2, head, female: 1, front view, 2, from above. 3-4, antenna: 3, female, 4, male. 5-10, female: 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, pronotum with submedian pronotal pits, part, dorsal view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part, 10, metasoma, lateral view.

delicately coriaceous to alutaceous laterally, with some delicate weak wrinkles and relatively more dense white setae along ventro-lateral edge. Submedian pronotal pits distinct, deep, separated by a distance, nearly twice shorter than width of a pit; pronotal plate distinctly delimited in anterior half of pronotum, alutaceous, without setae; dense white setae present aside pronotal plate. Scutum uniformly very delicately coriaceous, with transverse sculpture; slightly broader than long, 1.5 times as long as scutellum. Notauli narrow, shallow, incomplete, extending at most to 2/3 of scutum length; median mesoscutal line in a form of very short, narrow and indistinct triangle; parapsidal lines narrow, indistinct, reaching at most to level of tegula or slightly above; anterior parallel lines distinct and extending to 1/3 of scutum length. Scutellum longer than broad, with parallel sides, rounded posteriorly, uniformly coriaceous, with more delicate sculptured disk; slightly overhanging metanotum. Scutellar foveae transversely ovate, around 2.0 times as broad as high, shallow, indistinctly delimited posteriorly, smooth, shining, without setae, medially separated by narrow reticulate central carina. Dorso-axillar area delicately uniformly coriaceous, with some scattered white setae. Mesopleuron, including speculum, with uniform transverse interrupted delicate striae, spaces between striae smooth, shining; mesopleural triangle delicately coriaceous to alutaceous, with some white setae; area delimited by acetabular carina narrow, shining, smooth, visible laterally. Metapleural sulcus reaching mesopleuron in the upper third of its height; preaxilla smooth, shining; lateral axillar area very delicately wrinkled, axillar carina narrow, 2.5 times narrower than width of lateral axillar area; axillula elongated, delicately coriaceous to alutaceous, with few setae; subaxillular bar smooth, shining, in the most posterior part slightly higher than height of metanotal trough; ventral bar of metanotal trough smooth, narrower than height of metanotal trough. Dorsellum delicately coriaceous, medially nearly 3.0 times narrower than height of smooth, shining ventral impressed area; metanotal trough smooth, with sparse white setae. Propodeum delicately coriaceous, lateral propodeal carinae broad, nearly straight, slightly curved outwards in the middle, without setae; central propodeal area alutaceous; lateral propodeal area alutaceous, with piliferous points; nucha short, with some weak irregular wrinkles. Forewing with light brown veins, margin with very short cilia; radial cell closed, 2.9 times as long as broad; areolet very small and delimited with indistinct veins, Rs+M nearly reaching basal vein. Tarsal claws without basal lobe. Metasoma longer than head+mesosoma, longer than high in lateral view; metasomal tergite 2 with small patch of dense white setae antero-laterally, without punctures; subsequent tergites and hypopygium with dense uniform punctures; prominent part of ventral spine of hypopygium very short, with few short setae, not extending beyond apex of spine. Male. 1.6-1.9 mm. Similar to female, antenna also 14-segmented, but F1 1.8-1.9 times as long as pedicel and equal F2, F2 slightly shorter or equal F3.

Gall (Plate 8.7). A stem swelling-like gall, usually located under the flower head, sometimes in the lower part of the stem; spindle-like or cylindrical stem enlargement, 30-60 mm long, 10 mm in diameter; the surface with longitudinal ribs, like on the stem, sometimes the ribs are waved and distance between them larger, depending on the diameter of the gall. In a longitudinal dissection, single 2 mm large larval cells are visible which are located one near another. The number of larval cells is larger towards the periphery of the gall. The stem above the gall is shortened and the flower stops it development.

Diagnosis. Morphologically most closely resembles *A. serratulae*. In *A. scorzonerae* POL 3.0 times as long as the diameter of lateral ocellus; the female antenna is 14-segmented; notauli are incomplete, absent in the anterior 1/3-1/4; the median mesoscutal line in a form of a short triangle; the scutellum is uniformly coriaceous; scutellar foveae transversely ovate, much narrower; lateral propodeal carinae much broader, never branched posteriorly; the metasomal tergite 2 occupying nearly the half length of the metasoma dorsally; galls in stems on *Scorzonera*, while in *A. serratulae* POL at least 4.0 times as long as the diameter of lateral ocellus, the female antenna is 13-segmented; notauli are complete, reaching pronotum; the median mesoscutal line is narrow and longer, extending to 1/5-1/4 of the scutum length; the scutellum is dull rugose along sides, more delicately sculptured towards the center of the disk; scutellar foveae elongated, nearly as long as broad; lateral propodeal carinae often branched posteriorly; the metasomal tergite 2 occupying at most 1/3 of the metasoma length dorsally; galls in flower heads on *Serratula*.

Distribution. AT (Kieffer, 1897-1901), RU (Pavlodarsk Region – Belizin, 1959), HU (Dalla Torre & Kieffer, 1910; Ambrus, 1974). In Ukraine – Transcarpathian Region only, vicinities of Uzhgorod (five specimens were reared from galls on *S. austriaca*, author).

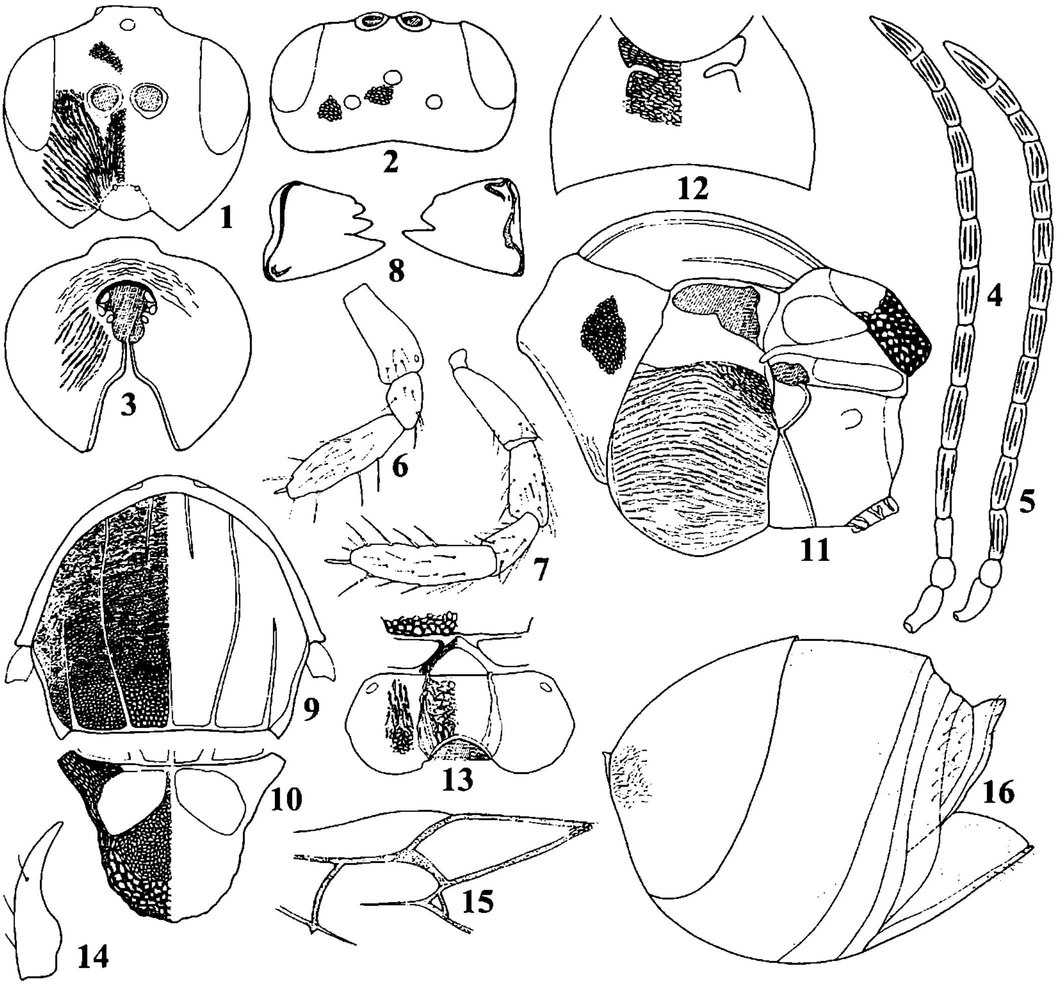
Biology. Monovoltine. Relatively rare species. The only known host plant is *Scorzonera austriaca* Willd. (Asteraceae) (Ambrus, 1974).

Aulacidea serratulae Diakontschuk, 1984

Figs 38.1-16, Plate 8.8.

Aulacidea serratulae Diakontschuk, 1984: 72 (female, male, gall).

Description. Female. 2.2-2.5 mm. Head dark brown in front and black posteriorly; lower face medially and ocellar triangle black; antennae uniformly brown; mesosoma predominantly black, with some dark brown patches on lateral part of pronotum, mesopleuron and lateral propodeal area and between notaulus and parapside line; wing veins dark brown; legs uniformly reddish brown; metasoma reddish-brown, slightly darker dorsally. Head with uniformly sparse white setae, 1.75 times as broad as long from above, rounded, as broad as high in front view; slightly broader than mesosoma. Gena delicately coriaceous, only slightly broadened behind eye, not visible behind eye in front view. Malar space 0.7 times as long as height of eye, with interrupted striae, radiating of clypeus and reaching eye. POL 1.9 times as long as OOL, 2.1 times as long as LOL and 4.2 times as long as diameter of lateral ocellus. Transfacial distance 1.24 times as long as height of eye and



Figs 38.1-16. *Aulacidea serratulae*: 1-3, head, female: 1, front view, 2, from above, 3, posteriorly. 4-5, antenna: 4, female, 5, male. 6-16, female: 6, palpus labialis, 7, palpus maxillaris, 8, mandibles, 9, scutum, dorsal view, 10, scutellum, dorsal view, 11, mesosoma, lateral view, 12, pronotum with submedian pronotal pits, dorsal view, 13, propodeum and dorsellum, dorso-posterior view, 14, tarsal claw, 15, forewing, part, 16, metasoma, lateral view.

1.4 times as long as height of lower face (distance between antennal rim and ventral margin of clypeus); diameter of antennal torulus 5.5 times as long as distance between them, very slightly longer than distance between torulus and eye margin. Lower face with delicate interrupted striae, radiating from clypeus and reaching eye and antennal sockets; median elevated area without striae, delicately coriaceous to alutaceous. Clypeus alutaceous, ovate; with indistinct anterior tentorial pits, with distinct epistomal sulcus and clypeo-pleurostomal line, ventral margin slightly rounded. Frons, vertex and occiput delicately coriaceous to alutaceous. Postocciput around occipital foramen impressed, with some interrupted weak subparallel striae above occipital foramen; postgena striate, especially near gula; posterior tentorial pits deep, slightly elongated; gula narrower than broad, gular sulci very indistinct; hypostomal carina narrow, emarginated; occipital foramen 1.5 times as high as height of gula and slightly higher than oral foramen. Mandibles, maxillar and labial palps on figures. Antenna 13-segmented, more or less one-half of body length; pedicel subglobose, only very slightly or not longer than broad, broader than F1; F1 1.3 times as long as pedicel and nearly 2.0 times shorter than F2; F2 slightly longer or equal F3; F11 2.5 times as long as F10; placodeal sensilla on F2-F11, absent on F1. Mesosoma convex, 1.2 times as long as high in lateral view, with uniform sparse white setae. Pronotum alutaceous dorsally, delicately uniformly coriaceous laterally, with few very weak striae and moderately dense white setae along antero-lateral edge. Submedian pronotal pits distinct, very narrow, at least 2.5 times as long as broad, separated by a distance nearly equal to width of a pit; pronotal plate alutaceous, without setae; delimited only in the most anterior part. Scutum uniformly delicately coriaceous, slightly broader than long and 1.4 times as long as scutellum. Notauli complete, reaching pronotum, very narrow, but distinctly impressed, strongly broadened at the base and narrowing till pronotum; median mesoscutal line narrow, extending at most to 1/3 of scutum length, strongly broadened at the main base; parapsidal lines narrow, indistinct, reaching at most slightly above tegulae; anterior parallel lines extending to 1/3 or less of scutum length. Scutellum nearly rounded, as broad as long; dull rugose along sides, with more delicately sculptured disk, microreticulate between foveae; slightly overhanging metanotum. Scutellar foveae nearly as broad as long, semi-rounded, deep, indistinctly delimited posteriorly, with some longitudinal wrinkles, without setae, medially separated by distinct reticulate central carina. Dorso-axillar area with longitudinal weak wrinkles. Mesopleuron with uniform weak transverse parallel interrupted striae; the most posterior upper part of speculum with more delicate sculpture, without distinct striae; mesopleural triangle smooth, with setae; acetabular carina delimiting a narrow smooth, shining area laterally. Metapleural sulcus reaching mesopleuron above half of its height; axillula transversely ovate, with piliferous points; subaxillular bar smooth, shining, broader than metanotal trough, measured above propodeal spiracle, with few setae; pit over propodeal spiracle deep, shining, carina along anterior border of propodeal spiracle strongly raised; ventral bar of metanotal trough smooth, equal to height of metanotal trough. Dorsellum with some weak striae, medially nearly 2.0 times shorter than height of smooth, shining ventral impressed area; metanotal trough smoth, with relatively dense white setae. Propodeum coriaceous, lateral propodeal carinae usually branched, broader posteriorly, curved outwards in the posterior 1/2-1/3, without setae; central propodeal area rugose, with some wrinkles, without setae; lateral propodeal area dull coriaceous, with some strong irregular rugae, with piliferous points; nucha short, with irregular weak wrinkles. Forewing with dark brown distinct veins, margin with very short cilia; radial cell closed, 2.9-3.1 times as long as broad; areolet small, indistinct, Rs+M extending to 2/3 of distance between areolet and basal vein. Tarsal claws narrow, simple, without basal lobe. Metasoma nearly as long as head+mesosoma, only slightly longer than high in lateral view; metasomal tergite 2 with small patch of dense white setae antero-laterally, without punctures; all subsequent tergites and hypopygium with dense distinct punctures; prominent part of ventral spine of hypopygium very short, with few short sparse white setae not extending behind apex of spine. Male. 1.8-2.2 mm. Similar to female but antenna 14-segmented, pedicel globose, F1 longer than pedicel, slightly curved medially and very slightly broadened apically; F1 slightly shorter than F2; F2 slightly shorter than F3; placodeal sensilla on F3-F12, absent on F1-F2.

Gall (Plate 8.8) is monolocular, ovate, thin-walled, up to 1.5 mm in length. Galls located at the base of the flower head of *Serratula* spp.; usually the flower head is not malformed and enlarged, galls inconspicuous externally (Diakontschuk, 1984).

Diagnosis. Most closely resembles *A. scorzonerae* (see Diagnosis to *A. scorzonerae*).

Material examined. Holotype female: Ukraine, Donetsk Region, Khomutovskyj steppe Natural Reserve, 23.04.1975, coll. M.D. Zerova, ex flower heads of *Serratula bracteifolia* (Iljin) Stank., em. 4.05.1975; paratypes: 1 female and 6 males with the same labels as the holotype. Body appendages in preparation № 52. Four specimens labelled "Primorskij Kraj, Krasnyj Jar, 21.IV.1983. M.D. Zerova", "ex flower head of *Serratula coronata*, em. 8.VI.1983"; 6 males from Kyrgizitan (coll. M.D. Zerova, ex flower heads of *Serratula tianshanica*). All are deposited in SIZK.

Distribution. Ukraine -- Donetsk Region, Khomutovskyj steppe Natural Reserve (Diakontschuk, 1984). It was collected also in Far East of Russia (Primorskij Kraj) and Kyrgyzstan, rare species (examined specimens in the collection of SIZK, see the examined material above). The species is rare (Zerova, Diakontschuk & Ermolenko, 1988).

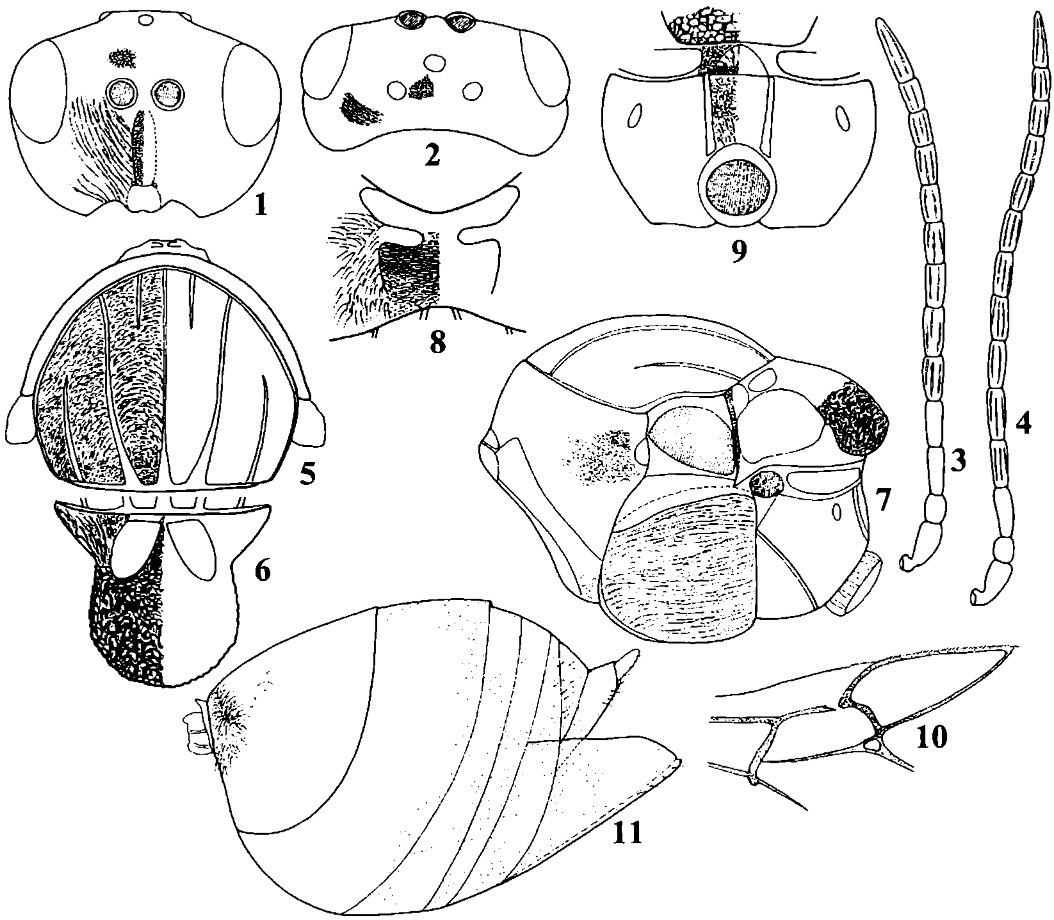
Biology. Monovoltine. Galls mature in autumn, larvae overwintering in galls, adults emerge next spring, in May (Zerova, Diakontschuk & Ermolenko, 1988). Host plants: *Serratula bracteifolia* (Iljin) Stank. (Diakontschuk, 1984), *Serratula coronata* L. and *Serratula tianshanica* L. (Asteraceae).

Aulacidea subterminalis Niblett, 1946

Figs 39.1-11, Plate 8.9.

Aulacidea subterminalis Niblett, 1946: 265 (female, gall).

Description. Female. 2.3-2.9 mm. Head and mesosoma black, mandibles and palpi dark brown, antenna dark brown, tegula light brown; all coxae, trochanters, femurs dark brown, tibiae and tarsi lighter. Metasoma dark reddish brown, dorsally to black; hypopygium much lighter. Wing veins distinct, dark brown. Head delicately coriaceous, with uniformly sparse white setae, 1.8 times as broad as long from above, 1.3-1.4 times as broad as high in front view and slightly broader than mesosoma. Gena delicately coriaceous, slightly broadened behind eye, not visible behind eye in front view. Malar space coriaceous, 0.3- 0.4 times as long as height of eye, with few delicate striae, radiating from clypeus and extending to half distance to eye. POL 1.2 times as long as OOL, 1.9 times as long as LOL and 2.8 times as long as diameter of lateral ocellus. Transfacial distance 1.5 times as long as height of eye and 1.5 times as long as height of lower face (distance between antennal rim and ventral margin of clypeus); diameter of antennal torulus 2.5 times as long as distance between them and 0.8 times as long as distance between torulus and eye margin. Lower face with delicately interrupted striae radiating from clypeus and reaching eyes and antennal sockets; median elevated are without striae, very delicately coriaceous to alutaceous. Clypeus rectangular, nearly as high as broad, delicately alutaceous, with ventral margin slightly incised medially; anterior tentorial pits small, indistinct, epistomal sulcus and clypeo-pleurostomal line distinct. Frons, vertex and occiput delicately coriaceous, without piliferous points. Antenna 13-segmented; pedicel subglobose, only 1.3 times as long as broad; F1 only 1.9 times as long as pedicel and equal F2; F2 slightly shorter or equal F3; F11 1.8 times as long as F10; placodeal sensilla on F3-F11, absent on F1-F2. Mesosoma convex, 1.3 times as long as high in lateral view, with uniform sparse white setae. Pronotum alutaceous dorsally, very delicately coriaceous or alutaceous laterally, with few very short weak striae and relatively dense white setae along antero-lateral edge. *Submedian pronotal pits distinct, transverse, at least 2.0 times as broad as high,* separated by a distance slightly more than half width of a pit; pronotal plate alutaceous, delimited in anterior 2/3 or more of pronotum, without setae, pronotum aside pronotal plate with very dense long white setae. Scutum uniformly delicately coriaceous, with transverse sculpture, broader than long in dorsal view and 1.4 times as long as scutellum. Notauli complete, well-impressed in all length, strongly broadened at the main base; median mesoscutal line long, sometimes reaching pronotum in form of a dark stripe; parapsidal lines reaching slightly above tegulae; anterior parallel lines distinct but short, extending at most to ¼ of scutum length. Scutellum rugose, very slightly longer than broad, with nearly parallel sides, rounded posteriorly, with some stronger rugae, sculpture towards the center of disk more delicate; slightly overhanging metanotum. Scutellar foveae distinctly elongated, much higher than broad, smooth, shining, well-delimited around; separated by narrow central carina; in some specimens scutellar foveae reaching one another in the most antero-median part. Dorso-axillar area with weak longitudinal striae. Mesopleuron, including speculum, with uniform, transverse interrupted striae; acetabular carina delimiting a narrow smooth, shining lateral area without setae. Metapleural sulcus reaching mesopleuron in the upper 1/3 of its height; preaxilla, lateral axillar area delicately coriaceous, with some transverse very weak wrinkles; axillar carina narrow, with some longitudinal weak striae; axillula transversely ovate, around 2.0 times as long as high, with dense piliferous points, well-delimited posteriorly; subaxillular bar smooth, shining, posteriorly higher than height of metanotal trough; pit over propodeal spiracle deep, shining, carina along anterior border of propodeal spiracle strongly raised; ventral bar of metanotal trough with delicate striae, equal to height of metanotal trough. Dorsellum delicately coriaceous, medially very narrow; ventral impressed area nearly reaching scutellum; metanotal trough smooth, with relatively dense white setae; ventral impressed area of the dorsellum shining, with some delicate weak wrinkles. Lateral propodeal carinae uniformly thick, straight, without setae; central propodeal area alutaceous to very delicately uniformly coriaceous, without setae; lateral propodeal area smooth to alutaceous, with piliferous points, setae more dense than in central prpodeal area; nucha short, with regular longitudinal sulci. Forewing with distinct dark brown veins, margin with very short cilia; radial cell closed, however vein along wing margin indistinct, weakly pigmented, 2.8 times as long as broad; areolet very small, indistinct, Rs+M distinctly reaching basal vein. Metasoma longer than head+mesosoma, much longer than high in lateral view, with large hypopygium; metasomal tergite 2 with a patch of very dense long white setae antero-laterally, without punctures; tergite 3 with punctures reaching anterior margin of tergite dorsally, with band of punctures lateralo-dorsally and without punctures in latero-ventral half of tergite; subsequent tergites and hypopygium with dense distinct punctures; prominent part of ventral spine of hypopygium very short, with few short sparse setae which not extending behind apex of spine. Male. 2.3-2.8 mm. Similar to female but antenna 14-segmented, pedicel globose, as broad as long, slightly broader than F1; F1 1.9 times as long as pedicel, F1 nearyl equal F2 and F3, subsequent flagellomeres slightly shorter, F12 1.5 times as long as F11; placodeal sensilla on F2-F12, absent on F1.



Figs 39.1-11. *Aulacidea subterminalis*: 1-2, head female: 1, front view, 2, from above, 3-4, antenna: 3, female, 4, male. 5-11, female: 5, scutum, dorsal view, 6, scutellum, dorsal view, 7, mesosoma, lateral view, 8, pronotum with submedian pronotal pits, dorsal view, 9, propodeum and dorsellum, dorso-posterior view, 10, forewing, part, 11, metasoma, lateral view.

Gall (Plate 8.9). Galls develop under the leaf rosette, at the main base of the midrib, more rarely on the main vein of the leaf. Inducing very inconspicuous galls, the leaf externally is not malformed.

Diagnosis. Most closely related to *A. pilosellae* or might be even synonymic with it (see Diagnosis to *A. pilosellae*).

Distribution. ES (Nieves-Aldrey, 1984, 1987), PL (Kierych, 1979), GB (Eady & Quinlan, 1963), RU (Kursk Region – Belizin, 1959; Zerova, Diakontschuk & Ermolenko, 1988), FR (Zerova, Diakontschuk & Ermolenko, 1988). In Ukraine – Crimea (Karadag Natural Reserve) (Diakontschuk, 2003) (12 examined specimens in the collection of SIZK) and Transcarpathian Region (vicinity of Uzhgorod; 14 specimens reared from *Hieracium pilosellae* L. by the author).

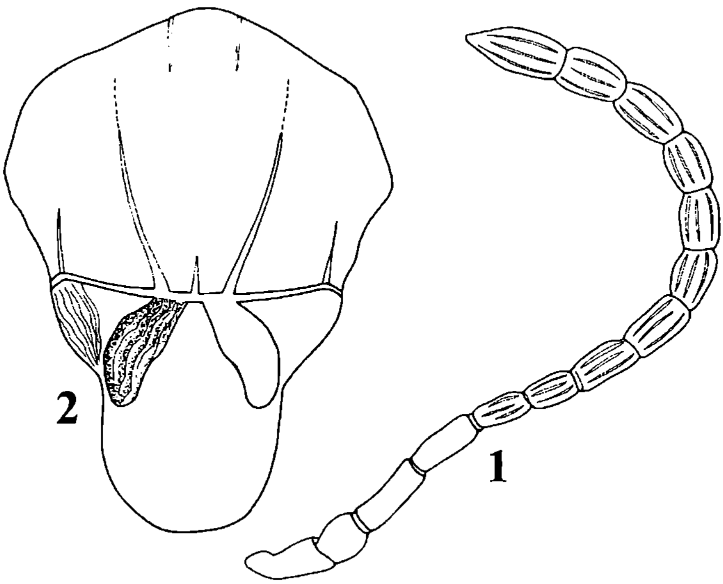
Biology. Monovoltine. Larvae overwintering in the gall, adults emerge next spring, in July–August (Zerova, Diakontschuk & Ermolenko, 1988). Host plants: *Hieracium pilosellae* L., *H. cymosum* L. (Kierych, 1979), *H. pratense* L.

Aulacidea taurica (Belizin, 1954)

Figs 40.1-2.

Trischiza taurica Belizin, 1954: 84 (female, male); *Aulacidea taurica* Kovalev, 1982: 87 (male redescription, diagnosis).

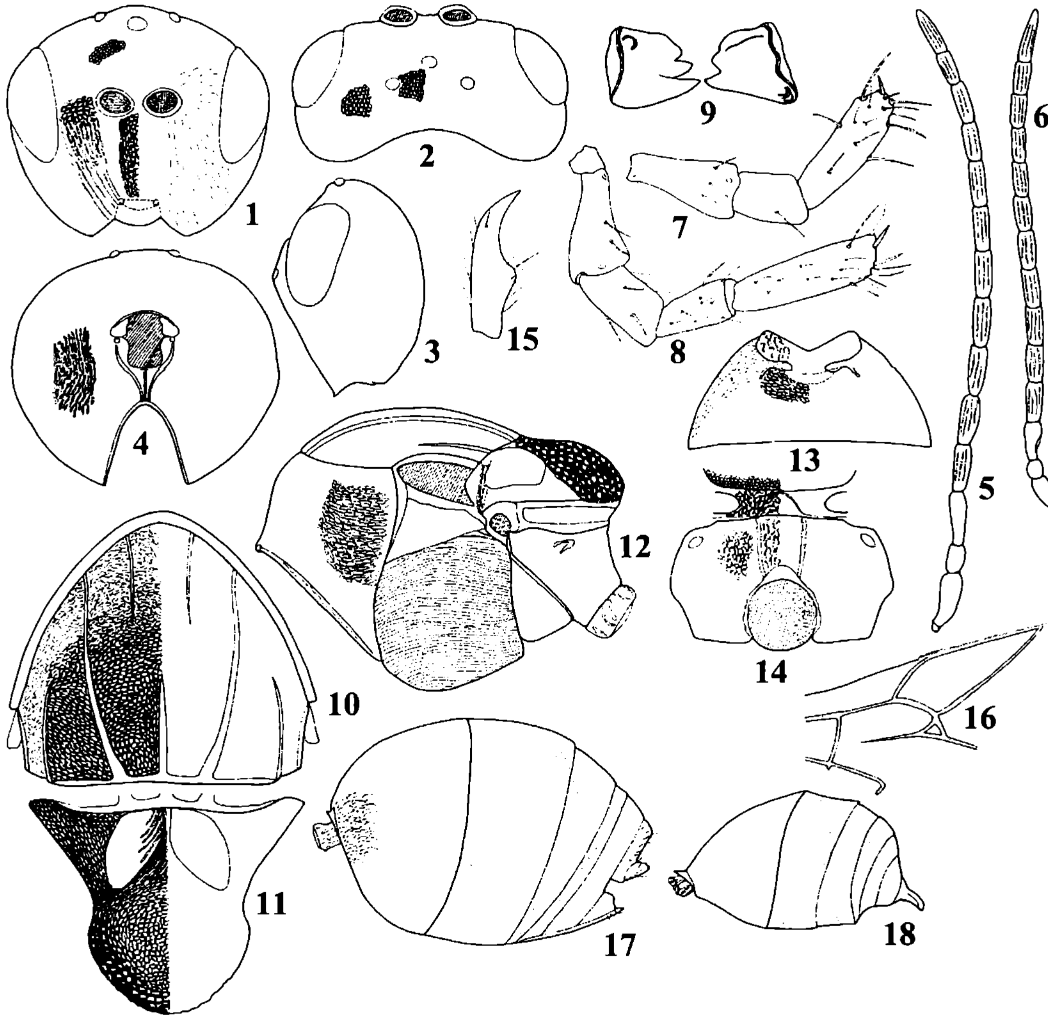
Taxonomic comments. Species is known from the only holotype male specimen "Simferopol, 23 B 1927, 1 male, E. & V. Kuznecov", "Trishiza taurica M., Belizin" (not examined, we were unable to locate the type in the collection of the Zoological Institute, St. Petersburg, where it suppose to be deposited together with all other Belizin types). Kovalev (1982) mentioned that the most closely related species is *A. tragopogonis*, gave the redescription and diagnostic characters to distinguish *A. taurica* from *A. tragopogonis*: notauli are incomplete, extending slightly above the half length of the scutum; the median mesoscutal line in a form of a short triangle; scutellar foveae are very narrow and elongated, smooth, shining, with longitudinal weak wrinkles; the radial cell of the forewing is closed, with very weakly pigmented vein along the wing margin, F2 nearly equal F1. However, the same characters can be found in some *A. tragopogonis* specimens as well, and the mentioned characters cannot be regarded as good diagnostic ones. It is possible that *A. taurica* is an abberant specimen and conspecific with *A. tragopogonis*, however, without the examination of the type, it is impossible to decide. Only the male is known, the host plant unknown. Ukraine only – Crimea, Simferopol (Kovalev, 1982).



Aulacidea tragopogonis (Thomson, 1877)

Figs 41.1-18, Plate 8.10.

Aulax tragopogonis Thomson, 1877: 803 (female, male, gall); *Aulacidea tragopogonis*; Kieffer, 1902d: 96, *Aulacidea tragopogonis tragopogonis*: Kierych, 1979: 60; *Aulacidea tragopogonis celata* Kierych, 1979: 61; *Aulax Pigeoti* Kieffer, 1898: 259 (female, gall); *Aulacidea pigeoti*: Eady & Quinlan, 1963: 20 (synonym).



Figs 41.1-18. *Aulacidea tragopogonis*: 1-4, head, female: 1, front view, 2, from above, 3, lateral view, 4, posteriorly. 5-6, antenna: 5, female, 6, male. 7-16, female: 7, palpus labialis, 8, palpus maxillaris, 9, mandibles, 10, scutum, dorsal view, 11, scutellum, dorsal view, 12, mesosoma, lateral view, 13, pronotum with submedian pronotal pits, dorsal view, 14, propodeum and dorsellum, dorso-posterior view, 15, tarsal claw, 16, forewing, part. 17-18, metasoma, lateral view: 17, female, 18, male.

Description. Female. 1.4-2.5 mm. Head and mesosoma black to very dark brown, mandibles and palpi dark reddish brown, antenna dark brown; legs reddish brown, with darker coxae, trochanters and partially femurs. Metasoma dark reddish brown, dorsally darker, hypopygium lighter than tergites. Wing veins distinct, dark brown. Head delicately coriaceous, with uniformly sparse white setae, 1.7 times as broad as long from above, rounded, as broad as high in front view, slightly broader than mesosoma. Gena delicately coriaceous, broadened behind eye, nearly 2.0 times as broad as cross diameter of eye, not visible behind eye in front view. Malar space coriaceous, with few striae towards lower face, 0.7 times as long as height of eye. POL 1.2 times as long as OOL, 2.0 times as long as LOL and 4.5-4.7 times as long as diameter of lateral ocellus. Transfacial distance 1.4 times as long as height of eye and 1.5 times as long as height of lower face (distance between antennal rim and ventral margin of clypeus); diameter of antennal torulus 4.6-4.8 times as long as distance between them and equal to distance between torulus and eye margin. Lower face with interrupted weak striae, radiating from clypeus and reaching eyes and antennal sockets; median elevated area delicately coriaceous, without striae. Clypeus rectangular, at least 2.0 times as broad as high, alutaceous, with distinct deep anterior tentorial pits, distinct epistomal sulcus and clypeo-pleurostomal line, ventral margin rounded. Frons, vertex and occiput uniformly delicately coriaceous. Postocciput around occipital foramen impressed, coriaceous, with some wrinkles; postgena rugose, with longitudinally orientated sculpture; posterior tentorial pits small, rounded; gula narrow in ventral half, broader in upper half; gular sulci distinct; hypostomal carina distinctly emarginated; occipital foramen higher than gula and at least 1.5 times as short as height of oral foramen. Mandibles, maxillar and labial palps on figures. Antenna 14-segmented; pedicel elongated, 1.5 times as long as broad; F1 1.8 times as long as pedicel and slightly longer than F2; F2 slightly shorter than F3; subsequent flagellomeres slightly shorter and nearly equal in length; F12 1.4 times as long as F11; placodeal sensilla on F2-F12, absent on F1. Mesosoma convex, 1.3 times as long as high in lateral view, with uniform sparse white setae. Pronotum very delicately coriaceous to alutaceous dorsally; uniformly alutaceous or delicately coriaceous laterally, with very dense white setae along ventro-lateral edge. Submedian pronotal pits distinct, deep, nearly 2.0 times as broad as high, separated by a distance larger than width of a pit; pronotal plate delimited in the most anterior part only, alutaceous; pronotum aside of pit with dense white setae. Scutum delicately coriaceous, with more delicate sculpture in anterior half, broader than long, slightly longer than scutellum. Notauli complete, broadened at the main base, sometimes indistinct and very narrow in anterior 1/3; median mesoscutal line usually extending to 1/3 or more of scutum length, sometimes in a form of very short triangle; parapsidal lines distinct but narrow, reaching slightly above tegulae level; anterior parallel lines distinct and extedning to 1/3 of scutum length. Scutellum slightly elongated, broadened below scutellar foveae, rounded posteriorly, only very slightly overhanging metanotum; dull rugose along sides, with more delicate sculpture towards the center of disk and with some longitudinal wrinkles between scutellar foveae. Scutellar foveae large, longer than broad, with some delicate wrinkles on shining bottom; separated by a narrow central carina, indistinctly delimited posteriorly. Dorso-axillar area delicately coriaceous. Mesopleuron, including speculum, with uniform delicate transverse striae which usually complete, not interrupted; mesopleural triangle with delicate longitudinal wrinkles; acetabular carina invisible laterally. Metapleural sulcus reaching mesopleuron in the upper 1/3 of its height, area delimited by metapleural sulcus with dense white setae; preaxilla and lateral axillar area with delicate wrinkles, axillar carina very narrow, axillula transversely ovate, with piliferous points; subaxillular bar smooth, shining, broader than height of metanotal trough; metapleuron with piliferous points; ventral bar of metanotal trough smooth, shining, slightly narrower than height of metanotal trough. Dorsellum coriaceous to rugose, very narrow medially, rugose ventral impressed area nearly reaching scutellum; metanotal trough smooth, with few white setae. Propodeum delicately rugose, lateral propodeal carinae nearly straight, slightly converging inwards in the most posterior part, uniformly thick, with setae; central propodeal area shining, with delicate wrinkles and sparse setae; lateral propodeal area delicately coriaceous, with relatively dense white setae and large ovate spiracle; nucha long, with few strong irregular rugae. Forewing with distinct brown veins, margin with short cilia; radial cell closed, vein along wing margin very indistinct, very weakly pigmented, at least 3.0 times as long as broad; areolet small but distinct, Rs+M extending to 2/3 of distance between areolet and basal vein. Tarsal claws very narrow, without basal lobe. Metasoma nearly as long as head+mesosoma, longer than high in lateral view; metasomal tergite 2 with small patch of dense long white setae antero-laterally, without punctures; subsequent tergites with punctures; hypopygium without or very indistinct few punctures; prominent part of ventral spine of hypopygium very short, with few sparse white setae, apical setae extending behind apex of spine. Male. 1.4-2.0 mm. Similar to female, antenna also 14-segmented, however, pedicel globose, nearly as broad as long; F1 incised medially, broadened apically, 2.0 times as long as pedicel and slightly shorter than F2; F2 equal F3; placodeal sensilla on all flagellomeres, except F1; metasomal tergite 2 without punctures and patch of setae antero-laterally, subsequent tergites densely punctate.

Gall (Plate 8.10). Galls are in stems, small, egg-shaped with smooth surface; the stem is not malformed externally, however, very often galls merge into a large conspicuous lignified, hard swelling up to 40 mm in length, with rough surface.

Diagnosis. Differs from other *Aulacidea* species by strongly elongated scutellar foveae, which are longer than broad. Most closely resembles *A. scorzonerae* and *A. serratulae*, however, in *A. tragopogonis* punctures on the metasomal tergite 3 are more sparse and weak in the anterior half; the hypopygium is very small, while in *A. scorzonerae* and *A. serratulae* punctures on the metasomal tergite 3 are uniformly dense and distinct; the hypopygium is much larger.

Distribution. SE (Nieves-Aldrey, 1994a), ES (Nieves-Aldrey, 1984, 1987, 1988b), RO (Ionescu, 1973), PL (Kierych, 1979), GB (Eady & Quinlan, 1963), DK, SE (Coulians & Holmåsen, 1991), DE, AT, SE (Kieffer, 1897-1901), FR (Dalla Torre & Kieffer, 1910), RU (Kursk, Saratov, Belgorod Regions - Belizin, 1959). Ukraine -- Crimea (Diakontschuk, 1987a; Zerova, Diakontschuk & Ermolenko, 1988); Kiev, Kanev Natural Reserve (Belizin, 1959); Donetsk Region, Khomutovskyj steppe Natural Reserve; Kherson Region, Askania-Nova Natural Reserve; Transcarpathian Region (few hundred specimens examined in the collection of SIZK). Common species and probably distributed all over the territory of Ukraine.

Biology. Monovoltine. Galls mature in autumn, larvae overwintering in the gall, pupate next spring, in April-May; adults emerge in May-June (Zerova, Diakontschuk & Ermolenko, 1988). Host plants: *Tragopogon dubius*, *T. maior* Jacq. (Kierych, 1979), *T. porrifolius*, *T. majus* Jacq., *T. orientale* L., *T. pratense* L. (Asteraceae).

Aylax Hartig, 1840

Figs 42.1-8.

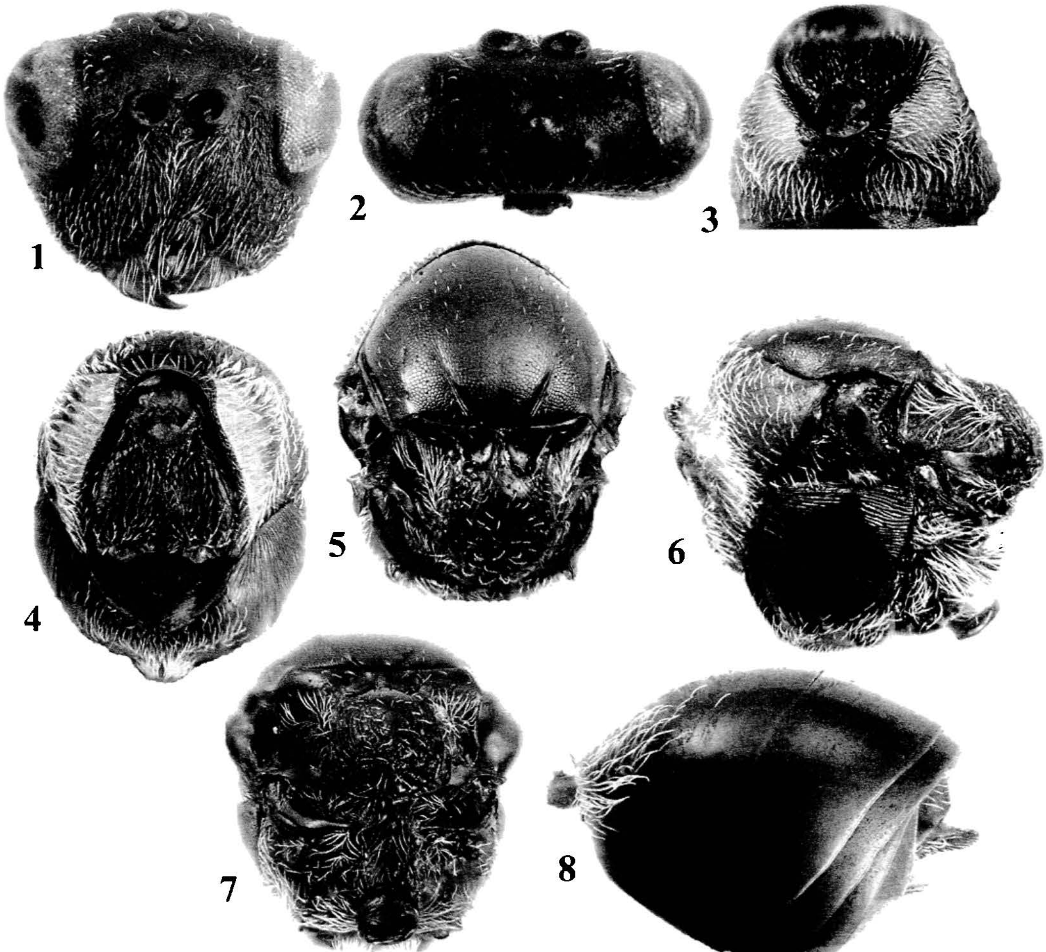
Aylax Hartig, 1840: 195 (female, male); *Aulax* Hartig, 1843: 412 (emendation); *Aclepiadiphila* Ashmead, 1897: 263. Type species: *Cynips rhoeadis* Bouché, 1834 (= *Aylax papaveris* (Perris, 1840), designated by Ashmead, 1903.

Head alutaceous, about 2.0 times as broad as long from above, slightly broader than high in front view. Gena not or slightly broadened behind eye; lower face with striae radiating from clypeus, median elevated area without striae. Antenna of female 13-segmented, male - 14-segmented; F1 equal F2 in female. Pronotum relatively short dorsally, submedian pronotal pits strongly transverse and narrowly separated. Scutum delicately coriaceous or reticulate; notauli complete, sometimes indistinct anteriorly; median mesoscutal line extending at most to 1/2 length of scutum; scutellar foveae small, slightly transverse, confluent or separated by a central carina; mesopleuron with transverse striae. Forewing margin with moderately long cilia; radial cell opened or only partially closed along margin; R1 reachinging wing margin. Metasomal tergite 2 with patch of dense white setae antero-laterally, without punctures, subsequent tergites and hypopygium with dense distinct punctures; prominent part of ventral spine of hypopygium very short, with few short sparse white setae.

The genus was originally very heterogenous. Some species were set apart and transferred to *Aulacidea* and *Isocolus*. Nieves Aldrey (1994b) erected two new monotypic genera, *Barbotinia* and *Iraella* and transferred two *Aylax* species, associated with *Papaver*: *A. oraniensis* and *A. luteipes* respectively to these genera.

Aylax sensu Nieves-Aldrey (1994b) comprises only three species, two associated with *Papaver* and *A. hypecoi* with *Hypecoum* (Papaveraceae). However, other species were also described within *Aylax*, most of them more than one century ago and estimated as having uncertain status (Dalla Torre & Kieffer, 1910; Liljeblad, 2002). Diakontschuk (1983) described three species inducing galls on Asteraceae: *Aylax ascanica*, *A.*

phaeopappuci and *A. ruthenicae* which are transferred to the *Isocolus* genus herein. Belizin (1940) described *Aylax taneritis* from Uzbekistan on the basis of one female only (males and galls are unknown). He mentioned that the species is closely resembles *Aylax ibericus* Tavares, 1927, synonym of *Isocolus lichtensteini* (Mayr, 1882) (synonym in Nieves-Aldrey, 2001a). The description given by Belizin (1959) is not enough clear to decide if this species really belongs to *Aylax* or it is an *Isocolus*. The holotype must be revised.



Figs 42.1-8. *Aylax hypecoi*, female: 1-2, head: 1, front view, 2, from above. 3, pronotum with submedian pronotal pits, dorsal view, 4, pronotum and propleura, front view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, metasoma, lateral view.

Currently the genus is represented by four species: three are known from Europe: *A. papaveris* (Perris, 1839), *A. minor* Hartig, 1840 (on *Papaver*), and *Aylax hypecoi* Trotter, 1912, described from Northern Africa (Tripoli) (on *Hypecoum*), also found in Greece and Algeria. One species, *Aylax quinquecostatus* (Provancher, 1883) was described from Canada (Ontario), however, the position of this species is questionable (Burks, 1979). Only the sexual generation is known, all species are monovoltine; induce galls on *Papaver* and *Hypecoum*.

Key to palaearctic species of *Aylax*

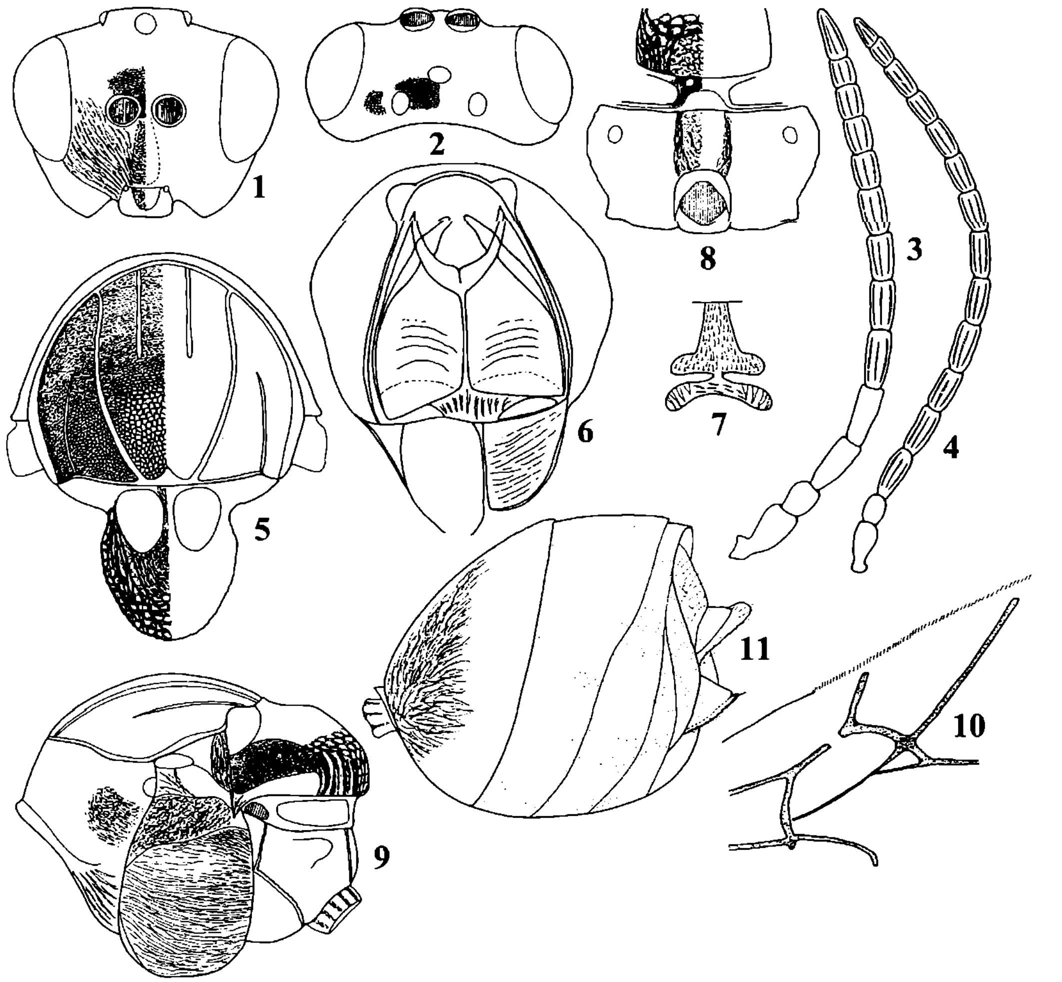
1. Body black; female antenna 14-segmented; Rs reaching margin of forewing; metasomal tergite 2 with few short white setae antero-laterally; hypopygium large in lateral view 2
-- Body with variable extension of reddish brown colour; female antenna 12-13-segmented; Rs not reaching margin of wing; metasomal tergite 2 with patch of dense white setae antero-laterally; hypopygium very small in lateral view .... ***hypecoi****
2. Notauli indistinct in anterior 1/3; scutum coriaceous; fruit capsule not enlarged and swollen, with individual galls .... ***minor***
-- Notauli distinct in anterior 1/3; scutum coriaceous-rugose; multilocular galls in hypertrophised capsules .... ***papaveris***

Aylax hypecoi Trotter, 1913*

Figs 43.1-11, Plate 8.11.

Aylax hypecoi Trotter, 1913: 214 (female, male, gall); *Aylax spirorhynchusii* Diakontschuk, 1990: 126 (female, male, gall) (synonym in Nieves-Adlrey & Melika, 2005: 2526).

Description. Female. 2.1-2.5 mm. Body mostly black, pronotum, except dorso-medially, scutellum dorsally and median part of mesopleuron reddish; scape, distal half of coxae and other parts of legs predominantly reddish brown; metasoma reddish brown. Head slightly trapezoid, delicately coriaceous with some clear piliferous punctures, 2.3 times as broad as long from above and 1.3 times as broad as high in front view. POL about 1.7 times OOL, posterior ocellus separated from inner margin of eye by about 1.6 times its diameter. Lower face with moderately dense setae, not keeled medially; with delicate striae radiating from clypeus and nearly reachinging eye and antennal sockets. Frons and vertex delicately smooth and shining coriaceous, with some sparse setae; interocellar area raised. Lateral margin of gena almost straight and convergent, not distinctly bowed, height of malar space about 0.5 times as high as height of eye. Clypeus subtrapezoid, ventral margin distinctly projecting; anterior tentorial pits indicated; epistomal sulcus and clypeo-pleurostomal line weakly marked. Antennal sockets situated at mid-height of eye; distance between antennal rim and eye as long as width of antennal socket including rim; distance between antennal sockets less than 0.5 times the diameter of antennal socket. Occiput with dense setae, without occipital carina but some conspicuous transverse rugae present above occipital foramen; gular sulci free, well separated at hypostoma; hypostomal foramen about 2 times as long as occipital foramen; distance between hypostomal and occipital foramina about 0.6 times height of occipital foramen. Mandibles moderately large, right mandible with three, left with two teeth. Maxillary stipes about 3.0 times as long as broad. Maxillary palp 5-segmented, labial palp 3-segmented. Antenna 12-13-segmented; 0.7 times as long as body, scape 1.4 times as long as broad; 1.4 times as long as pedicel; F1 as long as F2; F3 to F7 decreasing in length; ultimate flagellomere 2.6 times as long as penultimate; placodeal sensilla inconspicuous, on F3-F11. Pronotum medially high, in anterior view ratio of median distance between anterior and posterior margins to lateral distance between these margins about 0.35. Submedian pronotal pits transverse, deep, open laterally, separated by a distance equal to its width; pronotal plate with sparse setae. Lateral surface of pronotum without sculpture, with dense setae. Scutum shining, minutely coriaceous, with some scattered piliferous punctures. Notauli narrow and shallow, clearly visible only in posterior 1/3 of scutum, indistinct anteriorly; median mesoscutal line absent or in a form of very short triangle. Scutellum 0.9 times as as long as scutum; medially almost smooth, laterally with concentric strong rugae. Scutellar foveae shallow, smooth and shining, irregularly square shaped, relatively large and separated medially by central carina; their inner posterior margins indistinct. Postero-dorsal and posterior margins of axillula distinct; mesopleuron longitudinally costulate and shining; mesopleural triangle distinctly impressed, ventral margin clearly marked. Dorsellum alutaceous, medially nearly as high as height of ventral impressed area which is smooth, shinig; metanotal trough narrow, with setae. Metapleural sulcus reaching anterior margin of metapectal-propodeal complex slightly above mid-height of latter. Lateral propodeal carinae relatively narrow, subparallel; lateral and central propodeal areas smooth or alutaceous, with dense setae. Nucha moderately long dorsally, almost smooth, with some weak longitudinal striae. Tarsal claws without basal lobe. Forewing slightly longer than body, hyaline and pubescent; margin with short cilia; radial cell opened, about 2.5 times as long as broad. R1 and Rs nearly reaching wing margin; 1st abscissa of radius (2r) curved; areolet present, closed by nebulous to tubular veins. Metasoma as long as mesosoma; metasomal tergite 2 occupying about 1/3 of metasoma length, about 1.4 times as long as tergite 3, with large patch of white dense setae antero-laterally. Subsequent tergites and hypopygium with dense punctures; prominent part of ventral spine of hypopygium short, not projecting, united almost to apex with the lateral flaps; couple of rows of long setae present on each side, apical ones extending behind apex of spine.



Figs 43.1-11. *Aylax hypecoi*: 1-2, head female: 1, front view, 2, from above. 3-4, antenna: 3, female, 4, male. 5-11, female: 5, scutum and scutellum, dorsal view, 6, pronotum and propleura, front view, 7, pronotum with submedian pronotal pits, dorsal view, 8, propodeum and dorsellum, dorso-posterior view, 9, mesosoma, lateral view, 10, forewing, part, 11, metasoma, lateral view.

Male. 2.0 mm, similar to female, but head and mesosoma black, antenna black with some darkish brown tone, coxae, trochanter and basal half of femura black, tibiae and tarsi dark brown; metasoma dorsally dark brown to black laterally and ventrally; antenna 14-15-segmented (in some specimens suture between F13 and F12 indistinct), F1 very slightly longer as F2; subsequent flagellomeres shorter; placodeal sensilla on all flagellomeres.

Gall (Plate 8.11). Galls in fruits form a conspicuous swelling. Fruits of *Hypecoum* species are typically nodose, divided by transverse septa, thus galled fruits affect one or more seeded sections which are inflate considerably. The shape is oval or globular, slightly more elongated along the longitudinal axis. Each gall is 0.4-0.5 mm wide and 0.6-0.7 long. In each fruit from 1 to 3 galls are developing. Each individual gall has a single larval chamber separated from outside by a thick wall.

Diagnosis. *Aylax hypecoi* is a very distinctive species. Morphologically differs clearly from other *Aylax* species (*A. papaveris* and *A. minor*) in many characters, mainly the general colouration of the body, the shape of the head and clypeus, the number of antennal segments, relative length of the pronotum dorso-medially, the relative length of notauli, the sculpture of the scutum, the form of scutellar foveae and the form and sculpture of the scutellum. *Aylax hypecoi* is also quite similar to *Neaylax versicolor* (Nieves-Aldrey, 1985) a species formerly described within *Aylax* and later transferred to *Neaylax* (Nieves-Aldrey, 1994b). *Aylax hypecoi* shares with *N. versicolor* a similar colouration, antennae 12-segmented, the pronotum dorso-medially relatively long, with similar submedian pronotal pits, the relative length of notauli and the sculpture of the mesopleuron and the forewing venation.

Distribution. The species was originally described from Tripoli (North Africa) and recorded from Algeria and Greece (Trotter, 1913, Houard, 1913). After the synonymization of *A. spirorhynchusii* the distribution of *A. hypecoi* extends to Transcaucases (Armenia) and Middle Asia (Turkmenistan) (Nieves-Aldrey & Melika, 2005). Presumably occurs in southern part of Ukraine also, particularly in Crimea.

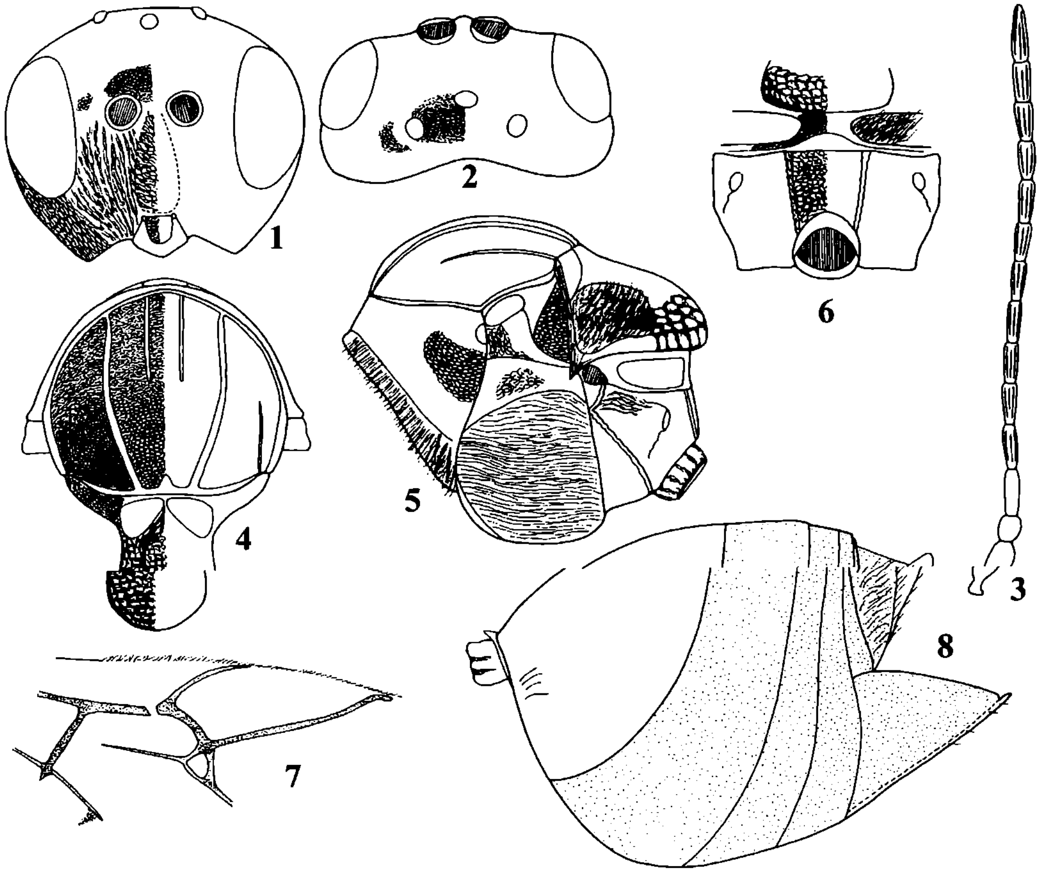
Biology. The life cycle is typically monovoltine as in most Aylacini. Males are very rare. Adults emerge from galls since the end of the winter in North Africa to early spring in Europe, at the time the host plant starts its flowering. Galls develop and mature in spring. Larvae overwintering inside the galls and pupate during the next winter or spring. Host plants: *Hypecoum imberbe* Sibth. & Sm., *H. geslini* L. and *H. grandiflorum* L. (Papaveraceae) (Nieves-Aldrey & Melika, 2005).

Aylax minor Hartig, 1840

Figs 44.1-8, Plate 8.12.

Aylax minor Hartig, 1840: 196 (female, male, gall); *Aulax minor* Hartig: Kieffer, 1897-1901: 304, 1902d: 95; *Aulax papaveris* var. *minor* Cameron, 1893: 49; *Aylax minor* Folliot, 1964: 421 (female, gall).

Description. Female. 1.4-2.5 mm. Head and mesosoma black; antenna, mandibles and palpi dark brow; legs yellow; metasoma reddish to light brown, posterior tergites much darker, to black. Wings with distinct brown veins. Head delicately coriaceous to alutaceous, with uniformly sparse white setae, 2.2 times as broad as long from above; 1.1-1.3 times as broad as high in front view and slightly broader than mesosoma. Gena delicately coriaceous to alutaceous, not broadened behind eye, nearly 2.0 times narrower than cross diameter of eye, measuring behind eye. Malar space delicately coriaceous, 0.5 times as long as height of eye, with few delicate short, interrupted striae, radiating from clypeus and reaching eye. POL 1.7-1.9 times as long as OOL; 2.0 times as long as LOL and 3.3 times as long as diameter of lateral ocellus. Transfacial distance 1.1 times as long as height of eye and 1.2 times as long as height of lower face (distance between antennal rim and ventral margin of clypeus); diameter of antennal torulus 1.4 times as long as distance between them and 0.5 times as long as distance between torulus and eye margin. Lower face with delicate interrupted striae radiating from clypeus and reaching eye and antennal sockets; median elevated area coriaceous, without striae. Clypeus delicately coriaceous to smooth, with indistinct anterior tentorial pits, with distinct epistomal sulcus and clypeo-pleurostomal line, ventrally slightly rounded. Frons, vertex and occiput delicately coriaceous. Antenna 14-segmented, slightly shorter than body length; pedicel subglobose, only slightly longer than broad; F1 1.85 times as long as pedicel and F2 and F3; F12 1.5 times as long as F11; placodeal sensilla on F2-F12. Mesosoma



Figs 44.1-8. *Aylax minor*, female: 1-2, head: 1, front view, 2, from above. 3, antenna, 4, scutum and scutellum, dorsal view, 5, mesosoma, lateral view, 6, propodeum and dorsellum, dorso-posterior view, 7, forewing, part, 8, metasoma, lateral view.

convex, as long as high in lateral view, with uniform sparse white setae. Pronotum delicately coriaceous, with very dense white setae along anterior margin, submedian pit transverse, small, distance between pits slightly shorter than width of a pit; pronotal plate indistinct, not delimited laterally. Scutum uniformly delicately coriaceous, slightly longer than broad, 1.5 times as long as scutellum. Notauli often indistinct in anterior 1/3; median mesoscutal line in a form of very short triangle; parapsidal lines indistinct and narrow, reaching slightly above tegulae; anterior parallel lines distinct and extending to 1/3-1/2 of scutum length. Scutellum delicately rugose, with some longitudinal striae behind scutellar foveae; slightly overhanging metanotum. Scutellar foveae transversely ovate, slightly broader than high, deep, smooth, shining, indistinctly delimited posteriorly, without setae; medially separated by a very narrow central carina (in some specimens scutellar foveae anteriorly tounching one another). Mesopleuron, including speculum, with uniform delicate transverse striae; mesopleural triangle alutaceous, with few setae. Metapleural sulcus reaching mesopleuron in the upper 1/3 of its height; axillula transversely ovate, with very dense white setae hidinig coriaceous sculpture; subaxillular bar smooth, shining, at least 2.0 times narrower than height of metanotal trough; pit over propodeal spiracle shallow, shining, with some longitudinal wrinkles; carina along anterior border of propodeal spiracle weak; ventral bar of metanotal trough delicately coriaceous, much narrower than height of metanotal trough. Dorsellum coriaceous, slightly higher medially than height of smooth, shining ventral impressed area; metanotal trough coriaceous, with dense white setae. Propodeum coriaceous, lateral propodeal carinae uniformly broad, subparallel, with very few setae; central propodeal area mat, alutaceous, with white setae; lateral propodeal area uniformly coriaceous, with dense white setae; nucha with uniform longitudinal delicate wrinkles. Forewing margin with long cilia; radial cell opened, 3.0 times as long as broad, Rs and R1 reaching or nearly reaching wing margin, areolet distinct, Rs+M extending to 3/4 of distance between areolet and basalis. Tarsal claws very narrow, without basal lobe. Metasoma longer than head+mesosoma, longer than high in lateral view; metasomal tergite 2 with very few short white setae antero-laterally, without punctures; subsequent tergites and hypopygium with dense punctures; hypopygium large, prominent part of ventral spine of hypopygium very short, with few short setae, which not extending behind apex of spine. Male. 1.4-2.0 mm. Similar to female but antenna 15-segmented.

Gall (Plate 8.12). The gall is rounded, 2 mm in diameter, whitish yellow, attached to septa of the fruit capsule. Galls are often laying so near one to another that they are malformed. Sometimes galls cover all septa in the capsule, however, the latter never malformed and swollen externally.

Diagnosis. *Aylax minor* and *A. papaveris* differ from the third known palaearctic species, *A. hypecoi* by 14-segmented antenna of the female and the metasomal tergite 2 without a patch of dense white setae antero-laterally. *Aylax minor* and *A. papaveris* are very closely related and only very slightly differ morphologically. In *A. minor* notauli are indistinct in anterior 1/3; the scutum is coriaceous and the galling fruit capsule not enlarged and swollen, with individual galls inside, while in *A. papaveris* notauli are complete, well-impressed prolong entire length; the scutum coriaceous-rugose; in galling and hypertrophised fruit capsule multiilocular galls can be find, which often form a large conglomerate.

Distribution. ES (Nieves-Aldrey, 1984, 1987, 1988), HU (Ambrus, 1974), PL (Kierych, 1979), GB (Eady & Quinlan, 1963), DE, GB, AT, FR (Kieffer, 1897-1901). In Ukraine – Crimea only (Diakontschuk, 2003) (12 examined specimens in the collection of SIZK).

Biology. Monovoltine. Galls can be found from July, adults emerge next year in May (Ambrus, 1974). Host plants: *Papaver rhoeas* (Ambrus, 1974); *P. argemone* L., *P. dubium* L. (Kierych,1979), *P. hybridum* L. (Diakontschuk, 2003).

Aylax papaveris (Perris, 1839)

Plate 8.13-14.

Diplolepis papaveris Perris, 1839: 95 (female, male, gall); *Aulax papaveris*: Cameron, 1893: 48; *Timaspis papaveris* Kieffer, in: Goury & Guignon, 1905: 200 (female, gall); *Cynips rhoeadis* Bouché, 1834: 164 (female, gall); *Aylax rhoeadis* Hartig, 1840: 195 (female, male, gall).

Description and Diagnosis. Very closely related to *A. minor*. See Diagnosis to *A. minor.* Notauli are distinct only in the posterior 2/3 of the scutum, which is coriaceous-rugose. *Aylax papaveris* induces multilocular galls in hypertrophised fruit capsules, while in *A. minor* individual galls do not enlarge and swollen the fruit capsules.

Gall (Plate 8.13-14) mainly in fruit capsules, occasionally in the stem. The individual galls are like in *A. minor*, but they never form a conglomerate of galls and the infested fruit capsule never enlarged, swollen. As the result of galling, the duration of plant life shortening and fruits ripening earlier, the poppy seeds turning brown and shrivelling. Detail description of the gall and its development is given in Reijnvaan & Docters van Leeuwen (1906).

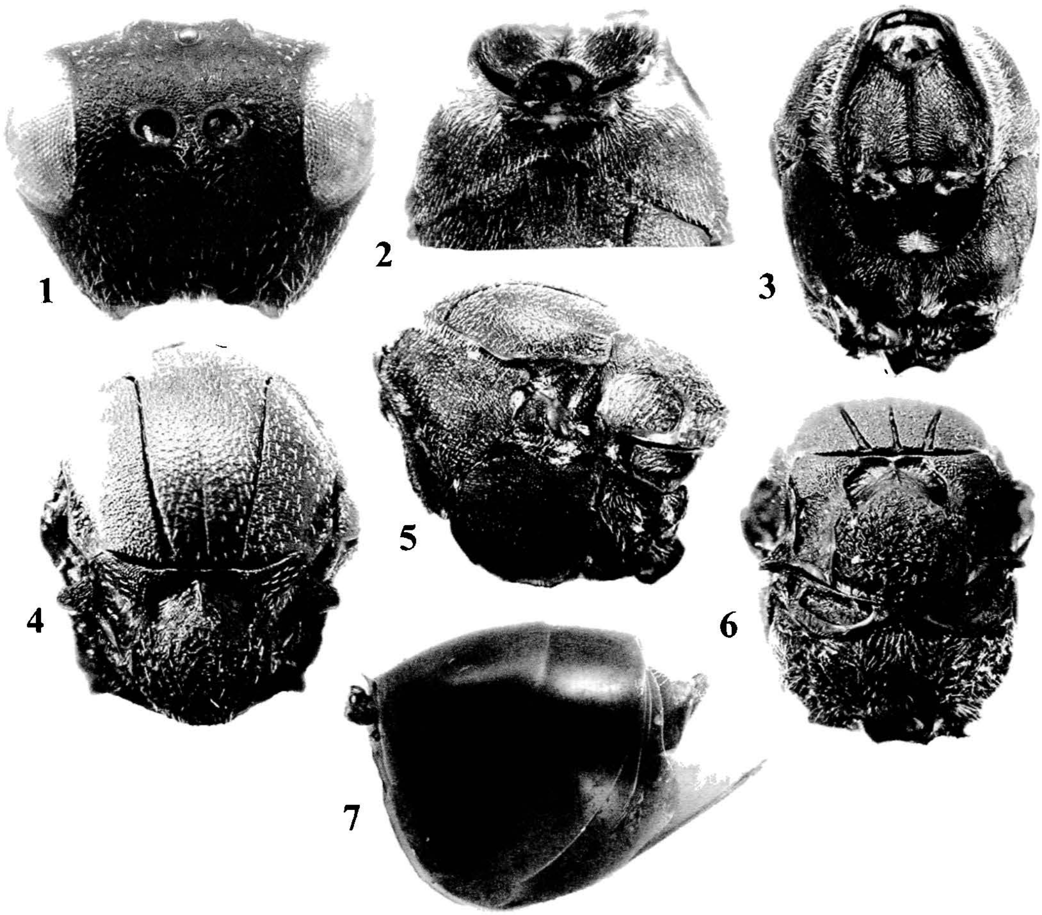
Distribution. ES (Nieves-Aldrey, 1984, 1985, 1987, 1988), RO (Ionescu, 1973), HU (Ambrus, 1974), PL (Kierych, 1979), GB (Cameron, 1893; Eady & Quinlan, 1963), SE (Coulians & Holmåsen, 1991), DE, GB, AT, FR, SE (Kieffer, 1897-1901), IL (Argaman, 1989). In Ukraine – Transcarpathian Region only, vicinities of Uzhgorod (12 specimens reared from galls on *P. somniferum*); probably a common species throughout the territory of the country.

Biology. Monovoltine. Adults emerge next year in May. Host plants: *Papaveris dubium* L., *P. rhoeas* L., *P. somniferum* L. (Papaveraceae).

Barbotinia Nieves-Aldrey, 1994

Figs 45.1-7.

Barbotinia Nieves-Aldrey, 1994b: 182. Type-species: *Aylax oraniensis* Barbotin, 1964, designated by Nieves-Aldrey, 1994b: 182.



Figs 45.1-7. *Barbotinia oraniensis*, female: 1, head, front view, 2, pronotum with submedian pronotal pits, dorsal view, 3, pronotum and propleura, front view, 4, scutum and scutellum, dorsal view, 5, mesosoma, lateral view, 6, propodeum and dorsellum, dorso-posterior view, 7, metasoma, lateral view.

Head trapezoid in front view, transverse from above, more than 2.0 times as broad as long. Gena not broadened behind eye; transfacial distance slightly longer than height of eye; malar space longer than height of eye; lower face and malar space with strong striae, radiating from clypeus and reaching inner margin of eye and antennal sockets; median elevated area coriaceous. Mandibles large. Frons and vertex minutely alutaceous. Antenna filiform, 14-segmented in female and 15-segmented in male; pedicel as long as broad in female, slightly broader than long in male; F1 equal F2 and F3. Pronotum dorsally relatively short; in median dorsal line, not more than 1/4 as long as greatest length on outer lateral margin; submedian pronotal pits distinctly impressed, slightly transverse and moderately separated. Scutum nearly as broad as long, coriaceous, with punctures (piliferous points), especially in posterior half. Notauli narrow but complete; median mesoscutal line distinct in posterior 1/2 of scutum. Scutellum rugose along sides, disk reticulate to delicately coriaceous; scutellar foveae large, rounded, contiguous, alutaceous to almost smooth. Mesopleuron with transverse interrupted short irregular striae, space between them reticulate. Wings hyaline; R1 and Rs not reaching wing margin, radial cell open; margin with short cilia. Tarsal claws simple, without basal lobe. Metasoma as long as head+mesosoma; metasomal tergite 2 without setae antero-laterally and without punctures; tergite 3 occupying about 1/3 of metasoma length, without punctures; subsequent tergites with obsolete punctures, hypopygium without punctures; prominent part of ventral spine of hypopygium short, with some short white setae.

Taxonomic comments. *Barbotinia* closely related to *Aylax*; in both genera the pronotum relatively short medially, submedian pronotal pits transverse and indistinctly separated. *Barbotinia* differs from *Aylax* in that the head is trapezoid, the malar space relatively long; scutellar foveae are large and rounded, nearly as long as broad; the mesopleuron with short irregular striae, reticulate in between them; the radial cell completely opened along the margin; R1 hardly reaching the wing margin; metasomal tergite 2 without antero-lateral patch of setae.

Distribution. Mediterranean region and Northern Africa (Barbotin, 1964). ES and IT (Nieves-Aldrey, 1994b, 2001a). In Ukraine – Crimea (Diakontschuk, 2003).

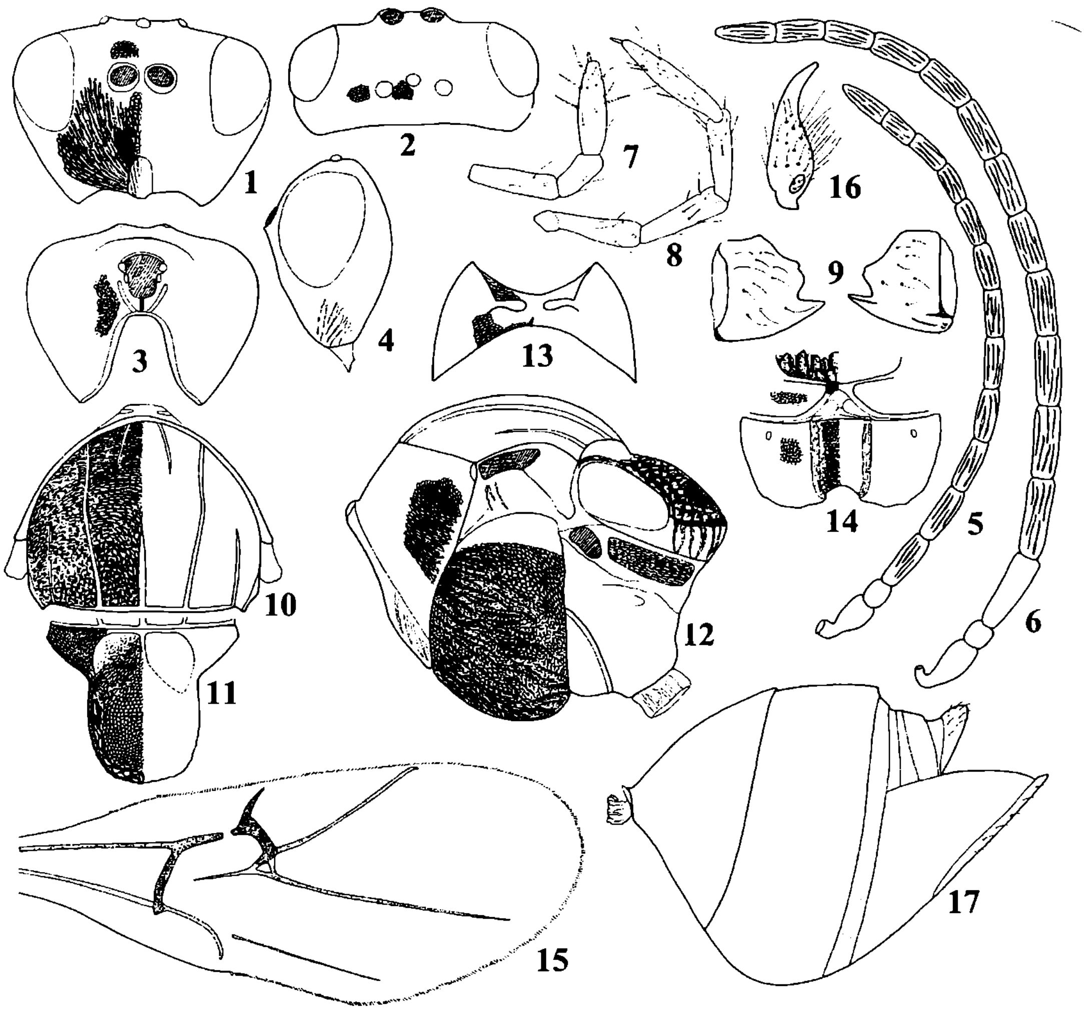
Biology. The genus comprises a single species, *Barbotinia oraniensis* (Barbotin, 1964), known to induce galls in fruit capsules of *Papaver* species (Papaveraceae). *Barbotinia* together with *Aylax* and *Iraella* phylogenetically forms one of the basal lineages of primitive cynipid gall-inducers (Liljeblad & Ronquist, 1998; Nylander et al., 2004).

Barbotinia oraniensis (Barbotin, 1964)

Fig. 46.1-17, Plate 8.15.

Aylax oraniensis Barbotin, 1964: 152 (female, male, gall); *Barbotinia oraniensis*: Nieves-Aldrey, 1994b: 183.

Description. Female. 2.5-4.0 mm. Head and mesosoma black; mandibles and palpi brown; antenna unfiromly dark brown. Legs, except black basal half of coxae, uniformly reddish brown. Metasoma reddish brown, posterior tergites darker to black; hypopygium lighter. Wing veins dark brown. Head delicately coriaceous to alutaceous, with uniformly sparse white setae, 1.8-2.0 times as broad as long from above, 1.35-1.4 times as broad as high and slightly broader than mesosoma. Gena delicately coriaceous, not broadened behind eye; not visible behind eye in front view; nearly as broad as cross diameter of eye, measuring behind eye. Malar space coriaceous, high, 0.7 times as long as height of eye, with short interrupted striae, radiating from clypeus and reaching margin of eye. POL only slightly shorter than OOL; 2.8 times as long as LOL and 2.5 times as long as diameter of lateral ocellus. Transfacial distance 1.2-1.3 times as long as height of eye and 1.3 times as long as height of lower face (distance between antennal socket and ventral margin of clypeus); diameter of antennal torulus 6.5 times as long as distance between them, and equal to distance between torulus and eye margin. Lower face with delicate dense striae, radiating from clypeus and reaching eye and antennal sockets, median elevated area coriaceous, without striae. Clypeus alutaceous to smooth, very narrow and small, at least 2.0 times as high as broad; with very indistinct anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line distinct, ventral margin straight. Frons, vertex and occiput delicately reticulate. Postocciput around occipital foramen impressed, coriaceous; postgena reticulate, with more dense setae than on front of head; posterior tentorial pits slightly elongated; occipital foramen at least 2.0 times as high as height of gula and around 2.0 times as short as hypostomal foramen; lower part of gula narrowed down to broad, distinct hypostomal carina. Mandibles, maxillar and labial palps on figures. Antenna 14-segmented, slightly shorter than body length; pedicel as long as broad; F1 3.1 times as long as pedicel and equal F2 and F3; F12 1.3 times as long as F11; placodeal sensilla on all flagellomeres. Mesosoma convex, only very slightly longer than high in lateral view, with uniform sparse white setae. Pronotum alutaceous, with distinct small piliferous points dorsally; uniformly coriaceous laterally, with some transverse parallel striae along posterior margin, which extending to at least half width of pronotum; anterior margin with more dense setae and with some wrinkles antero-ventrally. Submedian pronotal pits distinct, deep, transverse, at least 2.0 times as broad as high, separated by a smooth area, which nearly as broad as width of pit; pronotal plate not delimited, with piliferous points. Scutum nearly as long as broad, 1.3 times as long as scutellum, uniformly delicately coriaceous, with distinct punctures (piliferous points), especially in posterior half. Notauli complete, narrow; median mesoscutal line extending to nearly half length of scutum;



Figs 46.1-17. *Barbotinia oraniensis*: 1-4, head female: 1, front view, 2, from above, 3, posterior view, 4, lateral view. 5-6, antenna: 5, female, 6, male. 7-17, female: 7, palpus labialis, 8, palpus maxillaris, 9, mandibles, 10, scutum, dorsal view, 11, scutellum, dorsal view, 12, mesosoma, lateral view, 13, pronotum with submedian pronotal pits, dorsal view, 14, propodeum and dorsellum, dorso-posterior view, 15, forewing, part, 16, tarsal claw, 17, metasoma, lateral view.

parapsidal lines narrow, extending to tegula level; anterior parallel lines extending to 1/4 of scutum length. Scutellum distinctly longer than broad, with parallel sides, rounded posteriorly; dull rugose along sides, with delicate coriaceous or reticulate sculpture towards the center of disk, with some striae behind scutellar foveae; very slightly overhanging metanotum. Scutellar foveae large, as broad as high, alutaceous anteriorly and coriaceous posteriorly, separated by narrow median carina. Mesopleuron reticulate, with some short interrupted strong transverse striae, speculum coriaceous to reticulate, without striae; mesopleural triangle coriaceous, with some wrinkles. Metapleural sulcus reaching mesopleuron slightly above 1/2 of its height, inferior part of sulcus very indistinct; axillula transversely ovate, with few white setae; subaxillular bar alutaceous, shining, narrower than height of metanotal trough; pit over propodeal spiracle deep, shining, carina along anterior border of propodeal spiracle strongly raised; ventral bar of metanotal trough with delicate wrinkles, around 2.0 times narrower than height of uniformly delicately coriaceous metanotal trough. Dorsellum reticulate, very narrow medially; smooth ventral impressed area at least 3.5-4.0 times as high as height of dorsellum medially. Propodeum delicately coriaceous, lateral propodeal carinae uniformly broad, along with setae; central propodeal area delicately coriaceous, with white setae; lateral propodeal area coriaceous, with some rugae under propodeal spiracle, with dense white setae. Forewing margin with short cilia; radial cell opened, 2.6 times as long as broad, areolet small, indistinct, Rs+M extending to 2/3 of distance between areolet and basalis. Tarsal claws very narrow, without basal lobe. Metasoma as long as head+mesosoma; metasomal tergite 2 without setae antero-laterally and without punctures; tergite 3 occupying about 1/3 of metasoma length, without punctures; subsequent tergites with obsolete punctures, hypopygium without punctures; prominent part of ventral spine of hypopygium short, with some short white setae. Male. 2.2-4.0 mm. Similar to female but antenna 15-segmented; pedicel slightly broader than long; F1 2.0 times as long as pedicel and nearly equal to F2 and F3; placodeal sensilla on F2-F13.

Gall (Plate 8.15) in the fruit capsule, irregularly spherical, 2.0-3.0 mm in diameter. Usually 2-3 galls developing in one fruit capsule, rarely only one or more than 3. The infested capsule swollen, malformed externally, caused by the hypertrophy of plant tissues.

Distribution. Mediterranean Region and Northern Africa (Barbotin, 1964). ES and IT (Nieves-Aldrey, 1984a, 2001a). In Ukraine – Crimea only (Diakontschuk, 2003) (12 examined specimens reared from *P. hybridum* in the collection of SIZK).

Biology. Monovoltine. Galls starting to develop in April, mature in June; adults emerge next spring. Host plants: *Papaver hybridum* L. (Diakontschuk, 2003), *P. dubium* L. and *P. rhoeas* L. (Nieves-Aldrey, 2001a) (Papaveraceae). *Parnips nigripes* (Barbotin, 1964), a figitid parasitoid, recently described in a new subfamily Parnipinae (Figitidae), frequently associates with *B. oraniensis* in the Iberian Peninsula (Nieves-Aldrey, 2001a; Ronquist & Nieves-Aldrey, 2001).

Cecconia Kieffer, 1902

Cecconia Kieffer, 1902d: 93. Type species: *Aulax valerianellae* Thomson, 1877: 81, original designation. *Weldiella* Ionescu & Roman, 1962: 551. Type species: *Weldiella aequalis* Ionescu & Roman, 1962, original designation (synonym in Nieves-Aldrey, 1994b: 183).

Body black. Head coriaceous, slightly less than 2.0 times as broad as long from above, as broad as high or slightly higher than broad in front view. Malar space as long as height of eye, with striae raditing from clypeus. Lower face with radiating striae, median elevated area coriaceous. Clypeus subquadrate. Female antenna 13-segmented; F1 shorter or equal F2; male antenna 14-segmented. Submedian pronotal pits distinct, separated. Scutum alutaceous; notauli weakly impressed, absent in anterior half; median mesoscutal line absent. Scutellum reticulate; scutellar foveae confluent, rounded, indistinctly delimited posteriorly; mesopleuron with delicate longitudinal striae. Wings hyaline; radial cell opened on the margin; about 3.0 times as long as broad; margins with long cilia. Metasomal tergite 2 with a patch of dense white setae antero-laterally, tergites without punctures.

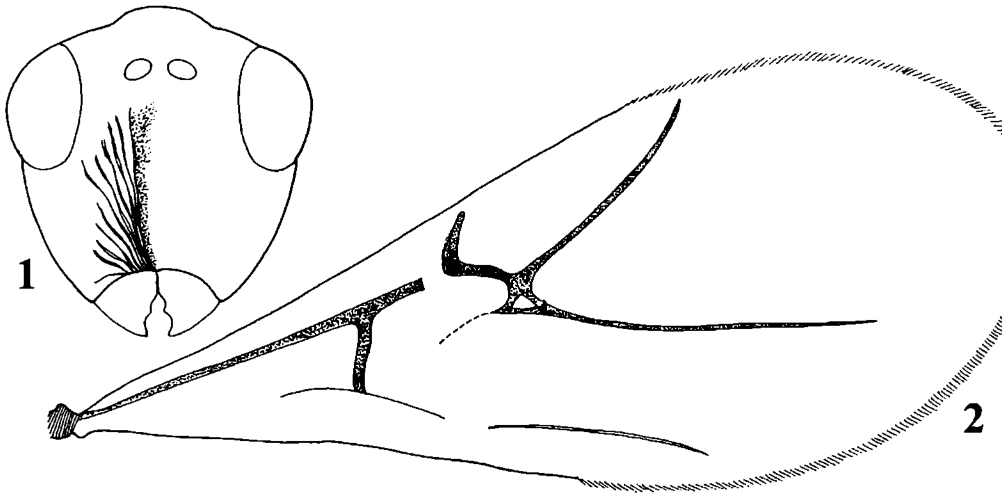
Distribution and Biology. The genus comprises only one known species widespread in Europe, from Sweden to the Iberian Peninsula. It induces galls in fruits of *Valerianella* species (Valerianaceae).

Cecconia valerianellae (Thomson, 1877)

Figs 47.1-2, Plate 8.16-17.

Aulax valerianellae Thomson, 1877: 810 (female, male, gall); *Cecconia valerianellae*: Kieffer, 1902d: 93; *Weldiella aequalis* Ionescu & Roman, 1962: **syn. n.**; *Aulacidea lutigea* Diakontschuk, 2003: 11 (female, gall), **syn. n.**

Description. Female. 2.0-3.0 mm. Head and mesosoma black, mandibles reddish. Antenna light chestnut, with much darker scape and pedicel; legs chestnut red, except black coxae, trochanters and basal part of femurs. Wings hyaline, with chestnut brown veins. Metasoma chestnut red basally and dark brown to black dorso-posteriorly. Head coriaceous, 1.8 times as



Figs 47.1-2. *Cecconia valerianellae*, female: 1, head, front view, 2, forewing.

broad as long from above and as broad as high or slightly higher than broad in front view. POL nearly equal OOL, distance between lateral ocellus and inner margin of eye slightly more than diameter of ocellus. Lower face and malar space with striae, radiating from clypeus and reaching inner margin of eye and antennal sockets; median elevated area of lower face without striae, delicately coriaceous. Transfacial distance around 1.6 times as long as height of eye. Clypeus alutaceous, small, subquadrate, anterior tentorial pits indistinct, small, epistomal sulcus indistinct, clypeo-pleurostomal line converging, ventral margin of clypeus not projecting over mandibles. Frons, vertex and occiput reticulate. Antenna 13-segmented; F1 shorter than F2; F11 1.6 times as long as F10; placodeal sensilla on all flagellomeres. Pronotum dorsally relatively short; in median dorsal line, not more than 1/3 as long as greatest length on outer lateral margin. Pronotum alutaceous to delicately coriaceous dorsally, reticulate laterally, with some weak striae along posterior margin. Submedian pronotal pits deep, distinct, ovate, broadly separated; pronotal plate alutaceous, laterally delimited only in the most anterior part. Scutum alutaceous to reticulate; notauli well-impressed in posterior half, absent or very indistinct in anterior half of scutum; median mesoscutal line absent. Scutellum convex in lateral view, uniformly reticulate; scutellar foveae rounded, reticulate, indistinctly delimited posteriorly, confluent, without central carina separating them. Mesopleuron with delicate transverse striae. Postero-dorsal margin of axillula well-defined. Forewing slightly longer than body; margin with moderately long cilia; radial cell opened along margin, at least 3.0 times as long as broad; R1 and Rs not reaching wing margin; areolet indistinct; Rs+M very indistinct. Tarsal claws simple, without basal lobe. Metasoma as long as mesosoma; metasomal tergite 3 occupying half length of metasoma, with white setae antero-laterally; metasomal tergites and hypopygium without punctures; prominent part of ventral spine of hypopygium very short. Male. 1.5 mm. Similar to female but head slightly higher than broad in front view; antenna longer, 14-segmented, F1 slightly excavated medially and broadened apically.

Gall (Plate 8.16-17). A monolocular gall, 3.5-8.0 mm in length, forming inside the fruit and as the result, the fruit malformed, enlarged, swollen; the typical elongated conical shape changed to rounded or ovate, with one end elongated. The galled fruit can be 6 times as large as the health one.

Taxonomic comments. On the basis of the original description and diagnosis given, *Weldiella aequalis* Ionescu & Roman, 1962 is conspecific with *C. valerianellae* (type supposedly lost, not examined) and a **syn. n.** of *C. valerianellae*. *Aulacidea lutigea* Diakontschuk, 2003, a recently described species was reared from stems of *Atriplex* sp. (Chenopodiaceae) from the Central Botanical Garden in Kiev, Ukraine (Diakontschuk, 2003), however, the examination of the only known specimen (holotype female in the collection of SIZK) showed, that it is conspecific with *Cecconia valerianellae* and thus, a **syn. n.** of *C. valerianellae.* No doubts, the host was misidentified.

Distribution. ES (Nieves-Aldrey, 1992), North Africa, FR, HU, RO, SE (Ambrus, 1974; Ionescu, 1973; Kieffer, 1897-1901), In Ukraine – Transcarpathian Region (few specimens were collected in the vicinity of Uzhgorod, reared from *V. carinata* by the author) and Kiev (Central Botanical Garden). Presumably distributed all over the territory of Ukraine.

Biology. Monovoltine. Larvae overwintering in the gall, adults emerge next year in April-May. Host plants: *Valerianella carinata* Loisel, *V. dentata* Pöllich., *V. locusta* L. and *V. olitoria* (L.) Mönch., *V. rimosa* Bast. (Valerianaceae).

Diastrophus Hartig, 1840

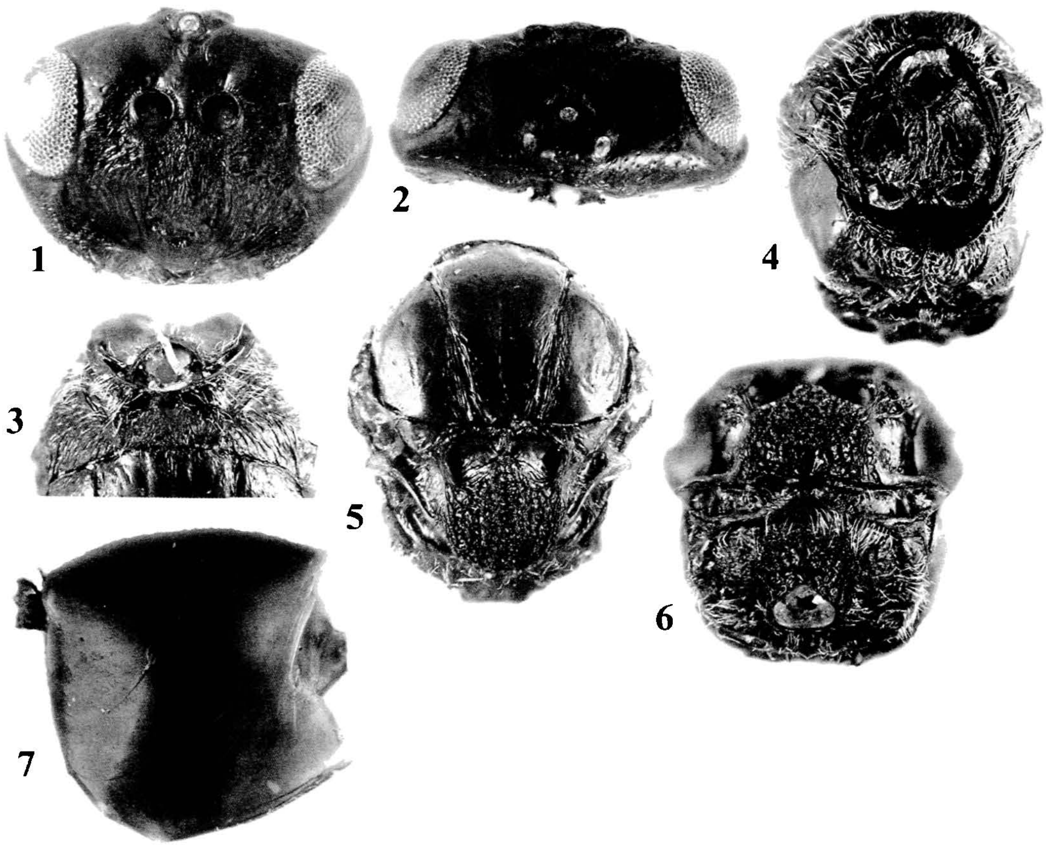
Figs 48.1-7.

Diastrophus Hartig, 1840: 186; *Gonaspis* Ashmead, 1897: 68 (synonym in Schick & Liu, 2003: 715). Type species: *Diastrophus rubi* (Bouché, 1834), designated by Weld (1931).

Head delicately coriaceous to alutaceous, slightly more than 2.0 times as broad as long from above and slightly broader than height in front view. Malar space slightly shorter than height of eye, alutaceous, with radiating striae from clypeus; transfacial distance 1.5-2.0 times as long as height of eye. Lower face with more or less distinct striae, radiating of clypeus and reaching or not inner margin of eye and antennal sockets; relatively strongly elevated median area delicately rugose, with some incomplete striae. Female antenna 13-, male antenna 14-segmented; F1 longer than F2. Pronotum dorsally long with distinct submedian pronotal pits, with distinct, well-delimited coriaceous pronotal plate. Scutum mostly smooth and shining; notauli well-impressed and complete; median mesoscutal line varies in length. Scutellum rugose, rounded or elongated; scutellar foveae deep, rounded, with or without wrinkles. Mesopleuron almost entirely smooth and shining, medially with some fine longitudinal striae. Wings weakly infuscate; radial cell open along margin; margin cilia moderately long. Tarsal claws with conspicuous acute basal lobe. Metasomal tergite 2 without or with very few short white setae, without punctures; subsequent tergites and hypopygium without or with very sparse indistinct punctures; prominent part of ventral spine of hypopygium very short, with few sparse short setae not extending behind apex of spine.

Taxonomic comments. The genus, together with *Xestophanes*, easily distinguishable from all other genera of Aylacini by having a basal lobe on tarsal claws, while all other genera with simple tarsal claws, without basal lobe. A special position of *Diastrophus* and *Xestophanes* within Aylacini has been pointed out by recent phylogenetic studies, which also indicate that *Diastrophus* is a genus of gall wasps, most closely related to inquilines (Ritchie, 1984; Liljeblad & Ronquist, 1998; Ronquist & Liljeblad, 2001; Nylander et al., 2004).

Distribution and Biology. Holarctic genus. In Europe represented by three species: *D. rubi* and *D. mayri*, associated with *Rubus* and *Potentilla* (Rosaceae) respectively and *D. hieracii* (galls on *Hieracium* (Asteraceae)) (Melika & Klymenko, 2005). According to the recent revision, 15 nearctic *Diastrophus* species are known from America North of Mexico (Schick & Liu, 2003), thus, the genus is represented by 17 holarctic species. In between nearctic species, 5 are associated with *Potentilla*, one species host relationship is unknown, one species is galling *Fragaria* (Rosaceae), one species associates with *Smilax* (Smilacaceae), and 7 species -- with *Rubus*. Originally gall wasps were herb gallers and woody hosts, like *Rosa*, *Rubus* (Rosaceae), *Quercus* L. (Fagaceae), were colonized later and formed a monophyletic group (Liljeblad & Ronquist, 1998; Ronquist, 1999a; Ronquist & Liljeblad, 2001). One species, *D. smilacis* Ashmead, 1896 induces galls on the monocotyledonous *Smilax*, in contrast to all other Aylacini which induce galls on advanced, dicotyledonous herbaceous host plants (Ronquist, 1994). Nieves-Aldrey (1994a) suggested that *Diastrophus* and *Xestophanes* form a monophyletic group on the basis of their mainly rosaceous host associations, presence of a basal lobe on tarsal claws and glabrous smooth sculpture of the scutum and vertex. Association of 8 *Diastrophus* species with *Rubus* probably originated once and three reversal events (host-shiftings) have contributed to the patterns of association of *Diastrophus* with *Smilax, Potentilla* (*Fragaria*) and *Hieracium* (Schick & Liu, 2003; Melika & Klymenko, 2005). Only the sexual generation is known, monovoltine species. Galls induced by *Diastrophus* species are relatively simple in their structure and represented by stem swelling-like formations mainly.



Figs 48.1-7. *Diastrophus rubi*, female: 1-2, head: 1, front view, 2, from above. 3, pronotum with submedian pronotal pits, dorsal view, 4, pronotum and propleura, front view, 5, scutum and scutellum, dorsal view, 6, propodeum and dorsellum, dorso-posterior view, 7, metasoma, lateral view.

Key to palaearctic *Diastrophus* species

1. Scutum longer than broad; scutellum longitudinally striate; metasomal tergite 2 and subseqeunt tergites punctate .... ***hieracii***
-- Scutum as broad as long or broader; scutellum uniformly rugose; metasomal tergites without or with very indsitinct sparse punctures 2
2. Female antenna 13-segmented, F1 longer and thiner than F2; male antenna 14-segmented; areolet present; scutum smooth, shining; galls in stems on *Rubus* .... ***rubi***

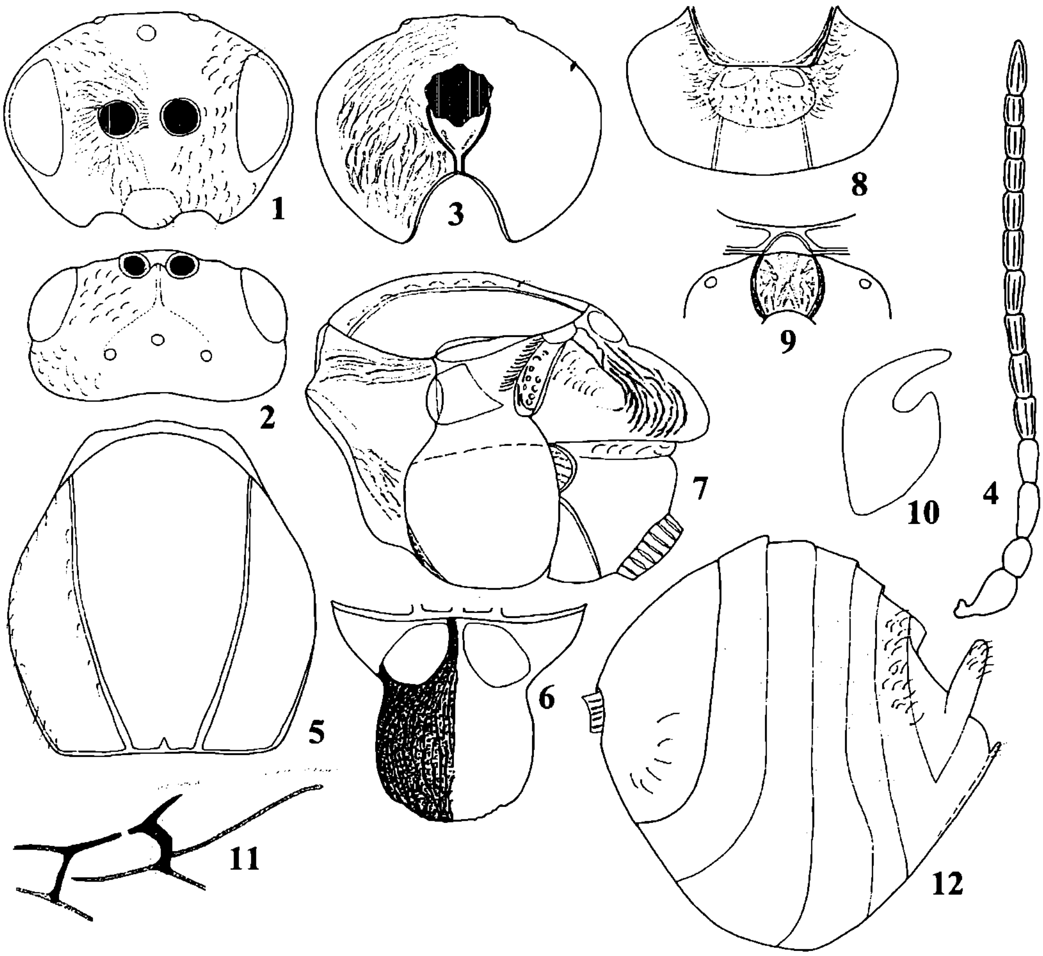
-- Female antenna 14-segmented, F1 only slightly longer or equal F2; male antenna 15-segmented; areolet absent; scutum with some delicate wrinkles; galls in stems on *Potentilla* .... ***mayri***

Diastrophus hieracii Melika & Klymenko, 2005

Figs 49.1-12, Plate 9.1.

Diastrophus hieracii Melika & Klymenko, 2005: 23 (female, gall).

Description. Female. 2.8-3.2 mm. Head black, mandibles brown; antenna dark brown to black; mesosoma uniformly black, legs uniformly dark brown, except black basis of coxae; metasoma black, hypopygium dark brown. Head alutaceous, transverse, 2.0-2.1 times as broad as long from above, 1.3 times as broad as high in front view; slightly broader than mesosoma. Gena slightly broadened behind eye, visible in front view. POL only slightly shorter than OOL; frontal ocellus with impression toward frons; interocellar area, occiput smooth, shining, without punctures; occipital carina absent, vertex and occiput rounded, last with transverse very minute striae above occipital foramen; interocellar area together with upper half of frons form a slightly elevated very smooth and shining zone without setae, which continuing into a median longitudinal carina, extending into area between antennal sockets; lower half of frons aside of this median carina, area between compound eye and antennal socket transversely striate, with short white setae. Postocciput and postgena with strong parallel rugae, with more dense white setae as on front of head; gular sulci free, well separated at hypostoma; oral foramen 1.3 times as high as height of occipital foramen, distance between oral and occipital foramens nearly 2.0 times as short as height of occipital foramen. Transfacial distance 1.5 times as long as height of eye, 1.8-1.9 times as long as height of lower face (measuring from antennal rims to ventral margin of clypeus); distance between antennal rim and inner margin of eye 4.2 times as short as transfacial distance; distance between eye and antennal rim nearly equal to diameter of antennal socket. Lower face with minute interrupted irregularly orientated striae; slightly elevated median area finely coriaceous. Malar space finely coriaceous, with some short, interrupted weak striae, 1.3 times as short as height of eye. Gena behind eye finely coriaceous, with some longitudinally orientated striae, giving a view of longitudinal very minute striation behind eye. Clypeus very minutely coriaceous; epistomal sulcus distinct, broad, slightly impressed, smooth, shining; anterior tentorial pits indistinct. Mandibles brown. Antenna uniformly dark brown to black, 14-segmented, F1 only slightly longer than F2, pedicel 1.5 times as short as F1, scape 2.25 times as long as F1, F12 1.9 times as long as F11, nearly equal in length to F11+F10; placodeal sensilla on F3-F12. Mesosoma uniformly black, 1.25-1.3 times as long as high in lateral view. Pronotum dorso-medially 2.0 times as short as the greatest length measuring on outer margin; smooth or very delicately coriaceous dorsally; with transverse parallel weak striae dorso-ventrally; with dense setae along anterior margin and more sparse setae laterally; antero-lateral margin also with strong transverse parallel striae. Submedian pronotal pits distinct, deep, slightly transverse, separated by carina which narrower than width of a pit; pronotal plate distinct, well-delimited laterally, slightly elevated above pronotum, with piliferous points; Propleuron black, smooth, shining. Scutum slightly longer than broad, smooth and shining, with very few short scattered setae, especially laterally to notauli and prolong lateral margins. Notauli deeply impressed, complete, smooth, shining; anterior parallel lines very indistinct, barely traceable; median mesoscutal line well-impressed in very posterior part, parapsidal lines invisible, absent. Scutellum 1.3 times as long as broad, rugose, with mainly longitudinal strong rugae; scutellar foveae ovate, smooth, shining, extending to 1/3 of scutellum length, separated by distinct longitudinally striate carina. Dorso-axillar area smooth, shining. Mesopleuron uniformly smooth and shining, acetabular carina narrow, area delimited by it longitudinally striate. Propodeum finely coriaceous laterally, with dense white long setae; lateral propodeal carinae distinct, uniformly thick, slightly curved outward in the middle; central propodeal area shining, with strong irregular rugae, without setae; dorsellum shining, with few striae; metanotal trough smooth, shining, with few sparse short white setae; propodeal spiracle rounded, with strong raised carina along anterior border; metapleural sulcus reaching mesopleuron slightly above half of its height; axillula smooth, shining with few white setae; lateral area of propodeum behind metapleural sulcus dull rugose; nucha black, with longitudinal rugae. Tarsal claws with acute basal lobe. Forewing longer than body; marginal cilia long, distinct; radial cell opened, 3.0-3.1 times as long as broad, R1 and Rs not reaching wing margin; Rs curved in proximal 1/3; areolet absent, Cu_{1b} not curved outwards wing margin. Metasoma slightly longer than head+mesosoma, strongly compressed laterally, black, with brownish tone; metasomal tergite 2 with few sparse white setae antero-laterally, smooth, without punctures, subsequent tergites smooth, shining, with sparse, indistinct punctures dorsally and laterally in the upper half of tergite; hypopygium smooth, without punctures, prominent part of ventral spine of hypopygium short, with very few short white setae. Male unknown.



Figs 49.1-12. *Diastrophus hieracii*, female: 1-3, head: 1, front view, 2, from above, 3, posteriorly. 4, antenna, 5, scutum, dorsal view, 6, scutellum, dorsal view, 7, mesosoma, lateral view, 8, pronotum with submedian pronotal pits, dorsal view, 9, propodeum and dorsellum, dorso-posterior view, 10, tarsal claw, 11, forewing, part, 12, metasoma, lateral view.

Gall (Plate 9.1) in the stem, multilocular, differently shaped, 2.0-2.5 cm in length and up to 1.5 cm in diameter, the gall tissue is spongy-like, not lignified; galled stems are malformed externally, swollened.

Diagnosis. *Diastrophus hieracii* differs from two other known European species, *D. rubi* and *D. mayri* by the scutum, which is longer than broad, the scutellum is longitudinally striate, the head is more rounded in front view, metasomal tergite 3 and subsequent tergites with punctures, while in *D. rubi* and *D. mayri* the scutum is broader than long, the scutellum is uniformly dull coriaceous, without longitudinal striae; the head is more transverse in front view, tergites without punctures. In *D. hieracii* female antenna 14-segmented, F12 1.9 times as long as F11, nearly equal in length to F11+F10, while in *D. rubi* antenna 13-segmented, if 14-segmented (suture between F11 and F12 visible), than F12 equal in length to F11. *Diastrophus hieracii* differs from *D. mayri* also by the absence of areolet in the forewing, while it is present in the last species. Some diagnostic characters of *D. hieracii* are present in some Nearctic species of *Diastrophus*: in *D. nebulosus* (Osten Sacken, 1861), *D. radicum* Bassett, 1870 and *D. smilacis* Ashmead, 1896 the disk of scutellum also longitudinally striate; in *D. smilacis* the scutum is slightly elongated; in *D. radicum* and *D. nebulosus* 3rd and subsequent tergites with inconspicuous punctures. However, *D. hieracii* differs from these species by other characters and by its host plant association.

Material examined. Holotype female: "Ukraine, Donetsk Region, Kamjani Mohyly Natural Reserve, 22-28.04.2002, leg. S. Klymenko", "ex stem galls on *Hieracium* sp."; 7 female paratypes with the same labels as the holotype. Deposited in the collection of SIZK.

Distribution. Known from Ukraine, Donetsk Region only.

Biology. Only females are known, probably also monovoltine species, like all other Aylacini. Induces stem swelling-like galls on *Hieracium* sp. (Asteraceae). Galls mature in autumn; adults emerge next year in spring.

Diastrophus mayri Reinhard, 1876

Plate 9.2.

Diastrophus mayri Reinhard, 1876: 26 (female, male, gall); Kieffer, 1897-1901: 329 (female, male, gall).

Description. Very closely related to *D. rubi*, except characters mentioned in the Diagnosis to *D. rubi*.

Gall (Plate 9.2). The gall developing in the upper part of the stem, often at the base of the flower, 10-30 mm in length, 7-15 mm in diameter, surrounding the stem from all sides, with dense hairs on the surface. Leaf midribs on the galling stem are shortened and leaf parts integrated into the growing gall, are visible around.

Diagnosis. Most closely related to *D. rubi* (see Diagnosis to *D. rubi*).

Distribution. HU (Ambrus, 1974), PL (Kierych, 1979), DK, FI, SE (Coulians & Holmåsen, 1991), RU (Kursk and Belgorod Regions – Belizin, 1959), DE, FR (Dalla Torre & Kieffer, 1910), RO (Ionescu, 1957). In Ukraine (Zerova, Diakontschuk & Ermolenko, 1988), particularly Donetsk Region, Kamjani Mohyly Natural Reserve (3 specimens examined in the collection of SIZK). Supposedly widespread species.

Biology. Monovoltine. Larvae overwintering in the gall and adults emerge next year in May. Host plants: *Potentilla argentea* L., *P. canescens* Bess., *P. heptaphylla* L., *P. impolita* Wahlenb., *P. supina* L., *P. wiemanniana* Günth. & Schum. (Rosaceae) (Ambrus, 1974; Kierych, 1979).

Diastrophus rubi (Bouché, 1834)

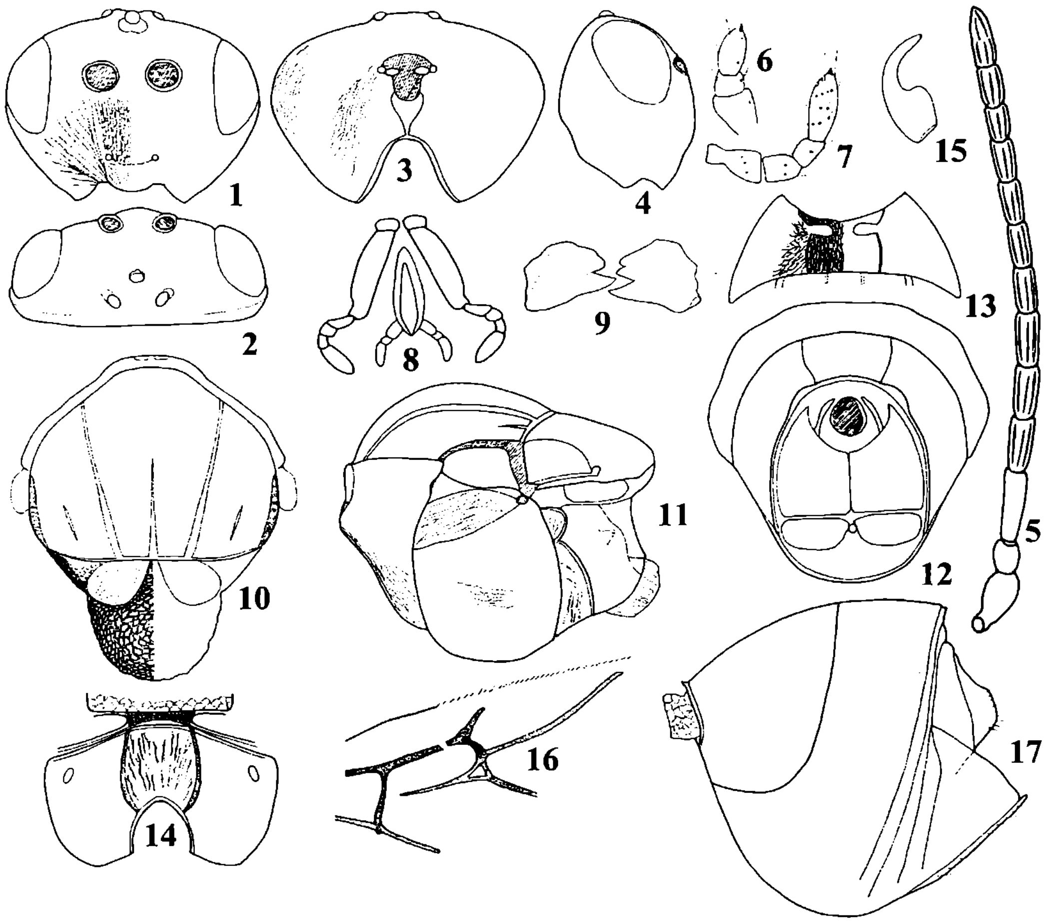
Figs 50.1-17, Plate 9.3

Cynips rubi Bouché, 1834: 163 (female); *Andricus hartigi* Marshall, 1867: 101 (female); *Andricus Hartigi* [sic!]: Cameron, 1893: 72; *Aulax rubi* Thomson, 1877: 808 (female, male); *Diastrophus rubi* Hartig, 1843: 410 (male); *Diastrophus rubi ibericus* Tavares, 1927 (synonym in Nieves-Aldrey, 2001a: 139).

Description. Female. 2.2-2.8 mm. Head and mesosoma black, in some specimens lower face, gena, sides of pronotum, mesopleuron, sides of propodeum and sometimes metanotum dark brown; metasoma dark brown, slightly darker dorsally. Antenna yellowish brown; legs, except dark brown base of coxae, yellowish brown. Mandibles and palpi light brown. Wing veins distinct, brown. Head delicately coriaceous to alutaceous, with uniformly sparse white setae, 2.1-2.2 times as broad as long from above, 1.3 times as broad as high and slightly broader than mesosoma. Gena delicately coriaceous to alutaceous, slightly broadened behind eye. Malar space coriaceous, with striae radiating from clypeus and nearly reaching eye, 0.8 times as long as height of eye. POL 0.6

times as long as OOL, 1.6 times as long as LOL and 2.2 times as long as diameter of lateral ocellus. Transfacial distance 1.7 times as long as height of eye and 1.6 times as long as height of lower face (distance between antennal rim and ventral margin of clypeus); diameter of antennal torulus 1.4 times as long as distance between them and slightly longer than distance between torulus and eye margin. Lower face with delicate branching striae radiating from clypeus, nearly reaching eye and antennal sockets; median elevated area delicately coriaceous, without striae. Clypeus smooth, with some delicate irregular weak wrinkles, with distinct deep anterior tentorial pits, with very indistinct epistomal sulcus and clypeo-pleurostomal line, ventral margin nearly straight. Frons alutaceous to smooth, with weak impression under central ocellus. Vertex and occiput alutaceous. Antenna 13-segmented; pedicel 1.2 times as long as broad; F1 2.4 times as long as pedicel and 1.3 times as long as F2, thiner than F2; F2 equal F3; placodeal sensilla on F2-F11. Mesosoma convex, nearly as long as high in lateral view, with very few white setae. Pronotum coriaceous, with some parallel wrinkles along postero-lateral half and along antero-ventral edge, with dense white setae aside pronotal plate and along anterior margin. Submedian pronotal pits deep, well-separated, transverse, at least 2.0 times as broad as high; distance between them slightly less than width of a pit; pronotal plate alutaceous, without setae, well-delimited around, slightly elevated. Scutum slightly broader than long and 1.6 times as long as scutellum, smooth. Notauli complete, slightly broader posteriorly, well-impressed in all length; median mesoscutal line extending at least to half length of scutum, much broader posteriorly, narrowing till a point anteriorly; parapsidal lines very indistinct, in a form of very short lines; anterior parallel lines indistinct, not traceable. Scutellum rounded or even broader than long, rounded posteriorly, rugose, disk of scutellum with slightly weaker sculpture; slightly overhanging metanotum. Scutellar foveae ovate, nearly as broad as long, well-delimited around, with strong rugae on shining bottom; separated by a carina (in some specimens carina very narrow but even so, distinct). Dorso-axillar area with few short white setae, uniformly delicately coriaceous. Mesopleuron smooth, with some delicate transverse weak striae centrally; mesopleural triangle longitudinally delicately striate. Metapleural sulcus reaching mesopleuron in the upper 1/3 of its height, area delimited by the posterior part of metapleural sulcus with weak wrinkles; axillula transversely elongated, at least 2.0 times as long as high, smooth, shining, with piliferous points; subaxillular bar smooth, shining, narrow, at least 2.0 times narrower than height of metanotal trough; pit over propodeal spiracle shallow, shining, carina along anterior border of propodeal spiracle strongly raised; metapleuron shining, with some delicate irregular wrinkles; ventral bar of metanotal trough delicately coriaceous, 2.0 times narrower than height of metanotal trough. Dorsellum uniformly very delicately coriaceous, nearly 2.0 times as broad as height of ventral impressed area; metanotal trough smooth, shining, with few white setae; ventral impressed area of the dorsellum smooth, shining. Propodeum delicately coriaceous, lateral propodeal carinae curved outwards in the middle, converging posteriorly, without setae; central propodeal area shining, with delicate wrinkles, without setae; lateral propodeal area uniformly delicately coriaceous, with relatively dense white setae; nucha short, with irregular delicate rugae. Forewing with dark brown veins, margin with very short cilia; radial cell opened, 3.2 times as long as broad; R1 and Rs not reaching wing margin, areolet small but distinct, Rs+M nearly reaching basalis, projecting in the upper half of it. Tarsal claws with basal lobe. Metasoma slightly longer than head+mesosoma, rounded, nearly as long as high in lateral view; metasomal tergite 2 without setae antero-laterally; all tergites and hypopygium without punctures; prominent part of ventral spine of hypopygium very short, with two rows of relatively long white setae, which never extending behind apex of spine. Male. 2.0-2.3 mm. Similar to female but antenna 14-segmented.

Gall (Plate 9.3). Galls on young green sprouts, 1.0-5.0 cm long and 7.0-11.0 mm in diameter, cylindrical stem swelling. The gall is green during its growing, turning yellowish-brown, with greyish spots and smooth surface when mature. Multilocular, numerous larval cells located mainly under the surface, perpendicularly to the stem axis; a single larval chamber ovate, 2.0-2.5 mm in length; the space between larval cells comprises of spongy-like tissue. The empty gall is dry, turn grey, lignified, with multiply emerging holes.



Figs 50.1-17. *Diastrophus rubi*, female: 1-4, head female: 1, front view, 2, from above, 3, posteriorly, 4, lateral view. 5, antenna, 6, palpus maxillaris, 7, palpus labialis, 8, labio-maxillar complex, 9, mandibles, 10, scutum and scutellum, dorsal view, 11, mesosoma, lateral view, 12, pronotum and propleura, front view, 13, pronotum with submedian pronotal pits, dorsal view, 14, propodeum and dorsellum, dorso-posterior view, 15, tarsal claw, 16, forewing, part, 17, metasoma, lateral view.

Diagnosis. Most closely related to *D. mayri*, however, in *D. rubi* female antenna 13-segmented, F1 longer and thiner than F2; male antenna 14-segmented; the areolet present; the scutum is smooth, shining; galls in stems on *Rubus*, while in *D. mayri* female antenna 14-segmented, F1 only slightly longer or equal F2; male antenna 15-segmented; the areolet absent; the scutum with some delicate wrinkles; galls in stems on *Potentilla*.

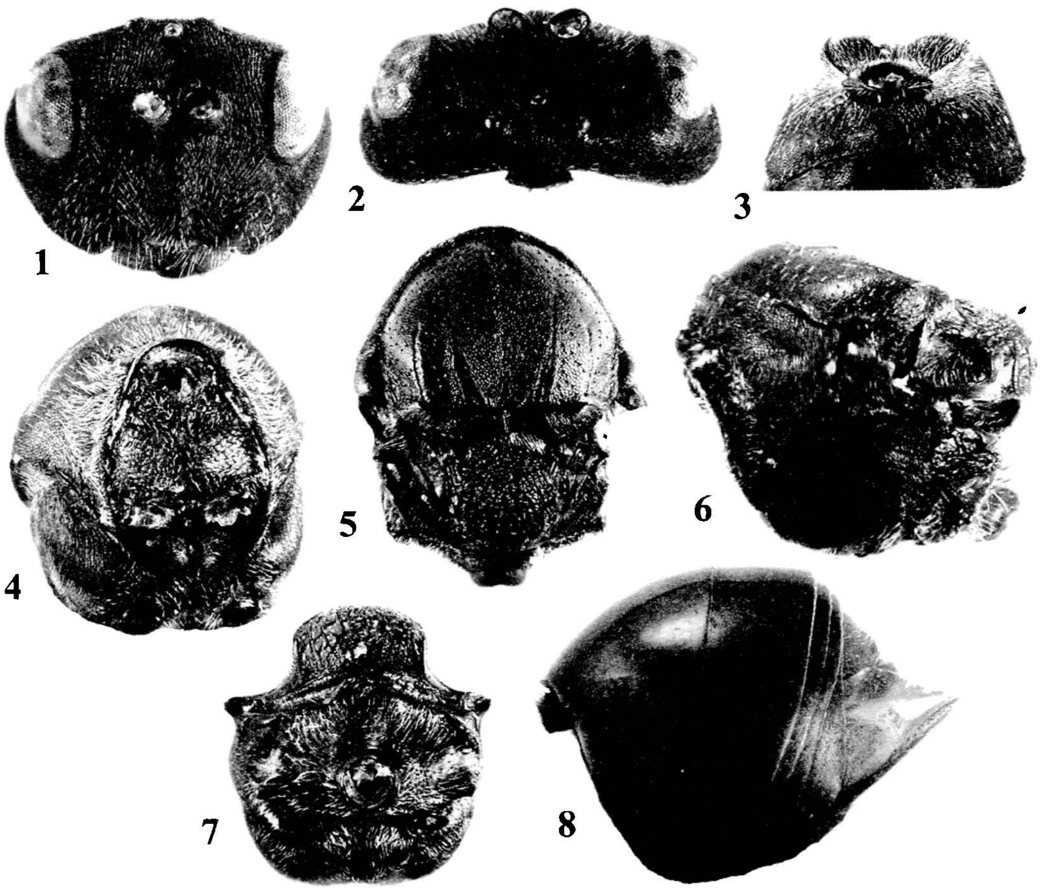
Distribution. ES, PT (Nieves-Aldrey, 1984, 1987), RO. (Ionescu, 1973), PL (Kierych, 1979), GB (Eady & Quinlan, 1963; Cameron, 1893), DK, FI, NO, SE (Coulians & Holmåsen, 1991), DE, GB, AT, FR, IT, SE (Kieffer,1897-1901), IL (Argaman, 1989), RU (Kursk and Belgorod Region – Belizin, 1959). In Ukraine common everywhere (Zerova, Diakontschuk & Ermolenko, 1988).

Biology. Monovoltine. Larvae overwintering in the gall, adults emerge next year in spring. Host plants: *Rubus caesius* L.; *R. fruticosus* L., *R. hirtus* L., *R. idaeus* L., *R. seebergensis* Pfuhl., *R. ulmifolius* Schott (Rosaceae) (Dalla Torre & Kieffer, 1910; Folliot, 1964; Kierych, 1979). Histological studies were carried out on *D. rubi* galls, particularly on nutritive cells (Meyer, 1973; Pujade-Villar, 1984a, 1984b). The life cycle was studied in details (Folliot, 1960b, 1964) and appeared that the reproduction of *D. rubi* is sexual (females and males are involved) and facultative parthenogenesis (arrhenotoky) occurs also.

Hedickiana Nieves-Aldrey, 1994

Figs 51.1-8.

Hedickiana Nieves-Aldrey, 1994b: 184. Type species: *Aulacidea levantina* Hedicke, 1928, designated by Nieves-Aldrey (1994b).



Figs 51.1-8. *Hedickiana levantina*, female: 1-2, head: 1, front view, 2, from above. 3, pronotum with submedian pronotal pits, dorsal view, 4, pronotum and propleura, front view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, metasoma, lateral view.

Description. Female. Head alutaceous, transverse, around 2.0 times as broad as long from above and broader than high in front view. POL slightly longer than OOL; gena broadened behind eye; transfacial distance slightly more than 1.5 times as long as height of eye; malar space shorter than height of eye, with striae radiating from clypeus; lower face also with striae, median elevated area coriaceous, without striae. Frons, vertex and occiput alutaceous. Female antenna 13-segmented, F1 equal F2; male antenna 14-segmented, F1 slightly excavated medially and broadened apically. Pronotum dorsally relatively long; submedian pronotal pits deep, broadly separated. Scutum coriaceous-punctate, with some distinct piliferous points; notauli complete, narrow but distinct, well-impressed only in posterior 3/4 of scutum; median mesoscutal line absent or in a form of short triangle. Scutellum rounded, nearly as broad as long, delicately rugose; scutellar foveae large, rounded, shining and finely coriaceous, nearly reaching one another, separated by a narrow carina. Mesopleuron transversely striate, space between striae and dorso-posterior part of speculum reticulate. Wings slightly infuscated; radial cell of forewing closed or partially closed; wing margin with very short cilia. Tarsal claws simple. Metasoma as long as head+mesosoma; metasomal tergite 2 occupying about 1/3 of metasoma length; metasomal tergites 2 and 3 without punctures; further tergites and large hypopygium with dense distinct punctures; prominent part of ventral spine of hypopygium short, with some relatively long setae, not extending behind apex of spine.

Taxonomic comments. The genus was erected for a single species, *H. levantina*, originally described within *Aulacidea*. In common with *Aulacidea*, *Hedickiana* exhibits a closed (or partially closed) radial cell, but it can be distinguished from *Aulacidea* as follows: the mesopleuron not clearly transversely striate and partially irregularly reticulate; the scutum with distinct large piliferous punctures; metasomal tergite 2 without a patch of setae antero-laterally, induces galls on *Salvia* only.

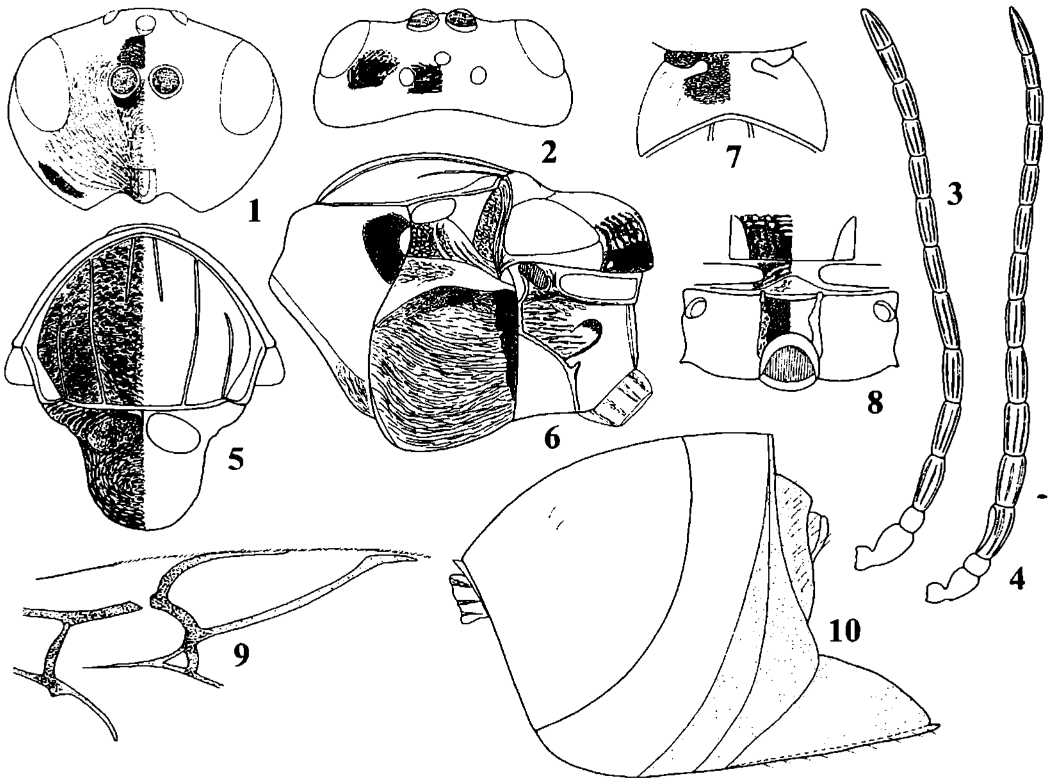
Distribution and Biology. Eastern Mediterranean, Transcaucasus, Iran, Syria, Israel. The only known species, *Hedickiana levantina*, induces conspicuous juicy galls in stems of *Salvia spp.* (Lamiaceae).

Hedickiana levantina (Hedicke, 1928)*

Figs 52.1-10.

Aulacidea levantina Hedicke, 1928: 83 (female, male, gall); *Hedickiana levantina*: Nieves-Aldrey, 1994: 184.

Description. Female 2.5-3.8 mm. Head and mesosoma black; antenna, except black scape, mandibles and palpi reddish brown; legs reddish brown, except black coxae, trochanters and basal half of tibiae; metasoma reddish brown, dorsally darker, hypopygium light brown. Wing veins dark brown. Head alutaceous, with uniformly sparse white setae, 2.2 times as broad as long from above; 1.1-1.3 times as broad as high and slightly broader than mesosoma. Gena delicately coriaceous to alutaceous, broadened behind eye, visible behind eye in front view, much broader than cross diameter of eye, measuring behind eye. Malar space delicately coriaceous, 0.8-0.9 times as long as height of eye, with striae, radiating from clypeus and reaching eye. POL 1.2 times as long as OOL; 2.2 times as long as LOL and 2.7 times as long as diameter of lateral ocellus. Transfacial distance 1.6 times as long as height of eye and 1.4-1.5 times as long as height of lower face (distance between antennal rim and ventral margin of clypeus); diameter of antennal torulus 4.3 times as long as distance between them and 0.8-0.9 times as long as distance between torulus and eye margin. Lower face with striae radiating from clypeus and reaching eye and antennal sockets; median elevated area coriaceous, without striae, however, below antennal sockets with some longitudinal delicate striae. Clypeus delicately coriaceous to smooth, rectangular, narrow, nearly 2.0 times as high as broad; with indistinct anterior tentorial pits, with distinct epistomal sulcus and clypeo-pleurostomal line, ventral margin slightly rounded. Frons with some delicate longitudinal striae laterally and delicately coriaceous medially; vertex and occiput delicately reticulate. Antenna 13-segmented, slightly shorter than body length; pedicel globose, as long as broad; F1 2.6 times as long as pedicel and nearly equal to F2 and F3; F11 1.3 times as long as F10; placodeal sensilla on all flagellomeres. Mesosoma convex, 1.3 times as long as broad in lateral view, with uniform sparse white setae. Pronotum reticulate, with very few white setae, submedian pronotal pit transverse, deep, distance between pits slightly longer than width of a pit; pronotal plate indistinct, not delimited laterally. Scutum reticulate, with large conspicuous piliferous points, slightly broader than long, 1.5 times as long as scutellum. Notauli complete, narrow but distinct, well-impressed only in posterior 3/4 of scutum; median mesoscutal line absent or in a form of short triangle; parapsidal lines distinct, reaching above tegulae; anterior parallel lines distinct and reaching to 1/3 of scutum length. Scutellum rounded, nearly as broad as long, delicately rugose; scutellar foveae large, rounded, shining and finely coriaceous, separated by a very narrow carina, nearly reaching one another. Mesopleuron transversely striate, space between striae and dorso-posterior part of speculum reticulate; mesopleural triangle delicately coriaceous, with few setae. Metapleural sulcus reaching mesopleuron slightly above 1/2 of its height; preaxilla and lateral



Figs 52.1-10. *Hedickiana levantina*: 1-2, head, female: 1, front view, 2, from above. 3-4, antenna: 3, female, 4, male. 5-9 female: 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, pronotum with submedian pronotal pits, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part, 10, metasoma, lateral view.

axillar area very delicately coriaceous; axillar carina broad, around 2.0 times only narrower than width of lateral axillar area; axillula transversely ovate, smooth, with sparse piliferous points; subaxillular bar smooth, shining, at least 2.0 times narrower than height of metanotal trough; pit over propodeal spiracle shallow, shining, with some longitudinal wrinkles; carina along anterior border of propodeal spiracle strongly raised; ventral bar of metanotal trough delicately coriaceous, much narrower than height of metanotal trough. Dorsellum very delicately coriaceous to smooth, shorter than height of shining, delicately wrinkled ventral impressed area; metanotal trough mat, smooth, with few white setae. Propodeum delicately coriaceous, lateral propodeal carinae strongly raised, slightly narrower anteriorly, subparallel, without setae; central propodeal area mat, microreticulate, with sparse white setae; lateral propodeal area uniformly delicately coriaceous, with relatively dense white setae; nucha with uniform longitudinal rugae. Forewing margin with short cilia; radial closed or partially closed, 3.5 times as long as broad, areolet distinct, Rs+M extending to 3/4 of distance between areolet and basalis, projecting in the lower half of it. Tarsal claws very narrow, simple, without basal lobe. Metasoma as long as head+mesosoma; metasomal tergite 2 occupying about 1/3 of metasoma length; tergites 2 and 3 without punctures; further tergites and large hypopygium with dense distinct punctures; prominent part of ventral spine of hypopygium short, with some relatively long setae, not extending behind apex of spine. Male 2.0-3.0 mm. Similar to female but antenna 14-segmented, distal flagellomeres broader than proximal; pedicel broader than long; F1 slightly excavated medially and broadened apically; F1 nearly equal F2 and F3; placodeal sensilla on all flagellomeres.

Gall. The gall is rounded, elongated, spindle-shaped or ovoid, usually on stems and branches in a form of a stem swelling, encircling the stem, 10-45 mm long, 8-17 mm in diameter. The surface of the young light-green or yellowish-green growing gall is felt-like, with very dense short hairs, with some longitudinal weak ribs. Mature galls turn yellowish brown to greyish, hard, lignified, the spongy parenchyma also turn hard, like a cork. Larval chambers usually nested along the periphery of the gall, more or less perpendicularly to the axis of the stem. Multilocular.

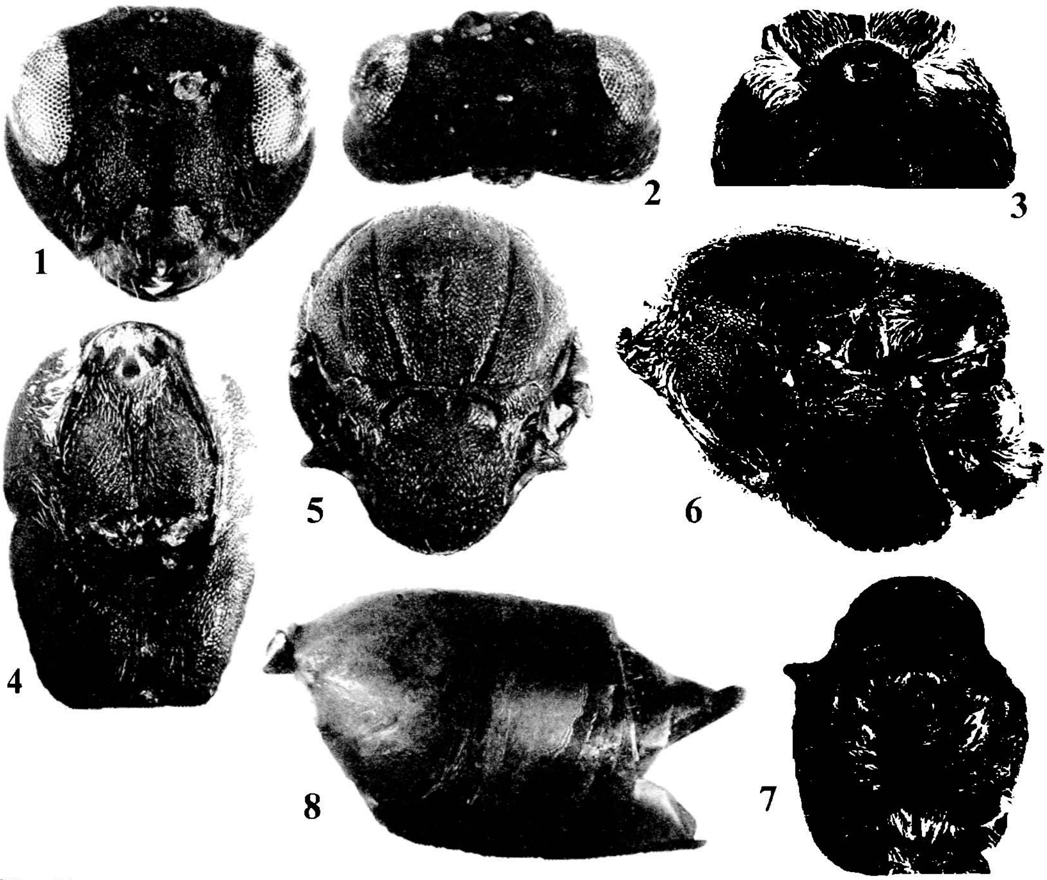
Distribution. AM (Belizin, 1966), Crete, IL, SY (Hedicke, 1928), IR (East Azarbaijan, author). Possible in the southern part of Ukraine, particularly in Crimea and the steppe zone.

Biology. Monovoltine. Larvae overwintering in the gall and adults emerge next spring. Host plants: *Salvia triloba* L. and *S. syriaca* L. (Lamiaceae).

Iraella Nieves-Aldrey, 1994

Figs 53.1-8.

Iraella Nieves-Aldrey, 1994b: 185. Type species: *Aulax luteipes* Thomson, 1877: 807 (= *Timaspis papaveris* Kieffer in: Goury & Gignon, 1905), designated by Nieves-Aldrey (1994b).



Figs 53.1-8. *Iraella luteipes*, female 1-2, head,: 1, front view, 2, from above. 3, pronotum with submedian pronotal pits, dorsal view, 4, pronotum and propleura, dorsal view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, metasoma, lateral view.

Head delicately coriaceous to reticulate, around 2.0 times as broad as long from above, slightly broader than high in front view. POL 1.3 times as long as OOL. Gena slightly broadened behind eye, not visible behind eye in front view. Transfascial distance slightly more than height of eye; lower face and malar space without radiating striae, median elevated area of lower face reticulate. Clypeus trapezoid-shaped, moderately projecting ventrally. Frons, vertex and occiput reticulate-coriaceous. Female antenna 13-14-segmented, F1 nearly equal F2 and F3; male antenna 14-15-segmented. Pronotum dorsally relatively short; submedian pronotal pits transverse, very narrow but distinct, deep, broadly separated. Scutum reticulate; notauli faint in anterior 1/3; median mesoscutal line extending to 1/3-1/2 of scutum length. Scutellum slightly elongated, with parallel sides, delicately coriaceous to reticulate; scutellar foveae transverse, confluent; mesopleuron reticulate. Wings hyaline; radial cell open, 3.5 times or more as long as broad; R1 and Rs not reaching wing margin; wing margin with long cilia. Tarsal claws simple, without basal lobe. Metasoma longer than high in lateral view, longer than head+mesosoma; metasomal tergite 2 with few sparse white setae antero-laterally; tergites 2-4 without punctures, subsequent tergites and hypopygium with dense distinct punctures.

Diagnosis. The following morphological characters most brightly define this genus: lower face without radiating striae; clypeus trapezoid, projecting ventrally; pronotum relatively short dorsally, with distinct submedian pronotal pits; mesopleuron entirely reticulate; radial cell opened, wing margin with long cilia. Some characters, like the general body shape, the sculpture of the lower face and mesopleuron, the shape of scutellar foveae, approach *Iraella* to *Phanacis*, but the presence of submedian pronotal pits, the entirely reticulate lower face without striae, F1 equal F2 in females, the radial cell being opened easily differentiate it.

Recently another species, *Iraella hispanica* Nieves-Aldrey, 2005 was described from Spain (Nieves-Aldrey, 2005) which also associates with *Papaver somniferum* L. (Papaveraceae).

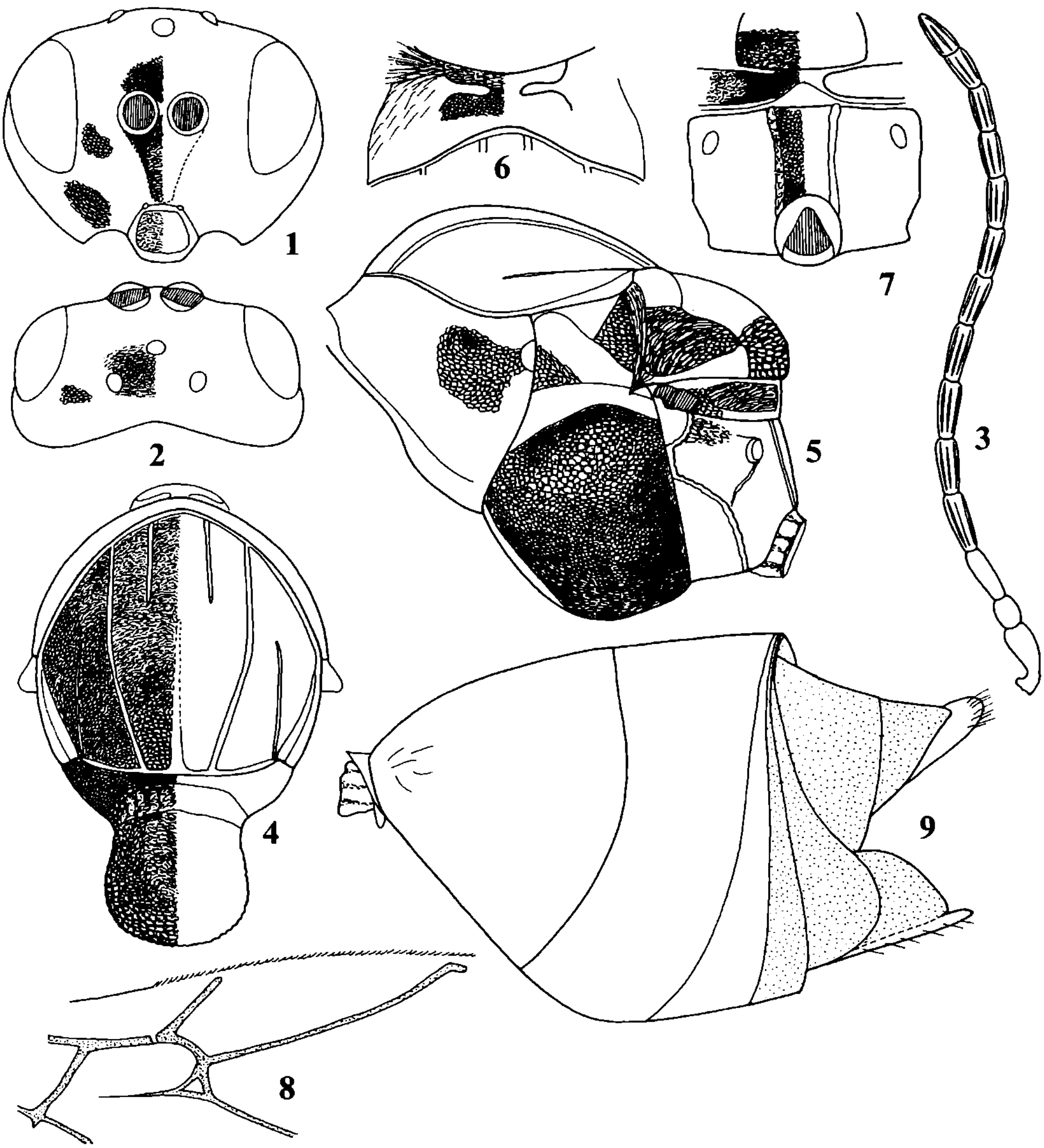
Distribution and Biology. Europe and Iran. Both known species are associated with *Papaver* sp. (Papaveraceae), inducing inconspicuous galls in stems.

Iraella luteipes (Thomson, 1877)*

Figs 54.1-9.

Aulax luteipes Thomson, 1877: 807 (female); *Aylax luteipes*: Dalla Torre & Kieffer, 1910: 676 (female); *Timaspis papaveris* Kieffer, in: Goury & Guignon, 1905: 200 (female, gall) (synonym in Nieves-Aldrey, 1994b: 156).

Description. Female. 1.4-2.6 mm. Head and mesosoma black; antenna, mandibles and palpi reddish brown, legs reddish brown, except darker trochanters. Metasoma orange brown, with dark brown to black posterior tergites. Wing veins dark brown. Head uniformly delicately reticulate, with uniformly sparse white setae, 1.8-2.0 times as broad as long from above; 1.25 times as broad as high and slightly broader than mesosoma. Gena reticulate, broadened behind eye, visible behind eye in front view, much broader than cross diameter of eye, measuring behind eye. Malar space reticulate, 0.5 times as long as height of eye, without striae. POL 1.4 times as long as OOL; 1.9-2.1 times as long as LOL and 3.2 times as long as diameter of lateral ocellus. Transfacial distance 1.2 times as long as height of eye and 1.3 times as long as height of lower face (distance between antennal rim and ventral margin of clypeus); diameter of antennal torulus 6.0 times as long as distance between them and slightly longer or equal to distance between torulus and eye margin. Lower face reticulate, without striae; median elevated area delicately coriaceous, without striae. Clypeus trapezoid-shaped, moderately projecting ventrally, delicately coriaceous; with indistinct anterior tentorial pits, with distinct epistomal sulcus and clypeo-pleurostomal line, ventral margin nearly straight. Frons, vertex and occiput delicately reticulate. Antenna 14-segmented, only slightly shorter than body; pedicel subglobose, only very slightly longer than broad; F1 1.9 times as long as pedicel and slightly shorter than F2; F2 nearly equal F3; F12 1.2 times as long as F11; placodeal sensilla on F2-F12. Mesosoma convex, longer than broad in lateral view, with uniform sparse white setae. Pronotum reticulate, with very few white setae, submedian pronotal pit transverse, deep, at least 2.5 times as broad as high, distance between pits nearly equal to width of a pit; pronotal plate well-delimited laterally only in the most anterior part of pronotum. Scutum delicately reticulate, longer than broad, 1.6 times as long as scutellum. Notauli narrow, faint in



Figs 54.1-9. *Iraella luteipes,* female: 1-2, head: 1, front view, 2, from above. 3, antenna, 4, scutum and scutellum, dorsal view, 5, mesosoma, lateral view, 6, pronotum with submedian pronotal pits, 7, propodeum and dorsellum, dorso-posterior view, 8, forewing, part, 9, metasoma, lateral view.

anterior 1/3; median mesoscutal line extending to 1/3-1/2 of scutum length; parapsidal lines distinct, reaching above tegulae; anterior parallel lines distinct and extending to 1/4-1/3 of scutum length. Scutellum slightly elongated, with parallel sides, delicately coriaceous to reticulate; scutellar foveae transverse, confluent, coriaceous, without central carina separating them. Mesopleuron uniformly reticulate; mesopleural triangle delicately coriaceous, with few setae. Metapleural sulcus reaching mesopleuron around 1/2 of its height; axillula transversely ovate, delicately coriaceous, with relatively dense white setae; subaxillular bar smooth, shining, nearly as broad as height of metanotal trough. Dorsellum very delicately coriaceous, medially nearly as high as height of shining, smooth ventral impressed area; metanotal trough alutaceous, with few white setae. Propodeum delicately coriaceous, lateral propodeal carinae subparallel, uniformly thick, without setae; central propodeal area microreticulate, with sparse white setae; lateral propodeal area uniformly delicately coriaceous, with relatively dense white setae; nucha very short, with some weak longitudinal rugae. Forewing margin with long cilia; radial cell opened, 3.5-3.7 times as long as broad; areolet distinct, Rs+M extending to 3/4 of distance between areolet and basalis, projecting into the lower half of it. Tarsal claws very narrow, simple, without basal lobe. Metasoma longer than head+mesosoma and longer than high in lateral view; metasomal tergite 2 occupying about 1/3 of metasoma length, without punctures, with few short white setae antero-laterally; tergites 3 and 4 without punctures; subsequent tergites and hypopygium with dense distinct punctures; prominent part of ventral spine of hypopygium short, with some relatively long setae, not extending behin apex of spine. Male. 1.4-2.6 mm. Similar to female but antenna much longer, 15-segmented, F1 slightly curved, colour lighter.

Gall. Small ellipsoid larval cells are located in the stem, maximum 4 mm in diameter. Externally the stem is not malformed, not hypertrophized, thus, it is impossible to distinguish the infested and health plants.

Distribution: SE (Nieves-Aldrey, 1994a, 1994b), (Kieffer, 1897-1901), FR (Dalla Torre & Kieffer, 1910); PL (Kierych, 1979), HU (Gödöllö, author). Possible in Ukraine. The detection of the gall is quite complicated, because there are no external signs for galled plants.

Biology. Monovoltine. Larvae overwintering in the gall, adults emerge next year in April-May. Host plants: *Papaver somniferum* L., *P. pseudorientale* L. and *P. bracteatum* Lindley (Papaveraceae) (Nieves-Aldrey, 1994b, 2001a, 2005).

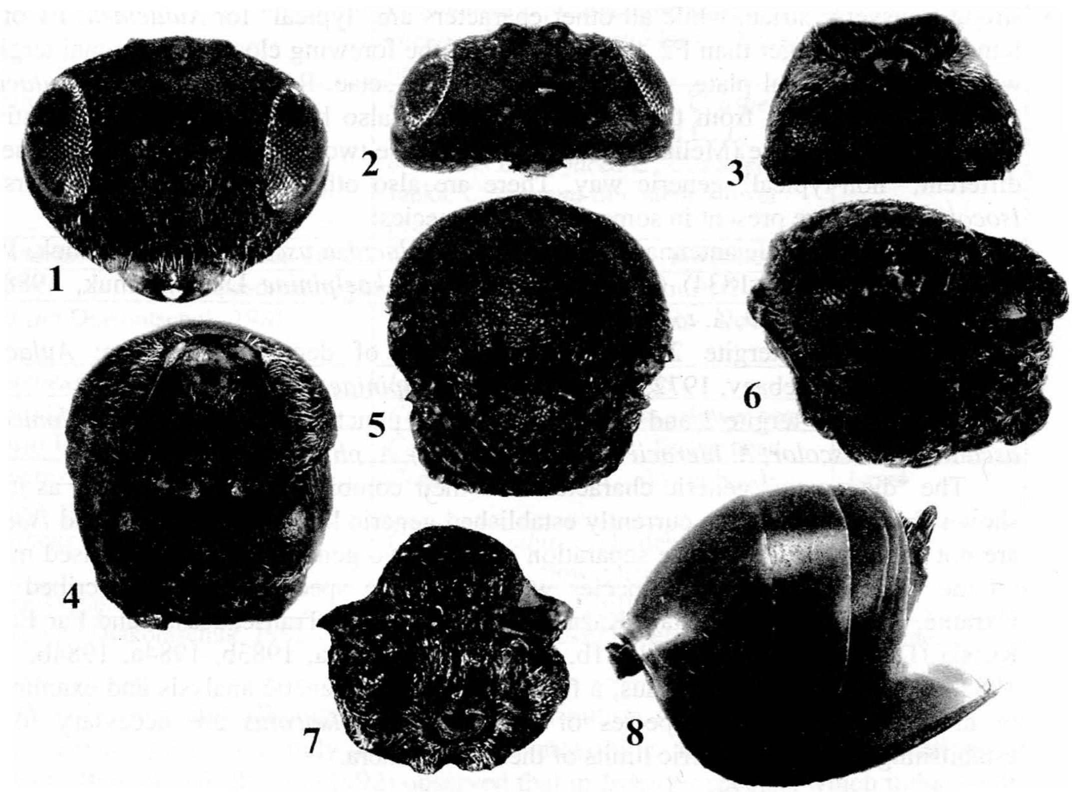
Isocolus Förster, 1869

Figs 55.1-8.

Isocolus Förster, 1869: 330, 334 (= *Eubothrus* Förster, 1869). Type species: *Diastrophus scabiosae* Giraud, 1859: 368, original designation.

Head about 2.0 times as broad as long from above and 1.3 times as broad as high in front view. Gena delicately coriaceous to alutaceous, only slightly or not broadened behind eye, not visible in front view. Transfacial distance around 1.5 times as long as height of eye; malar space shorter than height of eye; with striae radiating from clypeus and usually not reaching inner margin of eye; lower face also with radiating striae, median elevated area coriaceous to alutaceous, always without striae. Antenna 13-14 segmented in female (sometimes suture between F10 and F11 is very indistinct and antenna seems to be 12-segmented), 14-15-segmented in males; placodeal sensilla from F2 on the female and from F1 on male antenna. Pronotum dorsally long; submedian pronotal pits distinct, broadly separated medially; pronotal plate partially delimited. Scutum coriaceous-rugulose, with transverse, more or less strong striae. Notauli usually complete, sometimes indistinctly impressed anteriorly; median mesoscutal line extending at most to 1/3 of scutum length or present only in a form of a short triangle. Scutellum rugulose, scutellar foveae distinct, well-delimited around, separated by a central carina. Mesopleuron entirely uniformly tranversely striate. Wings hyaline, radial cell opened on wing margin (except *I. volgensis*, some specimens have partially closed radial cell); cilia on margin distinct but short. Tarsal claws simple. Metasomal tergite 2 with a patch of dense white setae antero-laterally, in some species dense white setae located on an elevated plate, interrupted dorsally; posteriorly with or without a band of punctures; metasomal tergite 3, subsequent tergites and hypopygium punctate (in some species the posterior part of tergite 2 also punctate); prominent part of ventral spine of hypopygium very short, with few short white setae, never extending behind apex of spine.

Taxonomic comments. The genus *Isocolus* is defined mainly on the basis of the forewing characters: R1 and Rs do not reaching the anterior margin, the radial cell clearly opened (except *I. volgensis* and *Isocolus* sp. (Israel, Melika) in which the radial cell partially closed); cilia on wing margin absent or very short. Western European species were revised, as well as species from the Iberian Peninsula (Nieves-Aldrey, 1994b, 2001a) and 5 valid species were established: *Isocolus fitchi* (Kieffer, 1898), *I. jaceae* (Schenck, 1863), *I. lichtensteini* (Mayr, 1882), *I. scabiosae* (Giraud, 1859), and *I. serratulae* (Mayr, 1882). Later, one new species, *Isocolus leuzeae* Nieves-Aldrey & Parra, 2003 was described from Spain, known to induce galls in flower heads of *Leuzea conifera* (L.) DC (Asteraceae) (Nieves-Aldrey & Parra, 2003). The revision made by Nieves-Aldrey (1994b, 2001a) does not include other 12 *Isocolus* species, described by Diakontschuk (1981a, 1982, 1983a, 1987, 1988, 2003) from the Eastern Europe (Ukraine, Russia) and Asia (North Kazakhstan, Turkmenistan). Also one new species, *I. tinctorius* Melika & Gharaei, 2006 was described from Iran (Melika & Gharaei, 2006) and one from Israel. Currently 20 palaearctic species of *Isocolus* are known. *Isocolus* species-groups are established on the basis of some morphological peculiarities, however, they do not resemble natural entities, and are given for an easier identification of the species (Table 5).



Figs 55.1-8. *Isocolus centaureae*, female 1-2, head,: 1, front view, 2, from above. 3, pronotum with submedian pronotal pits, dorsal view, 4, pronotum and propleura, dorsal view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, metasoma, lateral view.

According to Liljeblad & Ronquist (1998), Ronquist & Liljeblad (2001), Nylander et al. (2004) the *Isocolus* genus belongs to one of the most primitive phylogenetic lineages of cynipids, the *Isocolus-Neaylax* lineage. Phylogenetically and morphologically *Isocolus* most closely related to the genus *Aulacidea*. Nieves-Aldrey & Parra (2003) mentioned that *Isocolus* is one of the most better characterized aylacine genera. Except the diagnostic characters given above in the Aylacini generic key, they also listed as diagnostic ones the following characters: F1 of female shorter than F2, the mesopleuron transversely striate, metasomal tergite 3 and subsequent tergites punctate. However, all these characters present also in *Aulacidea* and by far are not enough for appreciable separation of *Isocolus* and *Aulacidea*. There are very few European species of *Isocolus* and *Aulacidea* which posses a "pure" combination of all mentioned "diagnostic" characters. At least one or two or even more of the above-mentioned "diagnostic" characters are mixed in many known *Aulacidea* and *Isocolus* species (see *Aulacidea* and *Isocolus* species descriptions). Only two morphological characters more or less can defined the two genera: a) opened (*Isocolus*) or closed (*Aulacidea*) radial cell of the forewing, except *I. volgensis* and *Isocolus* sp. from Israel, in which the radial cell partially closed; and b) the sculpture of the scutum: in *Isocolus* the scutum always with more or less strong transverse striae while in *Aulacidea* the scutum usually alutaceous or delicately coriaceous. However, even so, there are some exceptions, for example in *Aulacidea discolor* Diakontschuk, 1988, known from Turmenistan, the scutum with dull, strong transverse striae, while all other characters are "typical" for *Aulacidea*: F1 of the female antenna longer than F2, the radial cell of the forewing closed, metasomal tergite 2 with an antero-lateral plate, with very dense white setae. Recently described *Aulacidea tobiasi* Melika, 2004 from the Far East of Russia also has the scutum with relatively strong transverse striae (Melika, 2004). So, even these two characters can be combined in different, "non-typical" generic way. There are also other "diagnostic" characters for *Isocolus*, which are present in some *Aulacidea* species:

-- F1 of the female antenna shorter than F2: *Aulacidea ascanica* Diakontschuk, 1984, *A. hieracii* (Bouché, 1834) (some specimens), *A. koelpiniae* Diakontschuk, 1988, *A. phlomica* Belizin, 1959, *A. tobiasi* Melika, 2004.

-- metasomal tergite 2 without basal plate of dense white setae: *Aulacidea acroptilonica* Tyurebaev, 1972, *A. ascanica*, *A. koelpiniae*.

-- metasomal tergite 3 and subsequent tergites punctate: *Aulacidea acroptilonica*, *A. ascanica*, *A. discolor*, *A. hieracii* (some specimens), *A. phlomica*.

The "diagnostic" generic characters and their combinations strongly vary as it was shown above and, thus the currently established generic limits of *Aulacidea* and *Isocolus* are not enough for the precise separation of these two genera. Limits were based mainly on the "classical" European species with neglecting species recently described from Ukraine, Russia, Turkmenistan, Kazakhstan, Uzbekistan, Transcaucasus and Far East of Russia (Diakontschuk 1981a, 1981b, 1981c, 1982, 1983a, 1983b, 1984a, 1984b, 1987, 1988, 2003; Melika, 2004). Thus, a further detail phylogenetic analysis and examination of all known palaearctic species of *Aulacidea* and *Isocolus* are necessary for the establishing of precise generic limits of these two genera.

Table 5. Distribution, host-plant association, gall location and main morphological peculiarities in *Isocolus* species

***Isocolus* species**	**Host plant, gall location**	**Distribution**
Metasomal tergite 2 with antero-lateral patch of setae		
I. phaeopappucii (Diakontschuk, 1983)	*Centaurea* (= *Phaeopappus*) *trinervius* (Steph.) Boiss., flower head	Ukraine
I. ruthenicae (Diakontschuk, 1983)	*Centaurea ruthenica* Lam., flower head	Ukraine, Russia

I. leuzeae Nieves-Aldrey & Parra, 2003	*Leuzea conifera* (L.), flower head	Spain
I. lichtensteini (Mayr, 1882)	*Centaurea salmantica* L., *C. aspera* L., *C. melitensis* L., stem	France, Spain
I. serratulae (Mayr, 1882)	*Serratula radiata* (Waldst. & Kit.), *S. heterophylla* Desf., *S. bracteifolia* (Iljin) Stank., S. *xeranthemoides* M. B., flower head	Europe
Metasomal tergite 2 without antero-lateral patch of setae, smooth, without punctures		
I. carthami Diakontschuk, 2003	*Carthamus lanatus* L., flower head	Ukraine
I centaureae Diakontschuk, 1982	*Centaurea diffusa* Lam., *C. squarrosa* (Boiss.), *C. pseudomaculosa* Dobrocz., flower head	Ukraine, Turkmenistan
I. cousiniae Diakontschuk, 1988	*Cousinia bipinnata* Boiss., flower head	Turkmenistan
I. fitchi (Kieffer, 1898)	*Centaurea scabiosa* L., stem	Europe
I. jaceae (Schenck, 1863)	*Centaurea jacea* L., *C. paniculata* L., *C. montana* L., *C. scabiosa* L., *C. rhenana* Bor., *C. glastifolia* L., flower head	Europe
I. scabiosae (Giraud, 1859)	*Centaurea maculosa* Lam., *C. aspera* L., *C. scabiosa* L., *C. nigra* L., *C. orientalis* L.; *C. jacea* L., *C. sadleriana* Janka, *C. rhenana* Bor. stem, flower head	Europe
I. tinctorius Melika & Gharaei, 2006	*Carthamus tinctorius* L., flower head	Iran, Iraq
Metasomal tergite 2 with punctures in posterior 1/2-2/3		
I. belizini Diakontschuk, 1981	*Chartolepis intermedia* Boiss, flower head	Kazakhstan
I. brunneus Diakontschuk, 1982	*Inula hirta* L., flower head	Ukraine
I. cirsii Diakontschuk, 1987	*Cirsium ukrainicum* Bess., flower head	Ukraine
I. flavus Diakontschuk, 1982	*Centaurea orientalis* L., flower head	Ukraine
Isocolus sp. (Melika, submitted)	*Centaurea verutum* L., flower head	Israel
I. ponticus Diakontschuk, 1982	*Centaurea adpressa* Ledeb., *C. solstitialis* L., flower head	Ukraine
I. similis Diakontschuk, 1982	*Centaurea breviceps* Iljin, flower head	Ukraine
I. volgensis Diakontschuk, 1982	*Centaurea adpressa* Ledeb., stem	Ukraine, Russia

Distribution and Biology. Palaearctic distribution (Table 5). All known species have a sexual generation only and all are monovoltine, like other representatives of Aylacini. Baumann & Brandl (1992) observed that in *Isocolus* species, which induce galls in flower heads of *Centaurea* species, males are absent what indicating thelitokous parthenogenetic reproduction. Without exception, all known *Isocolus* species induces galls on Asteraceae (Compositae), although the majority induce galls in flower heads of *Centaurea* species, while others induce stem galls (Table 5).

Below a key to all known *Isocolus* species is given for the first time

Key to the palaearctic *Isocolus* species

(species mark with (*) are unknown for the Ukrainian fauna)

1. Metasomal tergite 2 with antero-lateral patch of white dense setae 2

-- Metasomal tergite 2 without antero-lateral patch of setae, without or with only few scattered setae 6
2. Metasomal tergite 2 with antero-lateral plate under setae 3
-- Metasomal tergite 2 without antero-lateral plate under setae 4
3. Female antenna 12-segmented, F1 equal or slightly shorter than F2 ... ***phaeopappucii***
-- Female antenna 13-segmented, F1 longer than F2 .... ***ruthenicae****
4. Pronotal plate posteriorly delicately coriaceous to alutaceous; galls in achenes of *Serratula* spp. .... ***serratulae***
-- Pronotal plate posteriorly without sculpture, shining, smooth; galls in achenes and stems of *Centaurea* spp. and *Leuzea conifera* 5
5. Scutellum without longitudinal depression medially, scutellar foveae smooth and shining, with anterior margins closed; punctures on metasomal tergites weak and faint; galls in stems of *Centaurea* spp. .... ***lichtensteini***
-- Scutellum with weak longitudinal depression medially, scutellar foveae rugulose, with anterior margins more broadly separated; punctures on metasomal tergites distinct; galls in achenes of *Leuzea conifera* .... ***leuzeae****
6. Metasomal tergite 2 smooth, without punctures or with only very indistinct superficial sparse micropunctures in the posterior 1/3 7
-- Metasomal tergite 2 with distinct punctures in posterior 1/2 to 2/3 15
7. Radial cell of forewing partially closed .... ***volgensis****
-- Radial cell of forewing opened 8
8. Metasomal tergite 2 occupying half of metasoma length in dorsal view (Fig. 33), notauli incomplete .... ***cousiniae****
-- Metasomal tergite 2 occupying 1/3 of metasoma length in dorsal view, notauli complete 9
9. Scutum delicately coriaceously-striate, striae in posterior 1/2-1/3 not distinctly transversely orientated, not raised over surface 10
-- Scutum with distinct transverse strong striae, raised above surface 11
10. Lower face with dense white short setae and very minute radiating striae; median mesoscutal line distinct in posterior 1/3; scutellar foveae more transverse, distinctly delimited posteriorly, smooth and shining; pronotum and scutellum black; galls in flower head of *Carthamus lanatus*, Ukraine .... ***carthami***
-- Lower face with sparse white setae and stronger irradiating striae; median mesoscutal line absent; scutellar foveae more rounded, indistinctly delimited posteriorly, deeper in antero-lateral part, with some delicate irregular wrinkles; pronotum and scutellum dark brown; galls in flower head of *Carthamus tinctorius*, Iran .... ***tinctorius****
11. Posterior half of internotauli area with very weak transverse interrupted striae, distance between them nearly equal to width of striae 12
-- Posterior half of internotauli area with stronger transverse striae, distance between them 2.0 or more times longer than width of striae 14
12. Median mesoscutal line distinct in posterior half 13
-- Median mesoscutal line absent or the most in a form of short triangle ...... ***centaureae***
13. Scutellum nearly as long as broad; scutellar foveae elongated, longer than broad, extending to half length of scutellum........ ***fitchi***
-- Scutellum distinctly longer than broad; scutellar foveae subquadrate, nearly as long as broad, extending to less than half length of scutellum .... ***volgensis****
14 Notauli complete, distinctly impressed in anterior 1/3; internotauli area posteriorly with weak striae; areolet small, indistinctly delimited .... ***scabiosae***

-- Notauli incomplete, indistinct in anterior 1/3; internotauli area posteriorly with stronger striae; areolet larger, distinctly delimited .... ***jaceae***
15. R1 continuing prolong wing margin, 1/3 of radial cell closed, Israel .... **sp. (Israel)***
-- R1 not reaching wing margin, radial cell opened 16
16. Internotauli area and parapsides in posterior 2/3 with strong, raised shining striae, interspaces finely coriaceous, 2.0 or more times longer than width of striae 17
-- Scutum with more delicate, interrupted and less raised transverse striae, distinct in posterior 1/2-2/3, especially in internotauli area 18
17. Areolet distinct, triangular, metapleural sulcus reaching mesopleurom slightly higher than half of its height; galls in flower head of *Centaurea verutum* .... **sp. (Israel)***
-- Areolet absent or very indistinct; metapleural sulcus reaching mesopleuron in upper 1/3 of its height, never lower; galls in flower head of *Cirsium ukrainicum* .... ***cirsii***
18. Median mesoscutal line absent 19
-- Median mesoscutal line extending at least to half length of scutum 21
19. Head, especially lower face and mesosoma, light brown; legs, including hind femurs light brown .... ***brunneus***
-- Head with lower face and mesosoma dark brown to black; legs brown to dark brown, hind femurs basally very dark to black 20
20. Radial cell 3.0-3.2 times as long as broad; areolet large, triangular, distinct; pronotal submedian pit at least 2.0 times as broad as distance separating them; central propodeal area much narrower, delimiting by subparallel lateral carinae .... **sp. (Israel)***
-- Radial cell 2.5-2.6 times as long as broad, areolet small, indistinct; width of pronotal submedian pit nearly equal to distance separating them; central propodeal area broader, delimiting by outwards curved lateral carinae .... ***ponticus***
21. Scutellar foveae subquadrate, nearly as broad as long; metapleural sulcus reaching mesopleuron in upper 1/3 of its height; area between metapleural sulcus and propodeal spiracle with strong rugae; central propodeal area with three distinct subparallel complete carinae .... ***belizini****
-- Scutellar foveae distinctly longer than broad, metapleural sulcus reaching mesopleuron at the half of its height or slightly higher; area between metapleural sulcus and propodeal spiracle dull rugose, without distinct rugae; central propodeal area without longitudinal parallel carinae 22
22. Head more rounded in front view; radial cell 2.8-2.9 times as long as broad, areolet larger; scutellar foveae shorter .... ***flavus***
-- Head less rounded in front view; radial cell 2.4 times as long as broad, areolet smaller; scutellar foveae longer .... ***similis***

Below detail descriptions and diagnoses are given for that species only, the original descriptions of which were superficial and insufficient for precise identification. Species presumably occur in the Ukrainian fauna are marked with (*). If the original description of a species is enough detailed, we cited only the relevant paper. For *I. brunneus*, *I. flavus*, *I. similis*, and *I. volgensis** which closely resemble other described species, only the diagnoses are given.

Isocolus brunneus Diakontschuk, 1982

Plate 9.3.

Isocolus brunneus Diakontschuk, 1982: 387 (female, male, gall).

Description. Female 3.0 mm, male 2.7 mm, a detail description is given in Diakontschuk (1982).

Gall (Plate 9.3). The gall is nested in the flower head, stem or even root, monolocular, lignified, rounded, near 3.0 mm in diameter; immature galls are green, turn yellow to brown when mature (Diakontschuk, 1982; Zerova, Diakontschuk & Ermolenko, 1988).

Diagnosis. Belongs to the group of species with metasomal tergite 2 punctate and without antero-lateral patch of setae. The absence of the median scutellar line brings this species most closely to *Isocolus* sp. (Israel, Melika, submit.) and *I. ponticus*. In *I. brunneus* the head, especially the lower face and mesosoma are light brown, legs, including hind femurs light brown, while in all other *Isocolus* species, including *Isocolus* sp. (Israel) and *I. ponticus*, the head and mesosoma are dark brown to black, legs are dark brown, hind femurs basally are very dark to black.

Material examined. Holotype female: Ukraine, Kherson Region, Chernomorskij Natural Reserve, 26.07.1974, coll. M.D. Zerova, ex flower heads of *Inula hirta* Z. 31.07.1974. 1 male paratype with the same label as the holotype (collection of SIZK).

Distribution. Ukraine only (Kherson Region, Chernomorskij Natural Reserve; Chernihiv and Kiev Regions (Diakontschuk, 1982; Zerova, Diakontschuk & Ermolenko, 1988).

Biology. Galls mature in September–October, larvae overwintering in the gall and adults emerge next spring or even in July – beginning of August. The only known host plant is *Inula hirta* L. (Asteraceae) (Diakontschuk, 1982; Zerova, Diakontschuk & Ermolenko, 1988).

Isocolus carthami Diakontschuk, 2003

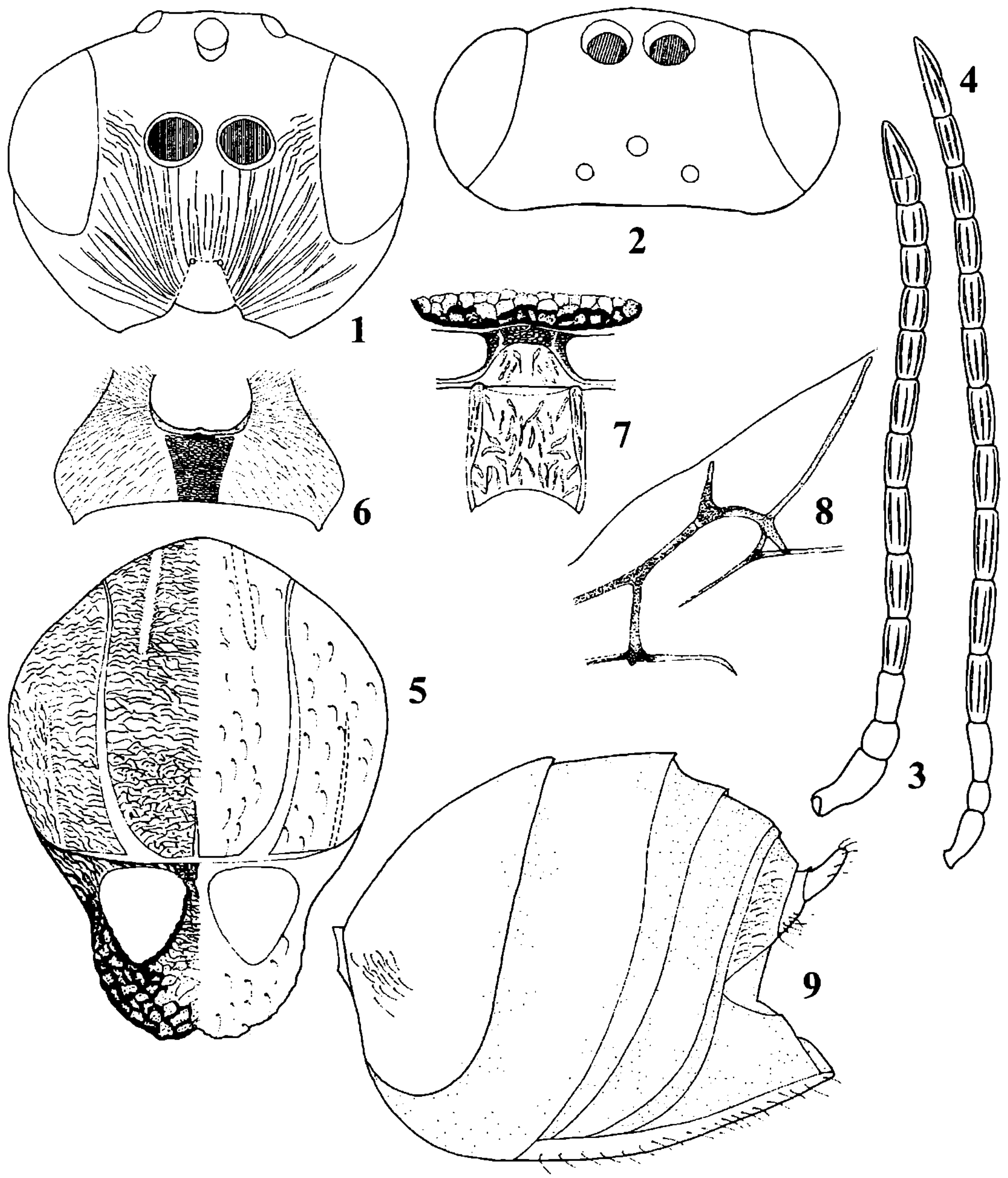
Figs 56.1-9, Plate 9.5.

Isocolus carthami Diakontschuk, 2003: 15 (female, gall).

Description. Female (holotype). 2.7 mm. Head and mesosoma black or dark brown, metasoma light brown to reddish; antenna light brown; legs brown to light brown, except dark brown to black coxae. Head black, with dark brown clypeus and mandibles, with short sparse white setae frontally and laterally, more dense on postgena and postocciput; 1.9 times as broad as long from above, 1.3 times as broad as high. POL only 1.1 times as long as OOL; LOL 0.5 times as long as POL, 0.5 times as long as OOL and 2.7 times as long as cross diameter of frontal ocellus. Frons delicately coriaceous, with small impressed area under frontal ocellus; vertex, interocellar area and occiput delicately coriaceous. Transfacial distance 1.2 times as long as height of eye; distance between antennal sockets 0.4 times as long as distance between antennal socket and inner margin of eye and 0.3 times as long as diameter of antennal socket. Gena finely uniformly coriaceous, not broadened behind eye, nearly 2.0 times as short as cross diameter of eye, measuring along transfacial line. Malar space 0.6 times as long as height of eye, with striae radiating from clypeus and reaching eye. Clypeus alutaceous, anterior tentorial pits shallow, epistomal sulcus slightly impressed but distinct. Lower face with dense white short piliferous points, hidding the very minute radiating striae. Postgena finely coriaceous; postocciput impressed, finely coriaceous; posterior tentorial pits deep. Antenna 13-segmented, light brown, except dark brown do black scapus, F4 the longest flagellomere. Mesosoma 1.2 times as long as high in lateral view. Pronotum dark brown, uniformly delicately coriaceous, with dense setae laterally along anterior margin; dorso-medially long, 2.5 times as short as greatest length on outer lateral margin; pronotal plate dark brown to black, with very few short white setae, well-delimited in anterior half, as broad as long, pronotal submedial pits distinct, separated by a narrow slightly impressed area. Propleuron black to dark brown, coriaceous, with transverse wrinkles. Scutum subequal, 1.17 times as broad as long; notauli complete, reaching pronotum, well-delimited, with smooth and shining bottom, broadened posteriorly; anterior parallel lines distinct, smooth, shining, extending to 1/3 of scutum length; parapsidal lines indistinct, in a form of smooth, shining narrow stripes, extending nearly to 1/2 length of scutum; median mesoscutal line in a form of small triangle; internotauli area and parapsides posteriorly finely coriaceous; area lateral to parapsidal line longitudinally very finely striate; entire scutum with uniformly scattered very short sparse white setae. Scutellum with parallel sides, nearly as broad as long, slightly overhanging metanotum, dark brown disk of scutellum anteromedially, in narrowed part, coriaceous, with mainly transverse striae, posteromedially and laterally very dull rugose, with very few short scattered white setae; posteromedially slightly impressed; scutellar foveae black, well-delimited posteriorly, transverse, smooth and shining, separated by a central carina. Dorso-axillar area with longitudinal parallel fine striae. Mesopleuron dark brown, black ventrally, uniformly finely transversely striate. Propodeum dark brown, finely coriaceous, with uniform dense white setae laterally from black, narrow central propodeal area, delimited by subparallel lateral propodeal carinae which in anterior half 3.0 times broader and higher than in posterior half, central propodeal area without setae, with irregular wrinkles; propodeal spiracle transverse, with strong raised carina along anterior border; dorsellum dull rugose, impressed, merged with ventral impressed area; metanotal trough coriaceous, with sparse short white setae; metanotal sulcus reaching mesopleuron in upper 1/3 of its height; axillula finely coriaceous with dense white setae hidding the sculpture; nucha black with strong longitudinal paralell ridges. Forewing margin with very short cilia; areolet small, triangular, well-delimited by veins; Rs and R1 not reaching wing margin, radial cell 2.5 times as long as broad, Cu_{1b} curved strongly outwards wing margin. Tarsal claws simple, without basal lobe. Metasoma light brown to reddish, metasomal tergite 2 with small lateral patch of white sparse short setae, smooth, with indistinct punctures in posterior 1/3; tergite 3 and subsequent tergites uniformly finely densely punctate; prominent part of ventral spine of hypopygium very short with very few short white setae.

Gall (Plate 9.5) are scattered at the base of the flower head, developing in brackts. Each brackt has only one gall. The location of galls on brackts vary from the base to the tip, but more frequently they are forming on the upper part of brackts. Galls at the base of brackts are elongated, elliptical, green when young, with very hard and smooth wall, 3.0-5.0 mm in length and 1.2-1.9 mm in diameter. After maturation, similarly to the flower head, they are becoming yellow. Galls on the free parts of brackts are rounded, spherical, 1.0-2.0 mm in diameter, or slightly elongated (2.1- 3.5 mm long and 1.5-2.0 mm in diameter), green, with smooth, very hard and thick wall.

Diagnosis. Very closely related to a recently described species from Iran, *I. tinctorius* Melika & Gharaei, 2006. In *I. carthami* the lower face with dense white very short piliferous setae (points), hidding the very minute striae radiating from the clypeus; the median mesoscutal line visible in the posterior 1/4; the scutum in the internotauli area posteriorly finely coriaceous; scutellar foveae are distinctly delimited posteriorly, more transverse, with smooth and shining bottom; the pronotum and scutellum are black. In *I. tinctorius* the lower face with only scattered sparse piliferous white setae (points) whhich are not hidding the stronger striae; the median mesoscutal line absent, the scutum in the internotauli area posteriorly delicately transversely striate, however the striae do not rise above the surface sculpture; scutellar foveae are more elongated, indistinctly delimited posteriorly, gradually getting deeper, with smooth, delicately wrinkled bottom; the pronotum and scutellum are dark brown (Melika & Gharaei 2006, *in press*). *Isocolus carthami* also closely resembles three other species: *Isocolus centaureae*, *I. scabiosae* and *I. serratulae*. In *I. scabiosae* metasomal tergite 3 punctated only in the posterior 1/3; the transfacial distance 1.6 times as long as height of the eye; the scutum with strong transverse striae posteriorly, the median mesoscutal line distinct in posterior half; the radial cell is about 3.0 times as long as broad; induces stem and flower head galls on *Centaurea* species, while in *I. carthami* tergite 3 is entirely and uniformly densely punctate; the transfacial distance only 1.2 times as long as height of the eye; the scutum is uniformly delicately transversely striate, the median mesoscutal line absent; the radial cell shorter, only 2.5 times as long as broad. In *I. serratulae* the median mesoscutal line present in the posterior 1/5 of the scutum; the scutellum reticulate-coriaceous; tergite 3 punctate only in the posterior 1/3; the transfacial distance 1.5 times as long as the height of the eye; F1 clearly shorter than F2; cilia on the forewing margin is very indistinct, short or absent; induces galls on *Serratula* species; while in *I. carthami* the median mesoscutal line absent; the scutellum dull rugose; the transfacial distance only 1.2 times as long as height of the eye; F1 nearly equal F2; the forewing margin cilia is short but distinct. *Isocolus centaureae* resembles *I. carthami* in its entire habitus: minutely, finely transversely sculptured scutum, absence of the median mesoscutal line, tergite 2 smooth, without punctures, while subsequent tergites are uniformly and densely punctate. However, differs in 12-segmented female antennae; submedian pronotal pits are separated by a distinct elevated broad carina; the head is rounded in front view, the lower face with very delicate radiating striae, scutellar foveae are smaller, with transverse rugae; lateral propodeal carinae subparallel, uniformly broad; induces galls in the flower heads of *Centaurea diffusa* Lam. and *C. squarrosa* (Boiss.).



Figs 56.1-9. *Isocolus carthami*: 1-2, head female: 1, front view, 2, from above. 3-4, antenna: 3, female, 4, male. 5-9, female: 5, scutum and scutellum, dorsal view, 6, pronotum with submedian pronotal pits, dorsal view, 7, propodeum and dorsellum, dorso-posterior view, 8, forewing, part, 9, metasoma, lateral view.

Material examined. Holotype female: Ukraine, Crimea, Karadag Natural Reserve, 20.04.1986, coll. L.A. Diakontschuk, ex flower head of *Carthamus lanatus*, em. 12.05.1986. Body appendages in preparation No 73 (collection of SIZK).

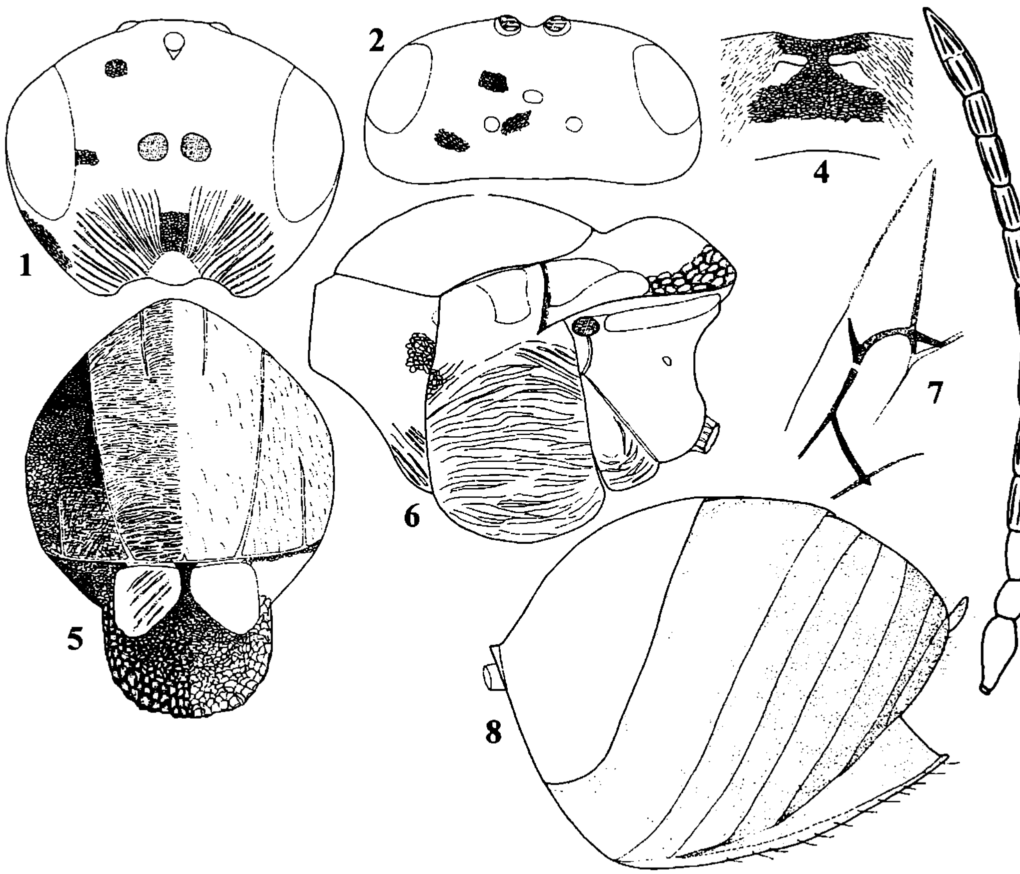
Distribution. Ukraine only (Crimea, Karadag Natural Reserve) (Diakontschuk, 2003).

Biology. Monovoltine. Adults emerge in May, the only known host plant is *Carthamus lanatus* L. (Asteraceae) (Diakontschuk, 2003).

Isocolus centaureae Diakontschuk, 1982

Figs 57.1-8, Plate 9.6.

Isocolus centaureae Diakontschuk, 1982: 385 (female, gall); *Isocolus minutus* Diakontschuk, 1982: 384 (female, male, gall); **syn. n.**



Figs 57.1-8. *Isocolus centaureae*, female: 1-2, head: 1, front view, 2, from above. 3, antenna, 4, pronotum and submedian pronotal pits, dorsal view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, forewing, part, 8, metasoma, lateral view.

Description. Female. 2.2-2.3 mm. Head and mesosoma black, metasoma dark brown to black; mandibles and palpi light brown; antenna uniformly dark brown to reddish, coxae dark brown to black, rest of leg brown, lighter towards tarsal claws. Head black, 1.2 times as broad as high in front view; 2.0 times as broad as long from above, slightly broader than mesosoma. POL 1.1 times as long as OOL and 2.0 times as long as LOL; LOL 2.0 times as long as diameter of lateral ocellus; frontal ocellus with small impression toward frons. Vertex, interocellar area, occiput alutaceous; area between antennal socket and eye very finely coriaceous, with distinct longitudinal minute carinae. Lower face with radiating striae extending to 2/3 of its height; median elevated area and area above striae finely coriaceous. Malar space 0.6 times as long as height of eye, delicately coriaceous, with delicate striae, radiating from clypeus and extending to 3/4 of malar space length. Gena delicately coriaceous, with longitudinal weak striae, slightly broadened, not visible behind eye in front view. Clypeus finely coriaceous; epistomal sulcus distinct, slightly impressed, smooth, shining; anterior tentorial pits indistinct, rounded ventrally. Transfacial distance 1.25 times as long as height of eye; distance between antennal socket and inner margin of eye 2.9 times as short as transfacial distance; diameter of antennal socket 2.0 times as large as distance between antennal sockets. Antenna 12-segmented (in some specimens indistinct suture between F10-F11 present and antenna seems to be 13-segmented); F1=F2=F3, ratio of scapus, pedicel and flagellomeres as follows: 1.4:0.8:1.0:1.0:1.1:1.2:1.1:1.1:0.9:1.0:0.8:1.9. If a suture between F10 and F11 present, than F10=F11 and nearly equal in length to preceeding flagellomeres. Mesosoma 1.3 times as long as high in lateral view. Pronotum dorso-medially 0.6 times as long as the greatest length measuring on outer margin; delicately coriaceous, with some smooth area behind submedian pronotal pits, which are distinct, narrow, transverse, separated by distance 0.5 times as broad as width of submedian pit; pronotal plate well-delimited in the most anterior part, just behind pit; pronotum with dense white setae along anterior margin, with less setae laterally and few sparse short white setae dorso-medially; with strong parallel rugae along antero-ventral margin. Propleuron black, coriaceous, with transverse wrinkles. Scutum 1.14 times as broad as long, with very few short scattered setae, especially laterally to notauli. Notauli complete, narrow but distinctly impressed, slightly broadened posteriorly; anterior parallel lines distinct, smooth, shining, extending to 1/3 of scutum length; parapsidal lines distinct, smooth, shining, extending to 1/2 length of scutum; median mesoscutal line indistinct, absent or in a form of very short triangular impression; internotauli area transversely sculptured, rugae in posterior part stronger, becoming more minute towards anterior end, area between notauli and lateral margin of scutum also very delicately minutely transversely striate. Scutellum subequal, only 1.1 times as broad as long; dull rugose along sides, with more delicate sculpture towards center of disk and scutellar fovea, latter ovate, large, separated by a distinct carina, shining, smooth, with some transverse striae. Dorso-axillar area finely coriaceous. Mesopleuron, including speculum, uniformly and delicately transversely striate, with very few short white setae, along ventral margin. Metapleural sulcus reaching mesopleuron in upper 1/3-1/4 of its height; axillula smooth, shining, with very few short white setae; subaxillular bar in posterior half as high as height of metanotal trough. Propodeum finely coriaceous laterally, with dense white long setae; lateral propodeal carinae uniformly broad, parallel; central propodeal area smooth, shining, without wrinkles and setae, except a row of short setae along lateral propodeal carinae; ventral impressed area smooth, shining; dorsellum finely coriaceous; metanotal trough smooth, shining, without setae; propodeal spiracle transverse, with strong raised carina along anterior border. Forewing margin with distinct cilia; R1 straight, radial cell 2.6-2.8 times as long as broad; Cu_{1b} not curved outwards margin, areolet triangular, distinct. Tarsal claws narrow, without basal lobe. Metasoma slightly longer than high in lateral view; metasomal tergite 2 smooth, shining with very few short white setae antero-laterally, without punctures; tergite 3 and all subsequent tergites and hypopygium uniformly densely punctate; ventral spine of hypopygium with few moderately long setae; prominent part of ventral spine of hypopygium very short, as long as broad. Male 1.5 mm. Similar to the female but antenna 14-segmented.

Galls (Plate 9.6) are between scales in the flower head, greyish, monolocular, lignified, elliptical, narrowed till the apex, with slightly rough surface, thin-walled, 2.0x1.0 mm. Galls when mature, freely falling out; the flower head is not malformed externally.

Diagnosis. Belongs to the group of species with metasomal tergite 2 smooth, without punctures and antero-lateral patch of setae. Closely resembles *I. fitchi* and *I. volgensis* in that the internotauli area posteriorly with very delicate transverse interrupted striae and the distance between striae nearly equal to the width of striae, however, in *I. centaureae* the median mesoscutal line absent or if present, than in a form of a short triangle, while in *I. fitchi* and *I. volgensis* the median mesoscutal line long, distinctly impressed in the posterior half of the scutum.

Taxonomic comments. *Isocolus minutus* is cospecific with *I. centaureae*. All the characters of *I. centaureae* are the same for *I. minutus*, except the more delicate and minute surface sculpture of the scutum and scutellum, because of smaller size. Thus, *I. minutus* is a **syn. n.** of *I. centaurea*.

Material examined. *Isocolus centaureae* -- Holotype female: Ukraine, Donetsk Region, Khomutovskyj steppe Natural Reserve, 18.05.1978, coll. L.A. Diakontschuk, ex flower heads of *Centaurea diffusa*, em. 9-16.05.1978. Paratypes: 13 females with the same labels as the holotype; 17 females: Ukraine, Kherson Region, Askania-Nova Natural Reserve, 25-26.04.1979, coll. L.A.Diakontschuk, ex flower heads of *Centaurea diffusa*. Body appendages in preparation No 39-40 (SIZK collection). *Isocolus minutus* -- Holotype female: Ukraine, Kiev Region, Vorzel, 15.04.1979, coll. L.A. Diakontschuk, ex flower heads of *Centaurea pseudomaculosa* Dobrocz., em. 7.05.1979. Paratypes: 10 females and 2 males: Ukraine, vicinities of Kiev, Pheophania, 26.05.1971, coll. M.D.Zerova; 3 females and 6 males: Ukraine, Cherkasy Region, Kanev Natural Reserve, 18.05.1979, coll. M.D. Zerova. Body appendages in preparation No 35-36 (SIZK collection).

Distribution. Ukaine – Kiev, Chernihiv and Cherkasy Regions; Donetsk Region, Khomutovskyj Natural Reserve; Kherson Region, Chernomorskij Natural Reserve and Askania-Nova Natural Reserve; Crimea, Alushta (Diakontschuk, 1982, 1987, Zerova, Diakontschuk & Ermolenko, 1988; 96 examined specimens in the collection of SIZK). Also Turkmenistan (Firuzin valley, from *Centaurea squarrosa* (Boiss.) (Diakontschuk, 1988) and Kazakhstan (examined specimens in the collection of SIZK).

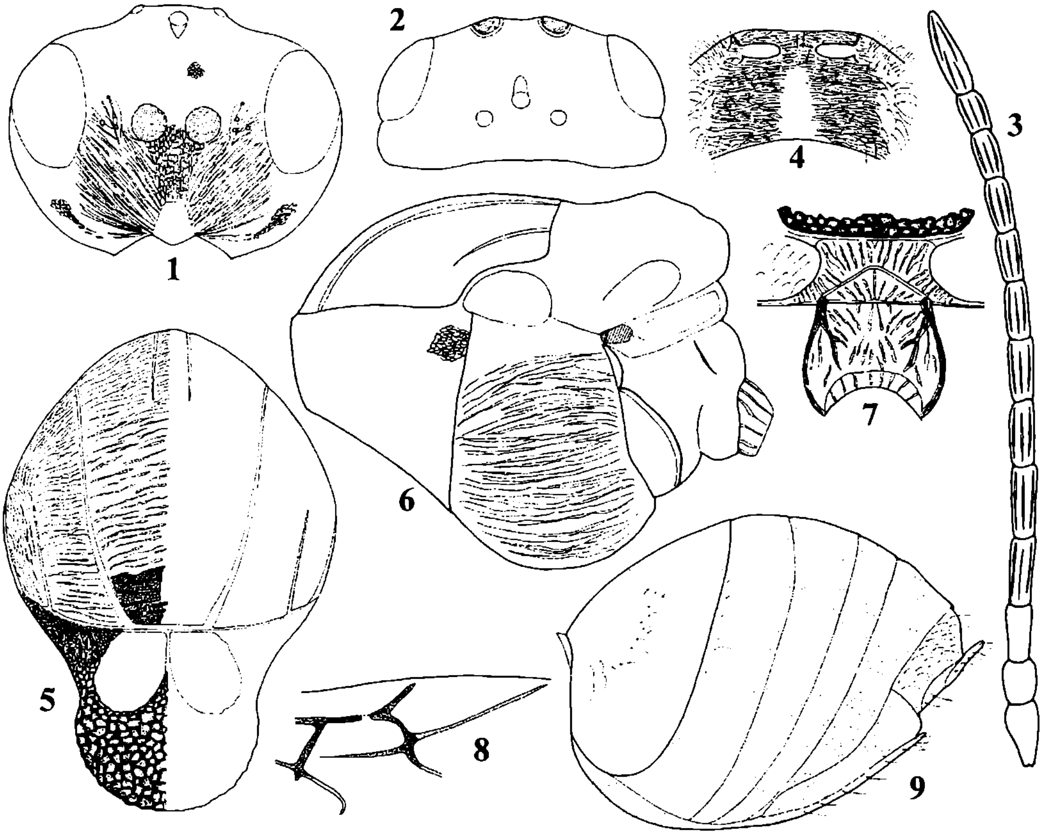
Biology. Monovoltine. Adults emerge from the beginning of May till the end of June (Diakontschuk, 1982). Host plants: *Centaurea diffusa* Lam., *C. pseudomaculosa* Dobrocz (Diakontschuk, 1982), *C. squarrosa* (Boiss.) (Diakontschuk, 1988).

Isocolus cirsii Diakontschuk, 1987

Figs 58.1-9.

Isocolus cirsii Diakontschuk, 1987a: 56 (female, gall).

Description. Female. 2.3-3.5 mm (holotype 3.5 mm). Body colour like in *I. centaureae*; mandibles and palpi light brown; antenna light brown, except dark brown to black scape and pedicel. All coxae, trochanters, femurs dark brown; tibiae and tarsi brown, with darker distal tarsomeres, tarsal claws dark brown. Head transverse, 1.4 times as broad as high in front view; 1.9-2.0 times as broad as long from above, slightly broader than mesosoma. POL equal OOL and 2.5 times as long as LOL; LOL only 1.25 times as long as diameter of lateral ocellus; frontal ocellus with impression towards frons; vertex, interocellar area, occiput alutaceous to very finely coriaceous; postocciput and postgena finely coriaceous, with more dense white setae; area between antennal socket and eye rugose. Transfacial distance 1.4 times as long as height of eye, 1.7 times as long as height of lower face (measuring from antennal sockets to the ventral edge of clypeus); distance between antennal toruli and inner margin of eye 3.8 times as short as transfacial distance; diameter of antennal toruli nearly 2.0 times as large as distance between antennal toruli. Malar space 0.8 times as long as height of eye, coriaceous, with strong striae radiating from clypeus and nearly reaching eye. Lower face with radiating striae reaching antennal socket and eye; median elevated area of lower face coriaceous; area between antennal socket and eye with some interrupted weak striae and some distinct piliferous points. Gena distinctly broadened behind eye in dorsal view; delicately coriaceous, with longitudinal very delicate striae. Clypeus higher than broad, shining, smooth; epistomal sulcus distinct, broad, slightly impressed, anterior tentorial pits indistinct, ventrally rounded. Antenna 13-segmented, pedicel slightly shorter than F1; scape only 1.1 times as long as F1; F1 slightly shorter than F2; F2-F4 nearly equal, subsequent flagellomeres slightly shorter; F10 shortest flagellomere, 0.8 times as long as F1; F11 2.1 times as long as F10; placodeal sensilla on F2-F11. Mesosoma 1.2 times as long as high in lateral view. Pronotum dorso-medially 2.0 times as short as the greatest length measuring on outer margin; delicately coriaceous, with some smooth area behind and between submedian pronotal pits, which are distinct, narrow, transverse, separated by carina which slightly narrower than width of submedian pit; pronotal plate laterally well-delimited in the most anterior part only; pronotum with dense white setae along anterior margin, less setae laterally and few short white setae dorso-medially; pronotum laterally with longitudinal minute striae, with few short strong parallel rugae antero-ventrally. Propleuron, black, coriaceous, with mainly transverse wrinkles. Scutum 1.1 times as



Figs 58.1-9. *Isocolus cirsii*, female: 1-2, head: 1, front view, 2, from above. 3, antenna, 4, pronotum and submedian pronotal pits, dorsal view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, dorsellum and propodeum, dorso-posterior view, 8, forewing, part, 9, metasoma, lateral view.

broad as long, with very few short scattered setae, especially along notauli. Notauli complete, narrow but distinctly impressed, with smooth, shining bottom; anterior parallel lines narrow, extending to 1/4 of scutum length; parapsidal lines distinct, smooth, shining, reaching to 2/3 of scutum length; median mesoscutal line absent; internotauli area with strong interrupted transverse rugae, especially in posterior 1/4-1/3; between anterior parallel lines scutum also transversely rugose, with more delicate and shorter striae; area between notauli and parapsidal line also transversely striate, with relatively strong striae. Scutellum only slightly longer than broad, posteriorly rounded; uniformly dull rugose. Scutellar foveae large, separated by very narrow but sharp carina, shining, smooth or in some specimens delicately coriaceous. Dorso-axillar area coriaceous with some distinct longitudinal striae. Mesopleuron uniformly transversely striate, with stronger striae centrally and more dellicate striae towards ventral edge; with very few short white setae, especially along ventral edge. Metapleural sulcus reaching mesopleuron in upper 1/4 of its height; axillula smooth, shining, with very few short white setae. Propodeum black, laterally very finely coriaceous, with dense white long setae; lateral propodeal carinae distinct, uniformly weak, slightly curved outwards in posterior 1/3; central propodeal area smooth, shining, with strong irregular rugae, without setae; ventral impressed area smooth, shining, with strong longitudinal striae; dorsellum with strong longitudinal rugae; metanotal trough smooth, shining, with few white setae; propodeal spiracle transverse, with strong raised carina along anterior border; nucha with longitudinal parallel ridges. Tarsal claws simple, without basal lobes. Forewing as long as body, cilia on wing margin very short or absent; radial cell opened, 2.9-3.1 times as long as broad; R1 and Rs not reaching wing margin, R1 straight; areolet very indistinct or even absent; Cu_{1b} strongly curved outwards wing margin. Metasoma slightly longer than head+mesosoma, slightly compressed laterally, dark brown; metasomal tergite 2 with few short white setae antero-laterally; posterior half of tergite 2 and all subsequent tergites and hypopygium with dense and uniform punctures. Male unknown.

Gall at the base of a flower head, monolocular, with lignified, hard walls, 3.0 mm in diameter; up to 28 galls can develop in one flower head (Diakontschuk, 1987).

Diagnosis. Belongs to the group of species with metasomal tergite 2 posteriorly densely punctate. The forewing venation like in *I. ponticus*, but the first abscissa of cubitus is longer and distinct, areolet absent or very indistinct; the scutum with very strong transverse rugae.

Material examined. Holotype female: Ukraine, Zaporizhja Region, Melitopol County, Sosnovka, 02.09.1982, coll. Volovnik, ex flower heads of *Cirsium ukrainicum* Bess., em. 18-25.04.1983. Paratypes: 58 females with the same labels as the holotype; 11 females: Ukraine, Zaporizhja Region, Melitopol County, Sosnovka, 15.08.1984, coll. Volovnik, ex flower heads of *Cirsium ukrainicum* Bess. Body appendages in preparation No 45 (SIZK collectin).

Distribution. Ukraine only -- Zaporizhja (Diakontschuk, 1987), Donetsk (Kamjani Mohyly Natural Reserve) and Kherson Regions (36 examined specimens in the collection of SIZK).

Biology. Monovoltine. Adults emerge from late April till June-August (Diakontschuk, 1987; Zerova, Diakontschuk & Ermolenko, 1988). Galls in flower heads of *Cirsium ukrainicum* Bess. (Diakontschuk, 1987) and *Onopordon* sp. (Asteraceae) (S. Klymenko, personal comm.).

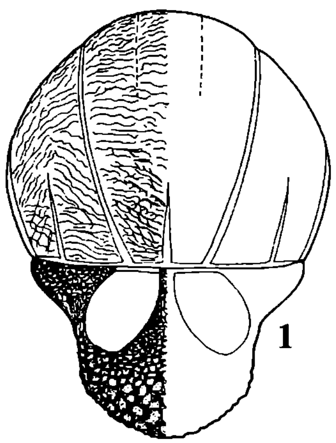
Isocolus fitchi (Kieffer, 1897)

Figs 59.1, Plate 9.7.

Aulax fitchi Kieffer, 1897-1901: 314 (female, gall); *Isocolus fitchi*: Eady & Quinlan, 1963: 22; Nieves-Aldrey, 2001a: 109 (female, gall).

Description. A detail description of the female and gall is given in Kieffer (1897-1901) and Nieves-Aldrey (2001a). Male unknown.

Gall (Plate 9.7). This species induces subterranean galls in stems and at the base of leaves (more details see in Nieves-Aldrey, 2001a).



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Diagnosis. Belongs to the group of species in which metasomal tergite 2 without punctures posteriorly; the internotauli area with very fine transverse interrupted striae posteriorly, the distance between striae is nearly equal to the striae width; the median mesoscutal line distinctly impressed in the posterior half. Closely resembles *I. volgensis*, but the scutellar foveae are elongated, longer than broad, reaching to the half length of the scutellum; the scutellum nearly as long as broad in dorsal view, while in *I. volgensis* scutellar foveae are subquadrate, nearly as long as broad, reaching less than to the half length of the scutellum; scutellum distinctly longer than broad. Also resembles *I. scabiosae* and *I. jaceae*, however, in these species the scutum in the posterior half in internotauli area, with stronger transverse striae, the distance between striae 2.0 times or more as long as width of striae.

Distribution. ES (Nieves-Aldrey, 1985, 2001a), GB (Eady & Quinlan, 1963), FR (Kieffer, 1897-1901). Ionescu (1957) cited *I. scabiosae* for Romania, however, the illustration of the gall more resembles that of *I. fitchi*. Russia and Kazakhstan (2 examined specimens in the collection of SIZK, collected by M.D. Zerova near Elton Lake, on the border of Belgorod Region of Russia and north Kazakhstan). In Ukraine – Transcarpathian Region only (few specimens were reared by the author from galls on *C. scabiosa* collected in the vicinities of Uzhgorod).

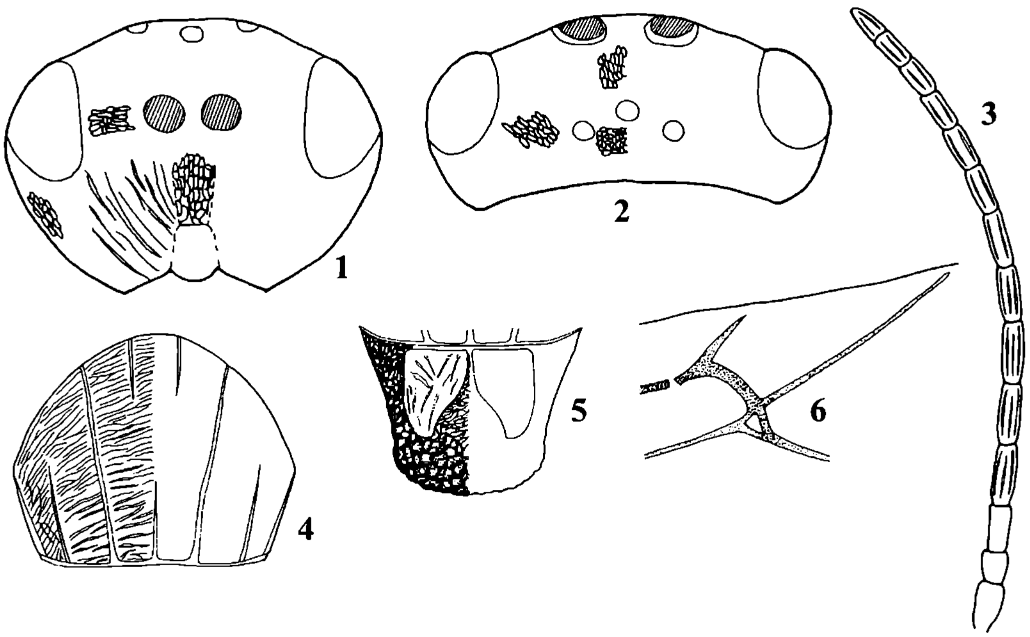
Biology. Monovoltine. The only known host plant is *Centaurea scabiosa* L. (Asteraceae).

Isocolus flavus Diakontschuk, 1982

Figs 60.1-6, Plate 9.8.

Isocolus flavus Diakontschuk, 1982: 385 (female, male, gall).

Description is given in Diakontschuk (1982). Closely related to the female of *I. similis* (see the description of *I. similis*). Female -- 4.5 mm, male – 4.0 mm.



Figs 60.1-6. *Isocolus flavus*, female: 1-2, head: 1, front view, 2, from above. 3, antenna, 4, scutum, dorsal view, 5, scutellum, dorsal view, 6, forewing, part.

Gall (Plate 9.8). Galls at the base of flower heads, like in all other *Isocolus* species, which induce galls in flower heads of *Centaurea* species. See also Diakontschuk (1982).

Diagnosis. Belongs to the group of species with the metasomal tergite 2 posteriorly punctate and without antero-lateral patch of setae; also the median mesoscutal line is well-impressed in the posterior half of the scutum. Most closely related to *I. similis*. In *I. flavus* the head 1.35-1.40 times as broad as high and 2.4 times as broad as long in dorsal view; the gena behind the eye is less broadened, rounded and narrowed down below the eye, thus, giving a view of a more rounded head in front view, below the eye; the radial cell of the forewing is much longer and narrower, 2.8-2.9 times as long as broad, areolet larger; scutellar foveae are larger, divided by a longer narrow carina, scutellar foveae shorter, slightly differently shaped; the sculpture of the dorsellum also differs. In *I. similis* the head is 1.4 times as broad as high in front view and 2.5 times as broad as long in dorsal view, more robust; the gena is much broader behind and below the eye and, thus giving a less rounded view to the head in front view below the eye; the radial cell is much broader, 2.4 times as long as broad, the areolet is much smaller; scutellar foveae are smaller, divided by a shorter dull rugose narrow carina. Both, *I. flavus* and *I. similis* closely resemble also another species, *I. belizini*, known from Kazakhstan (Diakontschuk, 1981) and which from differs in that the scutellar foveae are distinctly longer than broad, the metapleural sulcus reaching the mesopleuron only slightly higher than the half of its height; the area between the metapleural sulcus and the propodeal spiracle is dull rugose, without distinct striae; the central propodeal area without distinct three longitudinal parallel carinae, while in *I. belizini* the scutellar foveae are subquadrate, nearly as broad as long in dorsal view; the metapleural sulcus reaching the mesopleuron in the anterior 1/3; the area between the metapleural sulcus and the propodeal spiracle with strong rugae; the central propodeal area with three distinct subparallel complete carinae.

Material examined. Holotype female: Ukraine, Donetsk Region, Khomutovskyj steppe Natural Reserve, 08.07.1977, coll. L.A. Diakontschuk, ex flower heads of *Centaurea orientalis* L. Paratypes: 9 females and 4 males with the same labels as the holotype. Body appendages in preparation No 41-43 (SIZK collection).

Distribution. Ukraine only -- Donetska Region, Khomutovskyj steppe Natural Reserve (Diakontschuk, 1982), Crimea (Zerova, Diakontschuk & Ermolenko, 1988).

Biology. Monovoltine. Galls in flower heads of *Centaurea orientalis* L. (Asteraceae). Adults emerge from May till July (Diakontschuk, 1982; Zerova, Diakontschuk & Ermolenko, 1988).

Isocolus jaceae (Schenck, 1863)

Plate 9.9.

Aulax jaceae Schenck, 1863: 218, 230, 248 (female, male, gall); *Isocolus jaceae*: Eady & Quinlan, 1963: 22.

Diagnosis. Very closely related to *I. scabiosae*, thus the description of the female, male and gall is not given. In *I. jaceae* notauli are indistinct in the anterior 1/3; the scutum posteriorly in the internotauli area, with stronger striae; the areolet in the forewing is larger, distinctly delimited by veins, while in *I. scabiosae* notauli are distinctly impressed in the anterior 1/3, complete, reach the pronotum; the scutum posteriorly in the internotauli area with weaker striae; the areolet in the forewing is small, indistinctly delimited by veins.

Distribution. AT, DE, FR (Kieffer, 1897-1901), GB (Eady & Quinlan, 1963), PL (Kierych, 1979), RO (Ionescu, 1973), RU (Kursk Region – Belizin, 1959; Zerova, Diakontschuk & Ermolenko, 1988). For Ukraine cited by Ionescu (1973). We never collected and reared this species, but its distribution in Ukraine is not questionable.

Biology. Monovoltine. Galls in flower heads of *Centaurea jacea* L., *C. paniculata* L., *C. montana* L., *C. scabiosa* L., *C. rhenana* Bor., *C. glastifolia* L. (Asteraceae); inducing small rounded, thin-walled galls, 1.5 mm in diameter; plant is not malformed externally (Plate 9.9); adults emerge in June (Zerova, Diakontschuk & Ermolenko, 1988).

Isocolus lichtensteini (Mayr, 1882)

Aulax lichtensteini Mayr, 1882: 7 (female); *Aylax ibericus* Tavares, 1927: 50-52 (synonym in Nieves-Aldrey, 2001a: 107); *Isocolus lichtensteini*: Nieves-Aldrey, 1994b: 187; *Isocolus tavaresi* Nieves-Aldrey, 1984: 243 (female, male, gall) (synonym in Nieves-Aldrey, 1994b: 187).

Description. A detail description of the female, male and gall is given in Nieves-Aldrey (2001a).

Diagnosis. Belongs to the group of species with antero-lateral patch of white dense setae on metasomal tergite 2. Closely resembles *I. serratulae*, however, in this species the pronotal plate posteriorly delicately coriaceous to alutaceous and galls are in flower heads of *Serratula* spp., while in *I. lichtensteini* the pronotal plate posteriorly without sculpture, shining, smooth and galls are in stems of *Centaurea* species. Also closely resembles a Mediterranean species, *I. leuzeae* Nieves-Aldrey & Parra, 2003, known from the Iberian Peninsula only (Nieves-Aldrey & Parra, 2003).

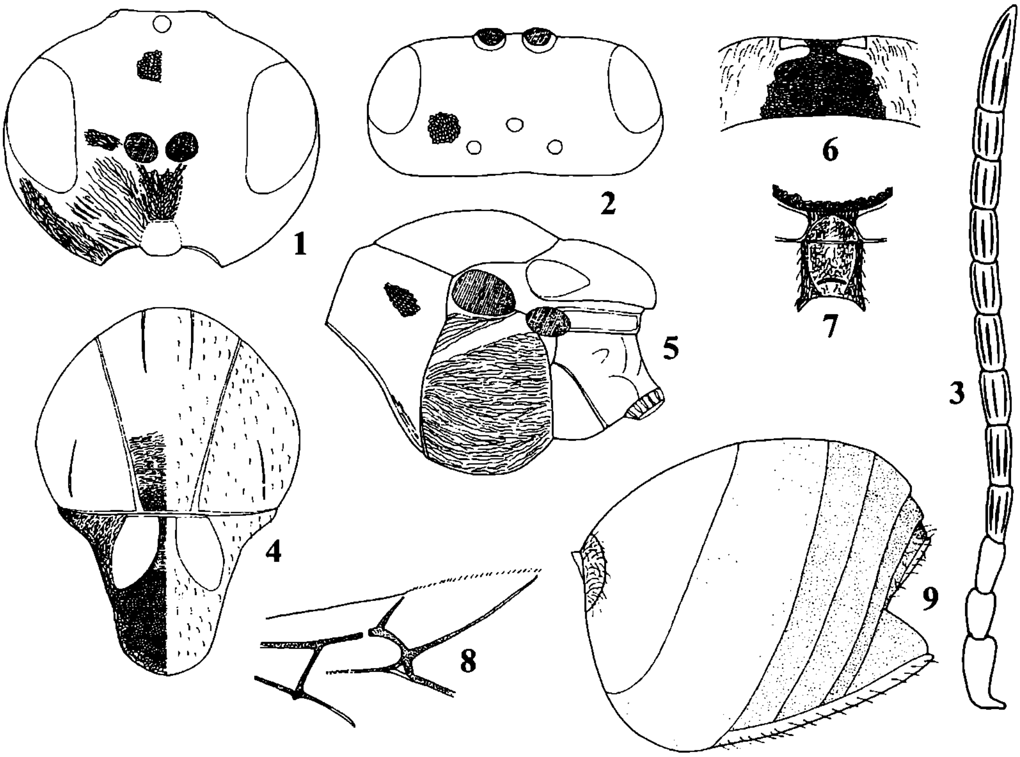
Distribution. ES (Nieves-Aldrey, 2001a), FR (Kieffer, 1897-1901). In Ukraine -- Donetsk Region, Kamjani Mohyly Natural Reserve (2 examined specimens reared from galls in stems of *Centaurea* sp, collected by S. Klymenko, collection of SIZK).

Biology. Galls in stems of *Centaurea aspera, C. melitensis* and *C. salamantina* L. (Asteraceae) (Nieves-Aldrey, 2001a).

Isocolus phaeopapucii (Diakontschuk, 1983)

Figs 61.1-9, Plate 9.10.

Aylax phaeopappucii Diakontschuk, 1983a: 18 (female, male, gall); *Isocolus phaeopappucii* (Diakontschuk, 1983), **comb n.**



Figs 61.1-9. *Isocolus phaeopapucii*, female: 1-2, head: 1, front view, 2, from above. 3, antenna, 4, scutum and scutellum, dorsal view, 5, mesosoma, lateral view, 6, pronotum and submedian pronotal pits, dorsal view, 7, dorsellum and propodeum, dorso-posterior view, 8, forewing, part, 9, metasoma, lateral view.

Description. Female. 1.9-2.0 mm. Head and mesosoma very dark brown to black. Antenna light brown, except slightly darker scape and pedicel. Mandibles and palpi light brown. Coxae, trochanters and basal 2/3 of femurs dark brown; proximal 1/3 of femurs, tibiae and tarsi light brown; tarsal claws dark brown. Metasoma reddish brown, much lighter than mesosoma. Head delicately coriaceous to alutaceous, 2.0 times as long as broad from above, 1.3 times as broad as high in front view, slightly broader than mesosoma. POL nearly equal OOL and 2.0 times as long as LOL; LOL 2.1 times as long as diameter of lateral ocellus. Frons delicately coriaceous, with small impression under frontal ocellus. Vertex, interocellar area and occiput alutaceous to very delicately coriaceous; postocciput and postgena also delicately coriaceous, with more dense white setae as frontally. Area between antennal socket and inner margin of eye with stronger sculpture as on frons and lower face. Transfacial distance 1.3 times as long as height of eye; distance between antennal socket and inner margin of eye 3.5 times as short as transfacial distance; diameter of antennal torulus 2.8 times as large as distance between antennal toruli. Lower face coriaceous, with striae radiating from clypeus and nearly reaching eye and antennal socket; median elevated area of lower face coriaceous, without striae. Malar space 0.6 times as long as height of eye, delicately coriaceous, with striae radiating from clypeus and nearly reaching eye. Clypeus quadrangular, nearly as broad as high, shining, smooth or alutaceous; anterior tentorial pits indistinct, small; epistomal sulcus distinct, broad, slightly impressed, smooth, shining. Gena delicately coriaceous, slightly broadened behind eye, with longitudinal striae. Antenna 12-

segmented, pedicel slightly shorter than F1, F1 very slightly shorter than F2; F9 shortest flagellomere; F10 nearly as long as F8+F9 (in some specimens a very indistinct suture is present between F10 and F11 and, thus antenna seems to be 13-segmented), placodeal sensilla on F2-F10. Mesosoma 1.3 times as long as high in lateral view. Pronotum dorso-medially 1.6 times as short as the greatest length measuring on outer margin; submedian pronotal pits distinct, narrow, transverse and deep, separated by a carina which slightly narrower than width of submedian pit; pronotal plate well-delimited laterally only in the most anterior part, just behind pit; pronotum with dense setae along anterior margin, less setae laterally and few short white setae dorso-medially; pronotum alutaceous dorso-medially, uniformly coriaceous laterally, with few short strong subparallel wrinkles along antero-ventral margin. Propleuron dark brown, coriaceous, with transverse wrinkles mainly. Scutum uniformly very delicately coriaceous, with transverse minute and interrupted striae; 1.2 times as broad as long, with very few short scattered setae, especially laterally to notauli. Notauli complete, distinctly impressed, broadened posteriorly, with mat bottom; anterior parallel lines distinct, extending to 1/3 of scutum length, broad, shining, smooth; parapsidal lines distinct, smooth, shining, extending to 2/3 of scutum length; median mesoscutal line absent. Scutellum 1.3 times as long as broad; delicately reticulate, with some rugae posteriorly. Scutellar foveae nearly reaching to 1/2 of scutellum length, smooth, shining, well-delimited around, separated by a broad reticulate central carina. Dorso-axillar area delicately coriaceous, with some transverse very weak striae. Mesopleuron uniformly transversely striate, with short white setae along ventral edge; metapleural sulcus reaching mesopleuron in the upper 1/3 of its height; area between metapleural sulcus and propodeal spiracle coriaceous, without distinct strong rugae; axillula coriaceous, mat, with some setae. Propodeum laterally coriaceous, with white long setae; lateral propodeal carinae nearly parallel, slightly curved outwards in posterior 1/4, with setae; central propodeal area with some setae, especially in anterior 1/3, narrow, alutaceous or delicately coriaceous, with transverse strongly curved carina in posterior end of propodeum; ventral impressed area mat, delicately coriaceous; dorsellum very short medially, with some longitudinal wrinkles; metanotal trough delicately coriaceous, with very few white setae; propodeal spiracle transverse, with strong raised carina along anterior border; nucha black, with longitudinal parallel ridges. Forewing margin with distinct cilia; Rs and R1 not reaching wing margin, R1 curved in proximal third; radial cell opened, 2.7 times as long as broad; areolet small triangular, distinct; Cu_{1b} very slightly curved towards wing margin. Tarsal claws simple, without basal lobe. Metasoma nearly as high as long in lateral view; metasomal tergite 2 with antero-lateral plate, with very dense white setae, smooth, without punctures; tergite 3 with relatively sparse and indistinct punctures, while subsequent tergites and hypopygium with uniformly dense, well-impressed punctures; prominent part of ventral spine of hypopygium very short, as long as broad, with very few short white setae which not extending behind apex of spine. Male. 2.0 mm. Similar to female but antenna 14-segmented, metasomal tergite 2 uniformly and more densely punctate and with more dense and longer white setae as in the antero-laterally.

Gall (Plate 9.10). The usual *Isocolus* galls at the base of flower heads of *Centaurea* species.

Diagnosis. Most closely related to *I. ruthenicae*, together with which form a group of species with metasomal tergite 2 without punctures, with an antero-lateral plate of dense white setae. Both species, *I. ruthenicae* and *I. phaeopappucii* closely resembles *A. serratulae*, but differs in the presence of a lateral basal plate of a very dense white setae and by the absence of the median mesoscutal line. *Isocolus phaeopappucii* differs from *I. ruthenicae* by the 12-segmented female antenna, F1 nearly equal or only slightly shorter than F2; the central propodeal area is quite different, while in *I. ruthenicae* the female antenna 13-segmented and F1 longer than F2.

Material examined. Holotype female: Ukraine, Donetsk Region, Khomutovskyj steppe Natural Reserve, 19.04.1978, coll. L.A. Diakontschuk; ex flower heads of *Phaeopappus trinervius* (Steph.) Boiss. Paratypes: 4 females and 1 male with the same labels as the holotype. Body appendages in preparation No 46-48 (SIZK collection).

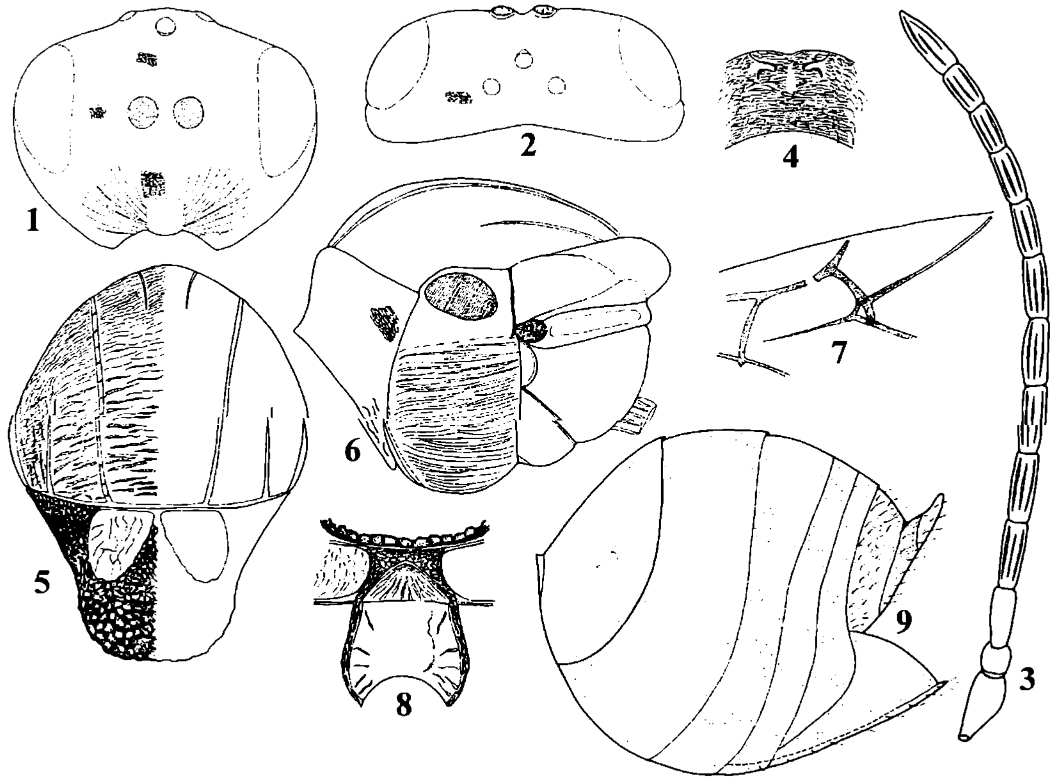
Distribution. Only in Ukraine (Donetsk Region, Khomutovskyj steppe Natural Reserve) (Diakontschuk, 1983a; later observed by S. Klymenko, personal comm.).

Biology. Monovoltine. Galls in flower heads of *Centaurea* (= *Phaeopappus*) *trinervius* (Steph.) Boiss. (Asteraceae), adults emerge in early May (Diakontschuk, 1983a).

Isocolus ponticus Diakontschuk, 1982

Figs 62.1-9, Plate 9.11.

Isocolus ponticus Diakontschuk, 1982: 382; *Isocolus tauricus* Diakontschuk, 1982: 388 (female, male, gall), **syn. n.**



Figs 62.1-9. *Isocolus ponticus*, female: 1-2, head: 1, front view, 2, from above. 3, antenna, 4, pronotum and submedian pronotal pits, dorsal view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, forewing, part, 8, dorsellum and propodeum, dorso-posterior view, 9, metasoma, lateral view.

Description. Female. 3.5 mm. Body dark brown with lighter metasoma. Lower face, gena brown; frons, vertex, occiput, postocciput darker brown to black; clypeus, mandibles and palpi much lighter than lower face and malar space. Antenna light brown, except slightly darker scape and pedicel. Legs uniformly lighter than body, tarsal claws dark brown. Head delicately coriaceous to alutaceous, 2.3 times as broad as long from above, 1.3 times as broad as high in front view, slightly broader than mesosoma. POL 0.9 times as long as OOL and 2.0 times as long as LOL; LOL 1.7 times as long as diameter of lateral ocellus. Frons alutaceous, with small impression under frontal ocellus. Vertex, interocellar area and occiput alutaceous to very delicately coriaceous. Postocciput and postgena delicately coriaceous to alutaceous, with more dense white setae as on front. Area between antennal socket and eye rugose. Transfacial distance 1.7 times as long as height of eye, 1.7 times as long as height of lower face (measuring from antennal socket to the ventral margin of clypeus); distance between antennal socket and inner margin of eye 3.5 times as short as transfacial distance; diameter of antennal socket 2.5 times as large as distance between antennal sockets. Lower face delicately coriaceous, with few delicate weak striae raditing from clypeus and extending slightly above 1/2 of lower face length; median elevated area coriaceous, without striae. Malar space 0.8 times as long as height of eye, with weak striae, radiating from clypeus and reaching to 1/2-2/3 of malar space length. Gena delicately coriaceous; distinctly broadened behind eye, with longitudinal minute striae. Clypeus shining, smooth, narrow, near 1.5 times as high as broad, with rounded ventral margin; epistomal sulcus distinct, broad, slightly impressed, smooth, shining; anterior tentorial pits very small, indistinct. Antenna 13-segmented, pedicel 2.0 times as short as F1; scape slightly longer than F1; F1 very slightly shorter or equal F2; F2-F6 nearly equal, subsequent flagellomeres slightly shorter; F10 shortest flagellomere, 0.8 times as long as F1; F11 1.6 times as long as F10; placodeal sensilla on F2-F11. Pronotum dorso-medially 1.5 times as short as the greatest length measuring on outer margin; delicately coriaceous, submedian pronotal pits distinct, narrow, transverse and deep, separated by broad carina which slightly broader than width of a submedian pit; pronotal plate laterally well-delimited in the most anterior part only. Pronotum with dense white setae along anterior margin; less setae laterally and few short white setae dorso-medially; delicately uniformly coriaceous laterally, with few short strong rugae along antero-ventral margin. Propleuron coriaceous, with mainly transverse wrinkles. Scutum 0.8 times as broad as long in dorsal view, with very few short scattered setae, especially laterally to notauli. Notauli complete, distinctly impressed, not broadened posteriorly, with some transverse parallel striae on the bottom; anterior parallel lines indistinct, extending to 1/5 of scutum length; parapsidal lines distinct, smooth, shining, extending to 2/3 of scutum length; median mesoscutal line absent. Internotauli area with interrupted transverse striae posteriorly till the level of anterior parallel lines length; surface between transverse striae very finely delicately coriaceous; between anterior parallel lines scutum transversely striate, with more delicate weak striae; area between notaulus and parapsidal line with moderately strong transverse striae; area between parapsidal line and parascutal carina coriaceous, with longitudinal striae. Scutellum subquadrate, 0.9 times as broad as long, uniformly dull rugose, with more delicate surface behind scutellar foveae, rounded posteriorly. Scutellar fovea large, separated by narrow carina, with numerous irregular weak wrinkles. Dorso-axillar area coriaceous with some strong longitudinal rugae. Mesopleuron with uniform transverse minute striae, with short white setae along ventral margin; acetabular carina delimiting a broad area antero-ventrally. Metapleural sulcus reaching slightly above 1/2 of its height; axillula smooth, shining with very dense white setae. Propodeum dark brown to black, laterally very delicately coriaceous, with dense white long setae; lateral propodeal carinae distinct, slightly curved outwards in posterior 1/4, at least 2.0 times broader in anterior 3/4; central propodeal area smooth, shining, with few irregular wrinkles, without setae; ventral impressed area smooth, with some irregular striae; dorsellum coriaceous, with irregular striae, medially 2.0 times as short as height of ventral impresswed area; metanotal trough smooth, shining, with relatively dense white setae; propodeal spiracle transverse, with strong raised carina along anterior border; nucha dark brown with longitudinal parallel rugae. Forewing without cilia on margin; R1 very slightly curved in proximal 1/3; radial cell opened, 2.6 times as long as broad; areolet small triangular, distinct; Cu_{1b} very slightly curved outwards wing margin. Tarsal claws simple, without basal lobe. Metasoma rounded, posterior 1/2 to 2/3 of metasomal tergite 2, all subsequent tergites and hypopygium with dense uniform punctures; tergite 2 with only few setae antero-laterally; prominent part of ventral spine of hypopygium very short, as long as broad, with very few short white setae. Male. 2.5 mm. Similar to female but differs by darker colour of the body and 14-segmented antenna.

Gall (Plate 9.11). This species induces galls at the base of the flower head and/or on the stem below it. In many cases no deformation (swelling) of the flower head base and stem was observed and only single galls (cells) were found in each infected flower head (in the case of *I. ponticus*). Sometimes a large number of galls are developing in one flower head and they strongly deforming and enlarging the flower head and the stem below. In this case, galls are merging together and forming a hard, lignified conglomerate at the base of the flower head (*I. tauricus*). Probably different gall formations led Diakontschuk (1982) to the description of two different species, *I. ponticus* and *I. tauricus*, rather than morphological differences in adults.

Diagnosis. Closely resembles *I. brunneus* and a new species, recently described from Israel (Melika, submitted) by the absence of the median mesoscutal line. However, in *I. brunneus* the head, especially the lower face, and mesosoma are light brown; legs, including hind femurs are light brown, while in *I. ponticus* and newly described species from Israel the head with the lower face and mesosoma are dark brown to black; legs are brown to dark brown, hind femurs basally very dark to black. Closely related to *Isocolus* sp. (Israel, Melika, submitted), but in the newly described *Isocolus*, the radial cell 3.0-3.2 times as long as broad, the areolet in the forewing is large, triangular and distinct, the length of the pronotal submedian pit at least 2.0 times as long as the distance between pits, the central propodeal area is much narrower, delimited by subparallel lateral carinae. In *I. ponticus* the radial cell is much shorter, only 2.5-2.6 times as long as broad, the areolet of the forewing is very small and indistinct; the length of the pronotal submedian pit nearly equal to the distance between pits; the central propodeal area broader, delimited with more outwards curved lateral carinae.

Material examined. *Isocolus ponticus*: Holotype female: Ukraine, Kherson Region, Chernomorskij Natural Reserve, 20.07.1974, coll. L.A. Diakontschuk, ex flower heads of *Centaurea adpressa*, em. 26.07.1974. Paratypes: 3 females: Ukraine, Kherson Region, Chernomorskij Natural Reserve, 25.06.1970, coll. M.D. Zerova, ex flower heads of *Centaurea adpressa*; 1 female: Ukraine, Kherson Region, Chernomorskij Natural Reserve, 20.05.1971, coll. M.D. Zerova, ex flower heads of *Centaurea adpressa*; 3 females and 1 male: Ukraine, Kherson Region, Chernomorskij Natural Reserve, 13.07.1972, coll. V. Slovokhotov, ex flower heads of *Centaurea adpressa*; 1 female and 2 males: Ukraine, Kherson Region, Chernomorskij Natural Reserve, 22.04.1978, coll. A.G. Kotenko; 3 females: Donetsk Region, Khomutovskyj steppe Natural Reserve, 07.07.1977, coll. L.A. Diakontschuk, ex flower heads of *Centaurea adpressa.* Body appendages in preparation No 30-33. *Isocolus tauricus*: Holotype female: Ukraine, Crimea, vicinities of Alushta, 22.08.1977, coll. L.A. Diakontschuk, ex flower heads of *Centaurea solstitialis* Z., em. 18.09.1977. Paratypes: 1 male with the same label as the holotype. Body appendages in preparation No 71 (SIZK collection). Another about 100 specimens, collected in Crimea (near Alushta) are examined by the author (SIZK collection).

Distribution. Known from Ukraine only -- Kherson Region, Chermorskij Natural Reserve; Donetsk Region, Khomutovskyj steppe Natural Reserve; Crimea, near Alushta (Diakontschuk, 1982; Zerova, Diakontschuk & Ermolenko, 1988; Diakontschuk, 2003).

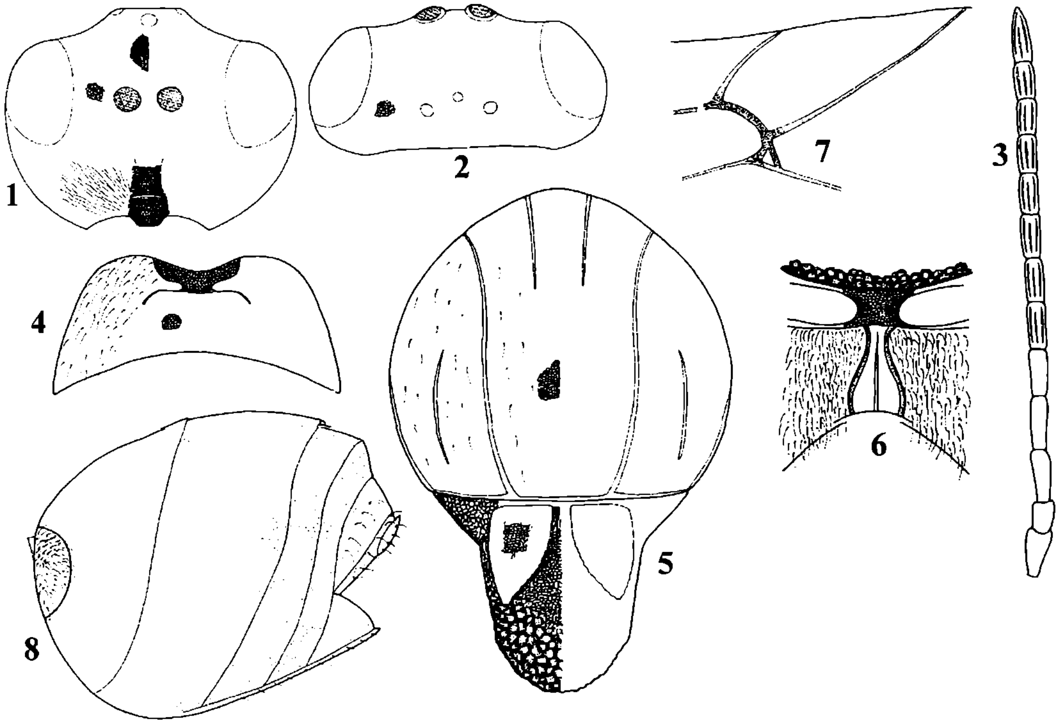
Biology. Monovoltine. Part of adults emerge in September of the same year, when the gall induction was initiated, however, the larger part of the population overwintering in the gall and emerges next spring, from late April till July (Zerova, Diakontschuk & Ermolenko, 1988). Host plants: *Centaurea adpressa* Ledeb. and *C. solstitialis* L. (Asteraceae) (Diakontschuk, 1982, Zerova, Diakontschuk & Ermolenko, 1988; Diakontschuk, 2003).

Isocolus ruthenicae (Diakontschuk, 1983)*

Figs 63.1-8.

Aylax ruthenicae Diakontschuk, 1983b: 18 (female, male); *Isocolus ruthenicae*: **comb. n.**

Description. Female. 2.0-3.2 mm. Head and mesosoma black; scape and pedicel black, flagellomeres dark brown; coxae, trochanters black, rest of legs brown; metasoma dark brown to black, except light brown hypopygium and lateral basal patch on metasomal tergite 2. Mandibles light brown. Head, except alutaceous frons, delicately coriaceous, 1.3 times as broad as high in front view; 2.2 times as broad as long in dorsal view; slightly broader than mesosoma. POL nearly equal OOL, LOL 1.5 times as long as diameter of ocellus. Gena not broadened behind eye in front view; vertex, interocellar area, occiput alutaceous to very finely coriaceous; postocciput and postgena delicately coriaceous, with more dense white setae as on front; area between antennal socket and eye with stronger sculpture than lower face. Transfacial distance 1.4 times as long as height of eye, 1.4 times as long as height of lower face (measuring from antennal sockets to ventral edge of clypeus); distance between antennal socket and inner margin of eye 3.7 times as short as transfacial distance; diameter of antennal socket 2.0 times as large as distance between antennal sockets. Lower face delicately coriaceous, with very short delicate striae, radiating from clypeus and extending to 1/5-1/6 of lower face height; median elevated area finely coriaceous. Malar space 0.9 times as long as height of eye, with delicate striae, radiating from clypeus and extending to half length of malar space. Gena behind eye delicately coriaceous. Clypeus



Figs 63.1-8. *Isocolus ruthenicae*, female: 1-2, head: 1, front view, 2, from above. 3, antenna, 4, pronotum and submedian pronotal pits, dorsal view, 5, scutum and scutellum, dorsal view, 6, dorsellum and propodeum, dorso-posterior view, 7, forewing, part, 8, metasoma, lateral view.

subquadrate, uniformly delicately coriaceous, slightly broader than high; anterior tentorial pits small, indistinct; epistomal sulcus distinct, broad, impressed, smooth, shining. Antenna 13-segmented, pedicel nearly 2.0 times as short as F1; scape slightly longer than F1; F1 longer than F2, placodeal sensilla on F2-F11. Mesosoma black, slightly longer than high in lateral view. Pronotum dorso-medially alutaceous, 1.5 times as short as the greatest length measuring on outer margin; uniformly coriaceous laterally; with some strong parallel rugae along antero-ventral margin. Submedian pronotal pit distinct, transverse and deep, separated by broad carina which slightly broader than width of submedian pit; pronotal carina well-delimited in very anterior part, just behind pit; pronotum with dense white setae along anterior margin, less setae laterally and few sparse short white setae dorso-medially. Propleuron black, coriaceous, with transverse delicate striae. Scutum black, uniformly and delicately coriaceous, with very few sparse short scattered setae, especially laterally to notauli; 1.1 times as broad as long. Notauli distinctly impressed, complete, smooth, shining, slightly broadened and converging posteriorly; anterior parallel lines very delicate, impressed in anterior 1/3; parapsidal lines distinct, smooth, shining, extending to 2/3 of scutum length; median mesoscutal line absent. Scutellum 1.2 times as broad as long; disk in between scutellar foveae finely coriaceous, dull rugose in posterior half and laterally. Scutellar fovea large, with irregular and minute striae on a finely coriaceous background, separated by relatively broad carina. Dorso-axillar area delicately coriaceous. Mesopleuron with uniform transverse delicately striae, except delicately coriaceous sculpture in the dorso-posterior part of speculum. Metapleural sulcus reaching mesopleuron in the upper 1/3 of its height; axillula smooth, shining, with dense white setae. Propodeum black, laterally finely coriaceous, with very dense white long setae; lateral propodeal carinae distinct, curved outwards in posterior 1/4; narrow central propodeal area shining, without setae, with central longitudinal carina, running from nucha up to dorsellum; dorsellum mat, uniformly coriaceous; metanotal trough smooth, without setae; propodeal spiracle transverse, with strong raised carina along anterior border. Forewing without cilia on margin; R1 and Rs distinctly reaching wing margin; radial cell opened, 3.0 times as long as broad; areolet small triangular, distinct. Tarsal claws simle, without basal lobe. Metasoma slightly shorter than head+mesosoma, rounded, metasomal tergite 2 antero-laterally with elevated plate and dense white setae, without punctures; tergite 3 dorsally entirely punctate, laterally punctate only in posterior 1/2 to 1/3, all subsequent tergites and hypopygium uniformly and densely punctate; prominent part of ventral spine of hypopygium very short, as long as broad, with very few sparse short white setae. Male unknown.

Gall. Galls are forming at the base of flower heads. Usually 8-10 galls form a conglomerate, up to 30-35 mm in diameter and, thus the base of a galled flower head usually enlarged, swollen. Mature galls are lignified, thick-walled, brown. Somehow resembles the gall of *Diplolepis mayri* (Diakontschuk, 1983).

Diagnosis. Presence of a lateral basal plate with very dense white setae on the metasomal tergite 2 is more typical for the *Aulacidea* genus. However, all other characters resembles more *Isocolus* than *Aulacidea*. Most closely related to *I. phaeopappucii* (see Diagnosis to *I. phaeopappucii*). Also both species, *I. ruthenicae* and *I. phaeopappucii* closely resembles *A. serratulae*, but differs in presence of a lateral basal plate with very dense white setae; F1 longer than F2 and the median mesoscutal line absent.

Material examined. Holotype female: Russia, Lipeck Region, Galichja Gora Natural Reserve, 13.08.1979, coll. V. Kuznecov, ex flower heads of *Centaurea ruthenica* Zam., em. 11.09.1979. Paratypes: 153 females with the same labels as the holotype. Body appendages in preparation No 49 (SIZK collection).

Distribution. RU (Lipeck Region, Galichja Gora Natural Reserve (Diakontschuk, 1983a); Kursk Region (Zerova, Diakontschuk & Ermolenko, 1988) and about 50 examined specimens in the collection of SIZK. This species presumably occurs in the eastern part of Ukraine.

Biology. Galls were collected in the middle of August, adults emerged in laboratory in mid-November (Diakontschuk, 1983a); in nature adults emerged in May – June (Zerova, Diakontschuk & Ermolenko, 1988). The only known host plant is *Centaurea ruthenica* Lam. (Asteraceae).

Isocolus scabiosae (Giraud, 1859)

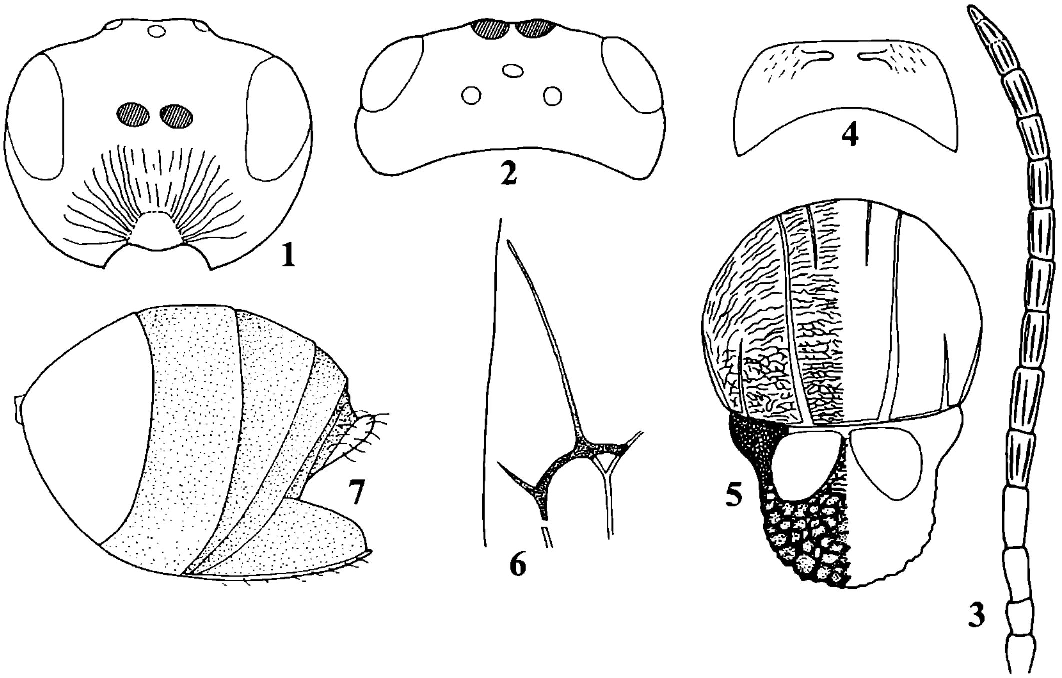
Figs 64.1-7, Plate 9.12-13.

Diastrophus scabiosae Giraud, 1859: 368 (female, male, gall); *Aulax scabiosae*: Cameron, 1893: 51 (female, male, gall); *Aylax scabiosae*: Dalla Torre & Kieffer, 1910: 671 (female, male, gall); *Diastrophus areolatus* Giraud, 1859 (synonym in Nieves-Aldrey, 1994b: 186); *Aulax areolatus*: Kieffer, 1897-1901: 315; *Isocolus scabiosae*: Förster, 1869: 334; *Eubothrus scabiosae*: Förster, 1869: 336; *Aulax Rogenhoferi* Mayr, 1882: 10; *Isocolus rogenhoferi*: Wachtl, 1880: 542 (synonym in Nieves-Aldrey, 1994b: 186); *Aulax* (*Phanacis*) *centaurae* Thomson, 1877: 809 (synonym in Dalla Torre & Kieffer, 1910: 671).

Description. A detailed description of adults and galls is given in Nieves-Aldrey (1994b, 2001a). Galls on Plate 9.12-13.

Diagnosis. F1 of female equal F2, submedian pronotal pits distinctly impressed, separated by a broad carina; striation on the lower face do not reaching the eye, POL slightly longer than OOL. Belongs to the group of species with metasomal tergite 2 smooth, without punctures, the scutum transversely striate, striae are raised over the surface, the posterior half of the internotauli area with stronger transverse striae, the distance between striae 2.0 times or more as long as the width of rugae. Most closely related to *I. jaceae*, however, in *I. scabiosae* notauli are complete, distinctly impressed in the anterior 1/3; the scutum posteriorly in the internotauli area, with weaker striae; the areolet in the forewing is small, indistinctly delimited by weakly pigmented veins, while in *I. jaceae* notauli are indistinct in the anterior 1/3; the scutum posteriorly in the internotauli area with more stronger striae; the areolet in the forewing is larger, distinctly delimited by veins.

Distribution. AT (Dalla Torre & Kieffer, 1910), FR (Kieffer, 1897-1901), GB (Cameron, 1893; Eady & Quinlan, 1963), HU (Ambrus, 1974), Iberian Peninsula (Nieves-Adrey, 2001a), PL (Kierych, 1979), RO (Ionescu, 1957, 1973), SE (Dalla Torre & Kieffer, 1910), RU (Belgorod, Kalinin, Kursk and Saratov Regions – Belizin, 1959; Zerova, Diakontschuk & Ermolenko, 1988). Known from Kazakhstan also (examined specimens in the collection of SIZK). In Ukraine known from the vicinities of Kiev (Diakontschuk, 1981).



Figs 64.1-7. *Isocolus scabiosae*, female: 1-2, head: 1, front view, 2, from above. 3, antenna, 4, pronotum and submedian pronotal pits, dorsal view, 5, scutum and scutellum, dorsal view, 6, forewing, part, 7, metasoma, lateral view.

Biology. Monovoltine. Galls are forming in stems and flower heads of *Centaurea maculosa* Lam., *C. aspera* L., *C. scabiosa* L., *C. nigra* L., *C. orientalis* L.; *C. jacea* L., *C. sadleriana* Janka (Ambrus, 1974); *C. rhenana* Bor. (Asteraceae) (Kierych, 1979). Some galls on *C. scabiosa* L. can be up to 45-70 mm long (Belizin, 1959).

Isocolus serratulae (Mayr, 1882)

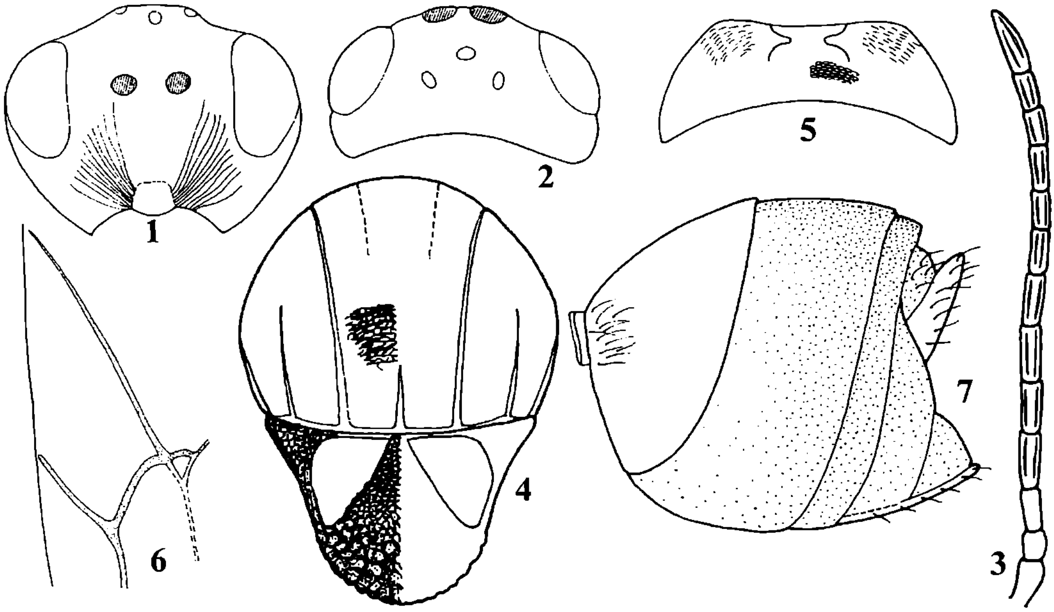
Figs 65.1-7.

Aulax serratulae Mayr, 1882: 9 (female, male); *Aylax serratulae*: Kieffer, 1897-1901: 313; *Isocolus serratulae*: Nieves-Aldrey, (1994b: 187); *Aylax ascanica* Diakontschuk, 1983b: 16 (female, male, gall), **syn. n.**

Description. Detailed redescriptions of *I. serratulae* adults and galls were given in Nieves-Aldrey (1994b).

Diagnosis. Belongs to the group of species in which metasomal tergite 2 with a patch of white dense setae antero-laterally, however, without raised plate under them, like in *I. phaeopappucii* and *I. ruthenicae*. Closely resembles *I. lichtensteini* and *I. leuzeae*. In *I. serratulae* the pronotal plate posteriorly delicately coriaceous to alutaceous; galls in flower heads of *Serratula*, while in *I. lichtensteini* and *I. leuzeae* the pronotal plate posteriorly without sculpture, shining, smooth; galls in flower heads of *Centaurea* and *Leuzea conifera*.

Taxonomic comments. *Aylax ascanica* conspecific with *I. serratulae* in all characters, except that in some paratype females punctures on the metasomal tergite 2 are well-impressed dorsally, however, indistinct or absent laterally; subsequent tergites are distinctly punctate. Thus, *Aylax ascanica* is a synonym of *I. serratulae.*



Figs 65.1-7. *Isocolus serratulae*, female: 1-2, head: 1, front view, 2, from above. 3, antenna, 4, scutum and scutellum, dorsal view, 5, pronotum and submedian pronotal pits, dorsal view, 6, forewing, part, 7, metasoma, lateral view.

Material examined. *Aylax ascanica*: Holotype female: Ukraine, Kherson Region, Askania-Nova Natural Reserve, 25-26.04.1979, coll. L.A. Diakontschuk, ex flower head of *Serratula xeranthemoides* M. B., em. 03.05.1979. Paratypes: 8 females with the same labels as holotype (SIZK collection).

Distribution. AT (Kieffer, 1897-1901). Ukraine (Donetsk Region, Khomutovskyj steppe Natural Reserve; Kherson Region, Askania Nova Natural Reserve and Mykolaiv Region) (Diakontschuk, 1980, 1983a and 35 examined specimens deposited in the collection of SIZK).

Biology. Galls in flower heads of *Serratula radiata* (Waldst. & Kit.), *S. heterophylla* Desf. (Dalla Torre & Kieffer, 1910), *S. bracteifolia* (Iljin) Stank. and *S. xeranthemoides* M. B. (Asteraceae) (Diakontschuk, 1983a). Adults emerge in late April -- beginning of May (Diakontschuk, 1983a; Zerova, Diakontschuk & Ermolenko, 1988).

Isocolus similis Diakontschuk, 1982

Figs 66.1-6.

Isocolus similis Diakontschuk, 1982: 387 (female, male, gall).

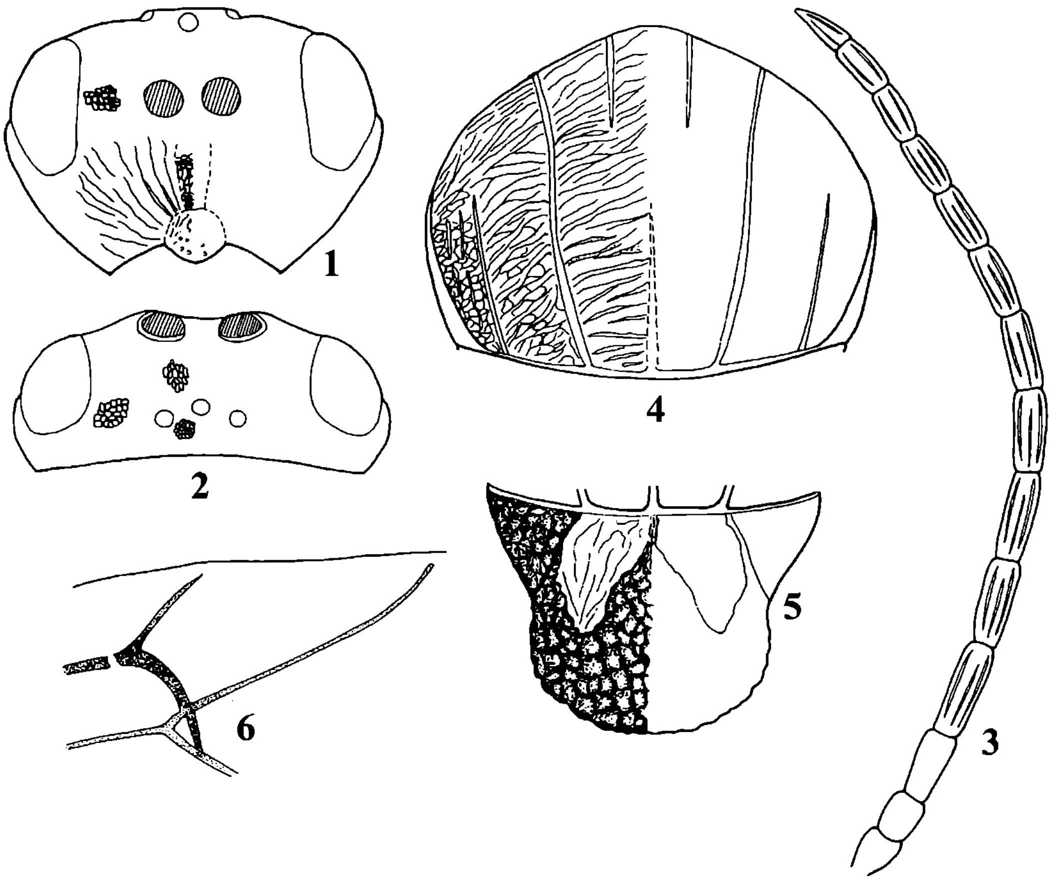
Description. A detailed description is given in Diakontschuk (1982). Male 3.4 mm, the colour of the body much darker, antenna 14-segmented.

Diagnosis. *Isocolus similis* most closely related to *I. flavus* and somehow resembles also *I. belizini* (see diagnosis to *I. flavus*).

Material examined. Holotype female: Ukraine, Kherson Region, Chernomorskij Natural Reserve, 15.05.1971, coll. M.D. Zerova, ex flower head of *Centaurea breviceps* Iljin. Paratypes: 2 females and 1 male with the same labels as the holotype. Body appendages in preparation No 37-38 (SIZK collection).

Distribution. Ukraine only (Kherson Region, Chernomorskij Natural Reserve, Khomutovskyj steppe Natural Reserve and Askania-Nova Natural Reserve (Diakontschuk, 1982: Zerova, Diakontschuk & Ermolenko, 1988).

Biology. Galls are in a form of swellings at the base of flower heads of *C. breviceps* Iljin (Asteraceae); adults emerge in mid May (Diakontschuk, 1982).



Figs 66.1-6. *Isocolus similis*, female: 1-2, head: 1, front view, 2, from above. 3, antenna, 4, scutum, dorsal view, 5, scutellum, dorsal view, 6, forewing, part.

Isocolus volgensis Diakontschuk, 1982*

Figs 67.1-3.

Isocolus volgensis Diakontschuk, 1982: 384 (female, gall).

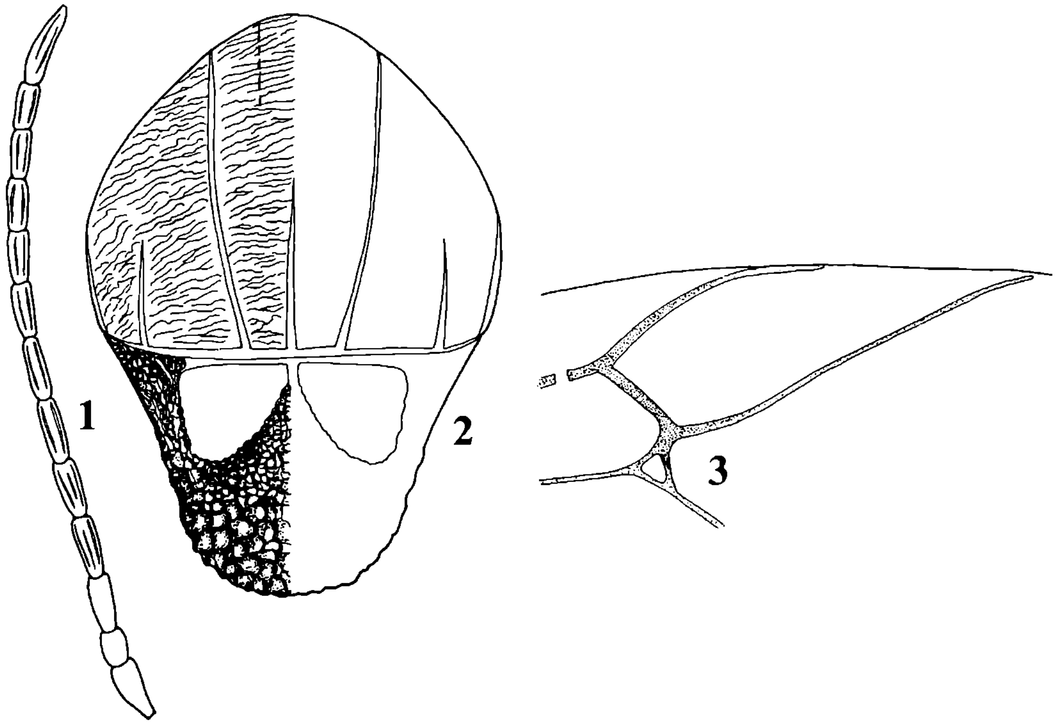
Description is given in Diakontschuk (1982). Male unknown.

Gall in flower heads of *Centaurea*, like in many other *Isocolus* species.

Diagnosis. Differs from all known *Isocolus* species in that the radial cell sometimes partially closed. However, in some specimens the radial cell is opened and R1 do not reaching the margin of the wing. In these cases, the females of *I. volgensis* most closely resembles *I. fitchi*. In both species the scutum in the posterior half in the internotauli area, with very fine transverse interrupted striae and the median mesoscutal line distinctly impressed in the posterior half. In *I. fitchi* scutellar foveae are elongated, longer than broad, extending to the half length of the scutellum and the scutellum nearly as long as broad in dorsal view, while in *I. volgensis* scutellar foveae are subquadrate, nearly as long as broad, extending less than to the half length of the scutellum and the scutellum distinctly longer than broad in dorsal view.

Material examined. Holotype female: Russia, vicinities of Astrakhan, 12.05.1976, coll. L.A.Diakontschuk, ex stems of *Centaurea adpressa* Zedeb., em. 08.05.1976. Paratypes: 97 females with the same labels as the holotype. Body appendages in preparation No 34 (SIZK collection).

Distribution. RU (vicinities of Astrakhan) (Diakontschuk, 1982). The occurance of this species in the eastern steppe part of Ukraine is quite possible.



Figs 67.1-3. *Isocolus volgensis*, female: 1, antenna, 2, scutum and scutellum, dorsal view, 3, forewing, part.

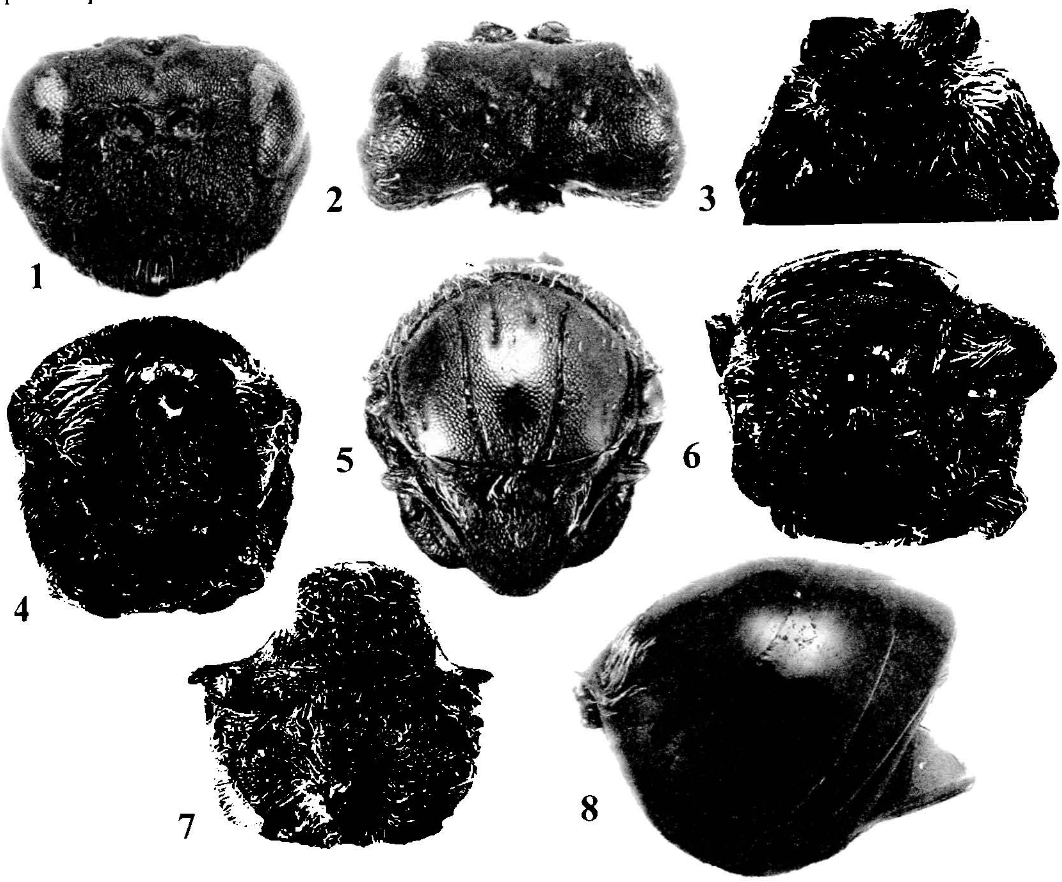
Biology. Galls in stems of *Centaurea adpressa* Ledeb. (Asteraceae) in a form of rounded or elliptical cells in the parenchima; the stem sometimes slightly malformed; adults emerge in May (Diakontschuk, 1982).

Liposthenes Förster, 1869

Figs 68.1-8.

Liposthenus (!) Förster, 1869: 332, *Liposthenes* Förster, 1869: 336. Type species: *Aulax glechomae* Hartig, 1841 (= *Liposthenes glechomae* (Linnaeus, 1758), original designation.

Head alutaceous to reticulate, slightly less than 2.0 times as broad as long from above, slightly broader than high in front view. Transfacial distance 1.5 times as long as height of eye; malar space 0.8 times as long as height of eye. Frons and vertex finely reticulate. Lower face alutaceous, with very short incomplete irregular striae, never reaching margin of eye and antennal sockets; malar space with some short incomplete striae, radiating from clypeus and extending to half length of malar space. Antenna of female 13-segmented, F1 slightly longer or equal to F2; male antenna 14-segmented, F1 equal F2; all flagellomeres in both sexes with placodeal sensilla. Pronotum dorsally long, laterally, especially along anterior margin, with very dense white long setae; with short parallel striae along posterior margin. Submedian pronotal pits deep, ovate, separated by a distance longer than width of a pit; pronotal plate microreticulate, distinctly delimited all around. Scutum regularly reticulate and shining; notauli complete, well-impressed; median mesoscutal line in a form of very short triangle or absent. Scutellum elongated, dull rugose with more delicate coriaceous to reticulate sculpture in the middle of disk or with transverse strong rugae; scutellar foveae deep, rounded, smooth and shining, well-delimited around, separated by a very narrow central carina. Mesopleuron uniformly finely longitudinally striated; mesopleural triangle coriaceous. Wings hyaline; with short cilia on margin, radial cell opened or partially opened, about 3.0 times as long as broad, R1 reaching or not wing margin. Tarsal claws simple, without basal lobe. Metasomal tergite 2 with a small patch of white setae antero-laterally; all tergites without punctures, hypopygium with some indistinct punctures; prominent part of ventral spine of hypopygium short, with two rows of moderately long setae, apical setae extending behind apex of spine.



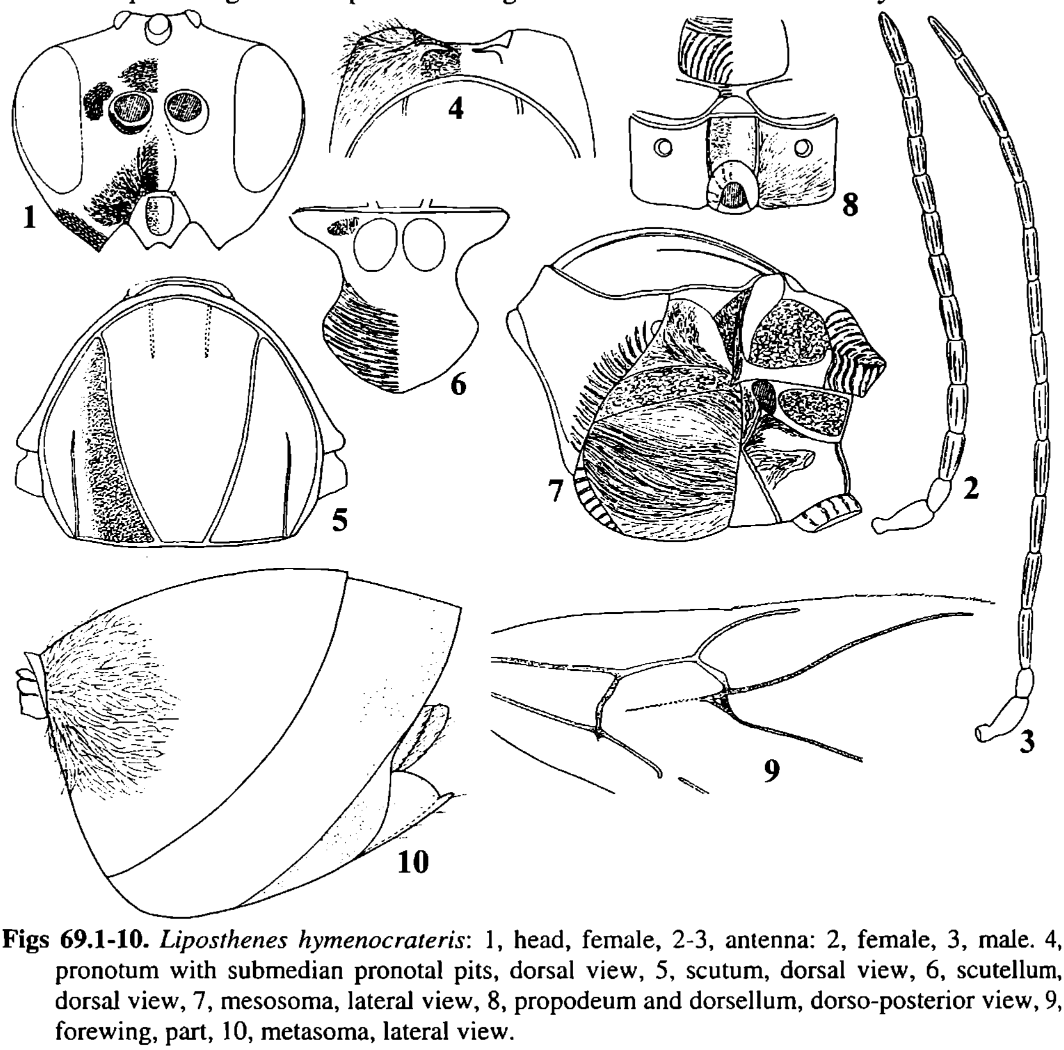
Figs 68.1-8. *Liposthenes glechomae*, female: 1-4, head: 1, front view, 2, from above. 3, pronotum with submedian pronotal pits, dorsal view, 4, pronotum and propleua, front view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, metasoma, lateral view.

Taxonomic comments. The genus morphologically is similar to *Isocolus*, but can be easily separated by the pronotum being strongly pubescent laterally; the presence of distinct long cilia on the wing margin; F1 longer than F2; the frons, vertex and scutum are reticulate; all metasomal tergites without punctures; the scutellum broadened in the posterior 1/3 and not rounded; apical setae on the ventral spine of the hypopygium extending behind the apex of the spine.

Distribution and Biology. Three species of *Liposthenes* are known: two from the Western Palaearctic Region, *L. glechomae* (accidentally introduced to North America) and *L. kerneri* (recently transferred from the *Aylax* genus, Nieves-Aldrey, 2001a); and the third species, *L. hymenocrateris* Diakontschuk, 1983, known from Turkmenistan (Diakontschuk, 1983a). *Liposthenes glechomae* and *L. kerneri* induce galls on leaves and stems of *Nepeta* species, while L. *hymenocrateris* on stems of *Hymenocrater bituminosus* Fisch. et Mey. (Lamiaceae) (Diakontschuk, 1983a). All species are known from the sexual generation only and all are monovoltine.

Key to palaearctic *Liposthenes* species

1. Female antenna 13-14-segmented; male antenna 15-segmented, very thin, longer than body; lower face and malar space with short striae; submedian pronotal pits transversely very narrow; scutum alutaceous; scutellum with strong transverse rugae, strongly overhanging metanotum in lateral view; scutellar foveae small, rounded, broadly separated; central propodeal area alutaceous, dorsellum very narrow, with some wrinkles; Rs+M absent, invisible, Cu1b nearly straight; metasomal tergite 2 with large patch of dense setae antero-laterally; tergite 3 postero-dorsally and subsequent tergites with punctures. Figs 69.1-10. .... ***hymenocrateris****



Figs 69.1-10. *Liposthenes hymenocrateris*: 1, head, female, 2-3, antenna: 2, female, 3, male. 4, pronotum with submedian pronotal pits, dorsal view, 5, scutum, dorsal view, 6, scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part, 10, metasoma, lateral view.

-- Female antenna 13-segmented; male antenna 14-segmented, shorter; lower face and malar space without striae; submedian pronotal pits rounded; scutum reticulate; scutellum dull rugose, without transverse rugae, slightly overhanging metanotum;

scutellar foveae large, transverse, separated by a very narrow median carina; central propodeal area microreticulate, dorsellum dull coriaceous; Rs+M distinct, extending to 2/3 of distance between areolet and basalis, Cu1b strongly curved towards wing margin; metasomal tergite 2 with small patch of sparse setae antero-laterally; all tergites without conspicuous punctures. Figs 70.1-17. 2

2. Fl slightly longer than F2; pronotum with dense white setae along anterior margin, laterally with transverse rugae along posterior margin; R1 not reaching wing margin, radial cell opened; galls in leaves and stems .... ***glechomae***

-- Fl slightly shorter than F2; pronotum without dense white setae along anterior margin, laterally without transverse rugae along posterior margin; R1 continuing along wing margin, radial cell partially closed; galls in fruits .... ***kerneri***

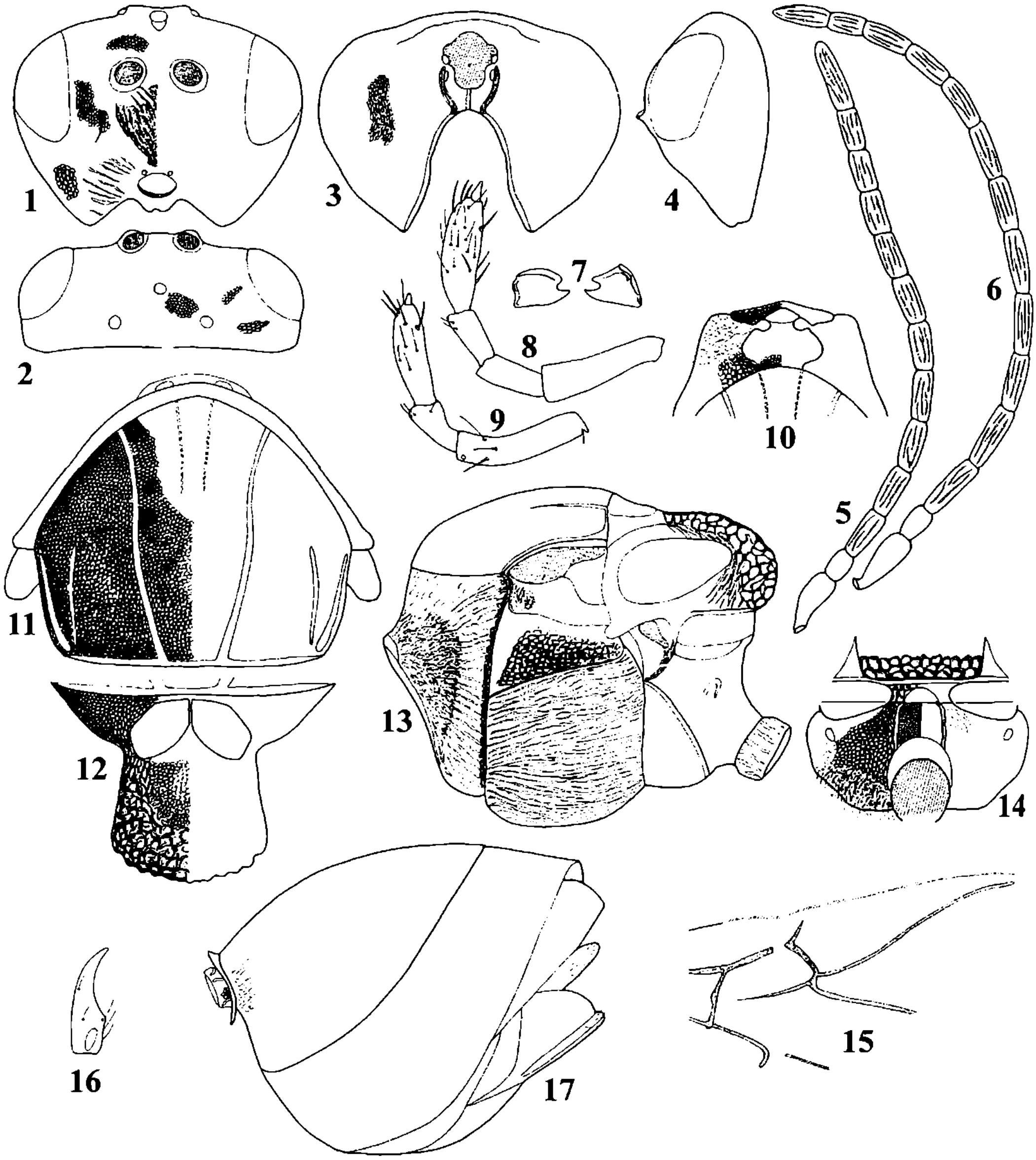
Liposthenes glechomae **(Linnaeus, 1758)**

Figs 70.1-17, Plate 9.14.

Cynips glechomae Linnaeus, 1758: 553 (female, gall); *Aulax glechomae* Kieffer, 1902d: 94; *Aulax Latreillei*(!) Kieffer, 1898: 257 (female, gall); *Aylax glechomae* Hartig, 1841: 342 (female); *Diastrophus glechomae*: Cameron, 1893: 46.

Description. Female. 2.8-3.3 mm. Head and mesosoma black, sometimes with dark brown tone; antennae reddish brown, except darker scape; mandibles and palpi reddish brown; legs uniformly reddish brown; metasoma reddish brown, darker dorsally. Wing veins distinct, dark brown. Head delicately coriaceous to alutaceous, with uniformly sparse white setae, 2.3 times as broad as long from above, 1.3 times as broad as high and slightly broader than mesosoma. Gena alutaceous to microreticulate, not broadened behind eye, invisible in front view behind eye. Malar space alutaceous, with delicate striae radiating from clypeus and extending at most to 1/2 of its length, 0.8 times as long as height of eye. POL 1.45 times as long as OOL; 1.7-1.9 times as long as LOL and 5.3 times as long as diameter of lateral ocellus. Transfacial distance 1.6 times as long as height of eye; diameter of antennal torulus 1.5-1.7 times as long as distance between them, slightly shorter than distance between torulus and eye inner margin. Lower face reticulate, with some short irregular striae radiating from clypeus into lateral part only; median elevated area with strong short irregular rugae reaching antennal socket and without rugae in between antennal sockets. Clypeus rugose, rounded, distinctly impressed along distinct anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line, elevated in the middle; ventral margin projecting over mandibles, rounded and slightly incised medially. Frons uniformly microreticulate, with smooth, shining impression under central ocellus. Vertex and occiput alutaceous to microreticulate. Postocciput and postgena alutaceous to reticulate; posterior tentorial pits small; gula broader than high; gular sulci free, well-separated ventrally, slightly curved outwards anteriorly; occipital foramen at least 2.5-3.0 times as high as height of gula and at least 3.0 times as long as hypostomal foramen. Mandibles, maxillar and labial palps on figures. Antenna 13-segmented, slightly longer than head+mesosoma; pedicel 1.5 times as long as broad; Fl 1.6 times as long as pedicel and equal F2; F2 only very slightly shorter or equal F3; F11 1.75 times as long as F10; placodeal sensilla on all flagellomeres. Mesosoma convex, slightly longer than high in lateral view, with sparse white setae. Pronotum dorsally long, laterally, especially along anterior margin, with very dense white long setae; with short parallel rugae along posterior margin. Submedian pronotal pits deep, ovate, separated by a distance longer than width of a pit; pronotal plate microreticulate, distinctly delimited all around. Scutum regularly reticulate and shining; notauli complete, well-impressed; median mesoscutal line in a form of very short triangle or absent. Scutellum elongated, dull rugose with more delicate coriaceous to reticulate sculpture in the middle of disk, slightly overhanging metanotum. Scutellar foveae deep, rounded, smooth and shining, well-delimited around, separated by a very narrow central carina. Mesopleuron with transverse delicate interrupted striae; mesopleural triangle coriaceous. Metapleural sulcus reaching mesopleuron in the upper 1/3 of its height; axillula ovate, alutaceous, mat, with few setae, very deep and well-delimited posteriorly also; subaxillular bar smooth, shining, as high or slightly shorter than height of metanotal trough.

Dorsellum coriaceous, medially nearly 2.5-3.0 times as short as height of ventral impressed area; metanotal trough alutaceous, mat, with few white setae, ventral impressed area smooth, shining.



Figs 70.1-17. *Liposthenes glechomae*: 1-4, head, female: 1, front view, 2, from above, 3, posteriorly, 4, lateral view. 5-6, antenna: 5, female, 6, male. 7-17, female: 7, mandibles, 8, palpus maxillaris, 9, palpus labialis, 10, pronotum with submedian pronotal pits, dorsal view, 11, scutum, dorsal view, 12, scutellum, dorsal view, 13, mesosoma, lateral view, 14, propodeum and dorsellum, dorso-posterior view, 15, forewing, part, 16, tarsal claw, 17, metasoma, lateral view.

Propodeum coriaceous to alutaceous; lateral propodeal carinae straight, parallel, uniformly thick, with setae; central propodeal area reticulate, with setae; lateral propodeal area with relatively dense white setae; nucha long, with uniform delicate longitudinal wrinkles. Forewing margin with short cilia; radial cell opened, 3.5 times as long as broad, R1 and Rs not reaching wing margin; areolet absent, Rs+M extending to 3/4 of distance between areolet and basalis, projecting slightly below the mid height of it. Tarsal claws without basal lobe. Metasomal tergite 2 with small patch of sparse setae antero-laterally; all tergites without punctures, hypopygium with punctures, prominent part of ventral spine of hypopygium very short, with some setae, apical setae extending behind apex of spine. Male. 2.8-3.2 mm. Similar to female but antenna 14-segmented, F1 1.9-2.0 times as long as pedicel and equal F2, F2 slightly longer than F3.

Gall (Plate 9.14). Galls are developing on leaves, leaf midribs and stems, irregular, rounded or ellipsoid swellings, 5-22 mm, greyish or brown when mature and dried; internally the gall with radiating dry fibres, the larval chamber located in the centre, attached to fibres; the surface of the gall with short soft spines. Often galls are coalesced and form a large conglomerate. The gall during its growing is glassy, than turn reddish and when mature became brownish; during the development the surface becoming more and more pubescent, silver-white; after drying, the surface is peeled. The infested leaf plate is limited in growing but never malformed. The gall is covered with a thin epidermis, under which a radiating parenchimatous nutritive tissue covers the larval cell in which one white gall-inducer larva is located. A detailed description of the inner structure of the gall is given by Belizin (1959), histology and physiology of the gall were also studied in details (Taylor, 1949; Gaufillet & Fourcroy, 1966; Rohfritsch, 1974, 1975).

Diagnosis. Most closely related to *L. kerneri*, but in *L. glechomae* F1 of the female antenna slightly longer than F2; the pronotum with dense white setae along the anterior margin and laterally with transverse rugae along the posterior margin; R1 of the forewing do not reaching the wing margin, the radial cell is opened; galls are in leaves and stems, while in *L. kerneri* F1 slightly shorter than F2; the pronotum without dense white setae along the anterior margin and laterally without transverse rugae along the posterior margin; R1 continuing along the wing margin and the radial cell partially closed; galls are in fruits.

Distribution. Common throughout Europe, RO (Ionescu, 1957, 1973), NL (Weld, 1952), PL (Kierych, 1979), GB (Eady & Quinlan, 1963; Cameron, 1893), DK, NO, FI, SE (Coulians & Holmåsen, 1991), RU (vicinities of Leningrad, Kostroma, Kursk, Moscow, Tula, Voronezh and Saratov Regions (Belizin, 1959)); Eastern Kazakhstan (Zerova, Diakontschuk & Ermolenko, 1988). Introduced to North America (USA, Ohio, New York; Canada, Ontario (Burks, 1979)). Common everywhere in Ukraine (Diakontschuk, 1981; Zerova, Diakontschuk & Ermolenko, 1988), particularly vicinities of Kiev, Zhytomir and Transcarpathian Regions (about 150 examined specimens in the collection of SIZK).

Biology. Monovoltine. Galls mature in autumn, larvae overwintering in the gall, chewing an emerging tunnel before pupating and adults emerge next year, in April – May (Belizin, 1959; Zerova, Diakontschuk & Ermolenko, 1988). Host plants: *Nepeta* (= *Glechoma*) *hirsuta* L. and *N. hederacea* L. (Lamiaceae).

Liposthenes kerneri (Wachtl, 1891)

Plate 9.15.

Aylax kerneri Wachtl, 1891: 277 (female, male, gall); *Aulacidea kerneri*: Nieves-Aldrey, 1994b: 181; *Liposthenes kerneri*: Nieves-Aldrey, 2001a: 524.

Description. Very similar to *L. glechomae*. Female. 1.7-2.1 mm. Body entirely black, except dorsal part of tergites. Antenna chestnut brown, with black scape and distal flagellomeres; coxae and basal parts of femurs black, tibiae and tarsi chestnut brown. Wings hyaline, veins light brown. Ventral margin of clypeus projecting onto mandibles. Lower face with very short striae, radiating from clypeus and extending to 1/2 of lower face length, not reaching eye and antennal socket; median elevated area of lower face without striae. Frons and vertex delicately coriaceous. Antenna 13-segmented; pedicel slightly longer than broad; and slightly shorter than F2 and F3, F11 1.7 times as long as F10; placodeal sensilla from F2. Pronotum longer medially. Pronotum and propodeum laterally with much less setae. Submedian pronotal pits separated by a distance larger than width of a pit; pronotal plate well-delimited around, smooth, shining. Pronotum laterally coriaceous, without transverse strong rugae along posterior margin. Scutum shining, delicately coriaceous; notauli complete; median mesoscutal line sometimes extending to 3/4 of scutum length. Scutellum dull rugose; scutellar foveae rounded, well-delimited around, smooth, shining.

Mesopleuron delicately costulate-striate; axillula large, deep, well-delimited postero-dorsally. Lateral propodeal carinae subparallel, delimiting a quadrangular central area; lateral propodeal area with relatively dense setae. Forewing margin with short cilia, radial cell partially opened, R1 extending to margin of wing, running along it on a small distance, radial cell 2.5 times or more as long as broad, areolet depigmented. Metasoma as long as mesosoma; metasomal tergite 2 occupying 1/3 of metasoma length; metasomal tergites 3 and 4 with some indistinct sparse punctures dorsally. Male similar to female, but antenna 14-15-segmented and the body colour is lighter.

Gall (Plate 9.15). The monolocular gall is forming in a flower head, rounded, up to 2 mm in diameter, with lignified walls and smooth surface. In the fruit, which normally is separated into four chambers, each of which containing one seed, one of the seeds, due to the gall wasp larva is strongly enlarged, while the rest of seeds are atrophized. The surface of the galled seed smooth, yellowish green.

Diagnosis. See Diagnosis to *L. glechomae.*

Distribution. AT, TR (Kieffer, 1897-1901), RU (Kursk Region (Belizin, 1959)), ES (Nieves-Aldrey, 1992), IT, RO (Ionescu, 1957, 1973), HU (Ambrus, 1974). In Ukraine (Diakontschuk, 1981; Zerova, Diakontschuk & Ermolenko, 1988), particularly in Crimea (Wachtl, 1891), Donetsk Region, Khomutovskyj steppe Natural Reserve (1 male examined, SIZK collection).

Biology. Galls mature in July and fall off the plant. The larva overwintering in the gall, adults emerge next spring, in May -- June (Zerova, Diakontschuk & Ermolenko, 1988). Host plants: *Nepeta cataria* L., *N. grandiflora*Bieb., *N. nuda* L., *Nepeta parviflora* M.B., *N. latifolia* DC, *N. ucrainica.*

Neaylax Nieves-Aldrey, 1994

Neaylax Nieves-Aldrey, 1994a: 188. Type species: *Aylax salviae* (Giraud, 1859), designated by Nieves-Aldrey (1994a).

Head 2.0 times as broad as long from above, slightly broader than high in front view. Gena not broadened behind eye. Lower face with striae, radiating from clypeus and reaching eye and extending into the area between inner margin of eye and antennal socket; median elevated area coriaceous. Malar space with striae, radiating from clypeus and extending nearly to inner margin of eye but never reaching it. Frons and vertex coriaceous to alutaceous. Female antenna 12-13-segmented, F1 equal or shorter than F2; male antenna 14-15-segmented. Pronotum dorsally long; submedian pronotal pits distinctly impressed, transverse, separated by a distance around 2.0 times shorter than width of a pit. Scutum coriaceous or alutaceous, with piliferous points; notauli complete or faint anteriorly; scutellar foveae large, rounded; mesopleuron transversely striate. Wings hyaline; radial cell of forewing open on front margin, R1 reaching or not wing margin; distal wing margins with moderately long cilia. Tarsal claws simple, without basal lobe. Metasomal tergite 2 with or without a patch of sparse setae antero-laterally; posteriorly with or without a narrow band of punctures; subsequent tergites and hypopygium densely punctuate; hypopygium large, prominent part of ventral spine of hypopygium short, with few white setae, not extending behind apex of spine.

Taxonomic comments. The genus *Neaylax* was erected to comprise some species formerly included into *Aylax*, but which do not fit well in that genus (Nieves-Aldrey, 1994b). This genus is closely related to *Isocolus*, which from it differs as follows: the scutum delicately coriaceous or microreticulate, with distinct piliferous points, never transversely striate; the radial cell of the forewing opened or partially opened, sometimes R1 reaching and extending further along the wing margin; wing margin with cilia. Biologically, *Neaylax* differs from *Isocolus* in its association with Lamiaceae rather than with Asteraceae. The dorsally long pronotum, the rounded scutellar foveae, and the association with Lamiaceae and not with Papaveraceae separate it from *Aylax.*

Aulacidea verticillica Belizin, 1959 was described from the European part of Russia (Kursk Region) and known to induce galls at the base of flower heads of *Salvia verticillata* L. (Lamiaceae) (Belizin, 1959; Zerova, Diakontschuk & Ermolenko, 1988). However, after the examination of the type (Zoological Institute, St. Petersburg, Russia) and some specimens in the collection of SIZK, no doubts, that it is a *Neaylax* species and thus transferred: *Neaylax verticillica* (Belizin, 1959), **comb. n.**

Distribution and Biology. Three species are known: *N. verbenacus* -- from the Iberian Peninsula and Italy, known to induce galls on *Salvia* species (Lamiaceae), another species, *N. versicolor* is known only from Spain and the host plant is unknown. The third species, *N. salviae* has a palaearctic distribution (see below).

Key to *Neaylax* species

(species marked with (*) are uknown for the Ukrainian fauna)

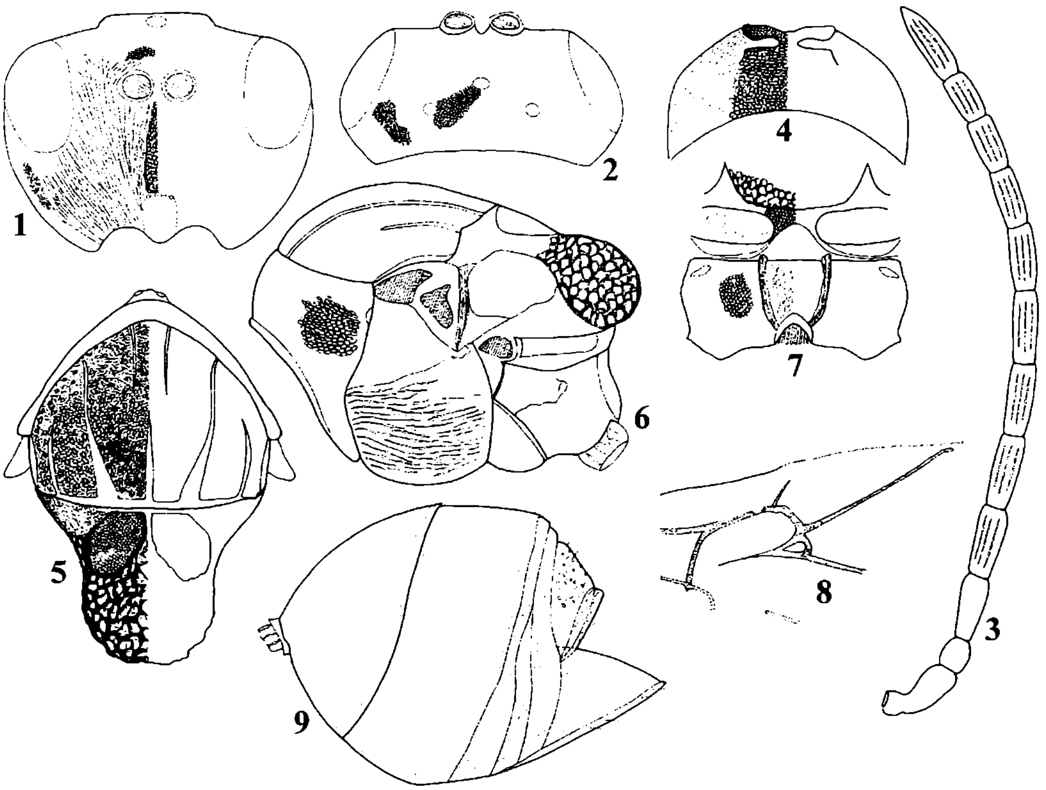
1. Notauli distinctly impressed prolong all length; body mainly black; R1 not reaching wing margin; metasomal tergite 2 without a patch of setae antero-laterally; galls on fruits of *Salvia* 2
-- Notauli indistinct in anterior 1/3; body mainly brown or light reddish brown; R1 distinctly reaching wing margin; metasomal tergite 2 with a patch of setae antero-laterally; galls unknown .... ***versicolor****
2. Scutum with distinct piliferous points; transfacial distance 1.5 times as long as height of eye; median mesoscutal line extending at least to 1/2 of scutum length .... ***salviae***
-- Scutum without piliferous points; transfacial distance 1.2 times as long as height of eye; median mesoscutal line absent .... ***verbenacus****

Neaylax salviae (Giraud, 1859)

Figs 71.1-9, Plate 10.1.

Aulax salviae Giraud, 1859: 369 (female, male, gall); Kieffer, 1902d: 95; *Isocolus salviae*: Nieves-Aldrey, 1988: 224; *Neaylax salviae*: Nieves-Aldrey, 1994b.

Description. Female. 2.8-3.5 mm. Head and mesosoma black; antennae very dark brown, scape and pedicel black; mandibles and palpi chestnut brown brown; coxae, trochanters, basal 4/5 of femurs very dark brown to black, tibiae and tarsi chestnut brown; metasoma dark chestnut brown, dorsally darker, hypopygium light chestnut brown. Wing veins pale brown. Head alutaceous, with uniformly sparse white setae, 1.8 times as broad as long from above, 1.33 times as broad as high and slightly broader than mesosoma. Gena alutaceous to microreticulate, not or slightly broadened behind eye, invisible in front view behind eye. Malar space alutaceous, with short interrupted striae radiating from clypeus and nearly reaching inner margin of eye, 0.9 times as long as height of eye. POL 2.1 times as long as OOL; 2.3 times as long as LOL and 7.0 times as long as diameter of lateral ocellus. Transfacial distance 1.5 times as long as height of eye; diameter of antennal torulus 4.5 times as long as distance between them and slightly shorter than distance between torulus and eye inner margin. Lower face alutaceous, with short irregular striae radiating from clypeus, reaching eye and extending into area between antennal socket and inner margin of eye; median elevated area strongly raised, coriaceous, without striae. Clypeus very small, higher than broad, rugose, deeply impressed along distinct epistomal sulcus and clypeo-pleurostomal line, anterior 2/3 of clypeus strongly raised; ventral edge much lower, rounded; anterior tentorial pits small, indistinct. Frons, vertex and occiput uniformly microreticulate to alutaceous. Postocciput and postgena alutaceous to reticulate. Antenna 12-segmented, slightly longer than head+mesosoma; pedicel 1.2 times as long as broad; F1 1.9 times as long as pedicel and slightly shorter than F2; F2 only very slightly shorter than F3; F10 only very slightly longer than F9; placodeal sensilla on F2-F11. Mesosoma convex, 1.3 times as long as high in lateral view, with sparse white setae. Pronotum dorsally microreticulate; with relatively dense white setae along anterior margin; laterally delicately coriaceous to microreticulate. Submedian pronotal pits deep, transverse, separated by a distance nearly 2.0 times as long as width of a pit; pronotal plate microreticulate, without setae, distinctly delimited in the anterior 1/4 only. Scutum regularly microreticulate, with distinct large piliferous points, slightly broader than long, 1.3 times as long as scutellum. Notauli complete, deeply impressed and strongly broadened posteriorly; median mesoscutal line very indistinctly impressed, however, extending at least to half length of scutum; parapsidal lines reaching above tegulae; anterior parallel lines reaching to 1/3 of scutum length.



Figs 71.1-9. *Neaylax salviae*, female: 1-2, head: 1, front view, 2, from above. 3, antenna, 4, pronotum with submedian pronotal pits, dorsal view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, forewing, part, 9, metasoma, lateral view.

Scutellum slightly elongated, uniformly dull rugose, slightly overhanging metanotum. Scutellar foveae deep, rounded, microreticulate, well-delimited around, separated by very narrow raised central carina. Mesopleuron with transverse delicate interrupted striae; space between striae and area without striae microreticulate; mesopleural triangle alutaceous. Metapleural sulcus reaching mesopleuron slightly above 1/2 of its height; axillula ovate, shining, with some piliferous points and setae, very deep and well-delimited posteriorly also; subaxillular bar smooth, shining, higher than height of metanotal trough; pit over strongly elevated propodeal spiracle deep, shining, with wrinkles, carina along anterior border of propodeal spiracle strongly raised; ventral bar of metanotal trough smooth, shining, at least 2.5-3.0 times narrower than height of metanotal trough. Dorsellum delicately coriaceous to microreticulate, medially nearly 2.5-3.0 times as short as height of smooth, shining ventral impressed area; metanotal trough alutaceous, mat, with few white setae. Propodeum microreticulate; lateral propodeal carinae nearly subparallel, slightly curved inwards in the most posterior part; uniformly broad, with setae; central propodeal area reticulate, with setae; lateral propodeal area with relatively dense white setae, also reticulate; nucha short, with some very delicate irregular wrinkles. Forewing margin with short cilia; radial cell opened, 3.0 times as long as broad, R1 and Rs not reaching wing margin; areolet indistinct, Rs+M reaching to 2/3 of distance between areolet and basalis, projecting slightly below the mid height of it. Tarsal claws narrow, simple, without basal lobe. Metasoma slightly longer than head+mesosoma, nearly as long as high in lateral view; metasomal tergite 2 without setae antero-laterally, with a very narrow posterior band of distinct punctures; subseqeunt tergites and large hypopygium with distinct, dense punctures; prominent part of ventral spine of hypopygium very short, with sparse setae, apical setae extending behind apex of spine. Male. 2.5-3.2 mm. Similar to female but antenna 13-14-segmented, body colour slightly lighter.

Gall (Plate 10.1) is rounded, monolocular, thin-walled, 4.0-6.0 mm in diameter. The gall is forming at the base of the flower head; two-three, sometimes more galls are developing.

Diagnosis. Most closely related to *N. verbenacus*, but in *N. salviae* the transfacial distance 1.5 times as long as the height of an eye; submedian pronotal pits separated by a distance nearly 2.0 times as long as the width of a pit; the scutum with distinct piliferous points; the median mesoscutal line indistinctly impressed, however, extending at least to the half length of the scutum; scutellar foveae separated by a very narrow raised central carina; the mesopleuron with distinct transverse striae, while in *N. verbenacus* the transfacial distance 1.2 times as long as the height of an eye; submedian pronotal pits separated by a distance slightly larger than the width of a pit; the scutum without piliferous points; the median mesoscutal line absent; scutellar foveae anteriorly often reaching one another; separated by a very narrow raised central carina; the mesopleuron coriaceous-reticulate.

Distribution. ES (Nieves-Aldrey, 1987), RO (Ionescu, 1973), DE, AT, IT (Kieffer, 1897-1901), HU (Ambrus, 1974), IL (Argaman, 1989), former Yugoslavia (Dalmatia) (Giraud, 1859), RU (Kursk and Belgorod Regions, Altajskij (Belizin, 1959; Zerova, Diakontschuk & Ermolenko, 1988). In Ukraine known from Crimea (Belizin, 1959; Diakontschuk, 1981, 1987; 18 examined specimens reared from flower heads of *Salvia sclarea* L. in Crimea and deposited in the collection of SIZK); Transcarpathian Region, vicinities of Uzhgorod (few specimens were reared by the author from stems of *S. silvestris* L.).

Biology. Galls mature in autumn, adults in June-July (Zerova, Diakontschuk & Ermolenko, 1988). Host plants: *Salvia nemorosa* L., *S. nutans* L., *S. officinalis* L., *S. pratensis* L., *S. sclarea* L., *S. silvestris* L., *S. transsilvanica* L. (Lamiaceae) (Belizin, 1959).

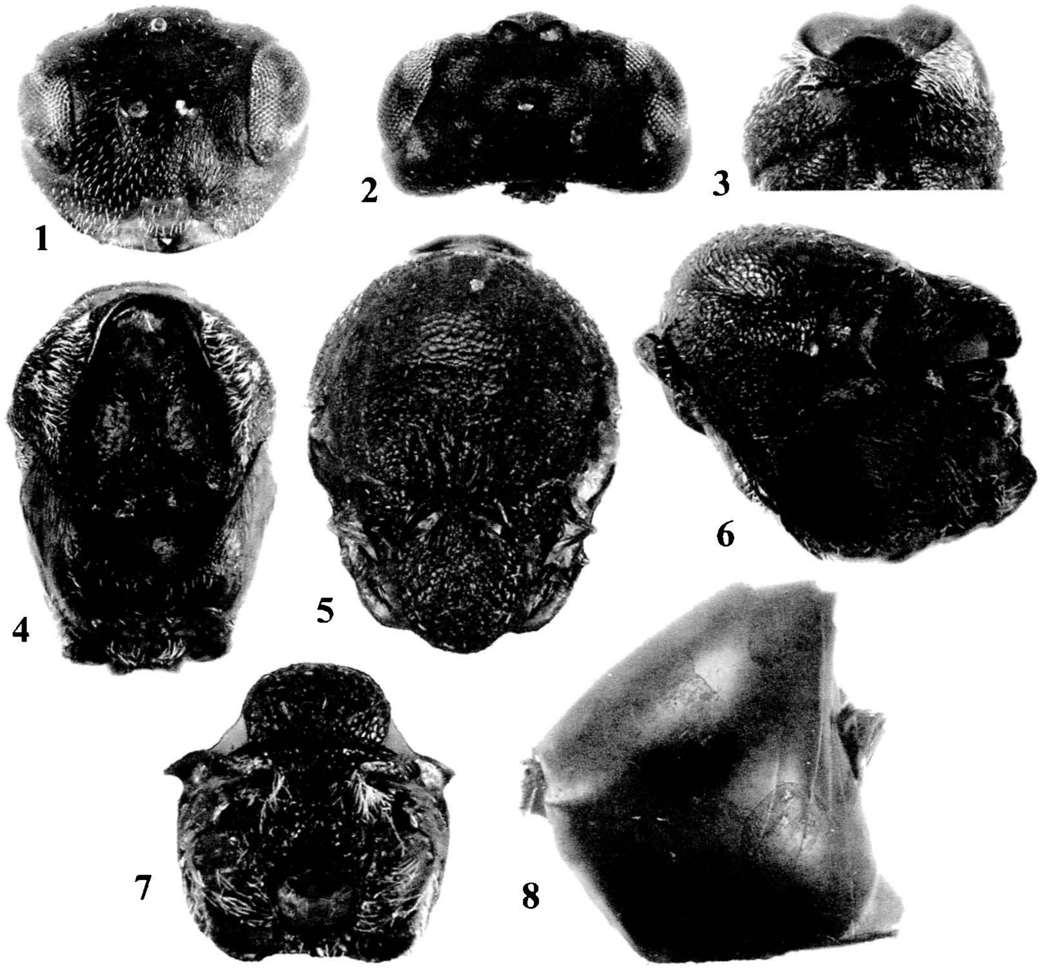
Panteliella Kieffer, 1901

Figs 72.1-8.

Pantelia Kieffer, 1897-1901: 248 (non Bolivar, 1887, Orthoptera); *Panteliella* Kieffer, 1897-1901: 324. Type species: *Aulax fedtschenkoi* (Rübsaamen, 1896), designated by Rohwer & Fagan (1917). *Endocaulonia* Ionescu & Roman, 1960: 222 (synonym in Nieves-Aldrey, 1994b: 189). Type species: *Endocaulonia bicolor* Ionescu & Roman, 1960: 223, original designation. *Vetustia* Belizin, 1959: 665-666 (female, male, gall), **syn. n.** Type species: *Vetustia investigata* Belizin, 1959: 666, original designation.

Head transverse in front view, slightly broader than high, delicately coriaceous to alutaceous; striae on lower face very weak, delicate, sometimes indistinct. Female antenna 13-segmented (very rarely indistinct suture dividing F11 and than antenna seems to be 14-segmented); male -- 14-segmented; F1 nearly equal F2 in both sexes. Submedian pronotal pits present, however, in some specimens very indistinct, small. Scutum very delicately coriaceous along lateral sides, with some distinct short transverse interrupted rugae mesad parapsidal lines, internotauli area posteriorly with some longitudinal rugae. Notauli narrow, incomplete, very indistinctly impressed or absent in anterior half or even more; median mesoscutal line indistinct, hidden by sculpture or in a form of short triangle; scutellar foveae transversely ovate, broader than long, separated by a narrow median carina; mesopleuron uniformly longitudinally striate. Radial cell of forewing open on the margin, Rs and R1 never reaching wing margin, 2.8-3.6 times as long as broad; cilia on wing margin distinct. Metasomal tergite 2 without a patch of setae antero-laterally, with or without a small punctured area dorso-posteriorly; subsequent tergites with some indistinct weak scattered punctures dorsally and laterally, punctures never cover the entire surface of tergites and area covered with punctures strongly vary; hypopygium without punctures. Tarsal claws simple.

The genus related to *Neaylax* and *Rhodus*, however, can be easily distinguished by incomplete narrow notauli, absence of distinct piliferous points on the scutum, a very sparse indistinct scattered punctures on metasomal tergites. From *Rhodus* it is also differs by the presence of long cilia on wing margin, F1 equal F2.



Figs 72.1-8. *Panteliella fedtschenkoi*, female: 1-2, head: 1, front view, 2, from above. 3, pronotum with submedian pronotal pits, dorsal view, 4, pronotum and propleura, front view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, metasoma, lateral view.

Taxonomic comments. Belizin in his original description (1959) mentioned that the genus *Vetustia* closely related to *Liposthenes*, *Aylax* and *Isocolus*, without mentioning *Panteliella*. Diagnostic characters given by him are insufficient to distinguish *Vetustia* from *Panteliella*. The only characters in his description: the complete notauli and the presence of an areolet, whih are unusual for *P. fedtschenkoi*, were also found in some abberant specimens examined by us in SIZK collection. Quinlan (1968) treated *Vetustia* as a distinct genus and separated *Vetustia* from *Panteliella* on the basis of the absence of submedian pronotal pits. However, submedian pronotal pits are present even in the type specimens, so they are very small and indistinct. Specimens of *P. fedtschenkoi* with very indistinct small submedian pits were found by us in between examined specimens in the SIZK collection. Thus, we do not except this character as a diagnostic one and treat *Vetustia* as a **syn. n.** of *Panteliella* and *V. investigata* as a **syn. n.** of *Panteliella fedtschenkoi*.

Distribution and Biology. The only known species, *Panteliella fedtschenkoi* (Rübsaamen, 1896) is distributed throughout Europe and Eastern Mediterranean Region. Mentioned also for Mongolia (Belizin, 1959). It induces galls in stems, leaves and flower heads of *Phlomis tuberosa* L. (Lamiaceae).

Panteliella fedtschenkoi (Rübsaamen, 1896)

Figs 73.1-16, Plate 10.2-5.

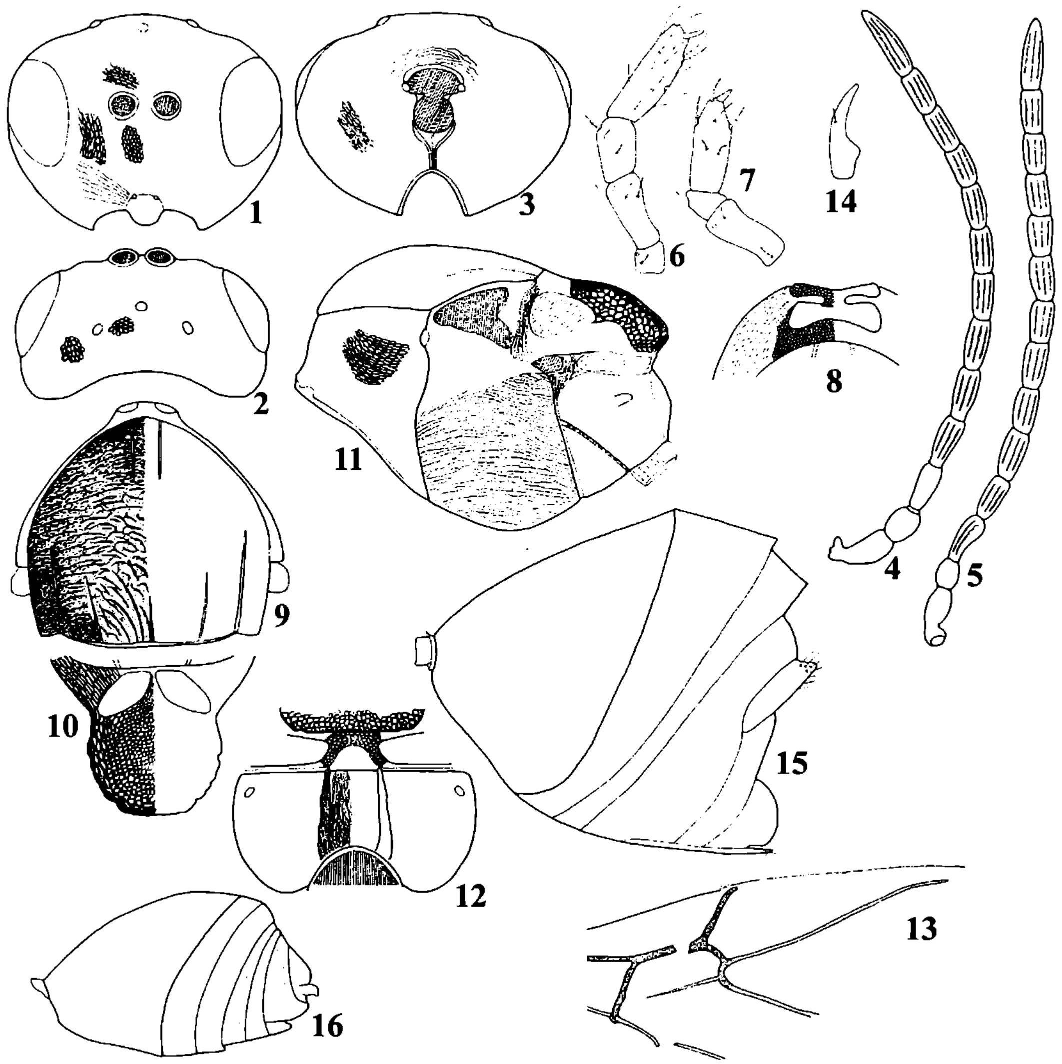
Aulax fedtschenkoi Rübsaamen, 1896: 472 (female, gall); *Panteliella fedtschenkoi*: Kieffer, 1897-1901: 325 (female, gall); *Endocaulonia bicolor* Ionescu & Roman, 1960: 223 (female, male); **syn. n.**; *Panteliella bicolor*: Nieves-Aldrey, 1994b: 189; *Vetustia investigata* Belizin, 1959: 665-666 (female, male, gall); Quinlan, 1968: 285 (female); **syn. n.** (types examined);

Description. Female. 2.0-2.8 mm. Head in specimens usually emerging from leaf and inflorescence galls black, while brown to light brown (especially lower face and gena) in specimens emerging from stem galls; mandibles and palpi light brown. Antenna from dark brown to yellowish brown. Mesosoma black, sometimes dark brown; legs light brown to yellowish. Metasoma dark reddish brown, more darker dorsally, often distal tergites darker, to black. Wing veins from dark to pale brown. Head delicately coriaceous to alutaceous, with uniformly sparse white setae, 1.7 times as broad as long from above, 1.2 times as broad as high in front view and slightly broader than mesosoma. Gena alutaceous, slightly broadened behind eye, not visible in front view behind eye. Malar space alutaceous, with few very delicate striae radiating from clypeus and extending to half or more length of malar space, however, never reaching eye margin, 0.6 times as long as height of eye. POL 1.7-1.9 times as long as OOL; 2.0 times as long as LOL and 6.0 times as long as diameter of lateral ocellus; ocelli very small. Transfacial distance 1.4 times as long as height of eye; diameter of antennal torulus 3.0 times as long as distance between them, slightly shorter than distance between torulus and eye inner margin. Lower face alutaceous, sometimes with some indistinct striae, radiating from clypeus but never reaching eye margin and antennal socket (in some specimens some piliferous points also visible); median elevated area delicately coriaceous or reticulate. Clypeus alutaceous, with very indistinct small anterior tentorial pits, with indistinct epistomal sulcus and clypeo-pleurostomal line, ventral margin rounded. Frons alutaceous, sometimes with few indistinct piliferous points. Vertex and occiput delicately alutaceous or microreticulate. Postocciput and postgena alutaceous, with very delicate striae; posterior tentorial pits small, rounded; gula narrow, higher than broad, gular sulci distinct, parallel and touching one another in the lower half of gula and curved outwards in the upper half; occipital foramen higher than gula and equal in height to height of hypostomal foramen. Maxillar and labial palps on Figs 73.6-7. Antenna 13-segmented (very rarely indistinct suture dividing F11 and than antenna seems to be 14-segmented); more or less half of body length; pedicel 1.2 times as long as broad, F1 1.4 times as long as pedicel and equal F2; F2 equal F3; F11 1.8 times as long as F10; placodeal sensilla on F2-F11. Mesosoma flattened dorso-ventrally, not convex, only 1.2 times as long as high in lateral view, with sparse white setae. Pronotum alutaceous dorsally, very delicately coriaceous laterally; with moderately dense white setae along anterior margin. Submedian pronotal pits usually present, well-delimited (in some specimens very indistinct, small) transverse, medially separated by a very narrow elevated part of pronotum; pronotal plate distinctly delimited all around, alutaceous to smooth; pronotum asides of pronotal plate with dense white setae. Scutum slightly longer than broad, 1.6 times as long as scutellum, very delicately coriaceous along lateral sides, with some distinct short transverse interrupted rugae mesad parapsidal lines, internotauli area posteriorly with some longitudinal rugae. Notauli narrow, incomplete, very indistinctly impressed or absent in anterior half or even more; median mesoscutal line indistinct, hidden by sculpture or in a form of short triangle; parapsidal line indistinct, narrow, extending slightly above tegula; anterior parallel lines extending to 1/4-1/3 of scutum length. Scutellum nearly rounded only very slightly or not longer than broad, rounded posteriorly, dull rugose along sides; disk of scutellum with more delicate sculpture; very slightly overhanging metanotum. Scutellar foveae transversely ovate, broader than long, separated by a narrow median carina; deep, indistinctly delimited posteriorly, smooth, shining, without setae, medially separated by narrow longitudinally striate carina (in some specimens scutellar foveae medio-anteriorly touching one another). Mesopleuron, including speculum, with uniform interrupted transverse very delicate striae, spaces between them smooth; mesopleural triangle with very delicate longitudinal parallel wrinkles. Metapleural sulcus reachinig mesopleuron in the upper 1/3 or less of its height; axillula transversely ovate, smooth, shining, with few piliferous points; subaxillular bar smooth, shining, higher than height of metanotal trough; metapleuron with piliferous points; ventral bar of metanotal trough delicately coriaceous, with some longitudinal weak wrinkles, as broad as height of metanotal trough. Dorsellum delicately coriaceous, medially slightly shorter than height of smooth, shining ventral impressed area; metanotal trough smooth to alutaceous, mat, with few white setae. Propodeum delicately coriaceous to alutaceous, lateral propodeal carinae straight, slightly broader posteriorly, with some setae (in some specimens lateral propodeal carinae indistinct); central propodeal area delicately rugose to coriaceous, with sparse setae; lateral propodeal area with moderately dense setae, rugose. Forewing margin with moderately long cilia; radial cell open along margin, Rs and R1 never reaching wing margin, 2.8-3.6 times as long as broad; areolet usually absent (in some specimens present, indisstinct); Rs+M extending to 3/4 of distance between areolet and basalis. Tarsal claws narrow, simple, without basal lobe. Metasoma nearly as long as head+mesosoma, nearly as high as long or slightly longer than high in lateral view; metasomal tergite 2 without patch of setae antero-laterally, with or without a small punctured area dorso-posteriorly; subsequent tergites with some indistinct weak scattered punctures dorsally and laterally, punctures never cover the entire surface of tergites and area covered with punctures strongly vary; hypopygium without punctures; prominent part of ventral spine of hypopygium very short, without or very few short sparse white setae, not extending behind apex of spine. Male. 1.7-2.3 mm. Similar to female but antenna 15-segmented, pedicel subglobose, only very slightly longer than broad, F1 equal or very slightly longer than F2, slightly curved and broadened apically; F2 slightly shorter than F3; placodeal sensilla on all flagellomeres; punctures from metasomal tergite 5 distinct and dense.

Gall (Plate 10.2-5). Galls in stems, on the upper side of leaves and flower heads of *Ph. tuberosa*. Monolocular rounded or ovate reddish-purple soft galls, 2.0-4.0 mm in diameter, the surface with dense hairs. Often the entire surface of the leaf is covered with galls, up to 100 on one leaf. As the result, the leaf deforming and swelling into a tube and dry out, but even after that, the galls are staying on the leaf, do not follen of the plant. Inside the empty stem lignified, hard, rounded, slightly elongated (up to 2 mm) galls are forming, which are light coloured when growing, turning dark brown to black when mature and larvae inside are ready for overwintering. The stem is without external deformations. The third case is when the gall developing in the inflorescences: galls are protruded from the flower; rounded or slightly elongated, with or without a small short peduncle; 7.5-10 mm long and 5.5-8.5 mm broad; hard, lignified, with small narrow larval chamber, which is 4 mm long and 1.5-2.0 mm broad; surface of the larval cell is rough, dark-grey or brownish, with some distinct ribs; parenchima of the gall is dense, lignified, light-greyish, often differently shaped.

Taxonomic comments. The same gall form, size and host plant are characteristic for *Aulacidea phlomica* and *Phanacis phlomidis*.

Distribution: RO (Ionescu, 1973), HU (Ambrus, 1974), RU (Kursk and Belgorod, Regions (Belizin, 1959)), KZ (Zerova, Diakontschuk & Ermolenko, 1988), Belizin (1959) mentioned this species on the basis of only one collected specimen from Mongolia also. In Ukraine (Diakontschuk, 1981; Zerova, Diakontschuk & Ermolenko, 1988) is known from Crimea (Belizin, 1959), Donetsk Region, Khomutovskyj steppe Natural Reserve (130 examined specimens in the collection of SIZK); Kherson Region, Askania-Nova Natural Reserve (21 examined specimens in the collection of SIZK), and Transcarpathian Region (vicinities of Csop, Latorica riverbank, 16 reared specimens from stem galls on *Ph. tuberosa*).



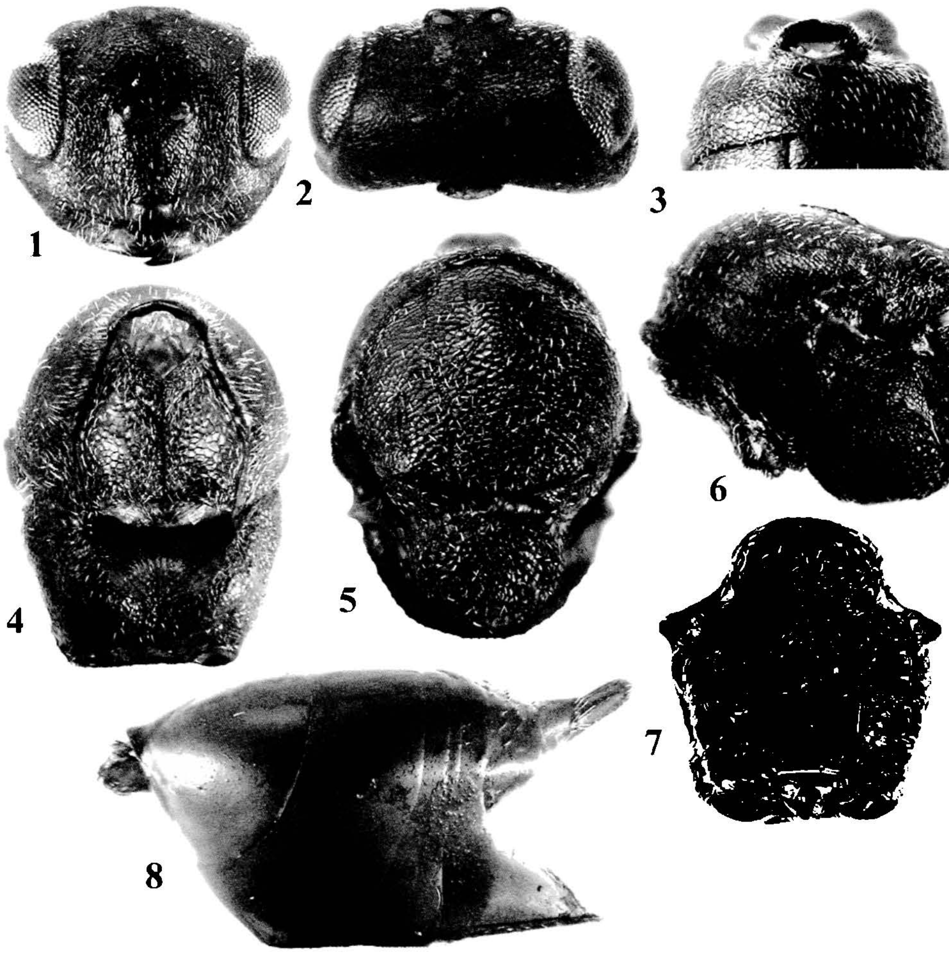
Figs 73.1-16. *Panteliella fedtschenkoi*: 1-3, head female: 1, front view, 2, from above, 3, posteriorly. 4-5, antenna: 4, female, 5, male. 6-15, female: 6, palpus maxillaris, 7, palpus labialis, 8, pronotum with submedian pronotal pits, dorsal view, 9, scutum, dorsal view, 10, scutellum, dorsal view, 11, mesosoma, lateral view, 12, propodeum and dorsellum, dorso-posterior view, 13, forewing, part, 14, tarsal claw, 15, metasoma, lateral view. 16, metasoma, lateral view, male.

Biology. Monovoltine. This species induces galls in stems, leaves and flower heads of *Phlomis tuberosa* (Lamiaceae), the only known and cited host plant. Larvae overwintering in the gall and adults emerge next spring-summer, mainly in May—June (Zerova, Diakontschuk & Ermolenko, 1988), in Russia some adults continuing to emerge through July (Belizin, 1959).

Phanacis Förster, 1860

Figs 74.1-8, 75.1-8.

Phanacis Förster, 1860: 145. Type species: *Phanacis centaureae* Förster, 1860, original designation. *Gillettea* Ashmead, 1897: 69 (synonym in Eady & Quinlan, 1963: 18). Type species: *Gillettea taraxaci* Ashmead, 1897, original designation. *Timaspis* Mayr, 1881: 18, **syn. n.** Type species: *Diastrophus lampsanae* Karsh, 1878, designated by Ashmead (1903). *Aylacopsis* Hedicke, 1923: 81, synonym in Nieves-Aldrey, 1994b: 191. Type species: *Aylacopsis heraclei* Hedicke, 1923, original designation. *Parapanteliella* Diakontschuk, 1981b: 1726, **syn. n.** Type species: *Parapanteliella eugeniae* Diakontschuk, 1981b: 1727, original designation. *Phanacis* (*Pseudophanacis*) Diakontschuk, 1981c: 26-27, **syn. n.**



Figs 74.1-8. *Phanacis centaurea*, female: 1-2, head: 1, front view, 2, from above. 3, pronotum with submedian pronotal pits, dorsal view, 4, pronotum and propleura, front view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, metasoma, lateral view.

Head delicately coriaceous to alutaceous, around 2.0 times as broad as long from above, slightly broader than high in front view, slightly broader than mesosoma. Frons and vertex reticulate-coriaceous. Lower face with delicate or indistinct complete or incomplete striae, radiating from clypeus; median elevated area without striae, delicately coriaceous or alutaceous. Female antenna usually 13-14-segmented (in some species only 12-segmented); male antenna 13-15-segmented; F1 in female longer than F2. Mesosoma distinctly longer than high in lateral view.

Pronotum dorsally moderately long, without separated submedian pronotal pits, they present in a form of a very narrow transverse impression. Scutum reticulate-coriaceous. Notauli usually more or less impressed in posterior half, faint or absent anteriorly; in some species distinctly impressed anteriorly also. Scutellar foveae transverse, confluent, never separated by a median carina; not or very indistinctly delimited (closed) posteriorly. Mesopleuron reticulate, rugoloso-reticulate, rugulose-alutaceous or alutaceous-striate. Wings fully developed in females, sometimes reduced in males; radial cell closed or partially closed, R1 reaching wing margin, sometimes more or less extending along wing margin; wing margin with moderately long cilia. Tarsal claws simple, without basal lobe. Metasoma usually distinctly longer than high in lateral view. Metasomal tergite 2 without a patch of white setae antero-laterally; tergites with or without punctures; prominent part of ventral spine of hypopygium short.

Figs 75.1-8. *Phanacis cichorii*, female: 1-2, head: 1, front view, 2, from above. 3, pronotum with submedian pronotal pits, dorsal view, 4, pronotum and propleura, front view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, metasoma, lateral view.

Taxonomic comments. *Phanacis* is easily distinguishable from other genera of Aylacini, except *Timaspis*, by the absence of submedian pronotal pits and the reticulate sculpture of the mesopleuron. Eady & Quinlan (1963) synonymized *Timaspis* to *Phanacis*. However, later Nieves-Aldrey (1994b) re-established *Timaspis*, and mentioned that the boundary between the two genera does not seem clearly defined and some species, particularly *P. caulicola* (Hedicke), *P. hypochoeridis* (Kieffer), and *Timaspis lampsanae* Perris, are not easily assigned to one or the other genus. More of that, Nieves-Aldrey (1994b) mentioned this uncertainty concerning western European species only, without analyzing the generic assignment of 17 *Phanacis* species described by Diakontschuk in *Phanacis*, *Pseudophanacis* and *Parapanteliella* genera (Diakontschuk, 1980, 1981b, 1981c, 1984, 1988, 2001, 2003) and two *Phanacis* species, described earlier by Belizin (1959). Examination of morphological peculiarities of these 19 species showed that the given generic limits between *Phanacis* and *Timaspis* becoming of no use.

According Nieves-Aldrey (1994b, 2001a) the main diagnostic differences between *Timaspis* and *Phanacis* are as follows: in *Timaspis* the mesopleuron is rugulose-reticulate or rugulose-striate, the median mesoscutal line generally is longer, the nucha is shorter and notauli are complete, reaching pronotum, while in *Phanacis* the mesopleuron is regularly and uniformly reticulate, the median mesoscutal line presents by a deep impression at the immediate base of the scutum, the nucha is much longer relatively and notauli faint or absent anteriorly. However, these characters are too variable and superficial to be of any generic value.

Diakontschuk (1981c) established a new subgenus *Pseudophanacis* for a number of species, all reared from stems of *Centaurea* species: *Ph.* (*Pseudophanacis*) *culmicola*, *Ph.*(*P.*) *stepicola* and *Ph.*(*P.*) *orientalis*. However, diagnostic characters given for the separation of this subgenus from the nominative *Phanacis* (*Phanacis*) are not appreciable and can be found in different combinations in different species of *Phanacis*. Thus, we synonymized *Pseudophanacis* to *Phanacis*.

Diakonstchuk (1981b) described a monotypic genus *Parapanteliella*, with the only known species, *P. eugeniae* Diakontschuk, 1981. She considered her newly described genus closely related to *Panteliella*, however, it is incorrect. No doubts, that *Parapanteliella* is synonymous with *Phanacis* and we regard it as a **syn. n.** of *Phanacis*.

Distribution and Biology. The genus has a palaearctic distribution with two species, *Phanacis hypochoeridis* and *P. taraxaci*, accidentally introduced to North America. The first species was also introduced to South Africa. Only the sexual generation is known, all species are monovoltine. All *Phanacis* species, with a few exceptions, are associated with Asteraceae, usually galls are in a form of small larval cells, hidden in the plant stem, without causing any deformation externally. However, there are three species, known to associate with other plant families: *Ph. eryngi* Diakontschuk, 1984, described from Georgia known to induce galls in *Eryngium* sp. (Apiaceae); *Ph. heraclei* (Hedicke, 1923) associates with *Heracleum sphondylum* L. (Apiaceae), and *Ph. phlomidis* Belizin, 1959 known to induce galls in stems of *Phlomis tuberosa* (Lamiaceae). Host associations and distribution of palaearctic *Phanacis* species are given in Table 6.

Table 6. Host associations and distribution of palaearctic *Phanacis* species
(species marked with (*) pressumably occurs in Ukraine; (**) – species unknown in the fauna of Ukraine)

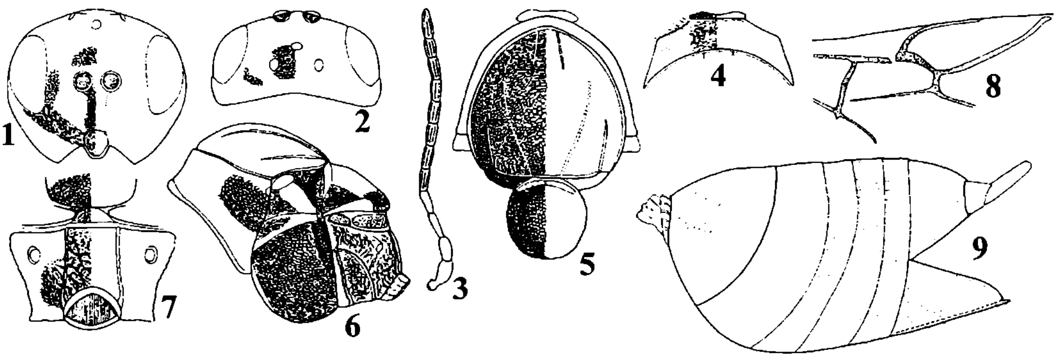
Species	Host Plant	Distribution
Ph. carthami Gussakovskij, 1933	*Carthamus* sp. (Asteraceae)	Uzbekistan, Ukraine

		(Crimea)
Ph. caulicola (Hedicke, 1939)*	*Picris echioides* L. and *P. hieracioides* L. (Asteraceae)	Europe
Ph. centaureae Förster, 1860 (=*karadagica* Diakontschuk, 2003, **syn. n.**; = *lucidulus* Diakontschuk, 1980, **syn. n.**; = *parvulus* Diakontschuk, 1980, **syn. n.**)	*Centaureae* spp. (Asteraceae)	Europe, Turkmenistan; introduced to North America
Ph. cichorii (Kieffer, 1909), **comb. rev.**	*Cichorium intybus* L. (Asteraceae)	Europe, Turkmenistan, Transcaucasus, Asia
Ph. cousiniae Diakontschuk, 1988** (= *gracilis* Diakontschuk, 1988, **syn. n.**; = *compactus* Diakontschuk, 1988, **syn. n.**; = *cereipes* Diakontschuk, 1988, **syn. n.**)	*Cousinia bippinata* Boiss., *C. onopordoides* Ldb., *C. polycephala* Rupr., *C. radians* Bunge, *C. refracta* Juz. *C. tenella* Fisch. & Mey; *Centaurea iberica* Trev.	Turkmenistan, Tadzhikistan
Ph. crassinervis Diakontschuk, 1980	*Centaureae* spp. (Asteraceae)	Ukraine
Ph. eryngi Diakontschuk, 1984**, **comb. n.**	*Eryngium* sp. (Apiaceae)	Georgia
Ph. eugeniae (Diakontschuk, 1981), **comb. n.**	*Serratula* sp. (Asteraceae)	Ukraine
Ph. heraclei (Hedicke, 1923)**, **comb. rev.**	*Heracleum sphondylum* L. (Apiaceae)	Germany
Ph. heteropappi Diakontschuk, 1988**	*Centaurea canescens L.* (Asteraceae)	Turkmenistan
Ph. hypochoeridis (Kieffer, 1887)	*Hypochoeris radicata* L. and *H. glabra* L. (Asteraceae)	Europe, North Africa
Ph. lampsanae (Perris, 1873), **comb. rev.**	*Lampsana communis* L. (Asteraceae)	Europe
Ph. lusitanica (Tavares, 1903)**, **comb. rev.**	*Crepis vesicaria* L. (Asteraceae)	Germany, Spain, Portugal
Ph. maculatus Diakontschuk, 1988**	*Centaurea squarrosa* (Boiss.) (Asteraceae)	Tadzhikistan
Ph. phlomidis Belizin, 1959	*Phlomis tuberosa* L. (Lamiaceae)	Russia, Ukraine
Ph. phoenixopodos (Mayr, 1882), **comb. rev.**	*Lactuca viminea* (L.) J.Presl. and *L. saligna* L. (Asteraceae)	Europe, North Africa
Ph. pillicornis (Thomson, 1877)**	?	Europe
Ph. rufipes Ionescu & Roman, 1959**	*Crepis pulchra* L. (Asteraceae)	Romania
Ph. sonchi (De Stefani, 1900)**, **comb. rev.**	*Sonchus asper* (L.) (Asteraceae)	southern Europe
Ph. taraxaci (Ashmead, 1897)**	*Taraxacum officinale* L. (Asteraceae)	Europe
Ph. urospermi (Kieffer, 1901)**, **comb. rev.**	*Urospermum picroides* (L.) (Asteraceae)	North Africa, Spain, Portugal
Ph. varians Diakontschuk, 1980 (= *culmicola* Diakontschuk, 1981, **syn. n.**; = *orientalis* Diakontschuk, 1981, **syn. n.**; = *stepicola* Diakontschuk, 1981, **syn. n.**)	*Centaurea adpressa* L., C. *orientalis* L. (Asteraceae).	Ukraine

Ph. zwoelferi Nieves-Aldrey, 1995**	*Silybum marianum* (L.) (Asteraceae)	southern Europe

Key to the palaearctic *Phanacis* species
(species marked with (*) are unknown for the Ukrainian fauna)

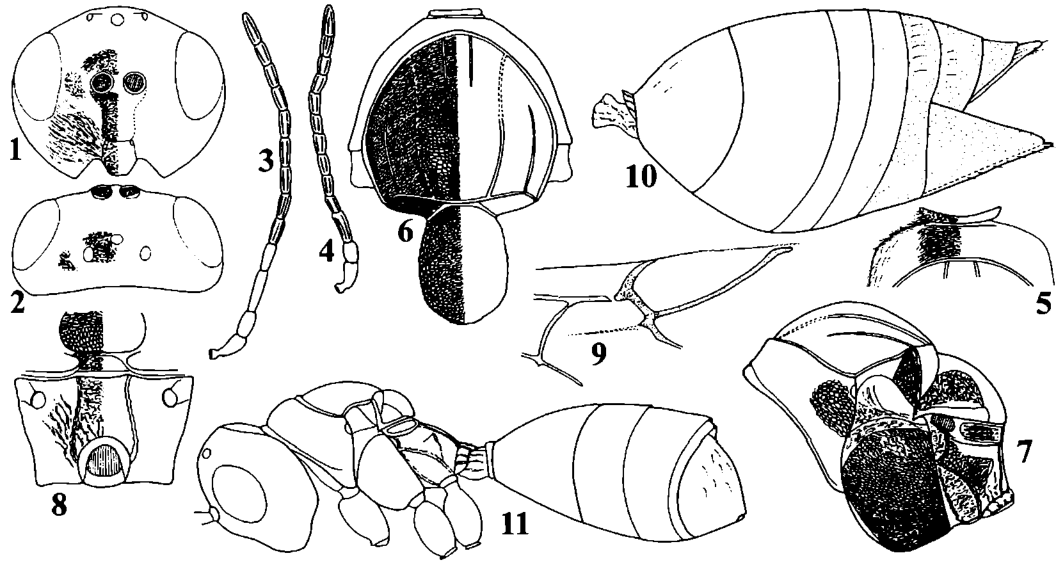
1. Antenna of female 12-segmented; male unknown; radial cell partially closed 2
-- Antenna of female 13-14-segmented, male antenna 13-15-segmented; radial cell closed or partially closed; galls usually hidden in stems 3
2. Scutum with transverse rugae; mesopleuron rugoso-striate; radial cell 2.5 times as long as broad; galls in flower heads of *Serratula* (Asteraceae), Ukraine ..... ***eugeniae***
-- Scutum microreticulate, with few transverse rugae; mesopleuron uniformly reticulate; radial cell 3.3 times as long as broad; galls in stems of *Eryngium* sp. (Apiaceae), Georgia .... ***eryngi*****



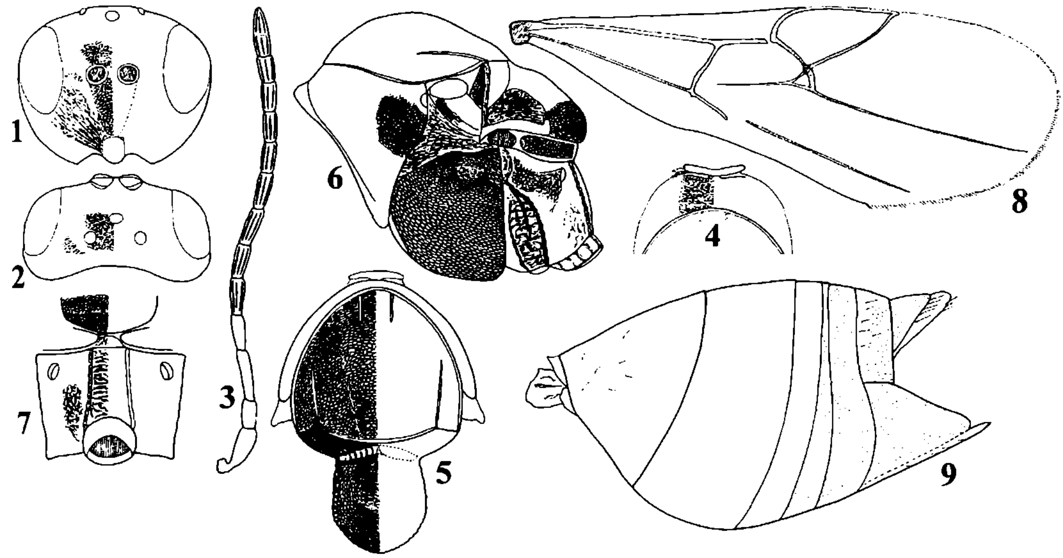
Figs 76.1-9. *Phanacis eryngi*, female: 1-2, head, female: 1, front view, 2, from above. 3, antenna, 4, pronotum with submedian pronotal pits, dorsal view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, forewing, part, 9, metasoma, lateral view.

3. Pedicel nearly equal in length to F1; forewing margin with very short or without cilia 4
-- Pedicel at least 1.3 or more times longer than F1; forewing margin with long, distinct cilia 5
4. F2 nearly equal F1; radial cell closed along entire length of margin; galls in stems of *Centaurea* (Asteraceae), Ukraine .... ***crassinervis***
-- F2 shorter than F1; radial cell closed at most to half length of radial cell galls in stems of *Centaurea*, Ukraine .... ***varians***
5. Metasoma strongly elongated, nearly 2.0 times as long as high in lateral view; galls in stems of *Cousinia*, Turkmenistan, Tadzhikistan .... ***cousiniae*****
-- Metasoma only slightly longer than high in lateral view or as long as high 6
6. Notauli absent or very indistinct, hardly traceable in the posterior 1/3 of scutum only; galls in stems of *Centaurea*, Turkmenistan .... ***heteropappi*****
-- Notauli distinct at least in posterior half or complete, reaching pronotum 7
7. Notauli distinctly impressed only in posterior half or less; sometimes reaching pronotum but very indistinct, shallow 8
-- Notauli distinctly and deeply impressed along entire length 14

8. Scutellar foveae confluent, in a form of transverse impression anteriorly, indistinctly delimited posteriorly; radial cell of forewing entirely closed along wing margin; median mesoscutal line in a form of short triangle or absent 9



Figs **77.1-11.** *Phanacis cousiniae*: 1-2, head, female: 1, front view, 2, from above. 3-4, antenna: 3, female, 4, male. 5-10, female: 5, pronotum with submedian pronotal pits, dorsal view, 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part, 10, metasoma, lateral view. 11, male, lateral view.

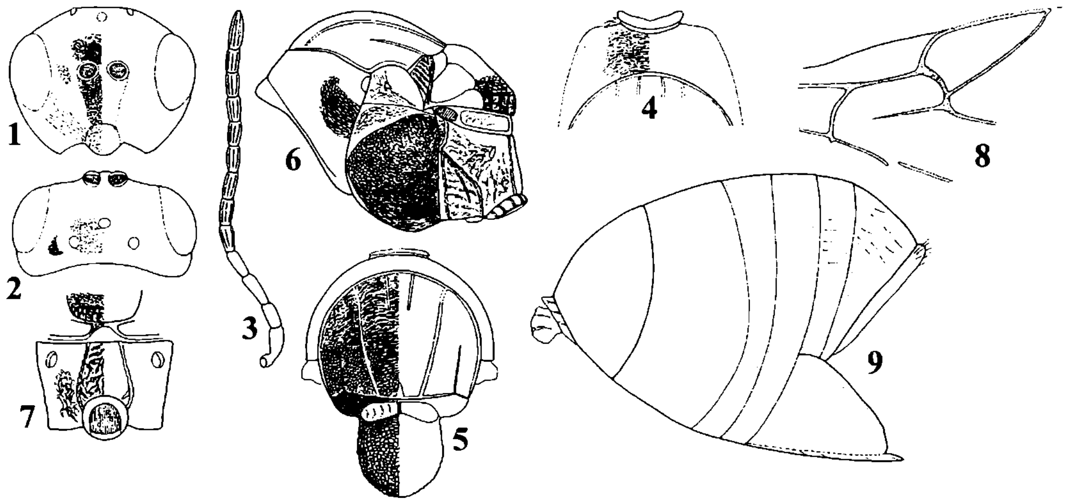


Figs **78.1-9.** *Phanacis heteropappi*, female: 1-2, head, female: 1, front view, 2, from above. 3, antenna, 4, pronotum with submedian pronotal pits, dorsal view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, forewing, part, 9, metasoma, lateral view.

-- Scutellar foveae separated by a central carina, sometimes foveae reaching one another in the most anterior part; radial cell partially opened along wing margin;

median mesoscutal line usually longer, reaching at least to 1/3 of scutum length 13

9. Scutellar foveae very short, with longitudinal rugae, antenna shorter than head+ mesosoma; males brachypterous or fully winged; galls in stems of *Centaurea* and *Phlomis* (Lamiaceae), and roots of *Carthamus* (Asteraceae) 10
-- Scutellar foveae higher, without longitudinal rugae, antennae clearly longer than head+mesosoma; males fully winged; galls in stems of *Silybum marianum* (Asteraceae), South Europe only .... ***zwoelferi*****
10. POL 1.5 or more times longer than OOL; males brachypterous or fully winged; galls in stems of *Centaurea* 11
-- POL nearly equal OOL; males fully winged; galls in *Carthamus* and *Phlomis* 12
11. F1 1.4-1.5 times as long as F2; males brachypterous; galls in stems of *Centaurea*; Europe, Turkmenistan; introduced to North America .... ***centaureae***
-- F1 only very slightly longer than F2; males fully winged, galls in stems of *Centaurea squarrosa*; Tadzhikistan .... ***maculatus*****



Figs 79.1-9. *Phanacis maculatus*, female: 1-2, head, female: 1, front view, 2, from above. 3, antenna, 4, pronotum with submedian pronotal pits, dorsal view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, forewing, part, 9, metasoma, lateral view.

12. Body in female black, except dark brown head; head with dense white short setae, especially lower face; males reddish brown; galls in stems of *Phlomis tuberosa*; Russia, Ukraine .... ***phlomidis***
-- Entire body of females and males brown or light brown; head with very few sparse short white setae; galls on roots of *Carthamus*, Uzbekistan, Ukraine .... ***carthami***
13. Radial cell of forewing 2.5 or less times as long as broad; R1 indistinct, depigmented; flagellomeres light brown, scape and pedicel dark brown to black; galls in stems of *Picris echioides* and *P. hieracioides* (Asteraceae), Europe ...... ***caulicola****
-- Radial cell 2.8 or more times as long as broad; flagellomeres, scape and pedicel uniformly light brown; galls in stems of *Hypochoeris* (Asteraceae) .... ***hypochoeridis***

14. Rs+M distinct and reaching basalis in the most lower part; interocellar area rised over vertex; F1 robust, more than 1.5 times as long as F2; mesopleuron rugoso-striate; galls in stems of *Lactuca* (Asteraceae) .... ***phoenoxipodos***
-- Rs+M indistinct, weakly pigmented, never extending to half length of distance between areolet and basalis; F1 usually less than 1.5 times as long as F2; mesopleuron rugoso-reticulate; galls in other plants 15
15. Flagellomeres with long dark setae; placodeal sensilla present on all flagellomeres; F1, F2, pedicel and scape contrasting with the rest of flagellomeres in colour darker than rest; legs, including coxae yellow to orange; galls in *Cichorium intybus* (Asteraceae) .... ***cichorii***
-- Flagellomeres with normal light sparse setae; placodeal sensilla from F2, absent on F1; scape, pedicel and all flagellomeres uniformly coloured; mid- and hindcoxae dark 16
16. Antenna distinctly 14-segmented, F12 and F11 separated by a distinct suture; F1 1.5-1.7 times as long as F2; R1 extending along wing margin to half length of radial cell; which is 3.5-3.7 times as long as broad; galls in stems of *Lampsana communis* (Asteraceae) .... ***lampsanae***
-- Antenna 13-14-segmented; if suture between F12 and F11 present than very indistinct; F1 less than 1.5 times as long as F2; R1 extending along wing margin to more than to half length of radial cell; radial cell 3.0 times as long as broad; galls in stems of *Crepis vesicaria* L. (Asteraceae); Germany, Spain, Portugal .... ***lusitanica*****

Phanacis heraclei (Hedicke, 1923), *Ph. pillicornis* (Thomson, 1877), *Ph. rufipes* Ionescu & Roman, 1959, *Ph. sonchi* (De Stefani, 1900), *Ph. taraxaci* (Ashmead, 1897) and *Ph. urospermi* (Kieffer, 1901) are not included into the key, because we were unable to obtain specimens of these species. Moreover, some of them are still with uncertain status.

The revision of the western European *Phanacis* and *Timaspis* species was made by Nieves-Aldrey (1994b) and species known from the Iberian Peninsula were analysed and described also (Nieves-Aldrey, 2001a). However, a large number of *Phanacis* species described by Diakontschuk (1980, 1981b, 1981c, 1988, 2001, 2003) from Ukraine and Middle Asia never were analysed and examined. We examined the type series of all species described by Diakontschuk and a short analysis, with synonyms and taxonomic comments are given. Below detailed descriptions are given to those species only, for which they are absent in the literature or the original descriptions are poor, insufficient.

Phanacis carthami Gussakovskij, 1933

Phanacis carthami Gussakovskij, 1933: 125-126 (female, male, gall) (in Rodd et al., 1933); Belizin, 1959: 672-673 (detailed redescription of female, male, gall, diagnosis).

Description. 1.7-2.0 mm. Very similar to *Ph. phlomidis*. The description of the female and male is given in Belizin (1959).

Gall. Galls on roots of *Carthamus* sp. (Asteraceae), usually to 7 cm deep in the ground, monolocular, sometimes more of them are aggregated in groups, forming a root swelling.

Diagnosis. Most closely related to *Ph. phlomidis* but the body of the female and male is brown or light brown, the head with very few short white setae, 2r in the forewing curved medially, metasomal tergites without punctures, while in *Ph. phlomidis* the body of the female is black, except dark brown head, the head with dense white short setae, especially the lower face; males are reddish brown, 2r nearly straight; posterior tergites with indistinct punctures.

Distribution. Uzbekistan (Belizin, 1959), Ukraine (Crimea – Diakontschuk, 1987; few examined specimens collected in Crimea in the SIZK collection).

Biology. Monovoltine, but it is possible, that there is more than one generation per year (Belizin, 1959). First galls were found on roots in mid May. Larvae overwintering in galls; pupate in late April and May; adults emerge in May (Belizin, 1959). The host plant is *Carthamus* sp. (Asteraceae).

Phanacis caulicola (Hedicke, 1939)*

Plate 10.7.

Aylax caulicola Hedicke, 1939: 45-47 (female, gall); *Phanacis caulicola*: Eady & Quinlan, 1963: 18.

Description. Female. 2.0-2.4 mm. A detailed description is given in Nieves-Aldrey (2001a: 171). Male unknown.

Diagnosis. Most closely related to *Ph. hypochoeridis* in that the scutellar foveae are separated by a central carina, sometimes foveae are reaching one another in the most anterior part; the radial cell partially is opened along the wing margin; the median mesoscutal line usually is long and extending at least to 1/3 of the scutum length. See Diagnosis to *Ph. hypochoeridis*.

Gall (Plate 10.7). The ellipsoid gall develops in the stem, 2.5 mm in diameter, usually with no external deformations. The gall and larva described in details by Bowdrey (1992).

Distribution. PL (Kierych, 1966, 1979), ES (Nieves-Aldrey, 1987, 1988), GB (Eady & Quinlan, 1963). Possible in Ukraine, however, not find yet.

Biology. Monovoltine. The absence of males suggests that this species reproducing parthenogenetically, by thelytoky. Host plants: *Picris echioides* L. and *P. hieracioides* L. (Asteraceae) (Hedicke, 1939; Kierych, 1979).

Phanacis centaureae Förster, 1860

Figs 80.1-14, Plate 10.8.

Cynips centaureae (Förster, in MS) Kaltenbach, 1859: 253 (gall); *Phanacis centaureae*: Kieffer, 1902d: 96 (female, male); *Aulax punctipleuris* Thomson, 1877: 807 (female); synonym in Nieves-Aldrey, (1994a: 156); *Aulacidea punctipleuris*; Kieffer, 1902d: 96; *Phanacis karadagica* Diakontschuk, 2003: 9 (female, male, gall), **syn. n.** *Phanacis lucidulus* Diakontschuk, 1980b: 23 (female, gall), **syn. n.** *Phanacis parvulus* Diakontschuk, 1980b: 22 (female, gall), **syn. n.**

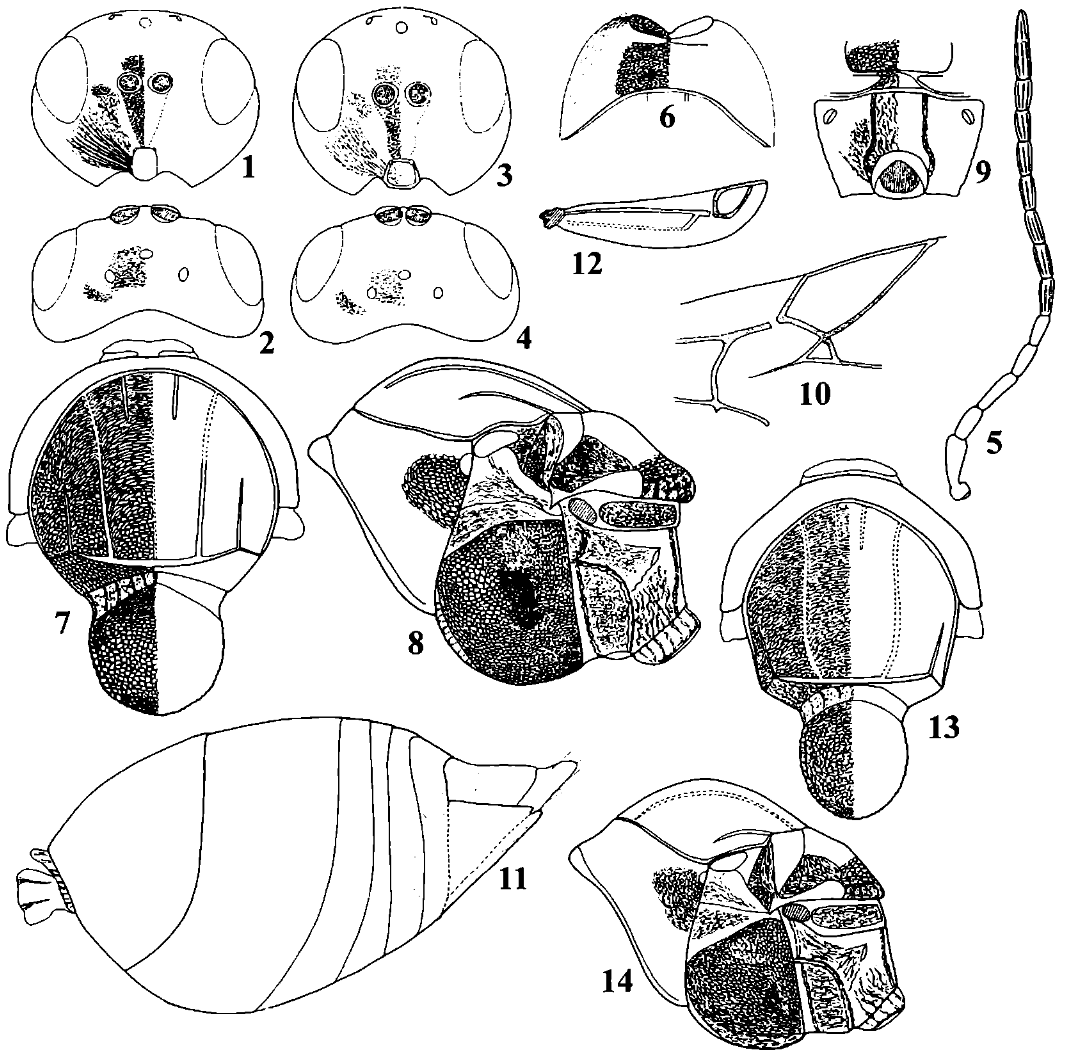
Description. Female. 2.1-2.7 mm. Head and mesosoma dark brown, metasoma lighter with darker posterior tergites. Antennae yellowish brown, legs light brown to yellowish, with darker coxae. Wing veins distinct, light brown. Head delicately coriaceous to alutaceous, with uniformly sparse white setae, 1.8-2.0 times as broad as long from above, 1.3 times as broad as high and slightly broader than mesosoma. Gena alutaceous, not broadened behind eye; not visible behind eye in front view; nearly as broad as cross diameter of eye, measuring behind eye. Malar space coriaceous, 0.5 times as long as height of eye, with delicate striae, radiating from clypeus and extending to 3/4 of malar space length. POL 1.6-1.8 times as long as OOL; 2.1 times as long as LOL and 5.6 times as long as diameter of lateral ocellus. Transfacial distance 1.3-1.4 times as long as height of eye; diameter of antennal torulus 2.2 times as long as distance between them and 0.7 times as long as distance between torulus and eye margin. Lower face delicately coriaceous, with delicate striae only laterally, radiating from clypeus and nearly reaching eye; median elevated area delicately coriaceous, without striae, very slightly raised. Clypeus alutaceous to smooth, rectangular, very narrow and small, at least 2.0 times as high as broad; with very indistinct anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line distinct, ventral margin rounded, projecting over mandibles. Frons, vertex and occiput delicately reticulate to alutaceous. Postocciput around occipital foramen impressed, coriaceous; postgena alutaceous, with more dense setae than on front of head. Antenna 13-14-segmented (sometimes suture between F12 and F11 very distinct), slightly shorter than head+mesosoma; pedicel 2.0 times as long as broad; F1 1.6 times as long as pedicel and F1 1.4-1.5 times as long as F2, F2 slightly longer than F3; placodeal sensilla well-visible from F4. Mesosoma convex, slightly longer than high in lateral view, with uniform sparse white setae. Pronotum alutaceous dorsally, uniformly delicately coriaceous laterally; anterior margin with more dense setae. Submedian pronotal pits indistinct, in a form of transverse impression, medially separated by a very narrow carina. Scutum slightly longer than broad, 1.5 times as long as scutellum, uniformly reticulate. Notauli distinctly impressed only in posterior half or less; sometimes reaching pronotum but very indistinct, shallow; median mesoscutal line in a form of short triangle or absent; parapsidal lines narrow, reaching tegula level; anterior parallel lines short, extending to 1/5-1/6 of scutum length. Scutellum rounded, nearly as long as broad; uniformly reticulate, not overhanging metanotum. Scutellar foveae confluent, in a form of transverse impression anteriorly, indistinctly delimited posteriorly, with longitudinal rugae. Mesopleuron uniformly reticulate; mesopleural triangle alutaceous, with some setae. Metapleural sulcus reaching mesopleuron slightly above 1/2 of its height; axillula transversely ovate, with few white setae, coriaceous; subaxillular bar smooth, shining, narrower than height of metanotal trough; metapleuron wrinkled, rugose; ventral bar of metanotal trough with delicate wrinkles, around 2.0 times narrower than height of uniformly delicately alutaceous metanotal trough. Dorsellum reticulate, very narrow medially; delicately coriaceous ventral impressed area at least 3.5 times as high as height of dorsellum medially. Propodeum rugose, lateral propodeal carinae subparallel, without setae; central propodeal area delicately rugose, with white setae; lateral propodeal area rugose, with dense white setae; propodeal spiracle strongly elevated; nucha short, with some longitudinal sulci. Forewing margin with long cilia; radial cell of forewing entirely closed, 2.8 times as long as broad, areolet large, triangular, distinct, Rs+M extending to 2/3 of distance between areolet and basalis. Tarsal claws very narrow, without basal lobe. Metasoma only slightly longer than high in lateral view; metasomal tergite 2 without setae antero-laterally and without punctures; only metasomal tergite 6, subsequent tergites and hypopygium with some indistinct punctures; prominent part of ventral spine of hypopygium short, with some short white setae. Male. 1.4-1.7 mm. Brachypterous. Similar to female, antenna also 14-segmented, but head is more massive, more longer from above, gena stronger broadened behind eye, visible behind eye in front view; notauli less impressed, sculpture of scutum, scutellum and mesopleuron more delicate than in female. The entire body is more light.

Gall (Plate 10.8). The gall developing in the stem, 5 mm long and around 1 mm in diameter; larval cells are with hard walls, assemblaging into a row. The galled stem is not malformed externally.

Diagnosis. Most closely related to *Ph. maculatus* by the length of POL, which 1.5 or more times longer than OOL. In *Ph. centaureae* female's F1 1.4-1.5 times as long as F2; males are brachypterous, while in *Ph. maculatus* female's F1 only very slightly longer than F2; males are fully winged.

Material examined. *Phanacis karadagica*: holotype female: Ukraine, Crimea, Karadag Natural Reserve, 19.04.1984, em. 15.05.1986, ex stems of *Centaurea solstitialis* L. (Asteraceae). Paratypes: 34 females and males, with the same labels as the holotype. *Phanacis lucidulus*: holotype female: Ukraine, Kiev Region, Vorzel, 15.04.1979, coll. L.A. Diakontschuk, ex stems of *Centaurea pseudomaculosa* Dobrocz., em. 7.05.1979. Paratypes: 1 female: Ukraine, vicinity of Kiev, Pheophanija, 11.04.1971, coll. M.D. Zerova, ex stems of *Centaurea pseudomaculosa* Dobrocz., em. 26.05.1971; 2 females: Ukraine, vicinity of Kiev, Pheophanija, 05.1970, coll. M.D.Zerova, ex stems of *Centaurea pseudomaculosa* Dobrocz., em. 06.1970; 1 female: Ukraine, vicinity of Kiev, Pheophanija, 02.05.1974, coll. M.D. Zerova, ex stems of *Centaurea pseudomaculosa* Dobrocz.; 1 female: Ukraine, vicinity of Kiev, Pheophanija, 10.1978, coll. L.A.Diakontschuk, ex stems of *Centaurea pseudomaculosa* Dobrocz., em. 07.1979. Body appendages in preparation No 6-8. *Phanacis parvulus*: holotype female: Ukraine, Donetsk Region, Khomutovskyj steppe Natural Reserve, 19.04.1978, coll. L.A. Diakontschuk, ex stems of *Centaurea diffusa* Zam., em. 23.05.1978. Paratypes: 1 female with the same labels as the holotype; 1 female: Ukraine, Kherson Region, Askania-Nova Natural Reserve, 25-26.04.1979, coll. L.A.Diakontschuk, ex stems of *Centaurea diffusa*, em. 25.05.1979. Body appendages in preparation No 5. All are deposited in the SIZK collection.

Distribution. SE (Nieves-Aldrey, 1994b; Kieffer, 1897-1901), ES, PT (Nieves-Aldrey, 1987, 1988), PL (Kierych, 1979), GB (Eady & Quinlan, 1963), FR (Kieffer, 1897-1901), RU (Belgorod Region, Belizin, 1959), Turkmenistan (Diakontschuk, 1988). Introduced to North America (Burks, 1979). Ukraine (Diakontschuk, 1981), particularly Crimea, Karadag Natural Reserve (Diakontschuk, 2003); vicinities of Kiev, Pheophanija and Kanev Natural Reserve; Donetsk and Kherson Regions (Diakontschuk, 1980b). Probably common everywhere (39 examined specimens collected in the vicinity of Kiev and Kherson Region, collection of SIZK).



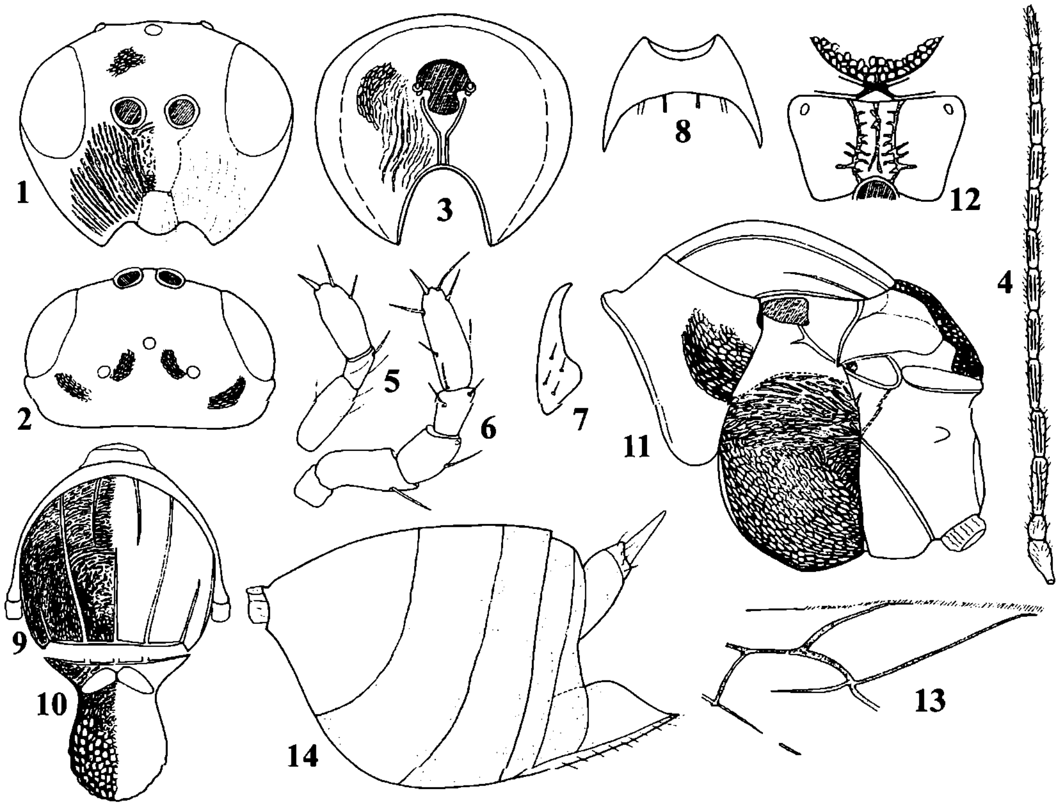
Figs 80.1-14. *Phanacis centaureae*: 1-2, head, female: 1, front view, 2, from above. 3-4, head, male: 3, front view, 4, from above. 5-11, female: 5, antenna, 6, pronotum with submedian pronotal pits, dorsal view, 7, scutum and scutellum, dorsal view, 8, mesosoma, lateral view, 9, propodeum and dorsellum, dorso-posterior view, 10, forewing, part, 11, metasoma, lateral view. 12-14, male: 12, forewing, part, 13, scutum and scutellum, dorsal view, 14, mesosoma, lateral view.

Biology. Monovoltine. Larvae overwintering in the gall and adults emerge next year, in May-June, sometimes in July (Zerova, Diakontschuk & Ermolenko, 1988). Host plants: *Centaurea aspera* L., *C. diffusa* Zam., *C. micranthos* SG Gmel., *C. nigra* L., *C. scabiosa* L. (Nieves-Aldrey, 1985); *C. jacea* L., *C. pseudomaculosa* Dobrocz., *C. rhenana* Boreau, *C. stenolepis* A.Kern., *C. solstitialis* L. (Ambrus, 1974), *C. squarrosa* (Boiss.) (Asteraceae) (Diakontschuk, 1988).

Phanacis cichorii (Kieffer, 1909)

Figs 81.1-14, Plate 10.11.

Aulax cichorii Kieffer, 1909: 6 (gall); *Timaspis cichorii* Balás, 1948: 246 (female); *Phanacis cichorii*: Eady & Quinlan, 1963; *Timaspis cichorii*: Nieves-Aldrey, 1994a: 195; *Phanacis cichorii*: **comb. rev.**



Figs 81.1-14. *Phanacis cichorii*, female: 1-3, head: 1, front view, 2, from above, 3, posteriorly. 4, antenna, 5, palpus labialis, 6, palpus maxillaris, 7, tarsal claw, 8, pronotum with submedian pronotal pits, dorsal view, 9, scutum, dorsal view, 10, scutellum, dorsal view, 11, mesosoma, lateral view, 12, propodeum and dorsellum, dorso-posterior view, 13, forewing, part, 14, metasoma, lateral view.

Description. Female. 1.7-2.3 mm. Head and mesosoma black, with some dark brown tone; mandibles and palpi light brown to yellow; antenna dark brown to black, except much lighter F1-F3, pedicel and scape. Legs uniformly light brown to yellow. Metasoma orange brown, with much darker to black posterior tergites, hypopygium light brown to orange. Wing veins pale brown. Head delicately coriaceous to alutaceous, with uniformly sparse white setae, 1.5 times as broad as long from above, 1.2 times as broad as high and slightly broader than mesosoma. Gena alutaceous, not broadened behind eye; not visible behind eye in front view; narrower than cross diameter of eye, measuring behind eye. Malar space 0.7-0.8 times as long as height of eye, with short interrupted strong striae, radiating from clypeus and nearly reaching inner margin of eye. POL 1.8 times as long as OOL; 1.9 times as long as LOL and 6.3 times as long as diameter of lateral ocellus. Transfacial distance 1.2 times as long as height of eye; diameter of antennal torulus 2.0

times as long as distance between them and 1.5 times as long as distance between torulus and eye margin. Lower face with interrupted striae, radiating from clypeus and nearly reaching eye and antennal sockets, median elevated area coriaceous, with some rugae. Clypeus alutaceous to smooth, very narrow and small, rectangular, nearly 1.5 times as high as broad; with very indistinct anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line indistinct, ventrally rounded, slightly projecting over mandibles. Frons, vertex and occiput alutaceous. Postocciput around occipital foramen not impressed, alutaceous; postgena coriaceous, with longitudinal striae towards gular sulci, with more dense setae than on front of head; posterior tentorial pits small, rounded; occipital foramen nearly as high as height of gula and around 1.5 times as short as hypostomal foramen; gular sulci parallel in the lower half, curved outwards in the upper half; hypostomal carina distinct, broad. Palpi maxillaris and labialis on figures. Antenna 14-segmented, slightly shorter than head+mesosoma; pedicel 1.3 times as long as broad; F1 2.4 times as long as pedicel and 1.3 times as long as F2, F2 slightly shorter than F3; flagellomeres with long dark setae; placodeal sensilla on all flagellomeres. Mesosoma convex, longer than high in lateral view, with uniform sparse white setae. Pronotum alutaceous, with more dense setae along antero-lateral edge. Submedian pronotal pits in a form of very narrow transverse impression, without median carina, separating it. Scutum slightly longer than broad, 1.3 times as long as scutellum; reticulate, with more dull sculpture in between notauli, in posterior half; with more transverse sculpture in between notauli in anterior half. Notauli distinctly and deeply impressed along entire length; median mesoscutal line distinct, extending to 1/3-1/2 half of scutum length; parapsidal lines narrow, indistinct, reaching tegula level; anterior parallel lines extending to 1/3 of scutum length. Scutellum distinctly longer than broad, rounded posteriorly; dull rugose along sides and posteriorly, with more delicate coriaceous sculpture towards the center of disk; not overhanging metanotum. Scutellar foveae confluent, in a form of transverse impression anteriorly, indistinctly delimited posteriorly. Mesopleuron reticulate, with some short interrupted transverse striae in the upper half; mesopleural triangle coriaceous, with some wrinkles. Metapleural sulcus reaching mesopleuron in the upper 1/3 of its height; axillula transversely ovate, coriaceous, with few white setae; subaxillular bar smooth, shining, as broad as height of metanotal trough; metapleuron rugose. Dorsellum reticulate, narrow medially; smooth ventral impressed area slightly higher than height of dorsellum medially. Propodeum rugose, lateral propodeal carinae uniformly thick, subparallel; central propodeal area rugose; lateral propodeal area rugose, with sparse white setae; nucha short, with some delicate longitudinal wrinkles. Forewing margin with long cilia; R1 reaching wing margin and extending along margin on a short distance; radial cell partially closed, around 3.0 times as long as broad, areolet absent, Rs+M indistinct, weakly pigmented, never reaching to half length of distance between areolet and basalis. Tarsal claws very narrow, without basal lobe. Metasoma only slightly longer than high in lateral view; metasomal tergite 2 without setae antero-laterally and without punctures; subsequent tergites and hypopygium with obsolete punctures; prominent part of ventral spine of hypopygium short, with relatively long white setae, apical setae extending behind apex of spine. Male. Unknown.

Gall (Plate 10.11). Galls are hidden in the stem, larval cells are ellipsoid, 1.5 mm in diameter, scattered along the axis of the stem. There is no external deformation on the infested stem.

Diagnosis. Together with *Ph. lampsanae* form a group of species in which Rs+M of the forewing is indistinct, weakly pigmented, never extending to the half length of the distance between the areolet and basalis; F1 usually less than 1.5 times as long as F2; the mesopleuron is rugoso-reticulate. Most closely related to *Ph. lampsanae*, but all antennal flagellomeres with long dark setae and placodeal sensilla; F1, F2, pedicel and scape contrasting with the rest of flagellomeres in colour, darker than the rest; legs, including coxae, are yellow to orange, while in *Ph. lampsanae* (and *Ph. lusitanica*) all flagellomeres are with normal light sparse setae; placodeal sensilla from F2, absent on F1; the scape, pedicel and all flagellomeres uniformly coloured; mid- and hindcoxae are dark.

Distribution. ES, FR (Nieves-Aldrey, 1985, 1987, 2001a), HU (Ambrus, 1974), PL (Kierych, 1979), Turkmenistan (Diakontschuk, 1988; 18 specimens examined in SIZK collection, collected near Ashkhabad); Transcaucasus, Middle Asia (Zerova, Diakontschuk & Ermolenko, 1988). In

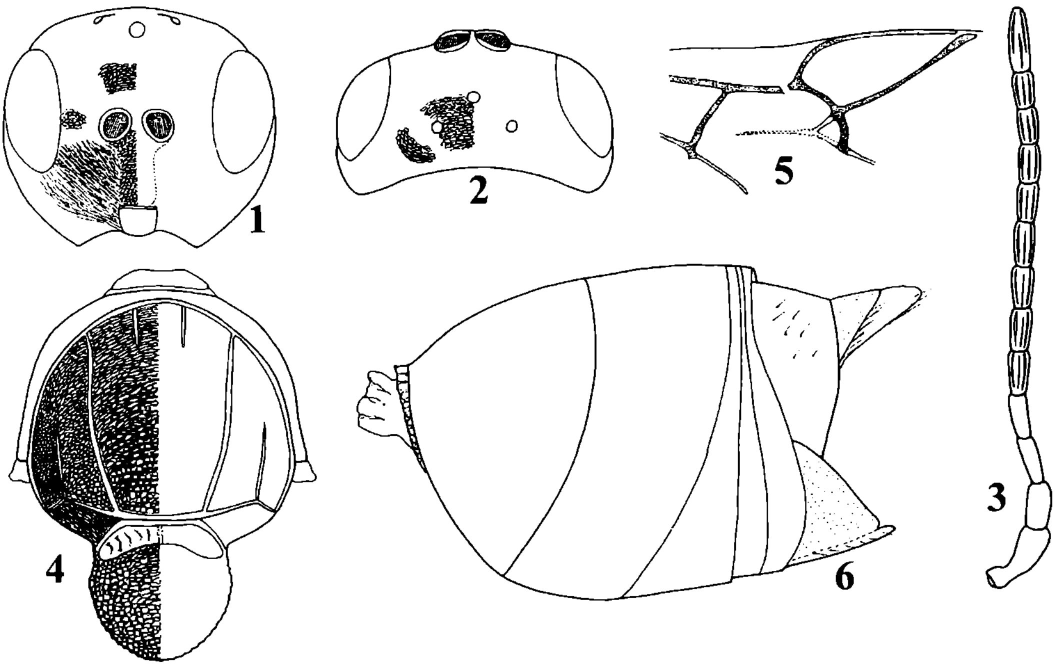
Ukraine -- Crimea, vicinity of Alushta and Karadag Natural Reserve; Donetsk Region, Khomutovskyj steppe Natural Reserve (40 examined specimens in SIZK collection).

Biology. Only females are known, monovoltine. The absence of males suggests that this species reproducing parthenogenetically, by thelytoky. Larvae overwintering in the gall, adults emerge next spring from April till July. The only known host plant is *Cichorium intybus* L. (Asteraceae).

Phanacis crassinervis Diakontschuk, 1980

Figs 82.1-6.

Phanacis crassinervis Diakontschuk, 1980a: 20 (female, gall).



Figs 82.1-6. *Phanacis crassinervis*, female: 1-2, head: 1, front view, 2, from above, 3, antenna, 4, scutum and scutellum, dorsal view, 5, forewing, part, 6, metasoma, lateral view.

Description. Female. 2.4 mm. Head and mesosoma dark brown; mandibles and palpi brown; antenna light brown, with darker distal flagellomeres. Legs uniformly light brown, with slightly darker coxae. Metasoma brown, posterior tergites darker, to black; hypopygium lighter. Wing veins dark brown. Head alutaceous, with uniformly sparse white setae, 1.6 times as broad as long from above, 1.1 times as broad as high and slightly broader than mesosoma. Gena alutaceous, not broadened behind eye; not visible behind eye in front view; narrower than cross diameter of eye, measuring behind eye. Malar space 0.7 times as long as height of eye, with very delicate striae, radiating from clypeus and reaching inner margin of eye. POL 1.3 times as long as OOL; 1.7 times as long as LOL and 5.0 times as long as diameter of lateral ocellus. Transfacial distance 1.4 times as long as height of eye; diameter of antennal torulus 3.3 times as long as distance between them and 0.8 times as long as distance between torulus and eye margin. Lower face with very delicate dense interrupted striae, radiating from clypeus and reaching eye and antennal sockets, median elevated area coriaceous, without striae. Clypeus alutaceous to smooth, quadrangular, nearly as high as broad; with very indistinct anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line distinct, ventral margin rounded. Frons, vertex, occiput and postgena alutaceous. Antenna 13-segmented, slightly shorter than head+mesosoma; pedicel 1.7 times as long as broad; F1 as long as pedicel and F2, F2 equal F3; F11 1.9 times as long as F10; placodeal sensilla on F3-F11. Mesosoma convex, slightly longer than high in lateral view, with uniform sparse white setae.

Pronotum alutaceous dorsally, coriaceous to reticulate laterally, with more dense setae along antero-lateral edge. Submedian pronotal pits in a form of narrow transverse impression, not separated medially. Scutum slightly longer than broad, 1.6 times as long as scutellum, reticulate. Notauli distinctly reaching pronotum; median mesoscutal line absent; parapsidal lines narrow, indistinct, extending slightly above tegula level; anterior parallel lines very short, extending to 1/5-1/6 of scutum length. Scutellum rounded, nearly as long as broad, uniformly coriaceous. Scutellar foveae confluent, in a form of transverse impression anteriorly, indistinctly delimited posteriorly, with some longitudinal weak rugae. Mesopleuron reticulate; mesopleural triangle alutaceous, with some setae. Metapleural sulcus reaching mesopleuron in the upper 1/3 of its height; metapleuron rugose, with some wrinkles; propodeal spiracle strongly rised; axillula transversely ovate, coriaceous, with few white setae; subaxillular bar smooth, shining, as broad as height of metanotal trough; ventral bar of metanotal trough smooth, around 2.0 times narrower than height of smooth metanotal trough. Dorsellum with longitudinal striae, medially as high as height of smooth ventral impressed area. Propodeum rugose, lateral propodeal carinae subparallel; central and lateral propodeal areas rugose. Forewing margin with very short cilia or cilia even absent; R1 extending along wing margin and nearly closed radial cell, which 2.8 times as long as broad, areolet large, triangular, indistinctly delimited by weakly pigmented veins; Rs+M indistinct, weakly pigmented, extending to 2/3 of distance between areolet and basalis. Tarsal claws very narrow, without basal lobe. Metasoma longer than high in lateral view; metasomal tergite 2 without setae antero-laterally and without punctures; subsequent tergites without punctures; hypopygium with distinct dense punctures; prominent part of ventral spine of hypopygium short, with some short white setae. Male unknown.

Gall in a form of typical small larval cell inside the stem, like in many *Phanacis* species, infested plant without external deformation.

Diagnosis. Most closely related to *Ph. varians* in that the pedicel is equal in length to F1, however, F2 nearly equal F1; the radial cell is closed along the entire length of the wing margin, while in *Ph. varians* F2 shorter than F1; the radial cell is closed at most to the half length of the radial cell.

Material examined. Holotype female: Ukraine, Donetsk Region, Khomutovskyj steppe Natural Reserve, 18.04.1978, coll. L.A. Diakontschuk, ex stem of *Centaurea adpressa* x *C. orientalis*, em. 28.05.1978. Paratypes: 2 males with the same labels as the holotype. Body appendages in preparation No 4. Deposited in SIZK.

Distribution. Ukraine (Donetsk Region, Zerova, Diakontschuk & Ermolenko, 1988).

Biology. Only females are known, monovoltine. The absence of males suggests that this species reproducing parthenogenetically, by thelytoky. Adults emerge in May (Zerova, Diakontschuk & Ermolenko, 1988). Host plants: *Centaurea adpressa* Ledeb. and *C. orientalis* L. (Asteraceae).

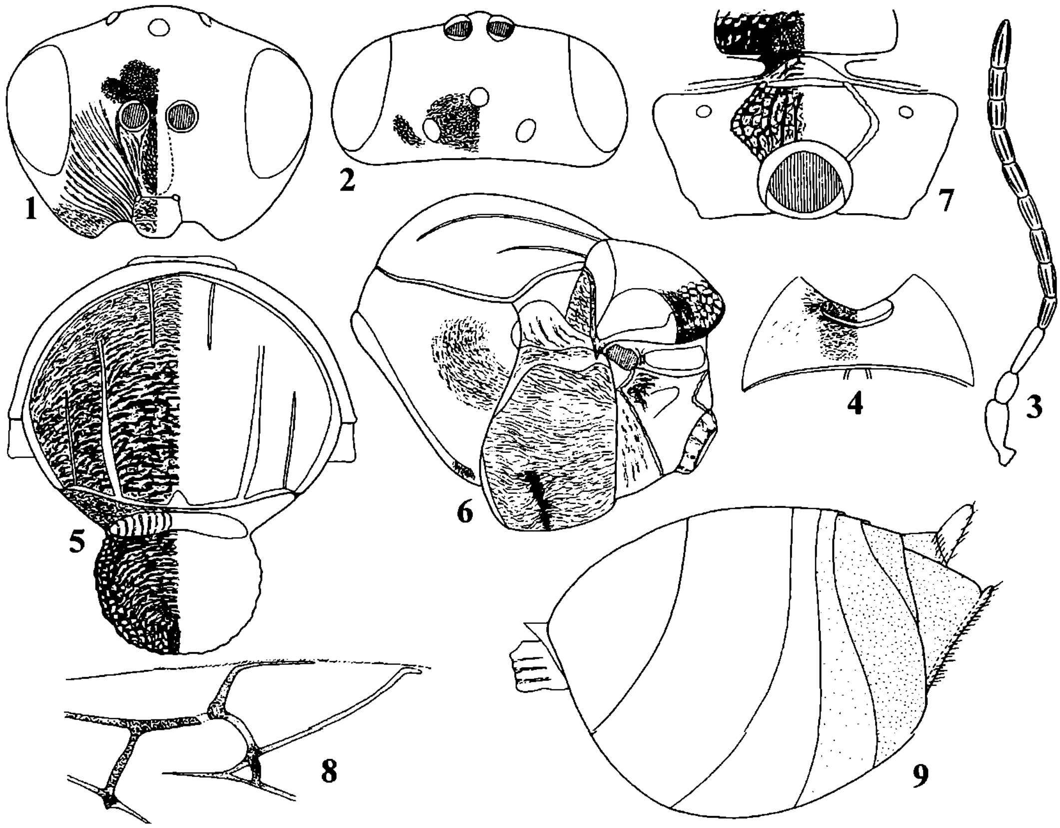
Phanacis eugeniae (Diakontschuk, 1981)

Figs 83.1-9, Plate 10.6.

Parapanteliella eugeniae Diakontschuk, 1981b: 1727 (female, gall); *Phanacis eugeniae*: **comb. n.**

Description. Female. 2.0-2.4 mm. Head dark brown, except light brown lower face and genae; mandibles and palpi light brown. Antenna brown, with darker proximal flagellomeres. Mesosoma dark brown. Legs light brown, coxae, trochanters and femurs much darker to black. Metasoma dark brown, posterior tergites darker, to black; hypopygium lighter. Wing veins dark brown. Head alutaceous, with uniformly sparse white setae, 1.9 times as broad as long from above, 1.3 times as broad as high and slightly broader than mesosoma. Gena alutaceous, not broadened behind eye; not visible behind eye in front view; narrower than cross diameter of eye, measuring behind eye. Malar space 0.5-0.6 times as long as height of eye, with very delicate striae, radiating from clypeus and nearly reaching inner margin of eye. POL 1.8 times as long as OOL; 2.0 times as long as LOL and 3.0 times as long as diameter of lateral ocellus. Transfacial distance 1.3 times as long as height of eye; diameter of antennal torulus 2.3 times as long as distance between them and

0.7 times as long as distance between torulus and eye margin. Lower face with very delicate dense striae, radiating from clypeus and reaching eye and antennal socket, and extending into the area between antennal socket and inner margin of eye; median elevated area coriaceous, without striae. Clypeus alutaceous to smooth, quadrangular, nearly as high as broad; with distinct anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line distinct, ventral margin rounded. Frons, vertex, occiput and postgena alutaceous. Antenna 12-segmented, slightly shorter than head+mesosoma; pedicel 1.5 times as long as broad; F1 1.6-1.7 times as long as pedicel and 1.6-1.7 times as long as F2, F2 slightly shorter than F3; F10 1.6 times as long as F9; placodeal sensilla on F2-F10. Pronotum alutaceous dorsally and laterally, with more dense setae along antero-lateral edge. Submedian pronotal pits in a form of narrow transverse impression, not separated medially. Scutum slightly broader than long, 1.6 times as long as scutellum, coriaceous, with strong short interrupted transverse ruga. Notauli very indistinct, shallowly impressed only in posterior half, absent anteriorly; median mesoscutal line in a form of very short broad triangle; parapsidal lines narrow, distinct, extending above tegula level; anterior parallel lines short, extending to 1/4-1/5 of scutum length. Scutellum rounded, slightly broader than long, dull rugose along aides, with more delicate transverse sculpture in the center and behind scutellar foveae. Scutellar foveae confluent, in a form of transverse impression anteriorly, indistinctly delimited posteriorly, with some



Figs 83.1-9. *Phanacis eugeniae*, female: 1-2, head: 1, front view, 2, from above. 3, antenna, part, 4, pronotum with submedian pronotal pits, dorsal view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, forewing, part, 9, metasoma, lateral view.

longitudinal weak rugae. Mesopleuron uniformly rugoso-striate; mesopleural triangle alutaceous, with some delicate wrinkles and setae. Dorsellum reticulate, very narrow medially; ventral impressed area with delicate wrinkles, at least 3.0 times as high as height of dorsellum medially.

Propodeum rugose, lateral propodeal carinae strongly curved outwards medially, delimiting broad, rugose central area; lateral propodeal areas coriaceous, with more dense setae. Forewing margin with very short cilia; R1 reaching wing margin and extending to 1/4-1/3 of radial cell length, which 2.5 times as long as broad; areolet small. Tarsal claws very narrow, without basal lobe. Metasomal tergites 2-4 without punctures and setae antero-laterally; subsequent tergites and hypopygium with dense punctures. Male unknown.

Gall (Plate 10.6). Galls in flower heads, without symptoms of external deformation.

Diagnosis. Closely related to *Ph. eryngi* by 12-segmented antenna and the radial cell of the forewing without or with very short indistinct cilia. In *Ph. eugeniae* the scutum is transversely striate; the mesopleuron rugoso-striate; the radial cell of the forrewing 2.5 times as long as broad; galls are in flower heads of *Serratula* (Asteraceae), while in *Ph. eryngi* the scutum is microreticulate, with few delicate transverse rugae; the mesopleuron uniformly reticulate; the radial cell 3.3 times as long as broad; galls are in stems of *Eryngium* sp. (Apiaceae).

Material examined. Holotype female: Ukraine, Donetsk Region, Khomutovskyj steppe Natural Reserve, 24.04.1975, coll. M.D. Zerova, ex flower head of *Serratula* sp., em. 7.05.1975. Paratypes: 8 females with the same labels as the holotype; 14 females: Ukraine, Donetsk Region, Khomutovskyj steppe Natural Reserve, 18.04.1978, coll. L.A. Diakontschuk, ex flower head of *Serratula* sp., em. 20-22.05.1978. Body appendages in preparation No 65 (SIZK collection).

Distribution. Ukraine, Donetsk and Kherson Region (Zerova, Diakontschuk & Ermolenko, 1988).

Biology. Only females are known, monovoltine. The absence of males suggests that this species reproducing parthenogenetically, by thelytoky. Adults emerge in late May (Diakontschuk, 1981b). The only known host plant is *Serratula* sp. (Asteraceae).

Phanacis hypochoeridis (Kieffer, 1887)

Figs 84.1-12, Plate 10.9.

Aulax hypochoeridis Kieffer, 1887: 205 (female, male, gall); *Phanacis hypochoeridis*: Eady & Quinlan, 1963: 17; *Phanacis seriolae* Stefani, 1903: 105, 130 (synonym in Dalla Torre & Kieffer, 1910: 669).

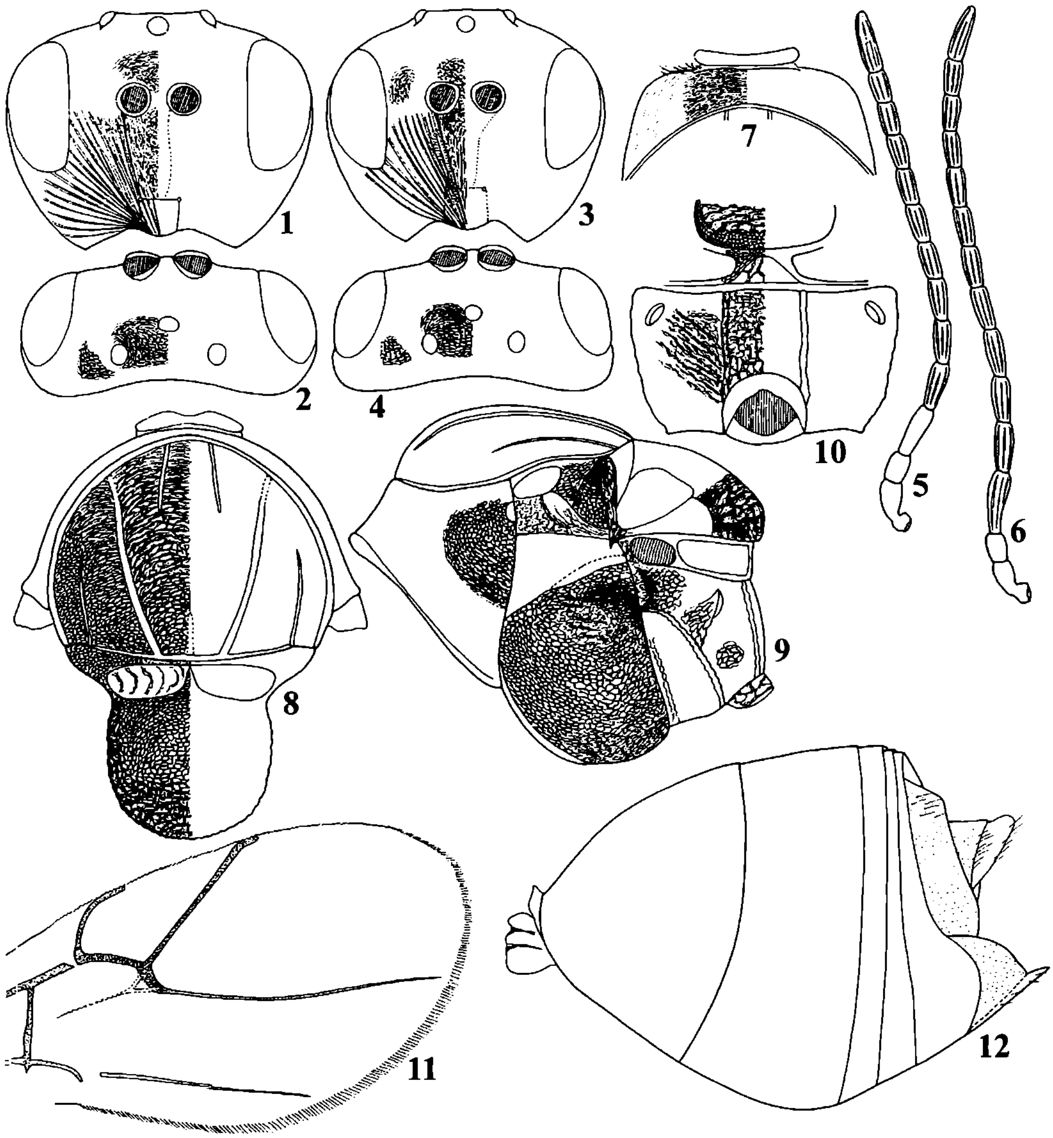
Description. Female 2.0-2.4 mm, male 1.5-1.8 mm. Detailed description is given in Nieves-Aldrey (2001a: 173).

Gall (Plate 10.9). The gall is in a form of a spindle-like stem swelling, 40 mm long, 7 mm in diameter, multilocular, of the same colour as the stem. Larval cells usually scattered in the outer parts of the stem.

Diagnosis. Similar to *Ph. caulicola* in that scutellar foveae separated by a central carina, sometimes foveae are reaching one another in the most anterior part; the radial cell of the forewing partially opened along the wing margin; the median mesoscutal line usually long, extending at least to 1/3 of the scutum length. In *Ph. hypochoeridis* the radial cell of the forewing 2.8 or more times as long as broad; flagellomeres, scape and pedicel are uniformly light brown; galls in stems of *Hypochoeris*, while in *Ph. caulicola* the radial cell of the forewing 2.5 or less times as long as broad; R1 indistinct, depigmented; flagellomeres are light brown, the scape and pedicel are dark brown to black; galls in stems of *Picris*.

Distribution. ES, PT, North Africa (Nieves-Aldrey, 1984, 1987, 1988), HU (Ambrus, 1974), PL (Kierych, 1979), GB (Eady & Quinlan, 1963; Cameron, 1893), DE, GB, AT, FR, IT (Kieffer, 1897-1901). In Ukraine – Transcarpathian Region, vicinities of Uzhgorod (22 specimens were reared from galls on *H. radicata* by the author).

Biology. Monovoltine. Larvae overwintering in the gall, adults emerge next year, in April. Host plants: *Hypochoeris radicata* L. and *H. glabra* L. (Asteraceae).

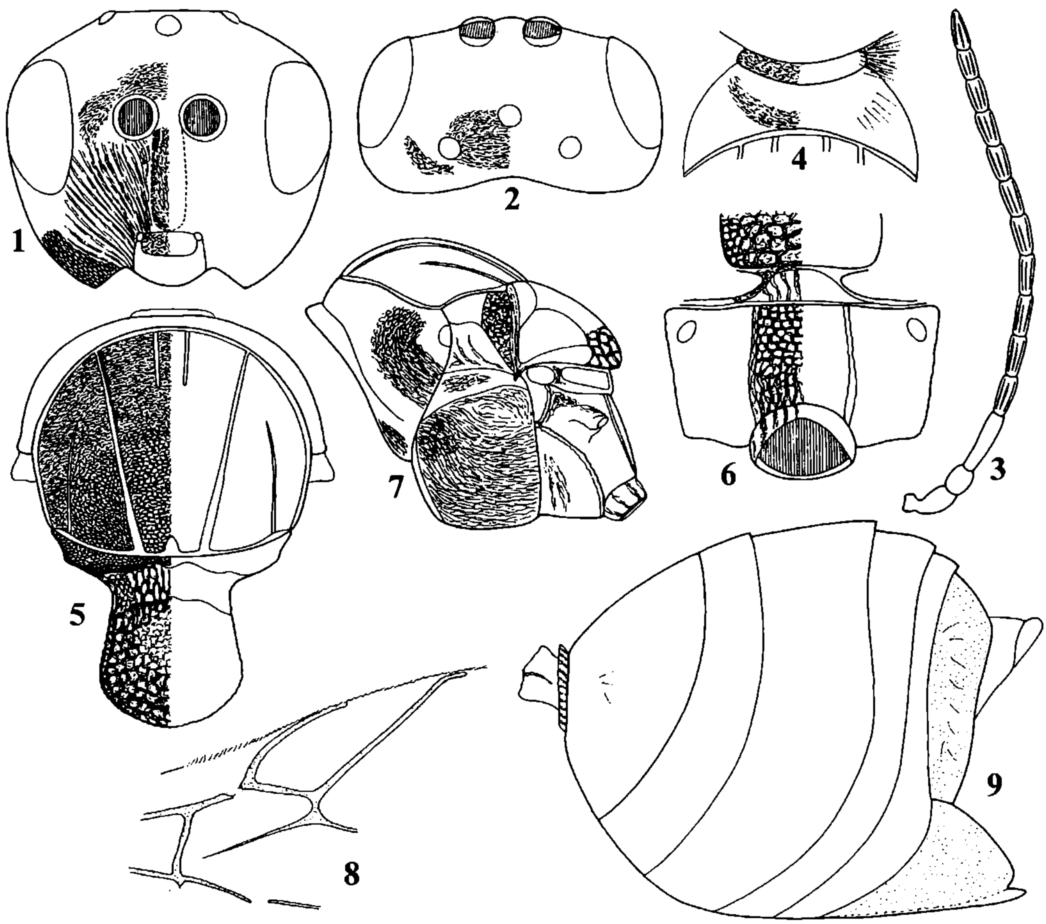


Figs 84.1-12. *Phanacis hypochoeridis*: 1-2, head, female: 1, front view, 2, from above. 3-4, head, male: 3, front view, 4, from above. 5-6, antenna: 5, female, 6, male. 7-12, female: 7, pronotum with submedian pronotal pits, dorsal view, 8, scutum and scutellum, dorsal view, 9, mesosoma, lateral view, 10, propodeum and dorsellum, dorso-posterior view, 11, forewing, part, 12, metasoma, lateral view.

Phanacis lampsanae (Perris, 1873)

Figs 85.1-9, Plate 10.12.

Aulax lampsanae Perris, 1873: 77 (gall); *Diastrophus lampsanae*: Karsch, 1878: 46 (female, gall); *Timaspis lampsanae*: Mayr, 1881: 18; Nieves-Aldrey, 1994a: 195; *Phanacis lampsanae*: Eady & Quinlan, 1963: 18; **comb. rev.**



Figs 85.1-9. *Phanacis lampsanae*, female: 1-2, head,: 1, front view, 2, from above. 3, antenna, 4, pronotum with submedian pronotal pits, dorsal view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, forewing, part, 9, metasoma, lateral view.

Description. Female. 1.6-2.2 mm. Head and mesosoma black, metasoma dark chestnut brown, posterior tergites darker. Antenna chestnut brown, with darker scape and pedicel. Legs light chestnut brown, with darker proximal tarsomeres. POL 2.0 times as long as OOL and 3.8 times as long as diameter of lateral ocellus. Transfacial distance 1.4 times as long as height of eye. Antenna 14-segmented, pedicel as broad as long, F1 1.5-1.7 times as long as F2; F12 and F11 separated by a distinct suture. Mesopleuron irregularly rugoso-reticulate. Forewing as long as body, with short cilia, R1 extending along wing margin to half length of radial cell; radial cell 3.5-3.7 times as long as broad. Otherwise similar to *Ph. cichorii*. Male. 1.6-1.8 mm. Similar to female but the colouration is darker; antenna and legs dark chestnut brown; antenna relatively longer, 14-segmented, F1 slightly curved medially and broadened apically.

Gall (Plate 10.12). The gall develops on any part of the stem, forming a 20-40 mm elongated swelling. The surface of the growing gall is of the same colour as the stem, turns brown when mature, with some longitudinal ribs. Multilocular.

Diagnosis. See Diagnosis to *Ph. cichorii*. It is also very closely related to *Ph. lusitanica* and often it is very hard to distinguish them (see the key), however, they induce galls on different plants.

Distribution. FR, DE (Kieffer, 1897-1901), ES (Nieves-Aldrey, 1985, 1987, 1988, 2001a), GB (Eady & Quinlan, 1963), HU (Ambrus, 1974), PL (Kierych, 1979), RO (Ionescu, 1973). In

Ukraine – Transcarpathian Region only, vicinities of Uzhgorod (few specimens were reared from stems of *Lampsana communis* by the author).

Biology. Monovoltine. Larvae overwintering in the gall, adults emerge next spring, in May. The only known host plant is *Lampsana communis* L. (Asteraceae).

Phanacis phlomidis Belizin, 1959

Phanacis phlomidis Belizin, 1959: 672 (female, male).

Description. Female 2.0-2.4 mm, male 2.0 mm. Very similar to *Ph. carthami* and *Ph. centaureae*. The description is given in Belizin (1959).

Gall in the stem, without external deformation; ellipsoid larval cells are located along the axis of the stem. Galls cannot be distinguished from those induced by *Aulacidea phlomica* and *Panteliella fedtschenkoi.*

Diagnosis. Very closely related to *Ph. carthami* (see Diagnosis to *Ph. carthami*). Similar also to *Ph. centaureae* but POL nearly equal OOL; the mesopleuron is dull reticulate, with distinct anterior parallel lines; the radial cell is more elongated, 3.0 times as long as broad, F3 shorter than F2, equal to F4; hind tarsomere 2 longer than 5; the head of the male is very massive, broader than the mesosoma, forewings are shortened and reaching to the middle of metasomal tergite 3.

Distribution. RU (Kursk Region (Belizin, 1959; Zerova, Diakontschuk & Ermolenko, 1988)). In Ukraine -- Donetsk Region, Khomutovskyj steppe Natural Reserve and Kherson Region, Askania-Nova Natural Reserve (123 examined specimens collected by S. Klymenko, SIZK collection).

Biology. Monovoltine. Adults emerge in May (Zerova, Diakontschuk & Ermolenko, 1988). The host plant association is unusual for *Phanacis*, *Phlomis tuberosa* L. (Lamiaceae).

Phanacis phoenixopodos (Mayr, 1882)

Plate 10.13-14.

Timaspis phoenixopodos Mayr, 1882: 5 (female, male, gall), Nieves-Aldrey, 1994b: 195; *Phanacis phoenixopodos*: Nieves-Aldrey, 1984: 237; **comb. rev.**

Description. Female. 1.8-2.3 mm. Predominantly black, antennae and legs chestnut brown, femurs distally, tibiae and tarsi lighter. Wings hyaline, veins dark chestnut brown. Head broader than long from above, 1.2 times as broad as high in front view, gena not broadened behind eye, not visible in front view behind eye. Interocellar area raised. POL 1.3 times as long as OOL; OOL nearly 3.0 times as long as diameter of lateral ocellus. Malar space 0.7 times as long as height of eye, with striae, radiating from clypeus and nearly reaching eye. Clypeus nearly quadrangular, ventral margin rounded, projecting over mandibles. Transfacial distance 1.5 times as long as height of eye; distance between antennal sockets nearly equal to diameter of socket, distance between antennal socket and inner margin of eye. Lower face with delicate striae radiating from clypeus and extending nearly to inner margin of eye and antennal socket. Frons and vertex dull coriaceous; occipital carina present; distance between occipital and oral foramens much shorter than height of occipital foramen. Antenna 14-segmented; pedicel slightly broadened apically, slightly longer than broad; F1 robust, 1.5 times as long as F2; placodeal sensilla on all flagellomeres. Mesosoma relatively short and high. Pronotum relatively short, along dorso-median line at least 1/3 shorter than measuring along outer lateral margin; submedian pronotal pits in a form of narrow transverse impression. Pronotum irregularly rugose laterally. Scutum alutaceous to delicately coriaceous. Notauli distinctly and deeply impressed along entire length; median mesoscutal line extending at most to 1/3 of scutum length. Scutellum rounded, rugose; scutellar foveae in a form of transverse anterior impression, smooth, shining. Mesopleuron rugoso-alutaceous or rugose-striate; axillula rugose, with relatively dense white setae. Dorsellum coriaceous to reticulate, medially shorter than the smooth ventral impressed area. Lateral propodeal carina subparallel, curved outwards in the most posterior part. Forewing slightly shorter than length of body; margin with relatively long cilia; radial cell partially closed, 2.5 or more times as long as broad; areolet distinct; Rs+M distinct, nearly reaching basalis in the most lower part, near M+Cu1. Tarsal claws very narrow, without basal lobe. Metasoma shorter than head+mesosoma; tergites without punctures; prominent part of ventral spine of hypopygium short, with short sparse white setae. Male. 1.5-1.8 mm. Similar to female but darker coloured, antenna relatively longer, 14-segmented, F1 slightly curved medially and broadened apically, slightly longer than F2.

Gall (Plate 10.13-14). The light brown yellowish gall is located on the stem, more or less spindle-like or in a form of an irregular swelling, 35-45 mm long and 12-15 mm in diameter. Multilocular.

Diagnosis. Closely related to *Ph. cichorii*, *Ph. lampsanae* and *Ph. lusitanica* but differs by the rugoso-striate mesopleuron, Rs+M is distinct and reaching basalis in the most lower part; the interocellar area raised over the vertex; F1 robust, more than 1.5 times as long as F2.

Distribution. ES, PT (Nieves-Aldrey, 1984, 1988, 2001a; Pujade-Villar, 1986b), FR (Kieffer, 1897-1901), IT, RO (Ionescu, 1973), IL (Argaman, 1989). In Ukraine – Transcarpathian Region only, vicinities of Uzhgorod (6 females were reared from stems of *Lactuca viminea* by the author); probably common throughout the territory of the country.

Biology. Monovoltine. Host plants: *Lactuca viminea* (L.) J.Presl. and *L. saligna* L. (Asteraceae).

Phanacis varians Diakontschuk, 1980

Figs 86.1-9, Plate 10.10.

Phanacis varians Diakontschuk, 1980a: 20 (female, gall); *Phanacis* (*Pseudophanacis*) *culmicola* Diakontschuk, 1981c: 27 (female, gall), **syn. n.** *Phanacis* (*Pseudophanacis*) *orientalis* Diakontschuk, 1981c: 31 (female, gall), **syn. n.** *Phanacis* (*Pseudophanacis*) *stepicola* Diakontschuk, 1981c: 29 (female, gall), **syn. n.**

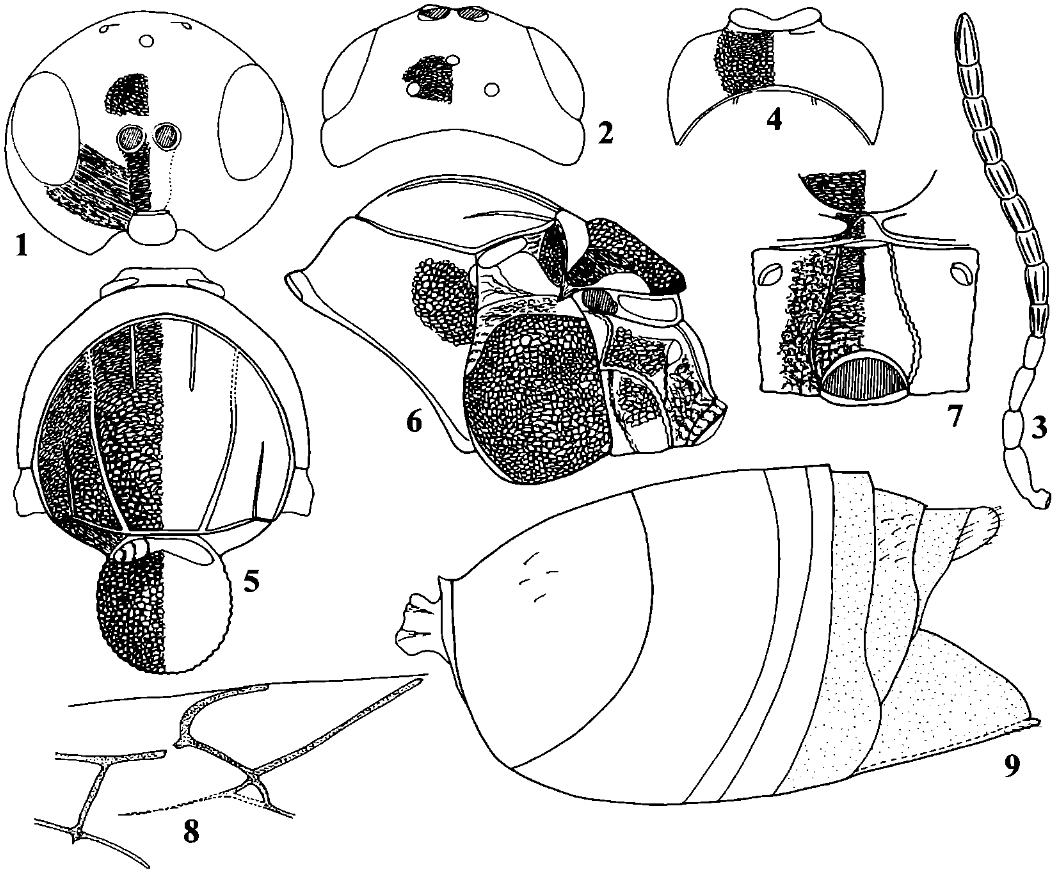
Description. Female. 1.8-2.4 mm. Similar to *Ph. crassinervis* (see Description and Diagnosis to *Ph. crassinervis*). Male uknown.

Gall (Plate 10.10) in a form of typical small larval cells inside the stem, without external deformations, as it is typical for many *Phanacis* species.

Material examined. *Phanacis culmicola*: holotype female: Ukraine, Kherson Region, Chernomorskij Natural Reserve, 22.04.1978, coll. A.G. Kotenko, ex stem of *Centaurea adpressa*, em. 19-22.05.1978. Paratypes: 256 females with the same labels as the holotype; 31 female: Ukraine, Donetsk Region, Khomutovskyj steppe Natural Reserve, 23.04.1975, coll. M.D. Zerova, ex stem of *Centaurea adpressa*, em. 22-28.05.1975; 8 females: Ukraine, Donetsk Region, Khomutovskyj steppe Natural Reserve, 28.04.1978, coll. M.D. Zerova, ex stem of *Centaurea adpressa*, em. 22-26.05.1978. Body appendages in preparation No 11-13. *Phanacis orientalis*: holotype female: Ukraine, Donetsk Region, Khomutovskyj steppe Natural Reserve, 18.04.1978, coll. L.A. Diakontschuk, ex stem of *Centaurea adpressa* x *C. orientalis*, em. 2-10.05.1978. Paratypes: 5 females with the same labels as the holotype; 3 females: Ukraine, Donetsk Region, Khomutovskyj steppe Natural Reserve, 23.04.1975, coll. M.D. Zerova, ex stem of *Centaurea adpressa* x *C. orientalis*. Body appendages in preparation No 16-17. *Phanacis stepicola*: holotype female: Ukraine, Donetsk Region, Khomutovskyj steppe Natural Reserve, 18.04.1978, coll. L.A.Diakontschuk, ex stem of *Centaurea adpressa* x *C. orientalis*, em. 28.05.1978. Paratypes: 118 females with the same label as the holotype. Body appendages in preparation No 14-15. All are deposited in the SIZK collection.

Distribution. Ukraine -- Kherson and Donetsk regions (Diakontschuk, 1981c; Zerova, Diakontschuk & Ermolenko, 1988).

Biology. Only females are known, monovoltine. The absence of males suggests that this species reproducing parthenogenetically, by thelytoky. Adults emerge in May (Zerova, Diakontschuk & Ermolenko, 1988). Host plants: *Centaurea adpressa* L. and *C. orientalis* L. (Asteraceae).



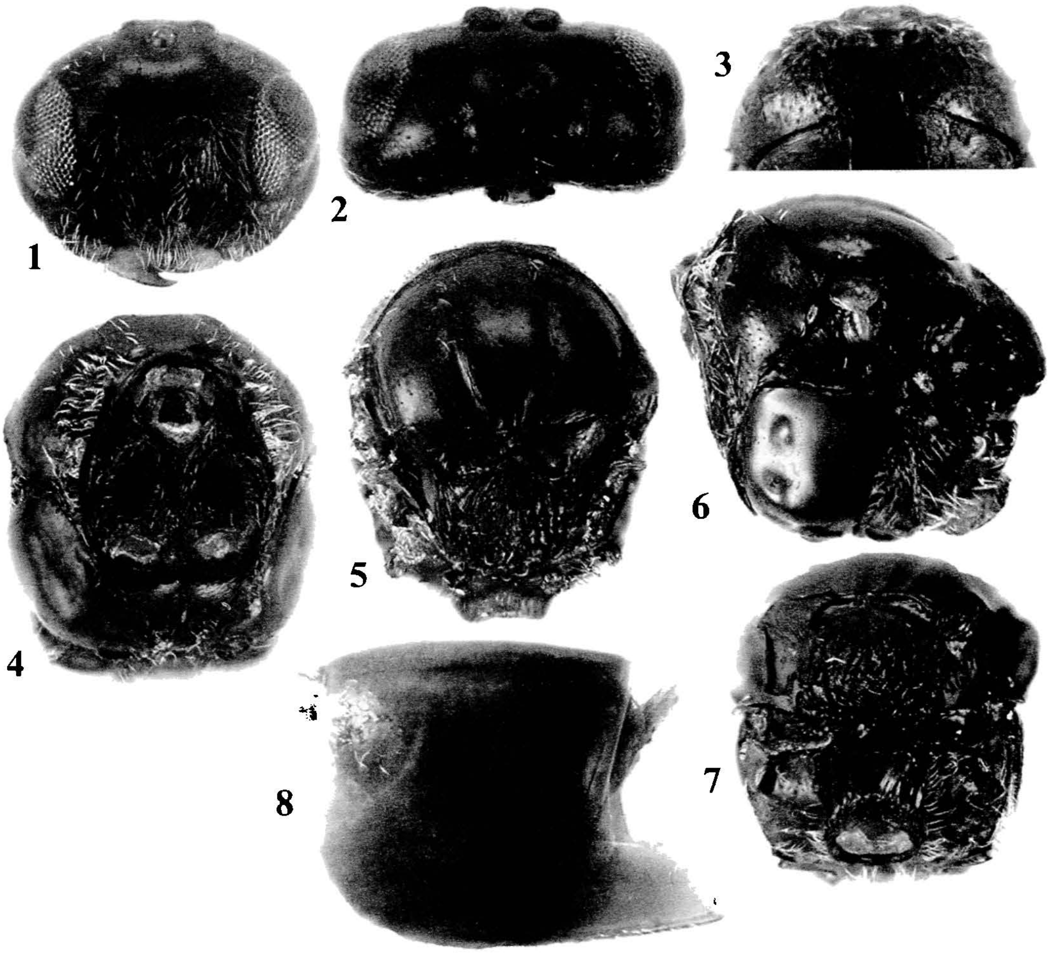
Figs 86.1-9. *Phanacis varians*, female: 1-2, head: 1, front view, 2, from above. 3, antenna, 4, pronotum with submedian pronotal pits, dorsal view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, forewing, part, 9, metasoma, lateral view.

Xestophanes Förster, 1869

Figs 87.1-8.

Xestophanes Förster, 1869: 332, 337. Type species: *Cynips potentillae* Retzius, 1783, designated by Förster (1869).

Head transverse, slightly broader than high in fron view. Gena broadened behind eye, visible behind eye in front view. Lower face with striae radiating from clypeus and reaching to eye and antennal socket; median elevated area coriaceous, relatively strongly raised. Clypeus quadrangular, smooth or alutaceous, projecting over mandibles, ventral margin rounded; clypeo-pleurostomal line, epistomal sulcus and anterior tentorial pits distinct. Frons, vertex, occiput, postociiput and postgena almost smooth and shining to alutaceous. Antenna of female 13-segmented, F1 as long as or slightly longer than F2; antenna of male 14-segmented. Pronotum dorsally long, laterally with dense white setae, alutaceous; submedian pronotal pits deep, transverse, separated by a distance around 2.0 times as short as width of a pit; pronotal plate well-delimited laterally till scutum, smooth, shining, without setae, slightly raised over dorsal part of pronotum. Scutum smooth to very delicately alutaceous, shining; notauli complete or faint anteriorly; median mesoscutal line in a form of short triangle; parapsidal and anterior parallel line also distinct. Scutellum delicately coriaceous; scutellar foveae transverse, smooth; mesopleuron smooth and shining. Forewing margin with moderately long cilia; radial cell opened on the margin, but R1 reaching to wing margin. Tarsal claws with weakly developed basal lobe. Metasomal tergite 2 with a patch of white setae antero-laterally, without punctures; subsequent tergites and large hypopygium with more or less distinct punctures; prominent part of ventral spine of hypopygium short, with two rows of setae, apical setae extending behind apex of spine.



Figs 87.1-8. *Xestophanes potentillae*, female: 1-2, head: 1, front view, 2, from above. 3, pronotum with submedian pronotal pits, dorsal view, 4, pronotum and propleura, front view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, metasoma, lateral view.

Taxonomic comments. *Xestophanes* together with the closely related *Diastrophus*, form a distinct group within Aylacini: a) morphologically, by tarsal claws having an acute basal lobe and the frons, vertex and mesopleuron are not sculptured; b) biologically, by their association with Rosaceae (the genera *Potentilla* and *Rubus*). The genus is very likely monophyletic, based on the fusion of the 2nd and 3rd metasomal tergites in females.

Distribution and Biology. Two species of *Xestophanes* are known only, both from the Western Palaearctic Region and both inducing galls on stems and runners of *Potentilla* species (Rosaceae). In between host plants Belizin (1959) mentioned also *Sibbaldia* L. (Rosaceae), however, it must be confirmed.

Key to *Xestophanes* species

1. Notauli indistinct in anterior 1/3 of scutum; tarsomere 4 of hindleg longer than broad; F1 as long as F2 .... ***potentillae***

-- Notauli usually complete; tarsomere 4 of hindleg nearly as long as broad; F1 slightly longer than F2 .... ***brevitarsis***

Xestophanes brevitarsis (Thomson, 1877)

Plate 10.15.

Aulax brevitarsis Thomson, 1877: 805 (female, male); *Xestophanes brevitarsis*: Mayr, 1881: 21 (female, male); *Xestophanes tormentillae* Schlechtendal, 1880: 54.

Description and Diagnosis. Female 1.7-2.0 mm, male 1.6-1.8 mm. See Description and Diagnosis to *X. potentillae*. Head and mesosoma chestnut red to black, metasoma orange to amber; antenna light chestnut; wing veins pale brown. Head and mesosoma with more dense setae; notauli complete, impressed anteriorly also; hind tarsomere 4 relatively shorter, nearly as long as broad; F1 slightly longer than F2; radial cell relatively longer and areolet well-delimited, always distinct.

Gall (Plate 10.15) The monolocular gall is developing on any part of a sprout and forming a one-side swelling, which bulking from the epidermis as a hemisphere. The gall cell 1.0-3.0 mm broad and 3.0-4.0 mm long, usually located in groups, which forming a string. They are yellowish-red when young and turn brown when mature. Sometimes the gall can form on the leaf midrib or even on the main vein of the leaf.

Taxonomic comments. Morphological characters of adults, the position and shape of galls, host associations which are given for the separation of *X. brevitarsis* from *X. potentillae* are not appreciable as well as experiments done by Folliot (1964) do not support indubitably the specificity of two *Xestophanes* species. I am doubt that *X. brevitarsis* and *X. potentillae* are different species and suppose that they are synonymic, however, further DNA analysis must to prove it.

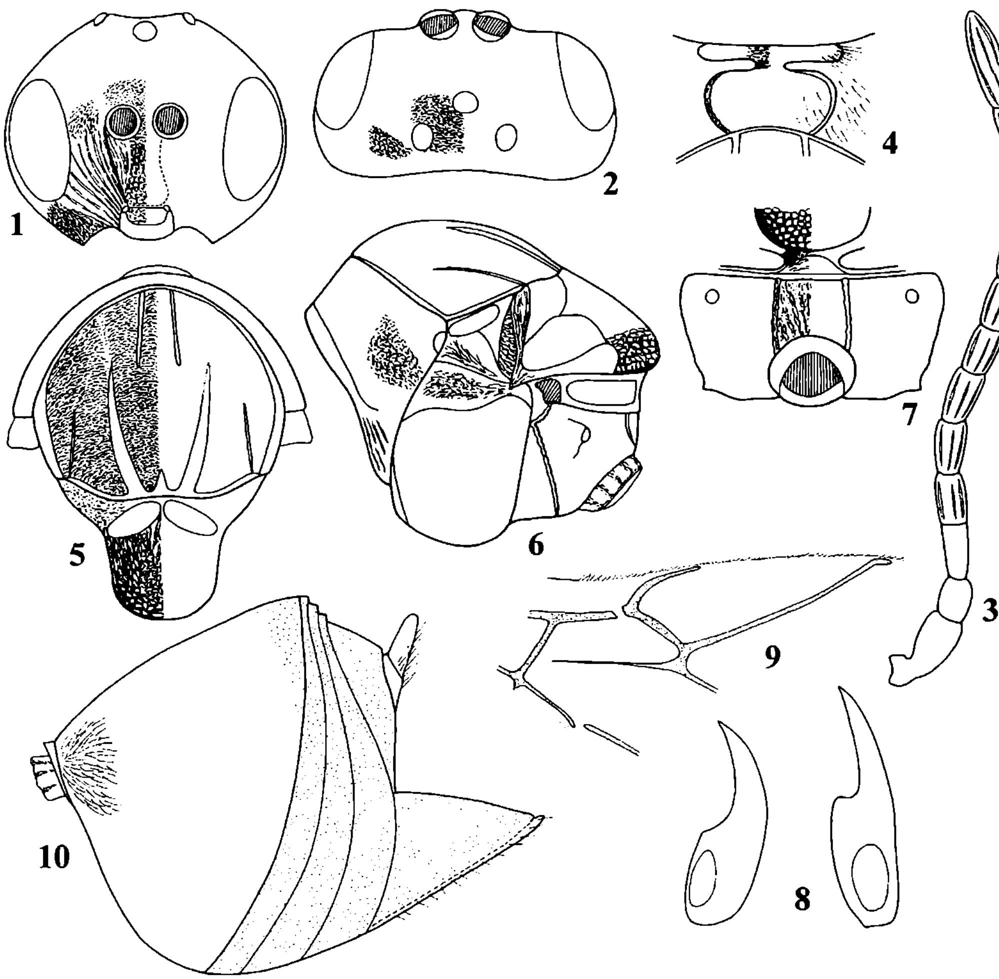
Distribution. Mainly western Europe: AU, FR (Kieffer, 1897-1901), SE (Nieves-Aldrey, 1994b), ES, PT (Nieves-Aldrey, 1984, 1987, 1988), GB (Eady & Quinlan, 1963; Cameron, 1893), FI, SE, (Coulians & Holmåsen, 1991); also HU (Ambrus, 1974), PL (Kierych, 1979), IT, RO (Ionescu, 1973). In Ukraine – Transcarpathian Region only (vicinities of Uzhgorod; few specimens reared from *P. recta* by the author).

Biology. Monovoltine. Host plants: *Potentilla erecta* L.; *P. arenaria* Borkh., *P. heptaphylla* L., *P. verna* L. (Kierych, 1979); also *P. canescens* Bess (Rosaceae) (Ionescu, 1973). According Nieves-Aldrey (2001a) and Ambrus (1974) *X. brevitarsis* associates exclusively with *P. erecta* L.

Xestophanes potentillae (Retzius, 1783)

Figs 88.1-10, Plate 10.16.

Cynips potentillae Retzius, 1783: 70 (female, male); *Xestophanes potentillae*: Cameron, 1893: 52; *Aylax splendens* Hartig, 1840: 196; *Aulax potentillae*: Cameron, 1893: 52; *Aulax abbreviatus* Thomson, 1877: 805 (synonym in Nieves-Aldrey, 1994a: 154); *Xestophanes abbreviatus*: Dalla Torre & Kieffer, 1910: 657; *Aulax foveicollis* Thomson, 1877: 804 (synonym in Nieves-Aldrey, 1994a: 154); *Xestophanes foveicollis*: Kieffer, 1897-1901: 288 (female, male, gall); 1902d: 93; *Aulax laevigata* Schenck, 1863: 218; *Xestophanes laevigatus*: Dalla Torre & Kieffer, 1910: 657; *Xestophanes potentillae* var. *laevigatus* Kieffer, 1897-1901: 290; *Xestophanes levigatus* (sic!) Kieffer, 1902d: 93; *Xestophanes Szépligetii* Balás, 1940: 4-5 (female, male gall), **syn. n.**



Figs 88.1-10. *Xestophanes potentillae*, female: 1-2, head: 1, front view, 2, from above. 3, antenna: 4, pronotum with submedian pronotal pits, dorsal view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, tarsal claws, 9, forewing, part, 10, metasoma, lateral view.

Description. Female. 1.7-2.7 mm. Head and mesosoma black, in some specimens lower face, gena, sides of pronotum, mesopleuron, sides of propodeum and sometimes metanotum dark brown; metasoma reddisk-brown, with dark brown to black posterior tergites, especially dorsally. Antenna dark brown; coxae, trochanters, femurs dirty brown, tibiae and tarsi yellow. Mandibles and palpi yellowish. Wing veins distinct, brown. Head alutaceous to smooth, shining, with uniformly sparse white setae, 1.8 times as broad as long from above, 1.2 times as broad as high and slightly broader than mesosoma. Gena alutaceous, slightly broadened behind eye, visible in front view. Malar space with delicate striae radiating from clypeus and reaching eye, 0.4 times as long as height of eye. POL nearly equal OOL, 2.1 times as long as LOL and 2.1 times as long as diameter of lateral ocellus. Transfacial distance 1.25 times as long as height of eye; diameter of antennal torulus 3.3 times as long as distance between them and slightly shorter than distance between torulus and eye margin. Lower face with delicate striae radiating from clypeus, and reaching eye and antennal socket; median elevated area delicately coriaceous, without striae. Clypeus rectangular, nearly 2.0 times as broad as high, alutaceous or smooth, with slightly elevated central area; with distinct anterior tentorial pits, with distinct impressed epistomal sulcus and clypeo-pleurostomal line, ventral margin nearly straight. Frons, vertex and occiput alutaceous.

Antenna 13-segmented; pedicel 1.3 times as long as broad; F1 nearly 1.5 times as long as pedicel and as long as F2; subsequent flagellomeres nearly equal in length; F11 nearly 2.0 times as long as F10; placodeal sensilla on F2-F11. Mesosoma convex, nearly as long as high in lateral view, with very few white setae. Pronotum dorsally long, laterally with dense white setae, alutaceous; submedian pronotal pits deep, transverse, separated by a distance around 2.0 times as short as width of a pit; pronotal plate well-delimited laterally till scutum, smooth, shining, without setae, slightly raised over dorsal part of pronotum. Scutum delicately alutaceous, shining, nearly as broad as long and 1.8 times as long as scutellum. Notauli indistinct in anterior 1/3; broader posteriorly, well-impressed in posterior half; median mesoscutal line in a form of short triangle; parapsidal lines indistinct, narrow, reaching to level of tegulae; anterior parallel lines distinct, extending at least to 1/3 of scutum length. Scutellum slightly longer than broad, with subparallel sides, uniformly coriaceous, very slightly overhanging metanotum. Scutellar foveae transverse, nearly 2.0 times as broad as high, smooth, shining, well-delimited around, separated by a very narrow central carina. Dorso-axillar area with few short white setae, alutaceous to delicately coriaceous. Mesopleuron smooth, shining; mesopleural triangle alutaceous. Metapleural sulcus reaching mesopleuron in the upper 1/3 of its height, metapleuron smooth, shining; axillula transverse, slightly longer than high, smooth, shining, with few setae; subaxillular bar smooth, shining, nearly as high as height of metanotal trough; ventral bar of metanotal trough smooth, 2.5 times narrower than height of metanotal trough. Dorsellum alutaceous to smooth, medially very narrow, at least 3.5 times narrower than height of ventral impressed area; metanotal trough smooth, shining, with few white setae; ventral impressed area smooth, shining or alutaceous. Propodeum smooth, shining to alutaceous, lateral propodeal carinae nearly straight, parallel, sometimes slightly curved inwards in the most posterior part, without setae; central propodeal area shining, with very delicate irregular wrinkles, with few setae; lateral propodeal area smooth, shining, with relatively dense white setae. Forewing with distinct brown veins, margin with long cilia; radial cell opened or partially opened along margin, 3.4 times as long as broad; R1 reaching wing margin and more or less extending along it; Rs reaching wing margin, areolet usually absent, Rs+M nearly reaching basalis, projecting into the lower half of it. Tarsomere 4 of hindleg longer than broad; tarsal claws with weak basal lobe. Metasoma nearly as long as head+mesosoma, rounded, nearly as long as high in lateral view, with metasomal tergites 2 and 3 fused, with a patch of dense white setae antero-laterally and with a small patch of punctures only in the most dorso-posterior part; subsequent tergites and hypopygium with dense distinct punctures; hypopygium large, long; prominent part of ventral spine of hypopygium very short, with two rows of relatively long white setae, apical setae extending behind apex of spine. Male. 1.5-2.0 mm. Similar to female but antenna 14-segmented, F1 slightly curved medially and broadened apically, metasomal tergites 2 and 3 not fused.

Gall (Plate 10.16). A rounded or elongated dark brown, 3.0-10 mm conglomerate from numerous rounded galls, with hard harsh walls, which are formed on the root collar or closely to the ground surface. The surface usually is reddish-brown, with delicate warts. The wall is loosing its resiliency by mid-summer, and the surface, due to dilatation, becoming cracked. Galls are invisible in the turf. The gall often developing on the leaf midrib or the above ground parts of runners and consists of separate 3.0-5.0 mm spherical or pearl necklace-like rows of galls. The surface is reddish-brown, mat, each gall consists one larva.

Taxonomic comments. We were unable to locate the type of *Xestophanes Szépligetii* Balás, 1940 (probably lost, absent from HNHM, Budapest), however, on the basis of the original description, no doubts, that it is synonymic with *X. potentillae*.

Distribution. Widespread and common species throughout Europe: DK, FI, NO, SE (Coulians & Holmåsen, 1991), RO (Ionescu, 1973), HU (Ambrus, 1974), PL (Kierych, 1979), GB (Eady & Quinlan, 1963; Cameron, 1893), DE, AT, FR, IT, SE, GB (Kieffer, 1897-1901), ES (Nieves-Aldrey, 1984, 1985, 1987, 1988), RU (Belgorod and Lipeck Region (Belizin, 1959; Zerova, Ermolenko & Diakontschuk, 1988)). Common in Ukraine, particularly in Crimea (Diakontschuk, 1981, 1987) and Transcarpathian Region (Uzhgorod, Velyka Dobrony, author). Presumably distributed all over the territory of Ukraine.

Biology. Mono- or bivoltine (Folliot, 1964). The life-cycle and the gall formation were studied in details by Folliot (1964). He established that the species can reproduce also by facultative parthenogenesis, arrhenotoky. The gall already visible on the stem by July, matures in September. The larvae overwintering in the gall and adults emerge next year in May-June. Host plants: *Potentilla arenaria* Borkh., *P. reptans* L., *P. canescens* Bess, *P. impolita* Wahlenb. (Belizin, 1959), *P. heptaphylla* L., *P. silesiaca* Uechtr., *P. sterilis* (L.) Garcke, *P. canescens* Bess, *P. pimpinelloides* L.; *P argentea* L. (Rosaceae) (Kierych, 1979).

Tribe Diplolepidini Latreille, 1802

Diplolepariae Latreille, 1802: 196.

Small wasps, maximum 6 mm long, predominantly black, with metasoma partially orange red to chestnut brown. Head transverse from above, delicately coriaceous, with some punctures on the lower face. Antennae in both sexes 14-15 segmented in *Diplolepis* Geoffroy, 1762 and 16-17-segmented in *Liebelia* Kieffer, 1903. Pronotum short, dorso-medially around 1/7 times as long as its length measuring dorso-laterally. Scutum delicately coriaceous, or reticulate, with some punctures, with distinct notauli, median mesoscutal line present or absent. Scutellum rounded or elongated, dull rugose or coriaceous, scutellar foveae present, indistinct, shallow, separated or not by a median carina. Mesopleuron smooth, with distinct more or less broad transverse furrow, area around it coriaceous; metathorax dull rugose, metapleural sulcus barely traceable between strong rugae; propodeum dull rugose, with strong irregular rugae; central propodeal area delimited or not by lateral propodeal carinae. Tarsal claws simple, without basal tooth. Forewing with dense setae, with short marginal cilia, usually infuscated; radial cell closed (in *Diplolepis*) or opened (in *Liebelia*), 2r always angled. First metasomal tergite reduced, visible only dorsally; 2nd tergite largest one, occupying 3/4 of metasoma length; hypopygium modified, plough-shaped in *Diplolepis* and usual shaped in *Liebelia.*

The Diplolepidini is a monophyletic group characterized by a unique autapomorphy in Cynipidae, the presence of a longitudinal furrow on the mesopleuron of the mesosoma. This tribe is currently divided into two genera: *Diplolepis* Geoffroy, 1762 (= *Rhodites* Hartig, 1840) and *Liebelia* Kieffer, 1903, both of which induce galls only on roses (*Rosa*, Rosaceae) (Table 7).

Table 7. The distribution and species richness of Diplolepidini

Genus	Species #	Distribution
***Diplolepis* Geoffroy, 1762**	6	Europe
	4	Asia
	31	USA and Canada
	41	World wide
***Liebelia* Kieffer, 1903**	1	Europe (Italy)
	10	Asia
	10	Palaearctic Region
	21	World wide
Total	**62**	World wide

Two other previously-recognised genera, *Lythorhodites* Kieffer, 1902 with a few species known from North America and *Nipporhodites* established by Sakagami (1949) for *Rhodites* (*N.*) *fukudae* Shinji from Japan, were later synonymised by Weld (1952a) to *Diplolepis*. Finally, Vyrzhikovskaya (1963) re-established *Nipporhodites* as a subgenus within *Liebelia*, and described a number of species collected in Kazakhstan and the Central Asian republics of the CIS. The two currently valid genera: *Diplolepis* and *Liebelia* can be easily distinguished on the basis of the next diagnostic characters: in *Diplolepis* antennae of females and males are 14-15-segmented, the radial cell of the forewing is closed along the wing margin, the hypopygium is plough-shaped, while in *Liebelia* antennae are 16-segmented, the radial cell opened and the hypopygium is not plough-shaped.

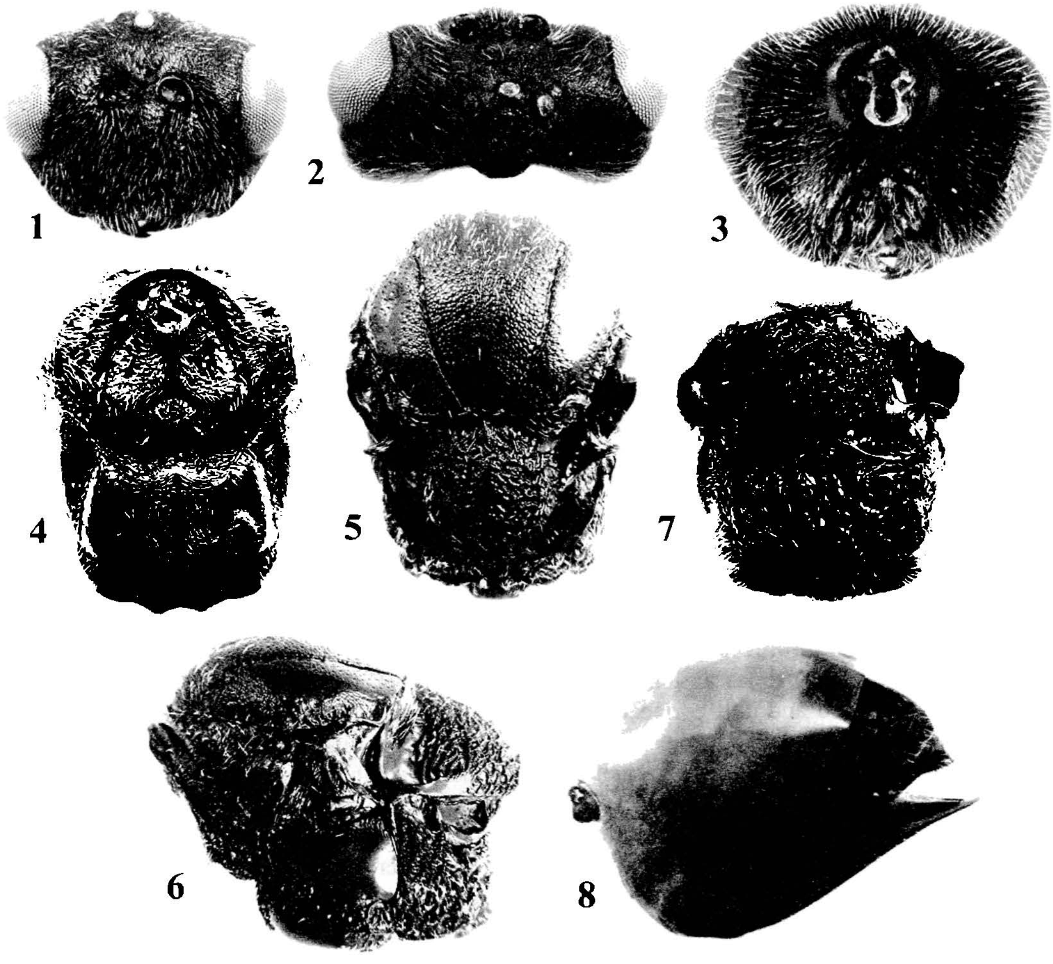
This group has a holarctic distribution, well represented in the Nearctic and Palaearctic Regions. The genus *Diplolepis* comprises 41 species (Table 7). The genus *Liebelia* contains 1 European species (*L. cavarai* Kieffer, 1895, Italy, Sardinia) and 10 species from Kazakhstan and Siberia (Belizin, 1957; Vyrzhikovskaya, 1963).

Diplolepis Geoffroy, 1762

Figs 89.1-8.

Cynips Linnaeus, 1758 (part): 343 & 553. *Diplolepis* Geoffroy, 1762: 309. *Cynips* (*Eucharis*) Panzer, 1806: 96. *Rhodites* Hartig, 1840: 186. *Aylax* Hartig, 1840: 196 (part). *Hololexis* Förster, 1869: 330 & 333. *Tribalia* Walsh, 1864: 470. *Cynips* (*Rhodites*): Kaltenbach, 1874: 223. *Lytorhodites* Kieffer, 1902d: 96. Type species: *Cynips rosae* Linnaeus, 1758, designated by Karsch (1880).

Body predominantly black, only the metasoma in some species partially chestnut brown or orange-yellow. Antennae and legs orange to chestnut brown. Head strongly transverse from above and in front view, with uniformly sparse white setae. Gena delicately coriaceous, not broadened behind eye, shorter than height of eye; transfacial distance much longer than height of eye; diameter of antennal torulus nearly equal to the distance between them, distance between torulus and eye margin 1.5-2.0 times as long as diameter of torulus. Lower face delicately coriaceous, with slightly elevated and dull coriaceous median area; with distinct punctures in some species. Clypeus coriaceous, trapezoid, projecting over mandibles, with distinct anterior tentorial pits, with distinct epistomal sulcus and clypeo-pleurostomal line. Mandibles, maxillar and labial palps on figures. Frons coriaceous to reticulate; vertex, interocellar area and occiput delicately coriaceous, postgena delicately striate. Postocciput around occipital foramen impressed, transversely delicately striate; gular sulci indistinct; occipital foramen slightly higher than gula and hypostomal foramen higher than height of occipital foramen. Antennae 14-15 segmented in both sexes, flagellomeres cylindrical, relatively large, F1 usually 1.3 or more times longer than F2; placodeal sensilla on all flagellomeres in males and absent on F1 in females. Pronotum short, dorso-medially 1/7 as long as measured latero-dorsally; submedian pronotal pits indistinct, slightly impressed or in form of narrow transverse impression; pronotum laterally with strong parallel or subparallel rugae. Mesosoma convex in lateral view; scutum coriaceous to microreticulate, sometimes with some punctures; notauli usually complete, reaching pronotum; anterior parallel lines and parapsidal lines present, distinct; median mesoscutal line absent, if present than very short or in a form of short triangle posteriorly. Mesopleuron rugose to smooth, with piliferous points; with a strong transverse coriaceous to dull rugose furrow. Scutellum ovate, rounded or slightly elongated, pointed posteriorly, rugose to dull rugose, with strong irregular rugae; scutellar foveae transverse, indistinctly delimited, divided by coriaceous to rugose median more or less broad carina. Dorso-axillar area and axillar carina with weak longitudinal striae, axillula smooth, shining; subaxillular bar smooth, shining, narrower than height of metanotal trough. Metapleural sulcus indistinct in between strong metapleural irregular rugae; propodeal spiracle small. Dorsellum rugose, usually higher than height of ventral impressed area; metanotal trough glabrous, usually with some longitudinal parallel striae. Propodeum with strong irregular rugae; central propodeal area usually not delimited by distinct lateral propodeal carina; nucha short, with strong longitudinal rugae. Tarsal claws simple, without basal lobe. Forewing moderately or strongly uniformly or partially infuscated, margins with short but distinct cilia; radial cell closed along the margin; 2r usually angled. Metasomal tergite 1 reduced, visible only dorsally, tergite 2 occupying nearly 3/4 of metasoma length measuring dorsally; posterior tergites and hypopygium with micropunctures; hypopygium plough-shaped, prominent part of the ventral spine of hypopygium slightly longer than broad, with some sparse short setae.



Figs 89.1-8. *Diplolepis rosae*, female: 1-3, head: 1, front view, 2, from above, 3, posteriorly. 4, pronotum and plopleura, front view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, metasoma, lateral view.

Diplolepis is a very distinct genus within all the western palaearctic gall wasps and by the presence of a strong transverse furrow on the mesopleuron and plough-shaped hypopygium it can be easily distinguished from all other gall wasp genera. Also all the *Diplolepis* species associate with roses only (*Rosa* L., Rosaceae).

Holarctic genus, distributed in Europe, Africa, Asia and North America. The genus *Diplolepis* contains 6 European species (Pujade-Villar, 1993a; Pujade-Villar & Plantard, 2002), 4 species in the Eastern Palearctic Region, known from Kazakhstan, Japan, China, and Korea (Dalla Torre & Kieffer, 1910; Kim, 1963; Monzen, 1953; Vyrzhikovskaya, 1963; Weld, 1952a), and 31 species from America north of Mexico (Burks, 1979; Shorthouse & Ritchie, 1984). Two species: *D. nervosa* and *D. spinosissimae*, are extremely widespread, extending from western Europe to the Far East of Russia

(Kovalev, 1965). Two European species, *Diplolepis rosae* and *D. mayri* have been introduced to North America (Muesebeck et al., 1951; Judd, 1959), another transpalaearctic species, *D. nervosa*, accidentally was introduced to Canada (Shorthouse, 2001).

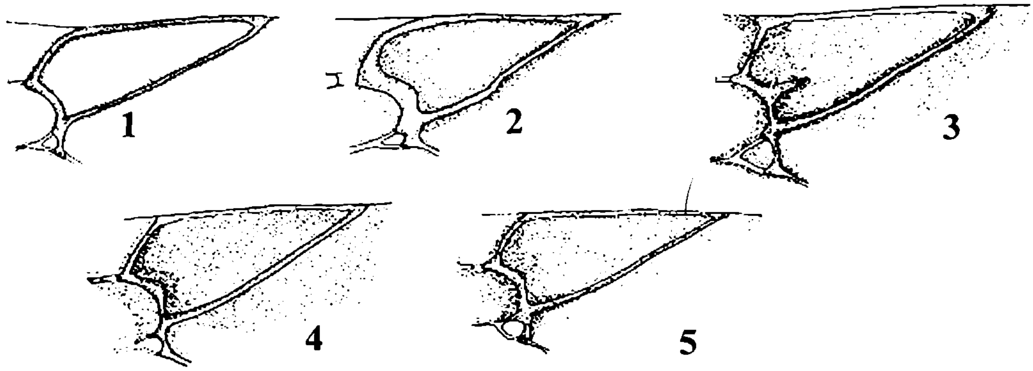
The alternation of sexual and asexual generations is unknown. Only the sexual generations are exist. All the known species are monovoltine. Recent research showed that the reproduction of *Diplolepis* rose gall wasps exhibit two different reproductive systems. In some populations only thelytokous females were found and males were extremely rare; all females were homozygous. This homozygous parthenogenesis was found to be strictly associated with the presence of the endosymbiotic bacterium *Wolbachia* sp. In other populations, deprived by *Wolbachia*, the *Diplolepis* reproduced by arrhenotoky and a larger number of males were present in the population and females were heterozygous (Plantard et al., 1998a, 1998b, 1999). All the *Diplolepis* species induce galls on wild roses of the genus *Rosa* (Rosaceae). Ca. 20-25 species of wild roses are known only from the Western Palaearctic Region, which with the *Diplolepis* species are associated (Nieves-Aldrey, 2001a). Recently five *Diplolepis* species were reported from Canada (in between them three accidentally introduced European species, *D. rosae*, *D. mayri* and *D. nervosa*), which were established on cultivated *Rosa rugosa* and its hybrids and became serious pests in gardens (Shorthouse, 2001).

Phylogenetic analysis showed that the Diplolepidini are closely related to another gall-inducing Cynipinae tribe Eschatocerini and within the European species of *Diplolepis* two distinct species groups are present: a) *D. eglanteriae* and *D. nervosa*; b) *D. rosae*, *D. mayri*, *D. fructuum* and *D. spinosissimae* (Plantard et al., 1998a, 1998b, 1999).

Key to the western palaearctic *Diplolepis* species

1. Radial cell more than 3.0 times as long as broad, 1st abscissa of radius strongly curved (Fig. 90.1); lower face and scutum smooth, shining, with weak punctures .... ***eglanteriae***

-- Radial cell usually 3.0 times or less as long as broad (usually less than 2.5 times), 1st abscissa of radius angled (Figs 90.2-5), lower face at least medially and scutum coriaceous, with or without punctures 2



Figs 90.1-5. Radial cell of the forewing, female: 1, *Diplolepis eglanteriae*, 2, *D. nervosa*, 3, *D. mayri*, 4, *D. rosae*, 5, *D. spinosissimae*.

2. Scutellum elongate and slightly constricted basally, median mesoscutal line present posteriorly .... ***nervosa***

-- Scutellum broadly ovate to nearly rounded, median mesoscutal line absent or indicated in a form of short indistinct triangle 3

3. Notauli complete and strongly converging posteriorly; median mesoscutal line only in posterior 1/3 of scutum; forewing uniformly infuscate; 2r angled, without median additional prolongation (Fig. 90.5); metasoma black .... ***spinosissimae***

-- Notauli complete or not, never strongly converging posteriorly; median scutal line absent or very indistinct; forewing infuscated around radial cell only; 2r with or without median additional prolongation (Figs 90.3-4); metasoma partially reddish 4

4. Area between scutellar foveae and disc of scutellum rugose; interspaces between rugae coriaceous; 2r in female angled, without or with very short additional vein (Fig. 90.4); male pedicel shorter or as long as broad .... ***rosae***

-- Area between scutellar foveae and disc of scutellum coriaceous; 2r in female with median additional prolongation into radial cell (Fig. 90.3); male pedicel longer than broad 5

5. Carina between scutellar foveae arise, with longitudinal projection into centre of scutellum; scutellum usually pointed posteriorly in both sexes, more conspicuously in female; pronotum dorso-laterally with large smooth area; 2r in male without or with short projection .... ***fructuum***

-- Carina between scutellar foveae flat, without projection; scutellum rounded posteriorly; pronotum dorso-laterally rugose; 2r in male with projection into radial cell .... ***mayri***

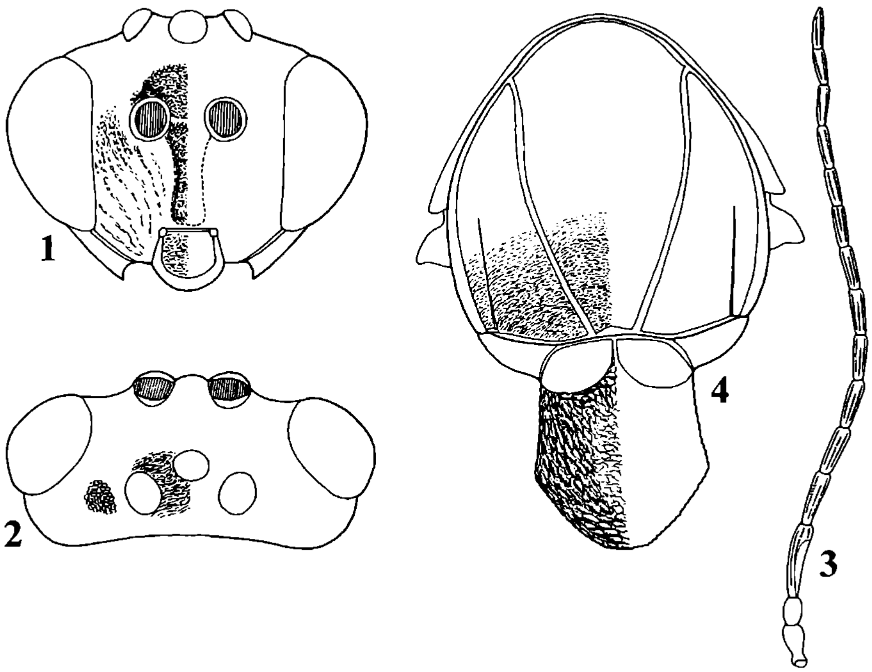
***Diplolepis eglanteriae* (Hartig, 1840)**

Figs 91.1-4, Plate 11.1.

Rhodites eglanteriae Hartig, 1840: 194 (female); *Hololexis eglanteriae*: Förster, 1869: 333; *Hololexis rufipes* Förster, 1869: 333 (synonym in Pujade-Villar, 1993a: 63); *Rhodites rufipes*: Mayr, 1882: 3; *Diplolepis eglanteriae*: Belizin, 1957: 928; Eady & Quinlan, 1963: 33.

Description. Female. 2.7-3.3 mm. Head and mesosoma usually black, however, in some specimens some chestnut brown or orange colouration present. Metasoma dorsally chestnut brown and dark brown postero-ventrally. Antenna dark brown to chestnut brown; legs uniformly brown to yellowish or orange brown. Wings moderately and uniformly infuscated, with darker stripes along 2r and basalis, veins dark brown, distinct. Head transversely trapezoid from above and transverse in front view, 1.5 times as broad as high. Gena not broadened behind eye. POL longer than OOL; OOL nearly 2.0 times as long as diameter of lateral ocellus. Transfacial distance nearly 2.0 times as long as height of eye, distance between antennal torulus and eye nearly equal to diameter of torulus. Lower face glabrous, with some short striae radiating from clypeus, median are slightly elevated, coriaceous. Clypeus trapezoid, moderately projecting over mandibles; clypeo-pleurostomal lines diverging ventrally, epistomal sulcus visible, anterior tentorial pits small, indistinct. Frons, vertex coriaceous to dull coriaceous. Antenna 14-15-segmented, pedicel longer than broad, flagellomeres cylindrical, relatively long, F1 around 5.0 times as long as broad and slighly less than 1.5 times as long as F2 and 3.0 times as long as pedicel; placodeal sensilla distinct, present on all flagellomeres, partially on F2 and absent on F1. Pronotum very short dorsally, submedian pronotal pits indistinct and present in a form of very narrow indistinct anterior depression; lateral pronotal carina absent. Mesosoma strongly convex in lateral view. Scutum slightly humped anteriorly, glabrous, delicately coriaceous, with some piliferous punctures. Notauli complete, deeply impressed; median mesoscutal line impressed and well-visible in posterior 1/3 of scutum. Scutellum dull rugose, slightly longer than broad, with subparallel sides.

Scutellar foveae absent, indistinct, present in a form of transverse depression behind transscutal articulation. Mesopleuron shining, with crenulate submedian longitudinal sulcus. Forewing densely pubescent, radial cell closed, around 3.0 times as long as broad, R1 depigmented anteriorly, 2r curved, areolet absent or indistinct, wing margin with short cilia. Male. 2.5-3.0 mm. Similar to female but ocelli much bigger; scutum delicately coriaceous to alutaceous, with complete notauli, median mesoscutal line absent; scutellar foveae partially delimited, separated by a median carina. Antenna 15-segmented, slightly longer than body length, F1 not modified, all flagellomeres with placodeal sensilla.



Figs 91.1-4. *Diplolepis eglanteriae*, male: 1-2, head: 1, front view, 2, from above, 3, antenna: 4, scutum and scutellum, dorsal view.

Gall (Plate 11.1). A regular spherical, pea-sized galls usually develops on the underside of leaves, rarely on the upper side. The gall attached to a leaf-vein by a very short pointed peduncle. Surface is smooth, glabrous, when the gall young – it is green, when mature turn red. The gall wall is thin, with a large larval chamber inside. Galls usually are in groups and differently sized. Very rarely the gall is developing on a leaf petiole.

Diagnosis. Differs from all other European species of *Diplolepis* by a long radial cell of the forewing, which is around 3.0 times as long as broad, the 1st abscissa of the radius strongly curved; the lower face and the scutum are smooth, shining, while in all other *Diplolepis* species the radial cell of the forewing usually less than 2.5 times as long as broad, the 1st abscissa of the radius only slightly angled, the lower face at least medially and the entire scutum are coriaceous.

Distribution. Common and widespread species. Common throughout the Western Palaearctic Region. Common in Europe: from Scandinavia (Coulianos & Holmåsen, 1991) and Leningrad Region of Russia (Vyrzhikovskaya, 1962) to the Iberian Peninsula (Pujade-Villar, 1993a; Nieves-Aldrey, 2001a), and Ural Mountains (Vyrzhikovskaya, 1954); Transcaucasus (Belizin, 1957); KZ (Belizin, 1957), Iran (author); Middle Asia, and India (Zerova, Diakontschuk & Ermolenko, 1988). In Ukraine common everywhere (Zerova, Diakontschuk & Ermolenko, 1988).

Biology. Monovoltine. Rare species. The gall fall off by mid-summer; the larva overwintering in the gall, pupates in spring and adults emerge in May. Develops on many species of *Rosa* (19 species were cited for the Iberian Peninsula only (Pujade-Villar, 1993a)), more often occurs on *R. canina* L., *R. sempervirens* L. and *R. pouzini* Tratt. (Nieves-Aldrey, 2001a).

Diplolepis fructuum (Rübsaamen, 1895)

Plate 11.2.

Rhodites fructuum Rübsaamen, 1895: 475 (female, gall); *Diplolepis fructuum* Belizin, 1966: 91.

Description. Female and male are very similar to *D. mayri* (see the Description of *D. mayri* and Diagnosis below). Head more rounded in front view. POL usually equal OOL. In male antenna pedicel longer than broad and F1 less curved. Pronotum latero-dorsally with few very weak rugae, with large smooth area. Notauli complete (in some specimens incomplete, barely traceable anteriorly), never strongly converging posteriorly; median mesoscutal line absent or very indistinct; scutellum uniformly rugose, usually pointed posteriorly in both sexes, more conspicuously in female; median carina between scutellar foveae narrow, raised, with longitudinal projection into the centre of scutellum; area between scutellar foveae and disc of scutellum coriaceous. Forewing infuscated around radial cell only; radial cell 2.6 times as long as broad; 2r in radial cell of forewing without (male) or with (female) short projection, areolet large, triangular. Propodeum with strong rugae, sometimes lateral propodeal carina present. Metasoma partially reddish.

Gall (Plate 11.2). Galls are similar to *D. mayri* only in their external morphology, especially when the galls of the last species develop on fruits. However, *D. fructuum* galls are produced by the hypertrophy of seeds inside the fruit, the development of which can finally split the external envelope of the fruit. In this case, each seed is modified into an egg-shaped multilocular gall, containing up to 10 larval cells and reach a size of 15 x 12 mm; one fruit can includes 20 seeds and it can be modified into a large multilocular gall. Galls of *D. mayri* do not split the external envelope of the fruit.

Diagnosis. Females of *D. fructuum* and *D. mayri* are very similar. Nevertheless, *D. fructuum* differs from *D. mayri* in the shape of the head, the structure of the scutellum and forewing. In *D. fructuum* the head is more ovate in front view; the median carina between scutellar foveae narrow, the scutellum entirely rugose; the scutellum normally more or less pointed posteriorly; 2r vein in the forewing radial cell with a short projection in females and inconspicuous in males; the lateral upper surface of the pronotum with very weak striae and the pronotum is smooth medially. In *D. mayri* and *D. rosae* have a trapezoid-shaped head; the median carina is broad and coriaceous, the disk of scutellum is also coriaceous; the scutellum always rounded; 2r of females with a longer projection, which, however, is shorter in males; the pronotum laterally with strong transverse striae and the entire pronotum rugose.

Taxonomic comments. Rübsaamen (1895) proposed *Rhodites fructuum* as a possible name for a few specimens reared from galls in deformed fruits, collected from *Rosa canina* in Crimea. He did not describe it as a separate species, because onto his opinion, they were very closely related to *D. rosae*. Dalla Torre & Kieffer (1910) considered *D. fructuum* as a dubious species. Kuznetzov-Ugamskij (1928) differentiated two morphologic types of *D. mayri* galls collected by in Turkmenistan. The first one causes hypertrophy and deformation of developing rose fruits and represents *D. fructuum* galls, while the second type is represented by much smaller sized and more numerous galls forming later on different vegetative parts of the plant. Unfortunatelly, this author did not reared the wasps from the two gall types. Belizin (1957) assumed that *D. fructuum* is a geographical race of *D. mayri* and named it as *D. mayri* race *fructuum*, what was accepted by some authors (e.g. Zerova & Diakontschuk, 1976). Kierych (1966) concluded that *D. fructuum* is a valid species and indicated the morphological differences between the females of *D. fructuum* and closely related *D. rosae* and *D. mayri*. Finally, Pujade-Villar & Plantard (2002), after careful examination of a large material on *D. fructuum* and allied species and also on the basis of molecular studies (Plantard et al., 1998b) concluded that *D. fructuum* is a valid species.

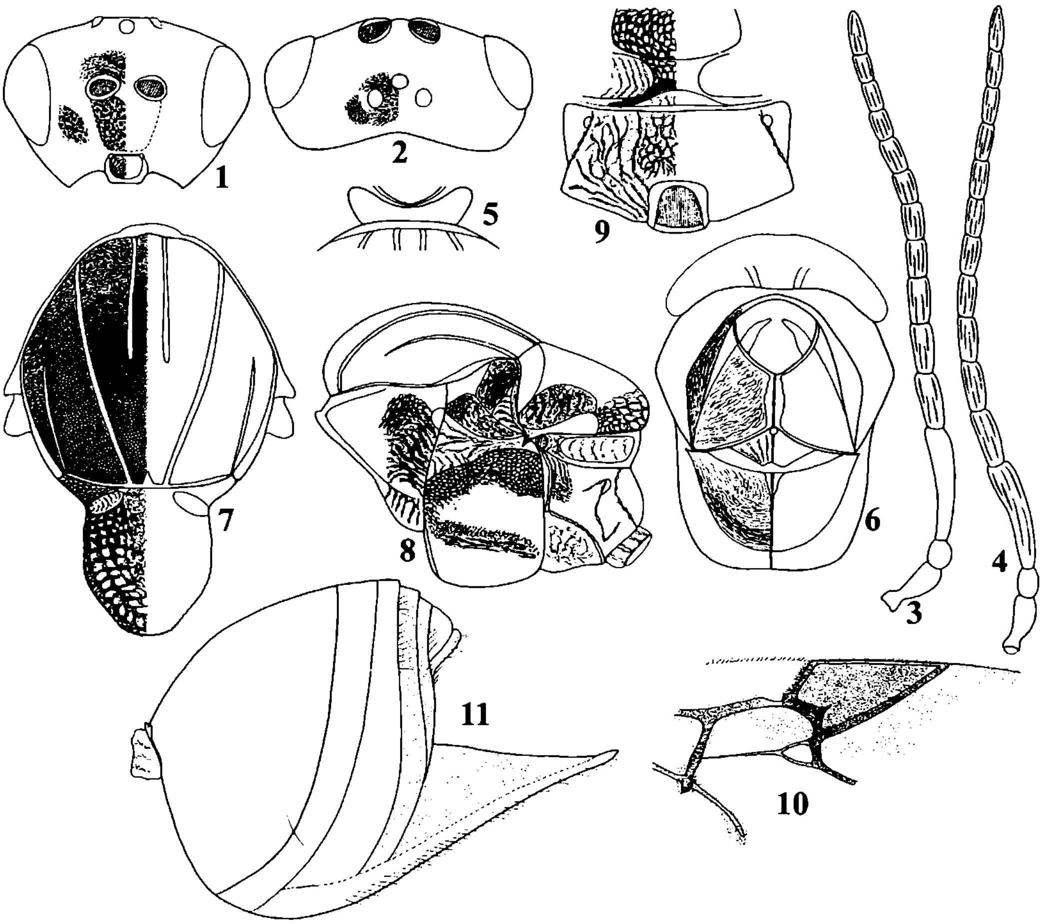
Distribution. AM (Belizin, 1966), Turkmenistan (Kuznetzov-Ugamskij, 1928), Transcaucasus (Kierych, 1966), IR, TR (Pujade-Villar & Plantard, 2002; author). In Ukraine -- Crimea (Rübsaamen, 1895). Presumably more widespread on the territory of Ukraine..

Biology. Monovoltine, usual sexual reproduction. Rare species. The gall fall off by mid-summer; the larva overwintering in the gall, pupates in spring and the adults emerge in May. Develops on many species of *Rosa.*

Diplolepis mayri (Schlechtendal, 1876)

Figs 92.1-11, Plate 11.3.

Rhodites mayri Schlechtendal, 1876: 59 (female); *Rhodites orthospinae* Beijerinck, 1883: 157-176; *Diplolepis mayri* Belizin, 1957: 927; Eady & Quinlan, 1963: 35.



Figs 92.1-11. *Diplolepis mayri*: 1-2, head, female: 1, front view, 2, from above, 3-4, antenna: 3, female, 4, male. 5-11, female: 5, pronotum, dorsal view, 6, pronotum and propleura, afront view, 7, scutum and scutellum, dorsal view, 8, mesosoma, lateral view, 9, propodeum and dorsellum, dorso-posterior view, 10, forewing, part 11, metasoma, lateral view.

Description. 3.7-4.0 mm. Head and mesosoma uniformly black. Antenna very dark brown, more to black. Mandibles reddish brown, with black tips; palpi maxillaris and labialis dark brown. Legs reddish brown, except black coxae, trochanters and basal half of femurs. Metasoma reddish brown, with darker tip. Wings partially fuscous; wing veins distinct, dark brown. Head trapezoid in front view, delicately coriaceous, with short sparse dark brown setae, 2.1 times as broad as long from above; 1.4 times as broad as high in front view, slightly broader than mesosoma. Gena delicately coriaceous to alutaceous, not broadened behind eye, invisible in front view behind eye, nearly as broad as cross diameter of eye. Malar space delicately coriaceous, 0.5 times as long as height of eye. POL 0.5 times as long as OOL; OOL nearly 3.5 times as long as length of lateral ocellus and 5.3 times as long as LOL. Transfacial distance 1.5 times as long as height of eye; diameter of antennal torulus 2.4 times as long as distance between them and equal to distance between torulus and eye margin. Inner margins of eyes parallel. Lower face delicately coriaceous, with distinct punctures (piliferous points); median elevated area also with punctures. Clypeus quadrangular, slightly broader than high, delicately coriaceous to alutaceous, flatenned, with indistinct small anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line distinct, ventral margin straight. Frons, vertex, occiput, postoccciput and postgena alutaceous. Antenna 14-segmented, slightly longer than head+mesosoma; pedicel subglobose, only slightly longer than broad; F1 very long, 3.7 times as long as pedicel and nearly 2.0 times as long as F2; F2 slightly longer than F3; F12 slightly longer than F11; placodeal sensilla on F2-F12. Mesosoma flattened and longer than high, with very few short white setae. Pronotum rugose, latero-dorsal surface with strong transverse rugae. Scutum longer than broad and at least 1.5 times as long as scutellum, uniformly reticulate, with distinct punctures. Notauli complete, never strongly converging posteriorly; median mesoscutal line in a form of very short broad triangle; parapsidal lines distinct, narrow, smooth, shining, reaching to tegulae level; anterior parallel lines distinct, extending to half length of scutum. Scutellum slightly elongated, with parallel sides, rounded posteriorly, dull coriaceous to rugose, with more delicate sculpture towards the center of the disk and between scutellar foveae. Scutellar foveae transverse, very indistinctly or not delimited posteriorly, rugose; median carina between scutellar foveae flat, broad, without projection, coriaceous. Mesopleuron reticulate to delicately coriaceous, with strong transverse dull rugose furrow; mesopleural triangle with numerous delicate wrinkles. Metapleural sulcus reaching mesopleuron slightly above half of its height; xillula ovate, coriaceous, with some strong, short rugae, with relatively dense setae; subaxillular bar smooth, shining, in the most posterior end only slightly narrower than height of metanotal trough. Dorsellum rugose in upper half, delicately reticulate in lower half; medially at least 2.0 times as high as height of ventral impressed area; metanotal trough smooth, shining, with some longitudinal parallel weak wrinkles and sparse setae; ventral impressed area with few delicate longitudinal wrinkles, shining. Lateral propodeal carinae very indistinct in between strongly rugose central and lateral propodeal areas. Tarsal claws simple, without basal lobe. Forewing infuscated mainly around radial cell, areolet large, 2r with median additional prolongation into radial cell; radial cell opened, 2.3-2.5 times as long as broad, 1st abscissa of radius nearly staright; areolet distinct, Rs+M well-marked and reaching basalis. Metasoma reddish, nearly equal to head+mesosoma length, slightly longer than high in lateral view, metasomal tergites 2 to 4 without punctures, subsequent tergites and hypopygium densely punctate; hypopygium large, plough-shaped; prominent part of ventral spine of hypopygium less than 3.0 times as long as broad, with sparse white setae, apical setae short, not extending behind apex of spine. Male. 2.4-4.2 mm. Similar to female but antenna 14-segmented, slightly longer than body length, pedicel longer than broad; F1 only very slightly curved, basally not excavated and apically slightly broadened, 1.9 times as long as F2; placodeal sensilla on all flagellomeres; 2r in forewing with projection into radial cell.

Gall (Plate 11.3). Spherical-like, irregularly shaped gall, reach about 25 mm in size, growing out from the flower-cup. The surface of the tuberous-like gall partially smooth, other parts with warts or 3 mm long spines; yellow or yellowish when young, later when mature, turn brown to violet-red. Multilocular. The wall is soft when the gall is young, latter turn very hard, lignified. Often galls are coalescent, forming large conglomerates which are staying on the plant prolong many years. The gall developing from a flower bud.

Diagnosis. Very closely related to *D. fructuum* (see Diagnosis to *D. fructuum*).

Taxonomic comments. Belizin (1957) treated *D. fructuum* (Rübsaamen, 1895) as a synonym of *D. mayri*, however, differentiated a northern race, *mayri* and the southern race – *fructuum*. According Belizin (1957) the northern race (*mayri*) distributed throughout Europe to Crimea and Transcaucasus and have two biological peculiarities: a) galls developing on vegetative organs, and b) males are very rare and, thus the northern race populations reproduct only parthenogenetically.

The southern race (*fructuum*) distributed in Crimea and adjacent southern territories of Ukraine and also in Transcaucasus, in Middle Asia and southern Kazakhstan and the two biological peculiarities are: a) galls developing on fruits, and b) populations are represented by females and males and the reproduction is sexual. For more details see also *D. fructuum*.

Distribution. Common everywhere in Europe; from Leningrad region (Belizin, 1957; Vyrzhikovskaya, 1962) to Ural Mountains (Belizin, 1957), Moscow, Siberia (Belizin, 1957); KZ, Uzbekistan and Tadzhikistan (Belizin, 1957). In Ukraine common everywhere (Zerova, Diakontschuk & Ermolenko, 1988).

Biology. Monovoltine, usual sexual reproduction. Very common and sometimes abundant species. Galls mature in autumn, larvae pupate in the larval chambers during late autumn – winter; adults emerge in May. The species developing also on many species of *Rosa*.

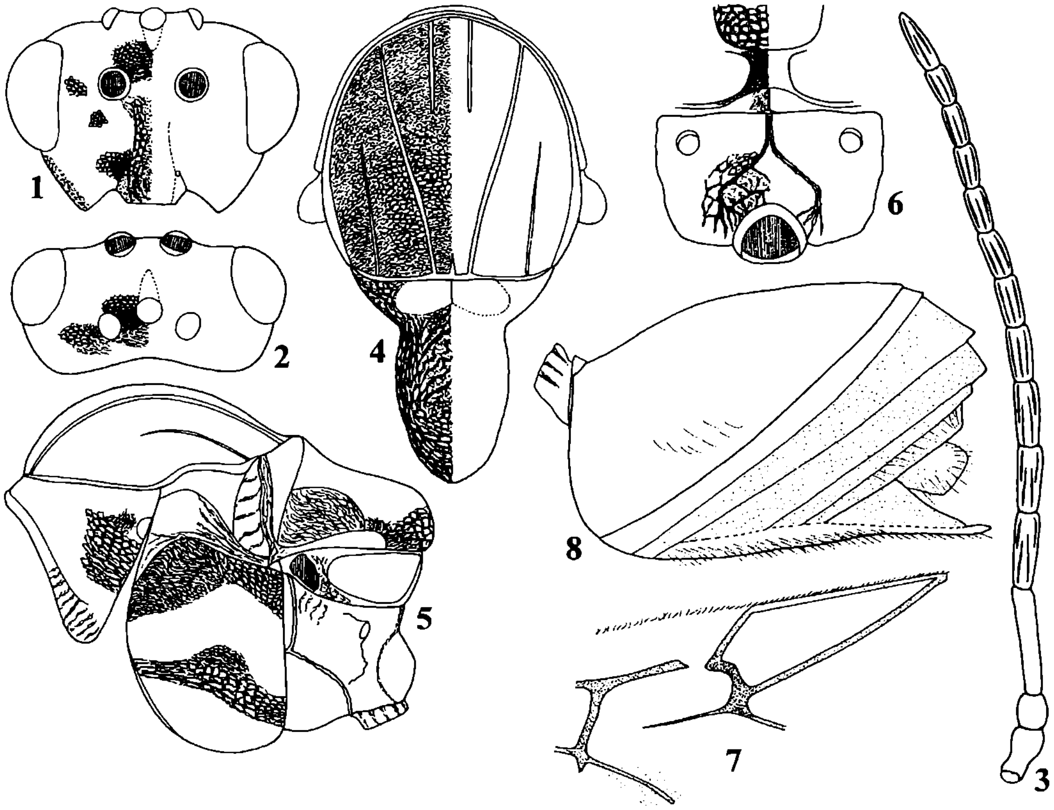
Diplolepis nervosa (Curtis, 1838)

Figs 93.1-8, Plate 11.4.

Cynips nervosa Curtis, 1838: 688 (female); *Rhodites rosarum* Giraud, 1859: 366 (synonym in Pujade-Villar, 1993a: 69); Schenck, 1862: 216 (male); *Rhodites nervosus*: Marshal, 1868: 173; *Hololexis nervosus*: Marshal, 1874: 117; *Rhodites kiefferi* Loiselle, 1912: 25 (synonym in Pujade-Villar, 1993a: 70); *Rhodites dispar* Niblett, 1943: 38 (synonym in Eady & Quinlan, 1963: 35); *Diplolepis nervosa*: Belizin, 1957: 928; Eady & Quinlan, 1963: 35; *Rhodites centifoliae* Hartig, 1840: 194 (female, male) (synonym in Pujade-Villar & Plantard, 2002: 141); *Diplolepis centifoliae*: Belizin, 1957: 928; Eady & Quinlan, 1963: 35; *Rhodites andrei* Kieffer, 1904: 525 (synonym in Pujade-Villar & Plantard, 2002: 141).

Description. Female. 3.1-3.5 mm. Head alutaceous to coriaceous, 1.4 times as broad as high in front view and 1.9 times as broad as long from above. POL slightly longer than OOL, 3.6 times as long as LOL and 2.0 times as long as diameter of lateral ocellus. Transfacial distance 1.7 times as long as height of eye; diameter of antennal torulus slightly shorter than distance between them and nearly equal to distance between torulus and eye margin. Inner margins of eyes parallel. Lower face delicately coriaceous, without punctures; median elevated area coriaceous. Clypeus trapezoid, broader than high, delicately coriaceous to alutaceous, flatenned, with indistinct small anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line distinct, ventral margin straight. Frons, vertex, occiput, postoccciput and postgena alutaceous. Pronotum coriaceous to rugose, with distinct striae along anterior margin. Scutum coriaceous without punctures; notauli distinct; median mesoscutal line present only posteriorly. Scutellum strongly elongated, nearly 2.0 times as long as broad, with subparallel sides and slightly constricted basally; rugose, with more delicate sculpture towards the disk of scutellum. Scutellar foveae large, transversely ovated, smooth, without sculpture, touching one another centrally. Mesopleural furrow with more delicate sculpture. Preaxilla and lateral axillar area wrinkled; axillar carina broad, with longitudinal delicate striae, nearly 3.0 times narrower than width of lateral axillar area; axillula ovate, slightly elongated, well-delimited, delicately striate; subaxillular bar smooth, shining, at least 2.5 times narrower than height of metanotal trough. Metapleural sulcus reaching mesopleuron slightly above half of its height. Dorsellum reticulate, at least 2.0 times as high as height of ventral impressed area; metanotal trough smooth, shining. Propodeum coriaceous to rugose, with distinct rugae; lateral propodeal carina indistinct, anteriorly parallel and in posterior 2/3 strongly curved outwards; central propodeal area alutaceous, with strong irregular wrinkles. Tarsal claws simple. Forewing not fuscous; wing margin with cilia, R1 and Rs reaching wing margin, radial cell 2.5-2.8 times as long as broad, 1st abscissa of radius angled; areolet absent; Rs+M nearly reaching basalis. Metasoma longer than high in lateral view; metasomal tergite with few white setae laterally; tergite 2 and 3 without punctures, subsequent tergites and large plough-shaped hypopygium with dense punctures; prominent part of ventral spine of hypopygium at least 3.0 or more times as long as broad in ventral view, with relatively dense and long white setae, apical setae extending behind apex of spine. Male. 3.0-3.4 mm. Similar to female.

Gall (Plate 11.4). A spherical gall with irregularly located spines, 1-6 mm in diameter, attached to the upper side of leaves. At the attachment point the leaf is much lighter. Green when young, later reddish, when mature – turn brown. Usually one to two galls can be find on one leaf. Monolocular, without inner larval chamber. The wall is thick, the gall parenchima consists of big cells.



Figs 93.1-8. *Diplolepis nervosa*, female: 1-2, head: 1, front view, 2, from above. 3, antenna, 4, scutum and scutellum, dorsal view, 5, mesosoma, lateral view, 6, dorsellum and propodeum, postero-dorsal view, 7, forewing, part, 8, metasoma, lateral view.

Diagnosis. Differs from all other *Diplolepis* species by a strongly elongated scutellum which at least 2.0 times as long as broad; scutellar foveae are large, transversely ovated, with a smooth bottom.

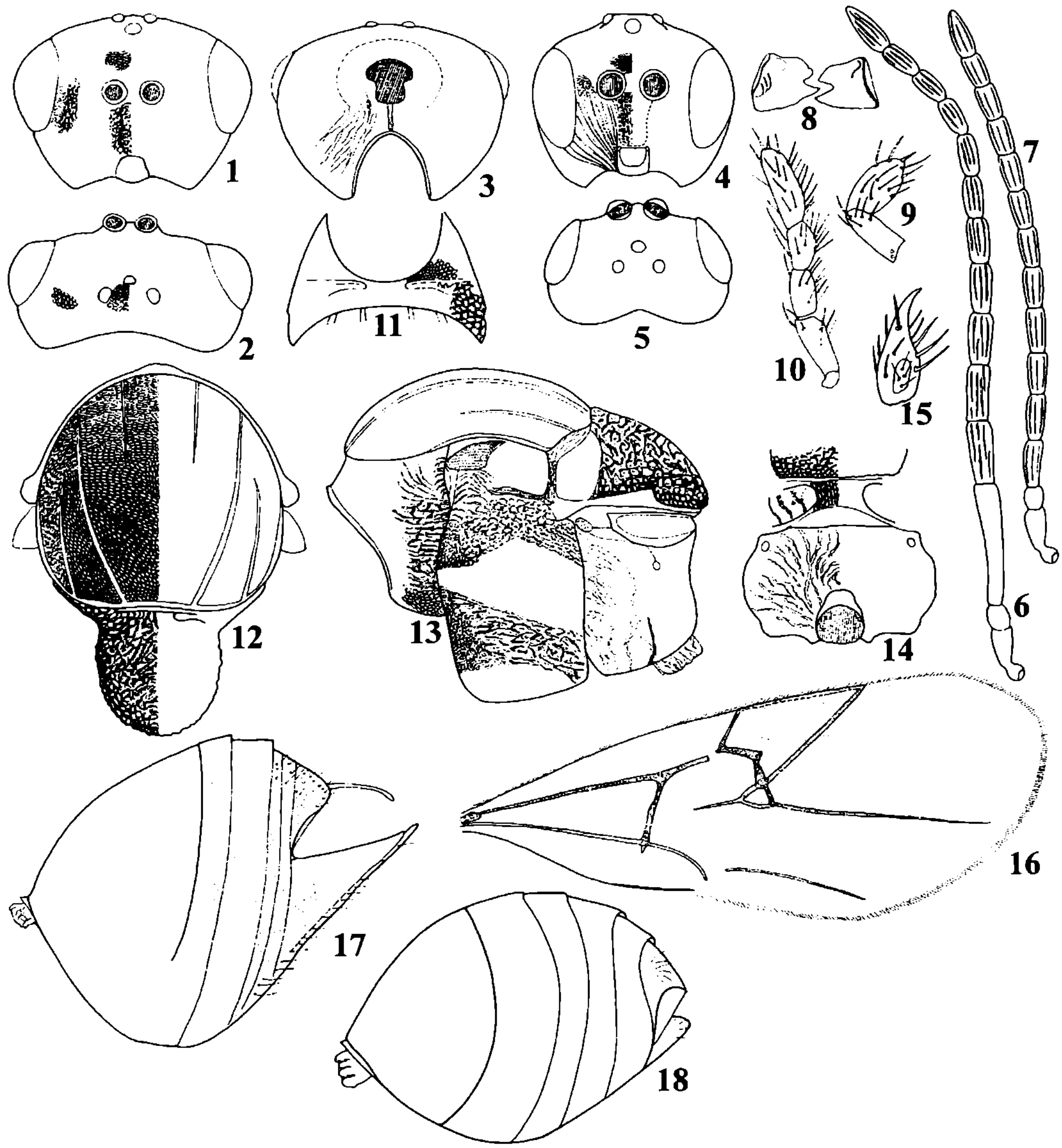
Distribution. GB, GE, AU, HU, IT, PT (Dalla Torre & Kieffer, 1910), FI, FR, DK and SE (Belizin, 1957), RU (from Leningrad Region (Vyrzhikovskaya, 1962) to Ural mountains (Vyrzhikovskaya, 1954); Kazakhstan (Belizin, 1957), Morocco (Kieffer, 1904); Middle Asia and Primorskij Kraj of the Far East of Russia (Kovalev, 1965; Zerova, Diakontschuk & Ermolenko, 1988). In Ukraine common everywhere.

Biology. Monovoltine, usual sexual reproduction. Galls fall off in July, mature in the litter during the autumn; adults emerge next year in May – June or even July.

Diplolepis rosae (Linnaeus, 1758)

Figs 94.1-18, Plate 11.5.

Cynips rosae Linnaeus, 1758: 553 (female); Christ, 1791: 476 (male); *Diplolepis bedeguaris* Fourcroy, 1785: 392; *Cynips (Eucharis) rosae*: Panzer, 1806: 96; *Diplolepis bedeguaris fungosae* Lamarck, 1817: 162; *Rhodites rosae*: Hartig, 1840: 194; *Diplolepis rosae*: Belizin, 1957: 927.



Figs 94.1-18. *Diplolepis rosae*: 1-3, head, female: 1, front view, 2, from above, 3, posteriorly. 4-5, head, male: 4, front view, 5, from above. 6-7, antenna: 6, female, 7, male. 8-17, female: 8, mandibles, 9, palpus labialis, 10, palpus maxillaris, 11, pronotum, dorsal view, 12, scutum and scutellum, dorsal view, 13, mesosoma, lateral view, 14, propodeum and dorsellum, dorso-posterior view, 15, tarsal claw, 16, forewing, part, 17, metasoma, lateral view. 18, metasoma, male, lateral view.

Description. Female. 3.7-4.6 mm. Head and mesosoma uniformly black. Antennae and legs dark brown. Metasoma orange-brown to dark brown, posterior tergites darker. Wings fuscous. Head delicately coriaceous, with short sparse dark brown setae, 1.6-1.8 times as broad as long from above; 1.3 times as broad as high. Gena delicately coriaceous, not broadened behind eye, invisible in front view behind eye, nearly as broad as cross diameter of eye. Malar space delicately coriaceous, 0.7 times as long as height of eye. POL 0.6 times as long as OOL; OOL nearly 1.7 times as long as length of lateral ocellus and 4.6 times as long as LOL. Transfacial distance 1.6 times as long as height of eye; diameter of antennal torulus 2.5 times as long as distance between them, and 0.6 times as long as distance between torulus and eye margin. Inner margins of eyes slightly diverging ventrally. Lower face coriaceous, with weak punctures; median area coriaceous, elevated. Clypeus rectangular, coriaceous, flatenned, only slightly broader than high, with very indistinct anterior tentorial pits, distinct epistomal sulcus and clypeo-pleurostomal line, ventrally not emarginated, medially rounded, not incised. Frons, vertex and occiput uniformly coriaceous to reticulate; interocellar area with more dull coriaceous sculpture. Postocciput around occipital foramen impressed, transversely delicately striate; posterior tentorial pits elongated; hypostomal carina strong, emarginated; occipital foramen slightly higher than height of gula and hypostomal foramen 1.6 times as heigh as height of occipital foramen. Mandibles, palpi labialis and maxillaris on figures. Antenna 14-segmented, slightly longer than head+mesosoma; pedicel subglobose, only slightly longer than broad; F1 1.8-2.0 times as long as F2, F3 slightly shorter than F2, F3-F6 nearly equal in length, subsequent flagellomeres slightly shorter; placodeal sensilla on F2-F12. Mesosoma convex in lateral view, slightly longer than high, with very few short white setae. Pronotum dull rugose, with strong parallel striae along postero-lateral part edge. Pronotum dorsally alutaceous; coarsely rugose laterally. Submedian pronotal pits present, indistinct, separated by a broad central carina. Scutum microreticulate, with weak punctures; longer than broad (width measured across the basis of tegulae). Notauli complete, never strongly converging posteriorly, well-impressed in all length; median mesoscutal line absent or very indistinct; parapsidal lines distinct, extending slightly above tegulae level; anterior parallel lines distinct, extending to 1/3 of scutum length. Scutellum ovate, only very slightly longer than broad, posteriorly rounded; dull rugose, with strong sharp rugae; slightly overhanging metanotum. Scutellar foveae very indistinct, barely traceable, rugose, separated by a broad central carina; area between scutellar foveae and disc of scutellum rugose; interspaces between rugae coriaceous. Mesopleuron coriaceous, with some transverse short irregular rugae; mesopleural furrow distinctly impressed, rugose; mesopleural triangle with numerous delicate wrinkles. Metapleural sulcus very indistinct on rugose surface of metapleuron. Axillula rounded, smooth, shining, with relatively sparse white setae; subaxillular bar smooth, shining, in the most posterior end nearly 2.0 times narower than height of metanotal trough; carina along anterior border of propodeal spiracle distinct; ventral bar of metanotal trough smooth, shining, at least 3.0 times narrower than height of metanotal trough. Dorsellum delicately coriaceous, medially nearly 0.5 times as high as height of ventral impressed area; metanotal trough smooth, shining, with sparse setae and longitudinal parallel weak striae; ventral impressed area smooth, shining. Lateral propodeal carinae indistinct on rugose surface of propodeum; central propodeal area not or very indistincly delimited. Tarsal claws simple, without basal lobe. Forewing margin with short cilia, wing infuscated around radial cell only; radial cell closed, 2.4-2.6 times as long as broad, 1st abscissa of radius strongly curved, 2r angled, without or with very short additional vein; areolet distinct, large, Rs+M distinct and extending to 2/3 of distance between areolet and basalis. Metasoma partially reddish, nearly equal to head+mesosoma length, as long as high in lateral view, metasomal tergite 2 without setae antero-laterally, without punctures; subsequent tergites and hypopygium with some sparse indistinct punctures; prominent part of ventral spine of hypopygium short, at most 3.0 times as long as broad in ventral view, with some moderately long sparse setae. Male. 2.4-4.2 mm. Similar to female but head more rounded, ocelli larger; antenna 14-segmented, slightly longer than body length, pedicel shorter or as long as broad; F1 only very slightly curved, basally not excavated and apically not broadened, slightly longer or equal F2; placodeal sensilla on all flagellomeres.

Gall (Plate 11.5). A mass of long, branched stiff yellowish-brown, sometimes reddish hairs, up to 7-8 cm in diameter. Multilocular. Galls often growth together and form a large conglomerate. The gall develops from a leaf bud, appears on the upper side of the leaf in a form of a 5 mm red rosette or sometimes on the fruit. At the basis of hairs thin-walled soft tissues developing, which becoming thick and hard prolong the summer. The growing gall drawing away nourishments from the plant; as the result, the twig above the gall suffering and usually shrivel up. Empty galls remain on the plant prolong many years.

Diagnosis. Belongs to the *rosae* species-group and most closely related to *D. mayri* and *D. fructuum*, however, in *D. rosae* the area between scutellar foveae and disk rugose; interspaces between rugae are coriaceous; 2r of the female forewing is angled, without or with a very short additional vein; the pedicel of the male antenna shorter or as long as broad and F1 slightly curved, while in *D. mayri* and *D. fructuum* the area between scutellar foveae and the disc is coriaceous; 2r of the female forewing with a median additional prolongation, projecting into the radial cell; the pedicel of the male antenna longer than broad, F1 is straight.

Distribution. The most common and widespread *Diplolepis* rose gall. Common throughout the Palaearctic Region. Introduced to North America in 1868 (Weld, 1926). Common throughout Europe: from Scandinavia (Coulianos & Holmåsen, 1991), LV (Belizin, 1957) and Leningrad Region of RU (Vyrzhikovskaya, 1962) to the Iberian Peninsula (Pujade-Villar, 1993a, Nieves-Aldrey, 2001a) and eastwards to the Ural Mountains (Vyrzhikovskaya, 1954) and Siberia (Zerova, Diakontshuk & Ermolenko, 1988); Transcaucasus (Belizin, 1957); KZ (Belizin, 1957), IR (author), Middle Asia (Zerova, Diakontschuk & Ermolenko, 1988), India (Belizin, 1957). In <u>Ukraine</u> common everywhere (Zerova, Diakontschuk & Ermolenko, 1988).

Biology. Monovoltine, usual sexual reproduction. Very common and sometimes abundant species. Gall appears in early summer, mature in mid-autumn, adults emerge next year in May-June. About 20 species of wild roses are listed in the literature as host plants (Nieves-Aldrey, 2001a).

Diplolepis spinosissimae (Giraud, 1859)

Plate 11.6.

Rhodites spinosissimae Giraud, 1859: 367 (female, male); *Diplolepis spinosissimae*: Belizin, 1957: 926; 928; Eady & Quinlan, 1963: 35.

Description. <u>Female</u> 2.2-2.7 mm. Very similar to *D. rosae* and *D. mayri* (see the descriptions). Body, including metasoma, black. Antennae and legs predominantly black, apical part of femura, tibia and tarsi chestnut brown. Head nearly rectangular in fron view and transverse from above, ocelli small, POL much smaller than OOL, lateral ocellus nearly 3.0 times smaller than OOL. Notauli complete, uniformly deeply impressed, strongly converging posteriorly; median mesoscutal line present in posterior 1/3 of scutum. Scutellum broadly ovate to nearly rounded. Forewing superficially but uniformly infuscate, veins dark brown, distinct; 2r angled, without median additional prolongation. <u>Male</u>. 1.5-2.0mm. Similar to female.

Gall (Plate 11.6). An integrated leaf gall, visible both sides of the leaf, the shape of the gall is irregular and strongly vary. Very often developing on the leaf midrib or petiole. The length of the gall is up to 3-7 mm. Green when young, later turn red to brown, with smooth surface. When strongly elevated from the lower surface of the leaf, than the upper surface is yellow, rounded. The gall wall is thick. Monolocular.

Diagnosis. Differs from *D. rosae*, *D. mayri* and *D. fructuum* by the uniformly infuscated forewing and black metasoma; notauli are strongly converging posteriorly; the median mesoscutal line present in the posterior 1/3 of the scutum, while in the three mentioned species notauli never strongly converging posteriorly; the median mesoscutal line is absent or very indistinct; the forewing infuscated around the radial cell only and the metasoma with some reddish to chestnut brown colouration, especially basally.

Distribution. GB, NL, FR, GE, AU, HU, IT (Dalla Torre & Kieffer, 1910), FI, DK, CZ, SK YU (Belizin, 1957); RU (from the Leningrad Region (Vyrzhikovskaya, 1962) to the Ural mountains (Vyrzhikovskaya, 1954; Belizin, 1957)), KZ (Belizin, 1957). It was found also in the Far East of Russia (Kovalev, 1965). In <u>Ukraine</u> -- Crimea and Kiev Region (Belizin, 1957; Zerova, Diakontschuk & Ermolenko, 1988); in Transcarpathian Region is also common (author).

Biology. Galls grow during late spring and summer, mature in autumn. The leaves with mature galls fall off the plant. The parasitized galls remain green. Adults emerge next year, in April -- June. Some authors found *D. spinosissimae* only on *R. pimpinellifolia* L. (Niblett, 1951; Eady & Quinlan, 1963; Plantard et al., 1998b). Belizin (1957) reported this species from many species of *Rosa* L., especially from *R. canina* L., *R. afzeliana* F., *R. cinnamomea* L., *R. coriifolia* Fr., *R. dumetorum* Thuill. and *R. pimpinellifolia* L. We also collected *D. spinosissimae* from *R. canina* in the Transcarpathian Region of Ukraine and also in Hungary.

Tribe Pediaspidini Ashmead, 1903

Pediaspidini Ashmead, 1903c: 147; Himalocynipinae Yoshimoto, 1970: 1583.

Body length 2.5 mm. Body usually brown, from yellowish brown to partially black. Head transverse from above, broader than high in front view. Gular sulci free, not united at the hypostoma. Palpus labialis 3-segmented, palpus maxillaris – 4-5-segmented. Antennae 14-16-segmented (in *Pediaspis*) or more than 20-segmented in *Himalocynips*. Pronotum in median dorsal line usually 1/3 as long as greatest length on outer lateral margin; with distinct deep submedian pronotal pits; pronotal plate indistinctly delimited only antero-laterally. Notauli complete, reaching pronotum, median mesoscutal line present, well-impressed in the posterior 1/4 or less. Scutum smooth and shining; scutellum trapezoid, dorsally flattened, with rounded reticulate or rugose impression centrally. Scutellar foveae absent. Mesopleuron smooth, shining. Forewing with cilia on margin; radial cell opened; areolet present, Rs+M distinct, nearly reaching basalis. Tarsal claws simple. Metasoma longer than high in lateral view; metasomal tergite 2 large, occupying nearly 1/3-1/2 of metasoma length; prominent part of ventral spine of hypopygium short, never more than 3.0 times as long as broad in ventral view.

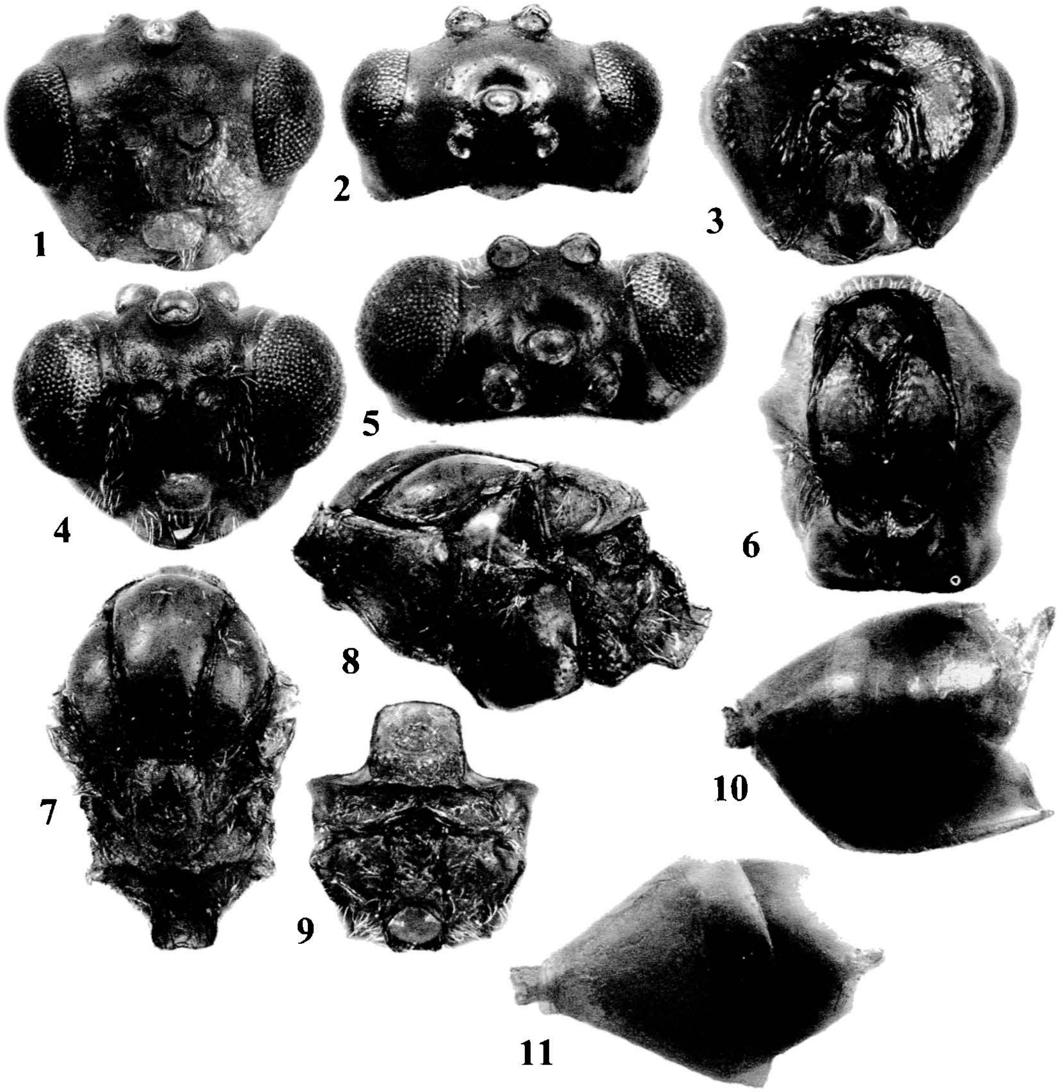
This tribe has one well-known species, *Pediaspis aceris* (Gmelin, 1790), and two little known and recent additions – *Himalocynips vigintilis* Yoshimoto, 1970 and *Paraulax*. *Pediaspis aceris* is a European species that is significant because it is the only cynipid outside the Cynipini to show alternation of sexual and asexual generations, a life cycle trait that has either evolved independently in the Pediaspidini, or indicates a sister-group relationship between the Cynipini and the Pediaspidini. In *P. aceris,* both generations develop in galls induced on the same host – maple (*Acer monspessulanum* L., *A. platanoides* L. and *A. pseudoplatanus* L.). *Himalocynips vigintilis* was originally described in its own subfamily, the Himalocynipinae, in the parasitoid family Figitidae of the Cynipoidea (Yoshimoto, 1970, Quinlan, 1979). Subsequently this subfamily was placed in the Cynipidae by Nordlander (1982), while Fergusson (1995) elevated it to separate family status. Finally, detailed and wide-ranging analyses by Ronquist (1995a) and Liljeblad & Ronquist (1998) placed this species in the Pediaspidini. The host associations and lifecycle of this species are unknown. *Paraulax* has in the past been tentatively placed in the Aylacini (Dalla Torre and Kieffer, 1910; Stone, Schönrogge et al., 2002; Weld, 1952a), but Liljeblad (2002) placed this genus within the Pediaspidini. Kieffer (1904) described *P. perplexus* Kieffer, 1904 from *Nothofagus* (southern beech, Nothofagaceae) in Chile. De Santis et al. (1993) described parasitoids reared from galls thought to be induced by *Paraulax* on *Nothofagus* in Argentina. Shinji (1938) described another species, *P. quercicola*, collected from oaks in Japan, but this species has since been transferred to *Ceroptres* (Liljeblad, 2002).

Pediaspis Tischbein, 1852

Figs 95.1-11, 96.1-8.

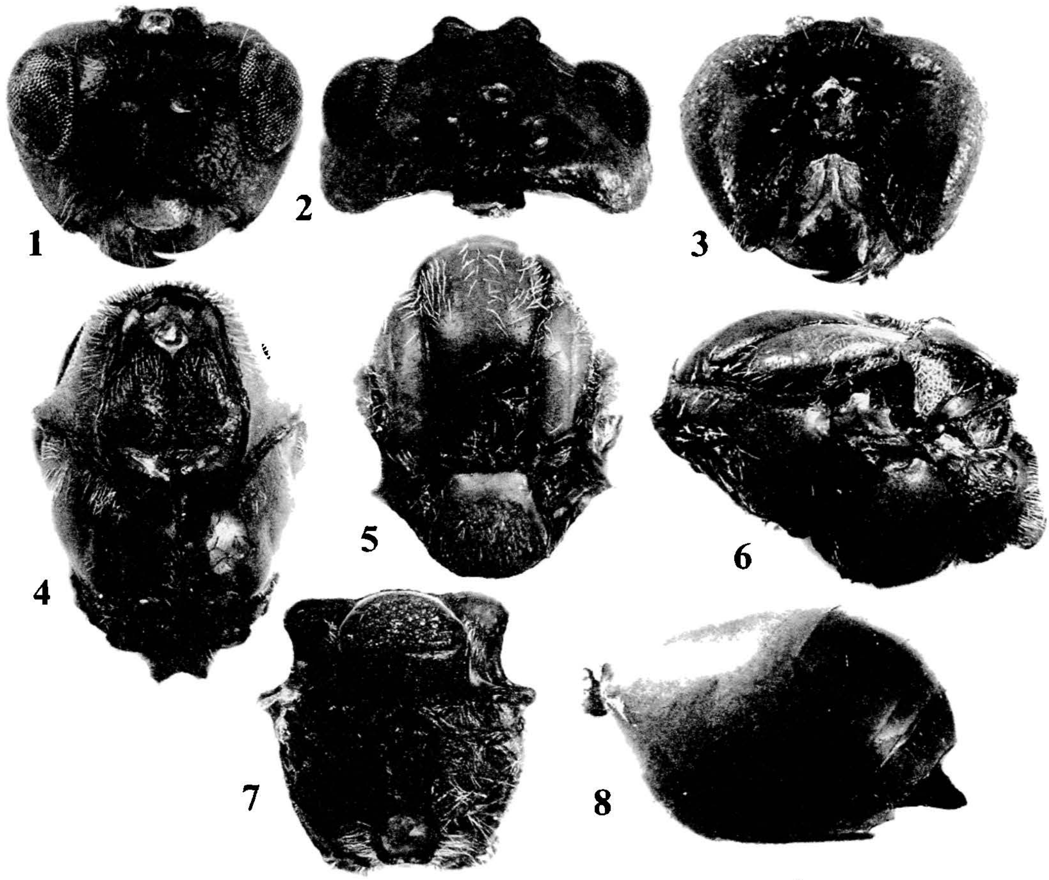
Pediaspis Tischbein, 1852: 141. *Bathyaspis* Förster, 1869: 330. Type species: *Pediaspis sorbi* Tischbein, 1852 (= *Pediaspis aceris* (Gmelin, 1790)).

Body length up to 5 mm, mainly yellowish brown. Body with sparse setae; frons, vertex, occiput and postgena alutaceous to smooth; scutum and mesopleuron smooth, shining. Gena broadened behind eye in asexual females, malar space shorter than height of eye; clypeus trapezoid, projecting over mandibles; clypeo-pleurostomal line diverging; epistomal sulcus distinct; lower face without striae. Diameter of antennal socket equal or shorter than distance



Figs 95.1-11. *Pediaspis aceris*, sexual generation: 1-3, head, female: 1, front view, 2, from above, 3, posteriorly. 4-5, head, male: 4, front view, 5, from above. 6-9, female: 6, pronotum and plopleura, front view, 7, scutum and scutellum, dorsal view, 8, mesosoma, lateral view, 9, propodeum and dorsellum, dorso-posterior view. 10-11, metasoma, lateral view: 10, female, 11, male.

between inner margin of eye and antennal socket; gula shorter than height of occipital foramen; gular sulci free, not united near hypostoma; diverging dorsally; oral foramen heigher than occipital foramen. Female antennae 14-15-segmented, rarely 16; male antenna 15-segmented. Pronotum in median dorsal line usually 1/3 as long as greatest length on outer lateral margin; with distinct deep transverse submedian pronotal pits, separated by a central carina; pronotal plate indistinctly delimited only antero-laterally. Notauli complete, reaching pronotum, deeply impressed; median mesoscutal line impressed, well- visible in posterior 1/3 of scutum. Scutum smooth and shining; scutellum trapezoid, dorsally flattened, with rounded reticulate or rugose impression centrally. Scutellar foveae absent. Mesopleuron smooth, shining; mesopleural triangle with very delicate wrinkles. Axillula ovate, with dense white setae; subaxillular bar smooth, shining, nearly as high as height of metanotal trough. Lateral propodeal carina subparallel; central propodeal area delicately coriaceous to reticulate, with some weak wrinkles, especially in posterior half. Forewing margin with cilia; radial cell opened, 3.0-3.2 times as long as broad; areolet present, Rs+M distinct, nearly reaching basalis. Tarsal claws simple. Metasoma longer than high in lateral view; metasomal tergite 2 large, occupying nearly 1/3-1/2 of metasoma length; tergites without punctures or with some very indistinct sparse punctures on posterior tergites; prominent part of ventral spine of hypopygium very short, with sparse setae, apical setae extending behind apex of spine.



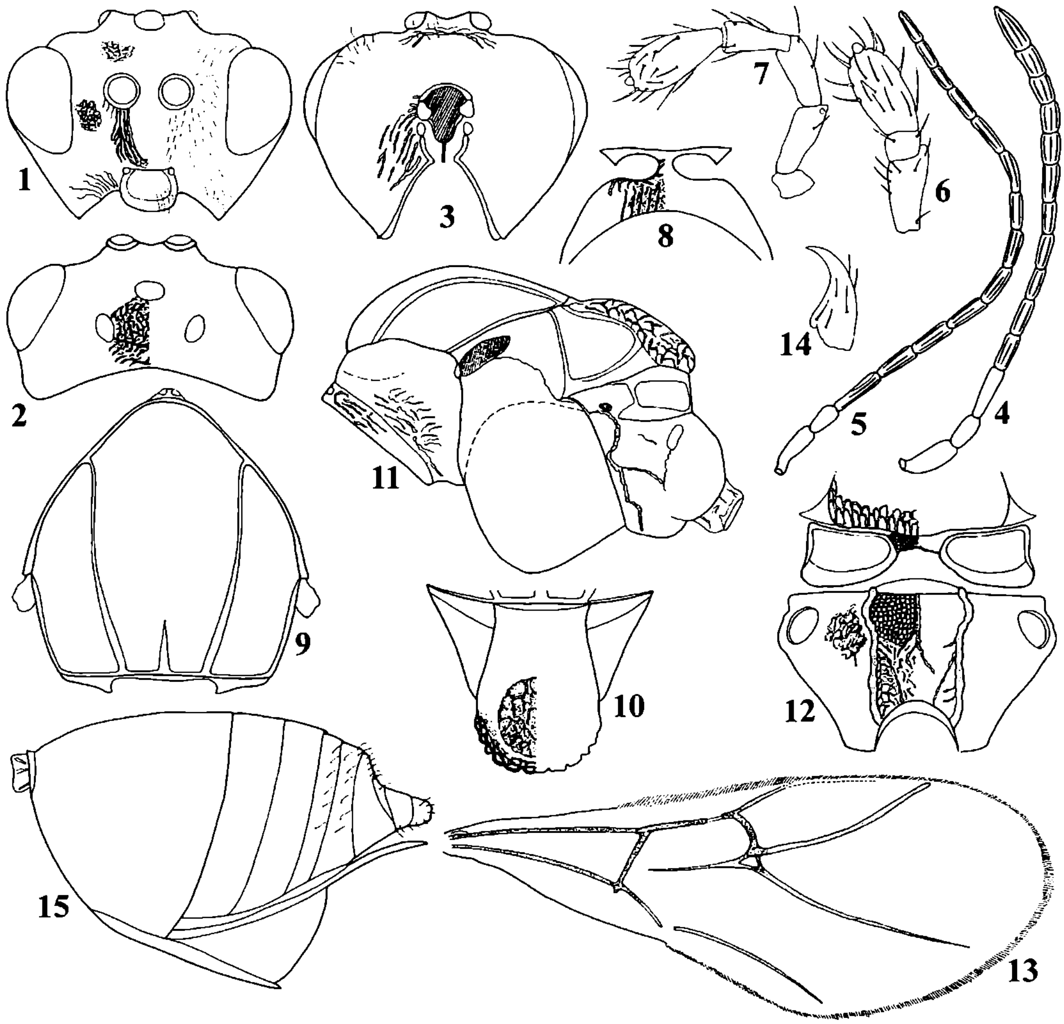
Figs 96.1-8. *Pediaspis aceris*, asexual female: 1-3, head: 1, front view, 2, from above, 3, posteriorly. 4, pronotum and plopleura, front view, 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, metasoma, lateral view.

Distribution and Biology. Western palaearctic distribution. Alternating sexual and asexual generations are known; both inducing galls on *Acer* (Aceraceae). Only one species, *P. aceris* is known.

Pediaspis aceris (Gmelin, 1790)

Figs 97.1-31, Plate 11.7-8.

Sexual generation: *Cynips aceris* Gmelin, 1790: 2652 (female, gall); *Bathyaspis aceris*: Förster, 1869: 332 (female, male, gall). Asexual generation: *Pediaspis sorbi* Tischbein, 1852: 142 (female, gall).

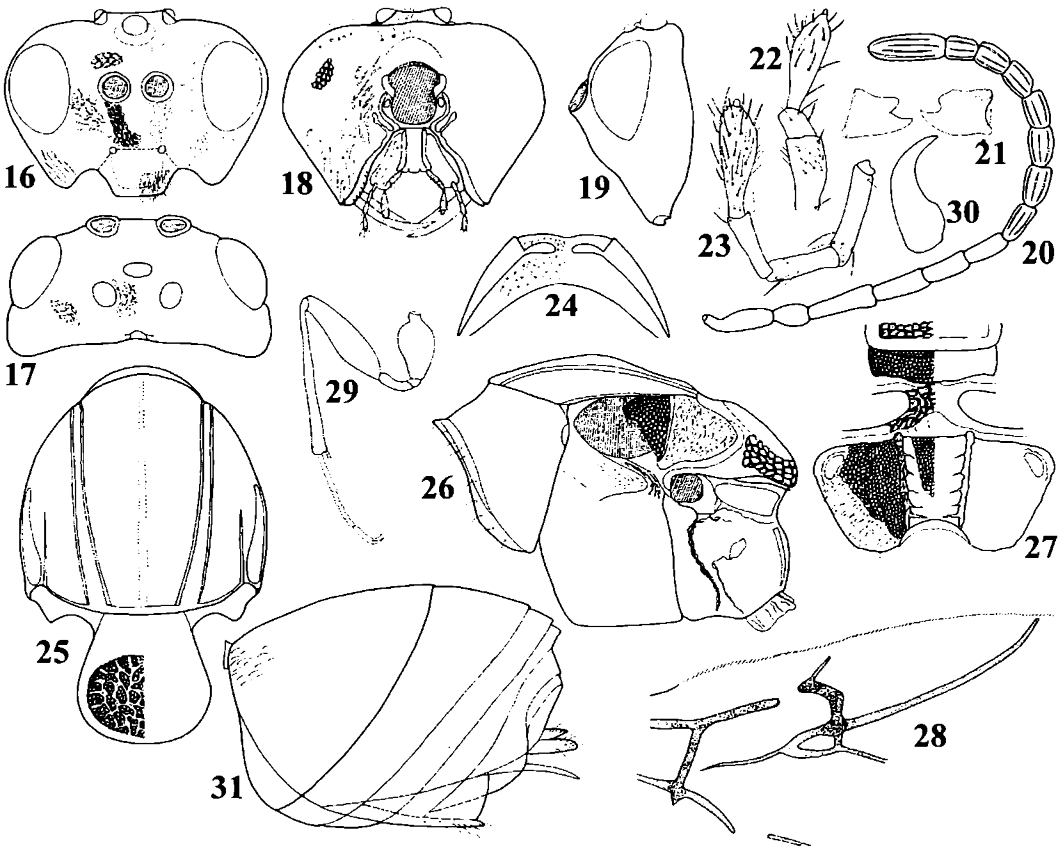


Figs 97.1-15. *Pediaspis aceris*, sexual generation: 1-3, head, female: 1, front view, 2, from above, 3, posteriorly. 4-5, antenna: 4, female, 5, male. 6-15, female: 6, palpus labialis, 7, palpus maxillaris, 8, pronotum, dorsal view, 9, scutum, dorsal view, 10, scutellum, dorsal view, 11, mesosoma, lateral view, 12, propodeum and dorsellum, dorso-posterior view, 13, forewing, part, 14, tarsal claw, 15, metasoma, lateral view.

Description. Sexual female. 2.3-3.0 mm. Body and appendages uniformly chestnut brown. Wing veins distinct, dark brown. Head alutaceous to smooth, with uniformly sparse white setae, 1.7 times as broad as long from above, 1.3times as broad as high in front view and slightly broader than mesosoma. Gena smooth, slightly broadened behind eye, not visible in front view behind eye. Malar space alutaceous, with delicate very few short striae radiating from clypeus and extending at most to half distance between clypeus and eye; 0.5-0.7 times as long as height of eye. POL 1.6 times as long as OOL; 1.9 times as long as LOL and 2.5 times as long as diameter of lateral ocellus. Transfacial distance 1.5 times as long as height of eye; diameter of antennal torulus 2.0 times as long as distance between them, slightly longer than distance between torulus and eye inner margin. Lower face delicately coriaceous laterally; with some branched rugae, starting from anterior tentorial pit and reaching antennal socket; median elevated area delicately coriaceous. Clypeus rectangular or trapezoid, alutaceous, strongly elevated over lower face and malar space, smooth, shining with distinct large rounded anterior tentorial pits, with distinctly impressed epistomal sulcus and clypeo-pleurostomal line; ventral margin rounded, strongly projecting over mandibles, with long white setae. Frons alutaceous to smooth; interocellar area coriaceous; vertex and occiput smooth, occipital carina distinct. Postocciput and postgena smooth, with some weak wrinkles; posterior tentorial pits deep, rounded; gula shorter than height of occipital foramen; gular sulci free, not united near hypostoma; diverging dorsally; oral foramen heigher than occipital foramen. Palpus maxillaris 5-segmented, palpus labialis 3-segmented; mandibles on the figures. Antenna 14-segmented, more or less one-half of body length; pedicel nearly 2.0 times as long as broad; F1 1.2 times as long as pedicel and 1.5 times as long as F2; F2 equal F3; F12 1.7 times as long as F11; placodeal sensilla on F2-F12. Mesosoma flattened dorso-ventrally, longer than high in lateral view, with very few white setae. Pronotum alutaceous to smooth dorsally, with some weak longitudinal rugae; with some weak wrinkles laterally and along anterior margin; with moderately dense white setae along anterior margin; dorso-medially usually 1/3 as long as greatest length on outer lateral margin. Submedian pronotal pits deep, transverse, separated by a distinct narrow central carina; pronotal plate indistinctly delimited only antero-laterally. Notauli complete, deeply impressed; median mesoscutal line impressed, well- visible in posterior 1/3-1/5 of scutum; parapsidal lineas and anterior parallel lines absent. Scutum smooth and shining; scutellum trapezoid, dorsally flattened, smooth, shining, except rounded reticulate or rugose impression centrally. Scutellar foveae absent. Mesopleuron smooth, shining; mesopleural triangle with very delicate wrinkles. Metapleural sulcus reaching mesopleuron slightly above half or more of its height; preaxilla and lateral axillar are smooth to alutaceous; axillar carina very narrow; axillula large, rounded, very slightly elongated only, smooth, shining, with relatively dense white long setae; subaxillular bar smooth, shining, nearly as high as height of metanotal trough; propodeal spiracle strongly raised, ovate; carina along anterior border of propodeal spiracle strongly raised; ventral bar of metanotal trough delicately coriaceous, with some longitudinal weak wrinkles, 3.0 times as short as height of metanotal trough. Dorsellum reticulate, medially nearly 3.5-4.0 times as short as height of smooth, shining ventral impressed area; metanotal trough smooth, shining, with few white setae. Propodeum coriaceous to rugose, interspaces between rugae smooth, shining; lateral propodeal carina subparallel, without setae; central propodeal area reticulate dorsally, with some irregular wrinkles posteriorly; lateral propodeal area rugose; nucha long, with some irregular weak wrinkles. Forewing margin with relatively long cilia; radial cell opened, 3.2 times as long as broad, R1 reaching wing margin and in some specimens continuing on a short distance along margin; areolet small, distinct, Rs+M distinct, nearly reaching basalis; Cu1b strongly curved outwards. Hind tarsomere 5 only slightly shorter than tarsomeres 2+3+4 and slightly shorter than tarsomere 1. Tarsal claws narrow, simple, without basal lobe. Metasoma distinctly longer than head+mesosma and longer than high in lateral view, metasomal tergite 2 without antero-lateral setae, without punctures; subsequent tergites and hypopygium without punctures; prominent part of ventral spine of hypopygium very short, without or very few short white setae, never extending behind apex of spine. Male. 2.1-2.8 mm. Similar to female but antenna 15-segmented, longer, more slender, thin; F1 nearly 2.0 times as long as pedicel; shorter and 1.3 times as long as F2; placodeal sensilla on all flagellomeres. The entire body usually lighter.

Asexual female. 3.4-4.7 mm. Body and appendages dark chestnut brown, with some darker parts. Wing veins distinct, dark brown. Head alutaceous to smooth, with uniformly sparse white setae, 1.8-1.9 times as broad as long from above, 1.4 times as broad as high and slightly broader than mesosoma. Gena smooth, with some weak short wrinklres, broadened behind eye, visible in front view behind eye, slightly narrower than cross diameter of eye. Malar space smooth, 0.6 times as long as height of eye. POL shorter than OOL; 2.1 times as long as LOL and 1.5 times as long as diameter of lateral ocellus. Transfacial distance 1.5 times as long as height of eye; diameter of antennal torulus 3.0 times as long as distance between them and slightly longer than distance between torulus and eye inner margin. Lower face delicately coriaceous to alutaceous, with some very delicate wrinkles; median elevated area coriaceous to delicately rugose. Clypeus trapezoid, coriaceous, strongly elevated over lower face and malar space; with distinct large rounded anterior tentorial pits, with distinctly impressed epistomal sulcus and clypeo-pleurostomal line; ventral margin straight, strongly projecting over mandibles, with long white setae. Frons alutaceous to smooth; interocellar area coriaceous; vertex and occiput smooth, occipital carina distinct.

Postocciput and postgena smooth, with some weak wrinkles; posterior tentorial pits deep, rounded; gula shorter than height of occipital foramen; gular sulci free, not united near hypostoma; diverging dorsally; oral foramen heigher than occipital foramen. Maxillar and labial palps, mandibles on figures. Antenna 14-segmented, more or less one-half of body length; pedicel 1.4 times as long as broad; F1 1.9 times as long as pedicel and 1.25 times as long as F2; F2 1.2 times as long as F3; F10 2.4 times as long as F9; placodeal sensilla well-visible only from F5.



Figs 97.16-31. *Pediaspis aceris*, asexual female: 16-19, head: 16, front view, 17, from above, 18, posteriorly, 19, lateral view. 20, antenna, 21, mandibles, 22, palpus labialis, 23, palpus maxillaris, 24, pronotum, dorsal view, 25, scutum and scutellum, dorsal view, 26, mesosoma, lateral view, 27, propodeum and dorsellum, dorso-posterior view, 28, forewing, part, 29, hindleg, 30, tarsal claw, 31, metasoma, lateral view.

Mesosoma flattened dorso-ventrally, longer than high in lateral view, with few white setae. Pronotum alutaceous to smooth dorsally, with piliferous points; smooth, shining laterally. Submedian pronotal pit distinct, deeply impressed, transverse, separated by a narrow central carina, which 2.0 times narrower than width of pit. Scutum longer than broad, smooth, shining and nearly 2.0 times as long as scutellum. Notauli broad, deep, complete, slightly broader posteriorly, well-impressed in all length; median mesoscutal line in a form of darker stripe, which reaching pronotum, not impressed posteriorly; parapsidal lines reaching tegulae level; anterior parallel lines absent. Scutellum slightly longer than broad, trapezoid, broader in posterior half, rounded posteriorly, smooth, shinig, with flattened and impressed rugose central rounded or heart-shaped area. Scutellar foveae absent. Mesopleuron smooth, shining, mesopleural triangle with some delicate weak wrinkles. Metapleural sulcus not reaching mesopleuron; metapleuron smooth, shining, with some strong rugae; axillula rounded, smooth, shining, with dense long white setae; subaxillular bar smooth, shining, as high or slightly shorter than height of metanotal trough.

Dorsellum rugose, with strong irregular rugae; medially nearly as high as height of ventral impressed area; metanotal trough smooth, shining, with few white setae, ventral impressed area smooth, shining. Propodeum reticulate to rugose; lateral propodeal carina broad, strong, subparallel, with branching rugae into central propodeal area; central propodeal area reticulate, with some irregular rugae. Forewing margin with short cilia; radial cell opened, 3.0 times as long as broad, R1 not reaching wing margin; areolet distinct, elongated, Rs+M nearly reaching basalis. Tarsal claws narrow, simple, without basal lobe. Metasoma nearly as long as head+mesosoma, slightly longer than high in lateral view, metasomal tergite 2 with antero-lateral patch of sparse short white setae, without punctures; subsequent tergites and small hypopygium without punctures; prominent part of ventral spine of hypopygium short, with sparse and relatively long white setae, apical setae extending behind apex of spine.

Gall. Sexual generation (Plate 11.7). Regular, spherical or egg-shaped, 6-10 mm large galls. Usually developing on the underside of the leaf, sometimes on the upper side, than the gall is more rounded or ovate. The presence of the gall on the underside of the leaf is visible from the upper side in a form of lighter 1-2 mm spot. The gall surface is smooth and green when young; later when mature, turn reddish to brown and the surface is glabrous. The broader part of the gall is attached to a leaf vein, forming groups from 2 to 10 galls. The empty gall stay on the leaf. Monolocular, wall is thin, lignified, with big larval chamber inside. On a leaf petiole, on the upper side of a leaf, on the bark of young shoots, on flower petiole and fruits occurs very rarely. The surface of a parasitized gall is rough, and the gall is slightly larger. The parenchyma of a parasitized gall is spongious and many larval chambers are formed; usually the gall matures later. Asexual generation (Plate 11.8). A pea-like gall, 6-8 mm in diameter, growing on young, slender roots and usually in coalesced clusters. The gall wall at the beginning is soft, later becoming hard, reddish-brown, with wrinkled surface, around 1 mm thick, with a larval chamber inside. Monolocular.

Distribution. AU, BL, FR, GE, HU, RO (Dalla Torre & Kieffer, 1910); Iberian Peninsula (Pujade-Villar, 1986, 1991a); RU (Voronezh Region, Negrobov & Shestopalova, 1980); IR (Lorestan Province, author). In Ukraine – only the Transcarpathian Region (vicinities of Uzhgorod, Mukachevo and Beregovo (Zerova, Diakontschuk & Ermolenko, 1988; author)).

Biology. Alternating sexual and asexual generations are known (Adler, 1881; Mayr, 1881). The asexual generation root galls mature in September, adults emerge from the gall only on the third year, usually in April. The asexual galls were found on *Acer pseudoplatanus* (Aceraceae) only. The sexual generation developing on *A. pseudoplatanus*, *A. platanoides*, *A. opalus* Miller and *A. monspessulanum*. Adults emerge usually in June.

Tribe Synergini Ashmead, 1896

Synerginae Ashmead, 1896: 186.

Small to moderate sized wasps, from 0.8 to 7 mm in body length. The tribe share the following morphological characters: genae not or weakly broadened behind eyes; lower face with striae radiating from clypeus and reaching antennal sockets; clypeus indistinctly delimited by anterior tentorial pits, clypeo-pleurostomal line and epistomal sulcus, ventral margin straight (in all European species); malar sulcus absent; gular sulci long, distance between occipital and oral foramens longer than height of occipital foramen; gular sulci and gular ridges united well before reaching hypostoma; maxillary palp 5-segmented; labial palp with three segments. Antenna of female 12-14-segmented; male -- 14-15-segmented, with first flagellomere usually more or less excavated, curved medially and broadened apically. Scutum usually tarnsversely striate; scutellum dull rugose; mesopleuron transversely striate. Pronotum relatively long, measuring medially 1/5 to 1/3 of the shortest distance across lateral margin; submedian pronotal pits usually conspicuous and separated medially, sometimes associated with a weak pronotal plate; lateral pronotal carinae present or not. Notauli usually complete, reaching pronotum; median mesoscutal line extending to half length of scutum or in a form of a short triangle; parapsidal and anterior parallel lines present. Lateral propodeal carinae subparallel. Fully winged except for some males of *Synergus thaumacerus*; radial cell opened or closed along wing margin. Tarsal claws with an acute basal lobe (in all Palaearctic species). Metasomal tergite 1 reduced or ring shaped and dorsally with longitudinal sulci; metasomal tergites 2 and 3 free or usually fused and occupying almost all the metasoma; prominent part of ventral spine of hypopygium short.

Ca. 159 inquiline cynipid species are known world-wide (Table 8). With very few exceptions, cynipid inquilines inhabit the galls induced by other cynipids, predominantly on oaks. A small number of species develops as inquilines in galls induced on oak by gall midges (Diptera: Cecidomyiidae): in North America, *Ceroptres inermis* (Walsh, 1864), develops in the galls of *Cincticornia pilulae* Beutenmüller, 1892, while in Europe *Synergus variabilis* and *Saphonecrus haimi* have been reared from *Dryomyia circinnans* (*S. variabilis* only) and *Janetia cerris* (both species) on *Quercus cerris* (Askew, 1999a; Pujade-Villar et al., 2003). The genus *Rhoophilus*, established by Mayr (1881) with the type species *R. loewi*, contains a single South African endemic species and was originally described as a gall inducer in galls on the leaves of *Rhus lucidum* L. (Anacardiaceae). As predicted by phylogenetic relationships, *R. loewi* is instead an inquiline wasp (Weld, 1952a; Ronquist, 1994). While all other cynipid inquilines develop in galls induced by cynipid wasps, or very rarely cecidomyiid midges, *R. loewi* is the only cynipid inquiline of a lepidopteran gall, inducing secondary inquiline cells in galls induced by a cecidosid moth of the genus *Scyrotis* on *Rhus* species. *Rhoophilus* is a lethal inquiline; its larval cells expand into the hollow interior of the host gall resulting in death of the gall inducer (van Noort et al., in press).

Until recently, *Synophrus* has been regarded as a gall-inducing genus on *Quercus*, because no cynipid host could be identified. However, recent studies confirmed species of the *Andricus burgundus* complex as inducers of the host galls (Pujade-Villar et al., 2003).

Recently an inquiline genus, *Ufo* Melika & Pujade-Villar, 2005, was described from Japan, with one known species, *U. abei* Melika & Pujade-Villar, 2005 (Melika et al., 2005). Another undescribed species of *Ufo* was find in South Korea (Melika, unpublished data).

Table 8. The world distribution and species richness of Synergini genera

Genera	**Hosts**	W. Palae-arctic	E. Palae-arctic	North America	Central & S. America	South Africa	World wide
Ceroptres Hartig, 1840	Oak cynipid galls	2	3	16	--	--	**21**
Synergus Hartig, 1840	Oak cynipid galls	34	8	52	5	--	99
Saphonecrus Dalla Torre & Kieffer, 1910	Oak cynipid galls	6	7	4	--	--	17
Synophrus Hartig, 1843	Oak cynipid galls	3	--	--	--	--	3
Periclistus Förster, 1869	*Diplolepis* galls, 1 species in *Diastrophus smilacis*	3	2	7	--	--	12
Synophromorpha Ashmead, 1903	*Diastrophus* galls	--	1	3	1	--	5

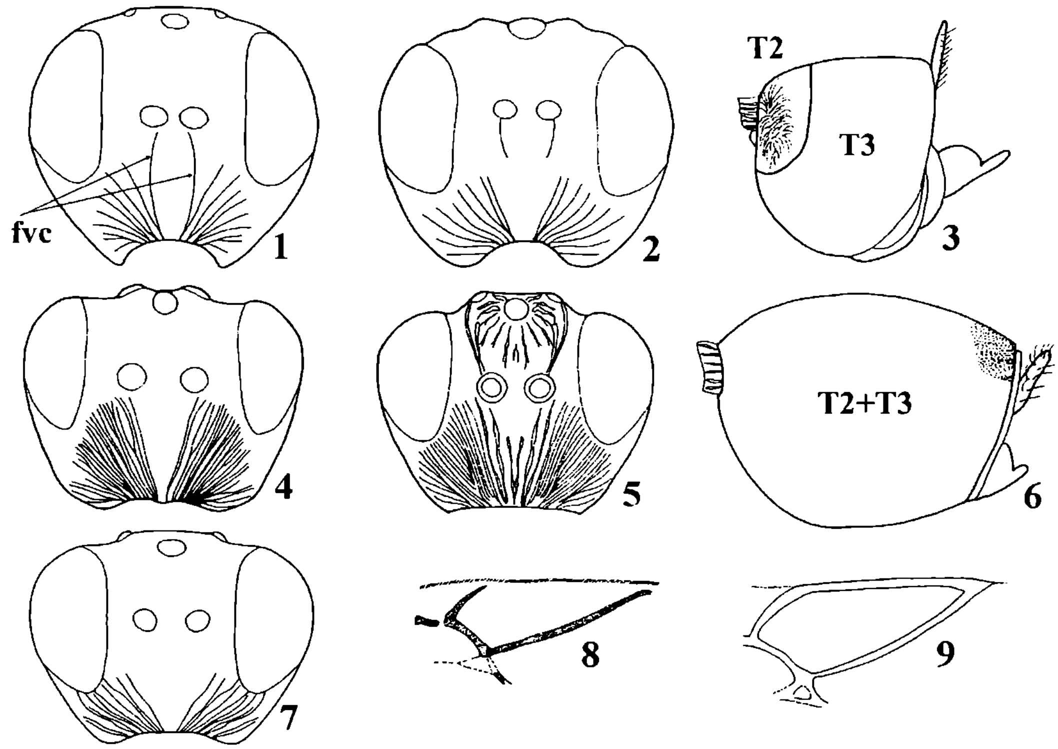
Rhoophilus Mayr, 1881	*Scyrotis* galls (Lep.: Cecidosidae) on *Rhus lucidum* L.	--	--	--	--	1	1
Ufo Melika & Pujade, 2005	Oak cynipid galls	--	1	--	--	--	1
Total		**48**	**22**	**82**	**6**	**1**	**159**

The taxonomic position and classification of the cynipid inquilines has long been controversial, but has recently been clarified somewhat (Pujade-Villar & Ros-Farré, 1998b; Pujade-Villar et al., 2003). Hartig (1840) was the first to recognise the biological differences between the inquiline and gall forming Cynipidae. He described the genera *Ceroptres*, *Synergus* and *Synophrus* as inquilines from oak galls, although he regarded *Synophrus* as a gall inducing genus (Hartig, 1840, 1843). At different times the cynipid inquilines have either been placed in a separate subfamily within the Cynipidae (Hartig, 1840; Ashmead, 1896, 1903a; Burks, 1979), included in the herb gall wasp tribe Aylacini (Roskam, 1992), or lumped with the gall inducers into a large group without subdivisions (Weld, 1952a; Eady & Quinlan, 1963). However, more recently they have been classified as belonging to the tribe Synergini within the Cynipidae, one of the five tribes proposed by Ashmead (1903a) (see also Hartig, 1840; Ashmead, 1896; Kinsey, 1920b; Burks, 1979; Nieves-Aldrey, 1994b; Ronquist, 1999a, 1999b).

The situation has also been complicated by the fact that advances in the global study of the Cynipoidea have revealed two different groups of inquilines (or probable inquilines) associated with cynipid galls - the tribe Synergini of the Cynipidae and a group of genera in a separate family, the Figitidae. Kinsey (1920b) regarded all cynipoid inquilines as members of the Figitidae. This family consists predominantly of species with a parasitoid life cycle, and he thus believed that none of the inquilines belonged to the same lineage as the true gall wasps. In contrast, Weld (1952a) recognised 10 genera of inquilines within the Cynipidae: *Ceroptres*, *Euceroptres*, *Myrtopsen*, *Periclistus*, *Poncyia*, *Rhoophilus*, *Saphonecrus*, *Synergus*, *Synophromorpha* and *Synophrus*. Ronquist (1994) supported the inclusion of most of these genera within the Cynipidae, but moved *Euceroptres* and *Myrtopsen* back towards the Figitidae. He included them in a group he named the "figitoid inquilines", which he considered to form part of a basal group of the Figitidae "sensu lato". The figitoid inquiline group also includes the genera *Thrasorus*, *Plectocynips*, *Pegacynips* and a then undescribed genus associated with the aylacine gall wasp *Barbotinia oraniensis* on poppies, *Papaver*. Further study of cynipoid phylogenetic relationships lead Ronquist to place all the genera of "figitoid inquilines" except for the undescribed genus in a separate subfamily, the Thrasorinae, within the Figitidae (Liljeblad & Ronquist, 1998; Ronquist, 1999a). The undescribed genus associated with *Barbotinia* galls has been described (*Parnips*) and included in its own subfamily, the Parnipinae (Ronquist & Nieves-Aldrey, 2001).

The biology of the figitids associated with cynipid galls is little known (Csóka et al., 2004), and none are associated with oak cynipid galls in Europe. The three known species of *Euceroptres* from North America (Burks, 1979) and one Japanese species (Ashmead, 1904a) are inquilines in oak cynipid galls. The genera *Pegacynips* (with one known species) and *Plectocynips* (with 2 described species) are known only from South America, and were reared from unidentified galls (perhaps induced by the cynipid genus *Paraulax*) on southern beech, *Nothofagus*. Most of the figitoid inquilines may in fact be parasitoids of hosts in the galls from which they have been reared, rather than true inquilines. At least one species, *Parnips nigripes,* has been demonstrated to be a parasitoid of *Barbotinia oraniensis* and not an inquiline (Ronquist & Nieves-Aldrey, 2001).

Important works on palaearctic inquiline Cynipidae include Hartig (1840, 1841, 1843), Mayr (1872), Kieffer (1901), Dalla Torre & Kieffer (1910), Tavares (1920b), Ross (1951), Eady (1952), Eady & Quinlan (1963), Nieves-Aldrey & Pujade-Villar (1985, 1986), Pujade-Villar (1992b), Pujade-Villar & Nieves-Aldrey (1990, 1993), Pujade-Villar & Ros-Farré (1998b), Abe (1998b) and Pujade-Villar et al. (2002). The species of the western Palaearctic Region were recently revised by Pujade-Villar et al. (2003), a new genus, *Ufo*, was described from Japan (Melika et al., 2005) and new species of *Synergus* and *Saphonecrus* were described from China and Iran (Melika et al., 2004; Sadeghi et al., 2006a). Rather less has been published on the nearctic fauna, and the available literature includes work by Osten Sacken (1861, 1862, 1863, 1865), Walsh (1864), Ashmead (1885, 1896, 1899, 1903a, 1903b), Gillette (1890, 1896), Fullaway (1911), McCracken & Egbert (1922), Weld (1926, 1952a), Ritchie & Shorthouse (1987b) and Díaz & Gallardo (1998). The most recent comprehensive study of the inquiline cynipid fauna can be found in Ritchie (1984), which includes a world catalogue of species, and Ritchie & Shorthouse (1987a), which presents a review of *Synophromorpha.*



Figs 98.1-9. 1-2, head, front view (fvc – frontal vertical carina): 1, *Ceroptres clavicornis.* 2, *Ceroptres cerri.* 3, metasoma, lateral view, *Ceroptres clavicornis.* 4-5, head, front view: 4, *Synophrus politus.* 5, *Synergus gallaepomiformis.* 6, metasoma, lateral view, *Synergus gallaepomiformis.* 7-8, *Saphonecrus connatus,* female: 7, head, front view, 8, forewing, radial cell. 9, *Synergus umbraculus,* female, forewing, radial cell.

The 51 species of western palaearctic cynipid inquiline species are associated with 161 host oak and rose gall wasps. A catalogue of host-associations for all western palaearctic Synergini species is given in Stone, Melika & Csóka (in press). For detail host associations of Synergini distributed in Ukraine see also Diakontschuk (1986) and Diakontschuk & Melika (1994). Below, in the inquiline species list where host gall wasps are mentioned, the asexual [a] or sexual [b] generation galls which from the inquilines were reared are given in brackets.

Key to western palaearctic genera of Synergini

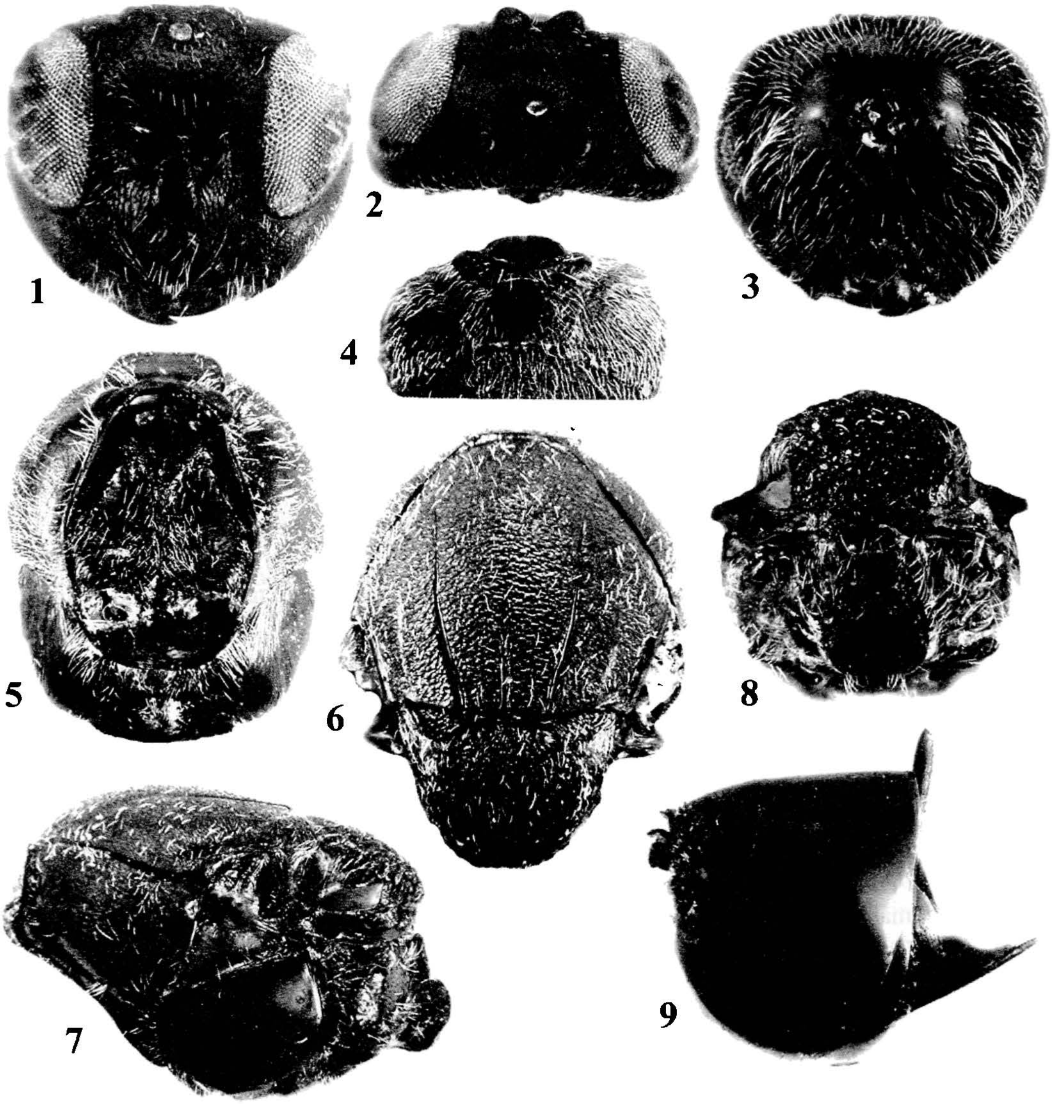
1. Lower face with two vertical carinae going from antennal sockets to clypeus (Figs 98.1-2); upper face, vertex and mesopleuron almost smooth; metasomal tergite 2 small and free, not fused with T3, with dense patch of setae antero-laterally (Fig. 98.3) .... ***Ceroptres***
-- Lower face without vertical carinae (Figs 98.4-5); upper face and vertex sculptured; mesopleuron regularly closely striate; metasomal tergites 2 and 3 in females fused, covering almost entire metasoma (Fig. 98.6) 2
2. Female antenna 13-, male 14-segmented; lateral frontal striae usually absent (Fig. 98.7); radial cell of forewing open (Fig. 98.8) 3
-- Female antenna 14-, male 15-segmented; lateral frontal striae usually present (Fig. 98.5); radial cell of forewing closed (Fig. 98.9), in *Synergus plagiotrochi* partially opened .... ***Synergus***
3. Position of anterior end of metapleural sulcus more dorsal; metasomal tergite 2 entirely sulcate .... ***Saphonecrus***
-- Position of anterior end of metapleural sulcus more ventral; metasomal tergite 2 smooth medially, sulcate only laterally, smooth dorsally .... ***Synophrus***

Ceroptres Hartig, 1840

Figs 99.1-9.

Ceroptres Hartig, 1840: 186. Type species: *Ceroptres clavicornis* Hartig, 1840.

Body predominantly black, rarely chestnut brown or even orange; antenna and legs light brown to yellow chestnut brown, except darker to black scape and coxae. Head alutaceous to delicately coriaceous, broader than high in front view, with sparse white short setae. Gena not broadened behind eye; malar space much shorter than height of eye, with striae radiating from clypeus and reaching eye. Transfacial distance shorter than height of eye; diameter of antennal torulus 3.0 times as large as distance between them and slightly longer than distance between torulus and eye margin. Inner margins of eyes slightly converging ventrally. Clypeus small, quadrangular, anterior tentorial pits, clypeo-pleurostomal line and epistomal suclus distinct, ventral margin rounded, not projecting over mandibles. Lower face with striae radiating from clypeus and reaching inner margin of eye and antennal sockets, with two vertical more or less distinct raised carina running from antennal sockets and reaching or not clypeus. Frons, vertex and occiput uniformly alutaceous. Distance between occipital and oral foramens larger than height of occipital foramen; gular sulci united well above hypostoma. Antenna of female slightly clavate, 12-13-segmented, in male – 14-15-segmented; F2 slightly shorter or equal F1. Pronotum dorso-medially 1/3-1/2 times shorter than measuring along lateral outer margin; submedian pronotal pits narrow, transverse, separated by a median carina. Scutum delicately coriaceous to alutaceous; notauli complete, well-impressed along entire length or indistinct only in anterior 1/3; median mesoscutal line short, extending to 1/3 of scutum length or in a form of short triangle. Scutellum coriaceous to rugose, rounded, scutellar foveae transverse, more or less well-delimited posteriorly, separated by a distinct central carina. Mesopleuron smooth, shining, with some very delicate transverse striae, especially in antero-dorsal part; metapleural sulcus reaching mesopleuron in the upper 1/3 of its height. Lateral propodeal carina subparallel. Forewing with short cilia on margin, radial cell closed along wing margin. Tarsal claws with basal lobe. Metasoma nearly as high as long in lateral view; metasomal tergite 2 small, with dense setae antero-laterally and free, not fused with metasomal tergite 3, which occupying 2/3 or more of metasoma length. Prominent part of ventral spine of hypopygium very short.



Figs. 99.1-9. *Ceroptres cerri*, female: 1-3, head: 1, front view, 2, from above, 3, posteriorly. 4, pronotum with submedian pronotal pits, dorsal view, 5, pronotum and propleura, front view, 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, metasoma, lateral view.

Ceroptres (at least the palaearctic species) has two main diagnostic morphological characters (autapomorphies): two raised vertical carinae on the lower face and the metasomal tergite 2 is free (not fused with metasomal tergite 3) and small (ratio of median length of metasomal tergite 2 to median length of tergite 3 <1.0). *Ceroptres* is also the only Synergini in cynipid galls on oaks with a smooth and shining metasomal tergite 1, reduced to a dorsal crescent-shaped scale, without sulci. While the European species of *Ceroptres* are distinct from other inquiline genera and particularly from *Synergus*, the situation for the nearctic species is less clear. Weld (unpublished data) described specimens that are intermediate between *Ceroptres* and *Synergus*. For example, the vertical carinae extending from the ventral margin of the antennal sockets (which are well-developed in European species) are incomplete or absent in the nearctic *Ceroptres* specimens. Ritchie (1984) believed similarities between *Synergus* and *Ceroptres* to support a close relationship between the two genera. This opinion has been supported by Liljeblad & Ronquist (1998), who stated that the North American species of *Ceroptres* resemble other inquiline genera more than they do European species in the same nominal genus. However, close relationships between *Ceroptres* and *Synergus* are not supported by recent sequence-based phylogenetic analyses, which find *Ceroptres* to represent a discrete evolution of inquilinism of oak cynipid galls from a different gall-inducing ancestor (Nylander et al., 2004; Ács et al., 2006b).

Ceroptres is distributed throughout the Holarctic Region. Four species are known from the Palaearctic and 17 from the Nearctic Regions (Ritchie, 1984; Csóka et al., 2004). The European species have been revised by Pujade-Villar & Nieves-Aldrey (1993), while the nearctic species have never been revised and it is very difficult to identify any of them (Ritchie, 1984). Two other species, C. *kovalevi* Belizin, 1973 and *C. masudai* Abe, 1997 are described from the Eastern Palaearctic Region, from Far East of Russia and Japan and Korea respectively (Belizin, 1973; Abe, 1997).

Key to the western palaearctic *Ceroptres* species

1. Two vertical carinae on lower face distinct prolong entire length; F1 equal to F2+F3 in male; mesopleuron entirely smooth and shining; prominent part of ventral spine of hypopygium less than 2.0 times as long as broad .... ***clavicornis***

-- Two relatively indistinct vertical carinae on lower face present only closely to antennal sockets; F1 equal F2 in male; mesopleuron with faint striae dorso-anteriorly; prominent part of ventral spine of hypopygium more than 2.0 times as long as broad .... ***cerri***

Ceroptres cerri Mayr, 1872

Figs 100.1-10.

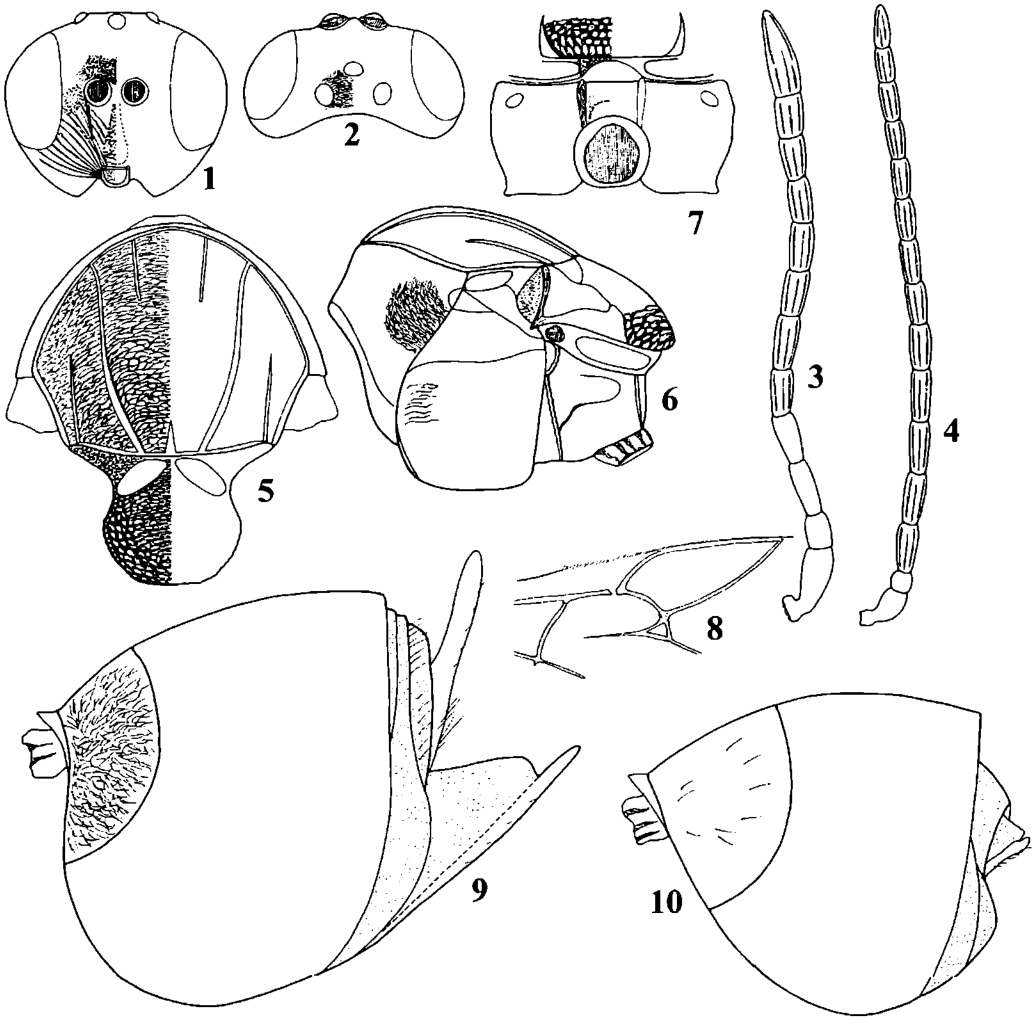
Ceroptres cerri Mayr, 1872: 725 (female, male); *Ceroptres cerriphilus* Giraud in Houard, 1911: 313 (female, male) (synonym in Pujade-Villar & Nieves-Aldrey, 1993: 56); *Ceroptres vitripennis* Giraud in Houard, 1911:314 (female, male) (synonym in Pujade-Villar & Nieves-Aldrey, 1993: 61).

Description. Female. 1.0-2.2 mm. Head and mesosoma entirely black, antenna light brown, legs light brown, except partially black coxae; metasoma black to dark brown, hypopygium light brown. Wing veins distinct, brown. Body with sparse white setae. Head coriaceous, slightly transverse in front view, with sparse white setae, more dense on lower face; 1.7 times as broad as long from above; 1.2-1.3 times as broad as high in front view and slightly broader than mesosoma. Gena delicately coriaceous, not broadened behind eye, invisible in front view behind eye, much narrower than cross diameter of eye, measuring behind eye. Malar space delicately coriaceous, 0.45-0.5 times as long as height of eye, with strong striae radiating from clypeus and reaching eye. POL 1.4-1.5 times as long as OOL; OOL slightly longer than LOL and diameter of lateral ocellus; ocelli large. Transfacial distance shorter than height of eye; diameter of antennal torulus 3.0 times as large as distance between them and slightly longer than distance between torulus and eye margin. Inner margins of eyes slightly converging ventrally. Lower face with strong striae radiating from clypeus and reaching antennal socket; elevated delicately coriaceous median area without striae, two relatively indistinct vertical carinae on face present only closely to antennal sockets. Clypeus quadrangular, coriaceous, impressed, broader than high, with distinct anterior tentorial pits, deeply impressed along distinct epistomal sulcus, clypeo-pleurostomal line distinct, ventrally widely emarginated, rounded, not incised medially. Frons, vertex and occiput uniformly alutaceous. Antennae 12-segmented (in some specimens indistinct suture present between F10 and F11 and than antenna seems to be 13-segmented), longer than head+mesosoma; pedicel slightly longer than broad; F1 only slightly longer than F2; F2 only slightly longer than F3; subsequent flagellomeres nearly equal in length and slightly shorter than F2; distal flagellomeres slightly broader than proximal ones; placodeal sensilla on F3-F10(F11). Mesosoma flatenned dorso-ventrally, slightly longer than high in lateral view, with white setae. Pronotum delicately uniformly coriaceous laterally, alutaceous to smooth, shining dorsally. Scutum coriaceous, with white setae, slightly broader than long (width measured across the basis of tegulae). Notauli complete, broader at the base, well-impressed in all length, converging posteriorly, with smooth, shining bottom; median mesoscutal line in a form of short triangle, extending at most to 1/5 of scutum length; parapsidal lines distinct, reaching slightly above the level of the base of tegulae; anterior parallel lines distinct, broad, extending to 1/4 of scutum length. Scutellum short, 1.7 times shorter than scutum, nearly rounded; rugose, very slightly overhanging metanotum. Scutelar foveae transversely ovate, 2.5 times as broad as high, well-delimited around, with coriaceous, mat bottom, without setae; separated by distinct, broad coriaceous central carina, indistinctly delimited posteriorly. Mesopleuron smooth, shining, with faint striae dorso-anteriorly (in some specimens striae more extended and anterior half striate; mesopleural triangle with very dense setae, hiding the sculpture. Metapleural sulcus reaching mesopleuron in upper 1/3 of its height; axillula elongated, coriaceous, with dense white setae; subaxillular bar smooth, shining, in the most posterior end slightly higher than height of metanotal trough; propodeal spiracle elevated, ovate; ventral bar of metanotal trough smooth, shining, nearly as broad as height of metanotal trough measuring above propodeal spiracle. Dorsellum uniformly delicately coriaceous, very short; metanotal trough very delicately coriaceous to alutaceous, with few white setae; ventral impressed area shining, smooth, without wrinkles. Lateral propodeal carinae slightly broader at the apex and without setae; central propodeal delicately coriaceous to alutaceous; lateral propodeal area delicately uniformly coriaceous or even alutaceous, with relatively dense white setae; nucha short, with longitudinal wrinkles. Forewing longer than body, margin with long cilia; radial cell closed, 2.6 times as long as broad, Rs and R1 slightly curved, areolet distinct, Rs+M distinct, extending to 2/3 length between areolet and basalis, projecting into lower half of it. Metasoma nearly as long as head+mesosoma, rounded, nearly as high as long in lateral view; metasomal tergite 2 small and free, not fused with T3, with dense patch of setae antero-laterally, T3 largest tergite, smooth, shining, without punctures, subsequent tergites and hypopygium with dense distinct micropunctures; prominent part of ventral spine of hypopygium more than 2.0 times as long as broad. Male. 1.0-2.0 mm. Similar to female but antenna 15-segmented, F1 equal F2; subsequent flagellomeres nearly of equal length; placodeal sensilla on all flagellomeres.

Diagnosis. In *C. cerri* two vertical carinae on the face present only closely to antennal sockets; male's F1 equal F2; the mesopleuron with faint striae dorso-anteriorly; lateral propodeal carinae slightly broader at the apex and without setae; the prominent part of the ventral spine of the hypopygium more than 2.0 times as long as broad, while in *C. clavicornis* vertical carinae on face distinct prolong entire length; male's F1 equal to F2+F3; mesopleuron entirely smooth and shining; lateral propodeal carinae uniformly broad and with some distinct setae; the prominent part of the ventral spine of the hypopygium less than 2.0 times as long as broad. The first species associates with cynipid galls on section Cerris oaks, while the second has a broader spectrum of hosts, trophically associated with other *Quercus* sections also.

Distribution. Probably throughout Western Palaearctic Region. In Ukraine – Transcarpathian Region only (Kosino, Julijivski Hory, Rafajlovo, author).

Biology. Known to associate with *Andricus, Neuroterus, Dryocosmus, Plagiotrochus Pseudoneuroterus* and *Trigonaspis* galls. *Ceroptres cerri* appears to be more specialised and is associated with galls on section Cerris oaks, including *Quercus cerris* and the Mediterranean evergreen species *Q. ilex, Q. coccifera* and *Q. suber.* On the Iberian Peninsula the host galls exploited by *C. cerri* are cryptic galls on twigs induced by cynipids of the genus *Plagiotrochus*, such as the galls of *Plagiotrochus amenti* or *P suberi* on cork oak (Stone, Melika & Csóka, in press). Usually associates with *Quercus cerris*, in the Iberian Peninsula with *Q. suber, Q. ilex, Q. coccifera*.



Figs. 100.1-10. *Ceroptres cerri*: 1-2, head, female: 1, front view, 2, from above. 3-4, antenna: 3, female, 4, male. 5-8, female: 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, forewing, part. 9-10, metasoma, lateral view: 9, female, 10, male.

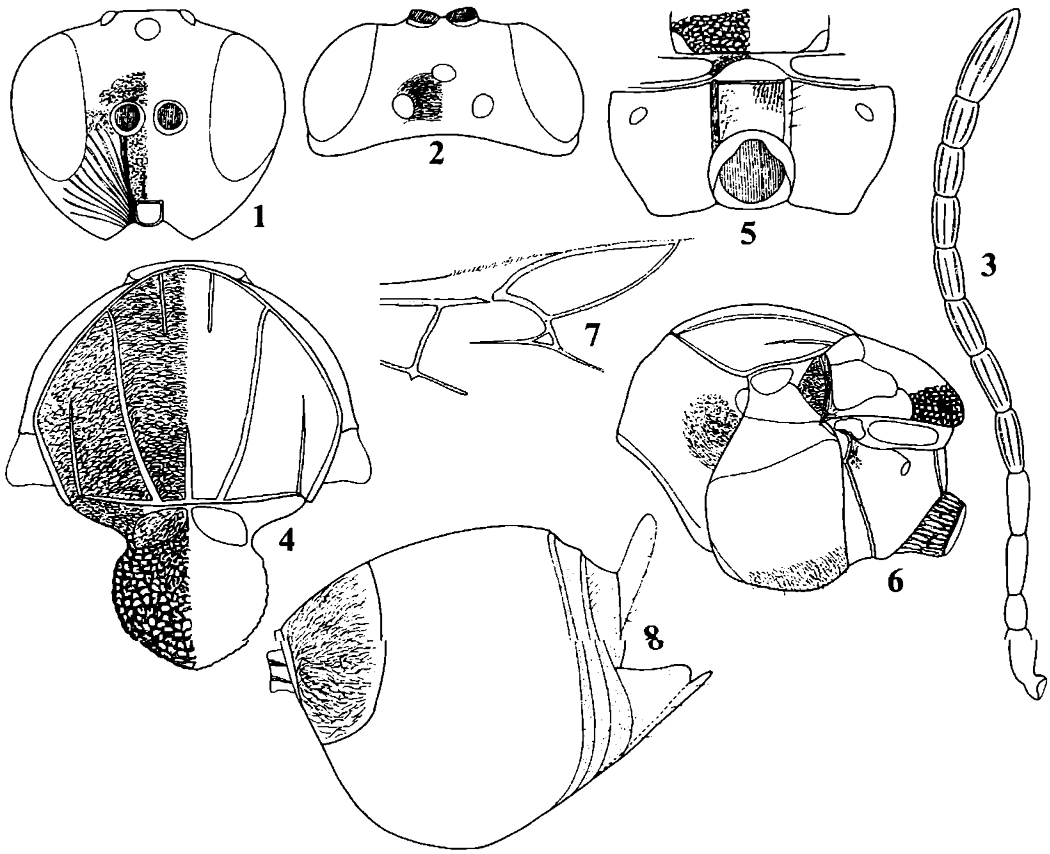
Ceroptres clavicornis Hartig, 1840

Figs 101.1-8.

Ceroptres clavicornis Hartig, 1840: 197 (female); *Cynips clavicornis*: Kaltenbach, 1874: 224; *Ceroptres arator* Hartig, 1841: 343(female); *Aulax arator*: Thomson, 1877: 799; *Ceroptres socialis* Hartig, 1840: 197 (female); *Ceroptres melanomerus* Hartig, 1841: 343 (female) (synonyms in Pujade-Villar & Nieves-Aldrey, 1993: 53).

Description. Female. Very similar to *C. cerri* (see Description of *C. cerri*), but head 1.8 times as broad as long from above. POL 1.8 times as long as OOL; two vertical carinae on lower face distinct prolong entire length; F1 equal F2 and F3; radial cell slightly longer, 3.0 times as long as broad. Scutellum with more dull sculpture, scutellar foveae very delicately coriaceous; mesopleuron entirely smooth and shining; lateral propodeal carinae uniformly broad prolong entire length, with sparse setae; prominent part of ventral spine of hypopygium less than 2.0 times as long as broad.

Male. Similar to male of *C. cerri* (see Description of *C. cerri*), except F1 equal to F2+F3.



Figs. 101.1-8. *Ceroptres clavicornis*, female: 1-2, head: 1, front view, 2, from above. 3, antenna, 4, scutum and scutellum, dorsal view, 5, propodeum and dorsellum, dorso-posterior view, 6, mesosoma, lateral view, 7, forewing, part. 8, metasoma, lateral view.

Distribution. Probably throughout the Western Palaearctic Region. In Ukraine it was collected in Transcarpathian Region, Crimea and vicinities of Kiev (specimens in the collection of SIZK).

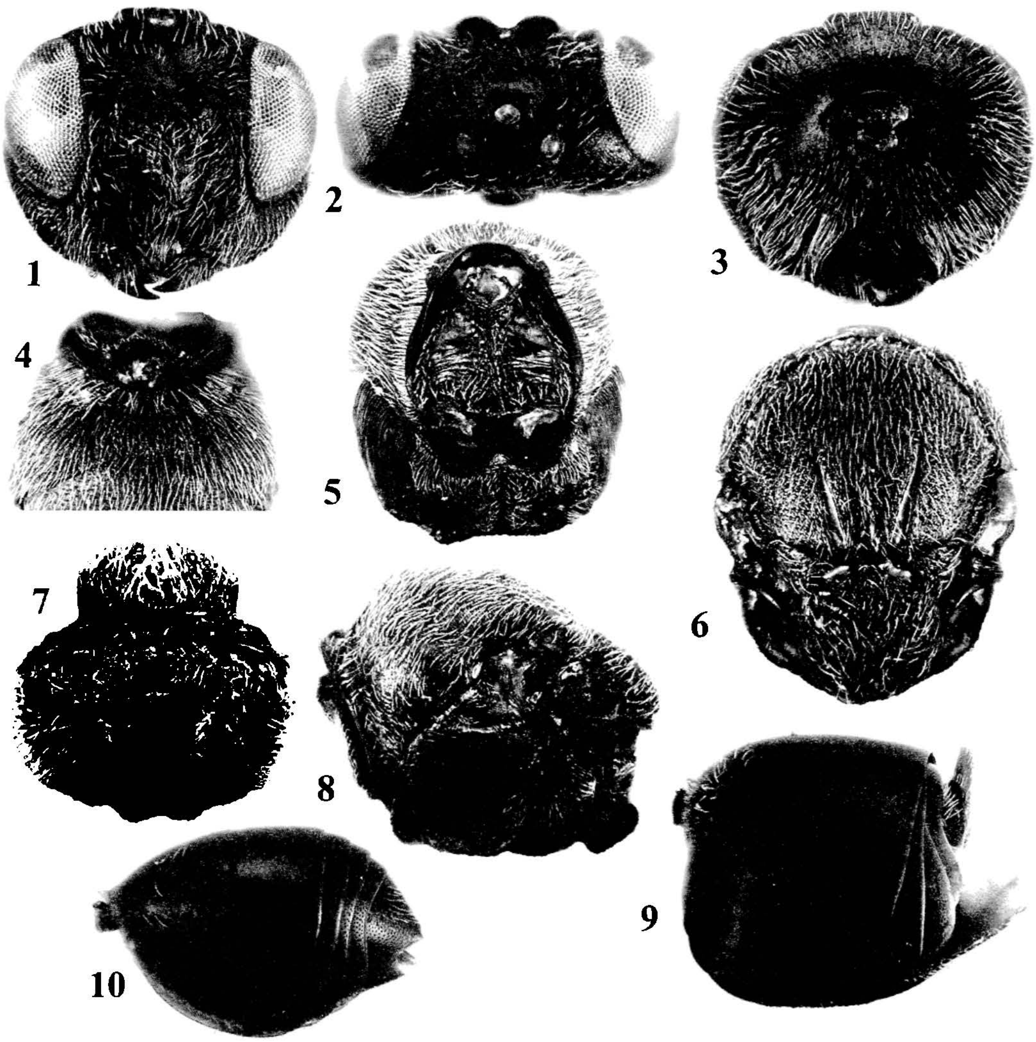
Biology. *Ceroptres clavicornis* is a generalist, has been reared from 30 different cynipid host galls on deciduous section *Quercus* oaks and have also been recorded from galls of cecidomyiid gall-midges (Riek in: Quinlan, 1979), and usually associates with *Quercus robur*, *Q. pubescens*, *Q. petraea*, *Q. pyrenaica*, and *Q. faginea*.

Periclistus Förster, 1869

Figs 102.1-10.

Periclistus Förster, 1869: 332. Type species: *Aylax caninae* Hartig, 1840.

Periclistus is very similar to *Ceroptres* in the shape of the first metasomal tergite but females have the 2nd metasomal tergite completely fused with the 3rd (a suture is present between them in males). Head and mesosoma black, metasoma chestnut brown, with darker posterior tergites. Antenna and legs yellow to partially chestnut brown; coxae dark brown to black. Head delicately coriaceous to alutaceous, nearly as high as broad in front view; gena not broadened behind eye; malar space very short, much shorter than height of eye; malar space and lower face with strong striae, radiating from clypeus and reaching eye and antennal sockets. Clypeus small, quadrangular, slightly higher than broad, with distinct anterior tentorial pits, clypeo-pleurostomal line and epistomal sulcus; ventrally rounded, not projecting over mandibles. Frons, vertex, occiput, postocciput and postgena delicately coriaceous to alutaceous. POL slightly longer than OOL; transfacial distance slightly shorter than height of eye. Antenna filiform, 12-13-segmented in female and 14-segmented in male. Scutum uniformly delicately coriaceous; notauli complete, although sometimes weakly impressed; median mesoscutal line usually extending at least to half of scutum length. Scutellum rugose, with more delicate sculpture towards center of scutellar disk and in between scutellar foveae. Scutelar foveae transversely ovate, only slightly broader than high, well-delimited around, separated by central carina. Mesopleuron transversely striate. Lateral propodeal carinae subparallel; central propodeal area coriaceous, without setae; lateral propodeal area delicately uniformly coriaceous, with relatively dense white setae. Forewing margin with long cilia; radial cell closed, at least 3.0 times as long as broad, areolet distinct, Rs+M nearly reaching basalis. Metasomal tergites 2 and 3 fused in female, free in male, punctate in dorso-posterior part, sometimes punctures indistinct; prominent part of ventral spine of hypopygium very short.



Figs. 102.1-10. *Periclistus brandtii*: 1-7, female: 1-3, head: 1, front view, 2, from above, 3, posteriorly. 4, pronotum with submedian pronotal pits, dorsal view, 5, pronotum and propleura, front view, 6, scutum and scutellum, dorsal view, 7, propodeum and dorsellum, dorso-posterior view, 8, mesosoma, lateral view. 9-10, metasoma, lateral view: 9, female, 10, male.

Holarctic distribution. Seven species are known from America north of Mexico (Burks, 1979). Three species are known from the Western Palaearctic Region and two of them are present in Ukraine. The third species, *P. idoneus* Belizin, 1973 is known from Israel only (Belizin, 1973). Four other species of *Periclistus* were described from the Eastern Palaearctic Region: *P. mongolicus* Belizin, 1973 from Mongolia (Belizin, 1973), *P. capillatus* Belizin, 1968 from Primorskij Kraj of Russia (Belizin, 1968), and two other species, *P. natalis* Taketani & Jasumatzu, 1973 and *P. quinlani* Taketani & Jasumatzu, 1973 from Japan, from galls of *Diplolepis japonicus* Walker, 1874 (Abe, 1998b).

Periclistus species are associated with *Diplolepis* rose galls, except one nearctic species, *P. smilacis* Ashmead, 1896 known from Florida and reared from galls of *Diastrophus smilacis* (Ashmead, 1896). Monovoltine species, represented by sexual generations only. The biology has been studied in details in some holarctic species (e.g. Brooks & Shorthouse, 1997; Shorthouse, 1973, 1980). Larvae of some *Periclistus* species can strongly modify the gall structure of the host (Shorthouse, 1973, 1980).

Key to the western palaearctic *Periclistus* species

1. Mesopleuron completely striate; notauli complete, although sometimes weakly impressed; 2nd and 3rd fused metasomal tergites of female and 3rd tergite of male broadly punctate in dorso-posterior part, sometimes punctures indistinct .... ***brandtii***
- Mesopleron partially striate, with smooth shining patch dorso-posteriorly; notauli incomplete, absent or very indistinct in anterior half or less; 2nd and 3rd fused metasomal tergites of female and 3rd tergite of male without or very narrow band of punctures in dorso-posterior part .... ***caninae***

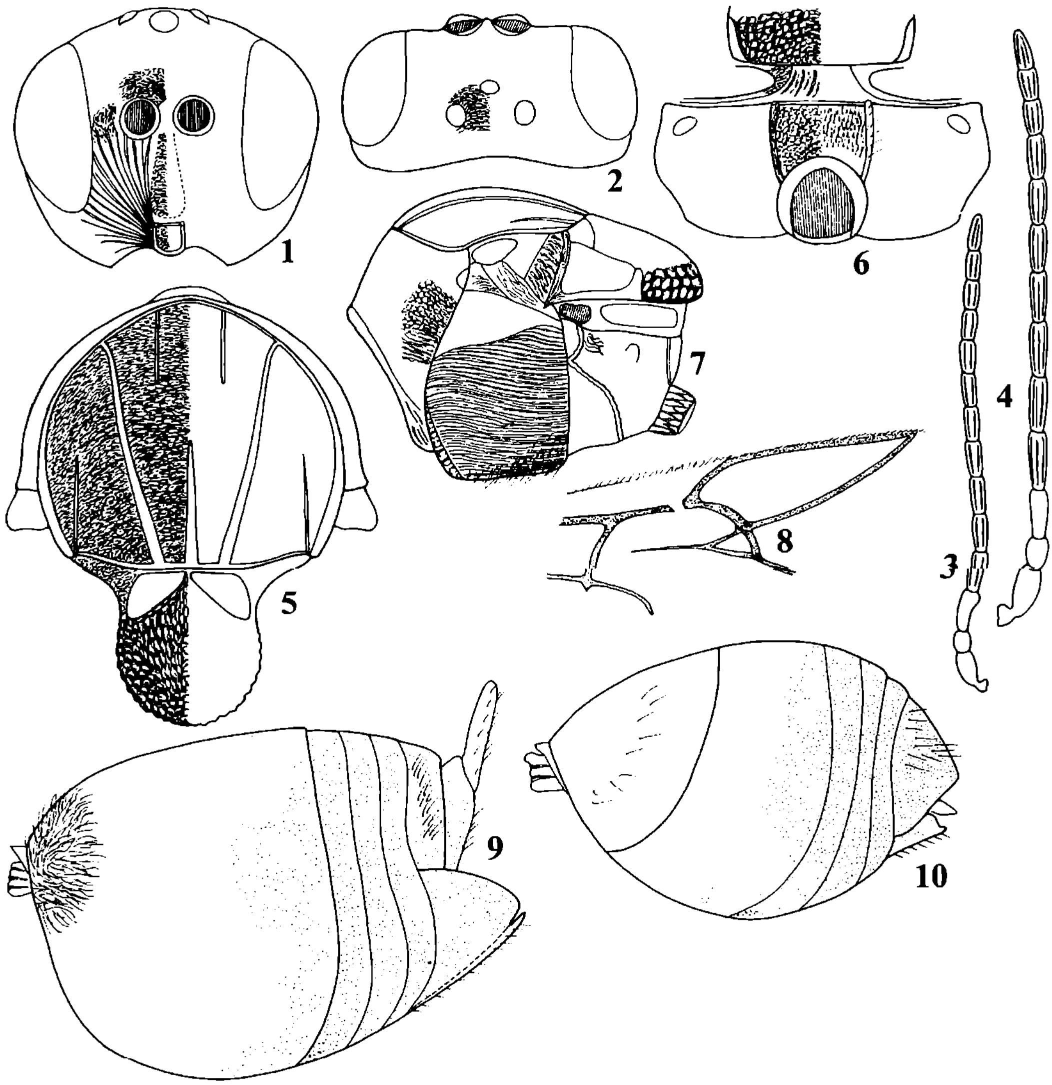
Periclistus brandtii (Ratzeburg, 1831)

Figs 103.1-10.

Cynips brandtii Ratzeburg, 1831: 183 (female, male); *Aylax brandtii*: Hartig, 1840: 196 (female, male); *Aulax brandtii*: Schenck, 1863: 218-219 (female, male); *Aulax* (*Periclistus*) *brandtii*: Thomson, 1877: 800 (female, male).

Description. Female. 2.3-3.0 mm. Head and mesosoma black, antenna dark brown to black; legs chestnut brown, coxae partially balck. Metasoma black to very dark brown, hypopygium chestnut brown, lighter. Compound eyes and ocelli light brown. Wing veins distinct, brown. Body with sparse white setae. Head coriaceous, nearly rounded in front view, with sparse white setae, more dense on lower face; 1.9 times as broad as long from above; 1.2-1.3 times as broad as high in front view and slightly broader than mesosoma. Gena delicately coriaceous, not broadened behind eye, invisible in front view behind eye, converging ventrally. Malar space 0.35-0.4 times as long as height of eye, with delicate striae radiating from clypeus and reaching eye. POL 1.2-1.3 times as long as OOL; OOL 1.8 times as long as diameter of lateral ocellus and 1.5-1.6 times as long as LOL. Transfacial distance 0.9 times as long as height of eye; diameter of antennal torulus 3.6 times as large as distance between them and 1.4 times as long as distance between torulus and eye margin. Inner margins of eyes nearly parallel. Lower face with stiae radiating from clypeus and reaching eye and antennal socket; median elevated area without striae, delicately coriaceous. Clypeus very small, quadrangular, delicately coriaceous, impressed, slightly higher than broad, with distinct small anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line indistinct, ventrally slightly rounded. Frons delicately coriaceous, with some very small and indistinct punctures, lateral frontal carina absent. Vertex and occiput uniformly weakly coriaceous. Antennae 13-segmented, slightly shorter than body length; pedicel subglobose, only very slightly longer than broad; F1 equal or slightly shorter than F2; F2 only very slightly longer than F3; subsequent flagellomeres nearly equal in length and slightly shorter than F2; placodeal sensilla on F2-F11. Mesosoma slightly compressed dorso-ventrally, longer than high in lateral view, with white setae.

Pronotum dorsally and laterally uniformly delicately coriaceous, with some delicate wrinkles on the level of mesopleuron, lateral pronotal carina absent, anterior corners of pronotum rounded in dorsal view. Scutum uniformly delicately coriaceous, without piliferous points, slightly broader than long (width measured across the basis of tegulae). Notauli complete, although sometimes weakly impressed, with smooth, shining bottom; median mesoscutal line usually extending at least to 1/2 length of scutum; anterior parallel lines distinct, extending to 1/3-1/4 of scutum length.



Figs. 103.1-10. *Periclistus brandtii*: 1-2, head, female: 1, front view, 2, from above. 3-4, antenna, 3, male, 4, female. 5-8, female: 5, scutum and scutellum, dorsal view, 6, propodeum and dorsellum, dorso-posterior view, 7, mesosoma, lateral view, 8, forewing, part. 9-10, metasoma, lateral view: 9, female, 10, male.

Scutellum 1.7 times shorter than scutum, slighly elongated, with nearly parallel lateral sides, rugose, with more delicate sculpture towards center of scutellar disk and in between scutellar foveae; very slightly overhanging metanotum. Scutelar foveae transversely ovate, only slightly broader than high, well-delimited around, with smooth, shining deep bottom, without setae;

separated by distinct, narrow coriaceous central carina. Mesopleuron completely densely striate, interspaces smooth, shining; ventrally and especially postero-ventrally with dense setae; mesopleural triangle alutaceous, with sparse setae. Metapleural sulcus reaching mesopleuron in upper 1/3 of its height; axillula ovate, shining, coriaceous, with few white setae; subaxillular bar smooth, shining, in the most posterior end slightly higher than height of metanotal trough; propodeal spiracle elevated, area between spiracle and metapleural sulcus with sparse white setae and distinct wrinkles; ventral bar of metanotal trough smooth, shining, nearly 2.0-2.5 times narrower than height of metanotal trough measuring above propodeal spiracle. Dorsellum uniformly coriaceous, absent medially; ventral impressed area reach scutellum; metanotal trough alutaceous to smooth, mat, with few white setae; ventral impressed area shining, with distinct longitudinal wrinkles. Lateral propodeal carinae uniformly broad, with some setae; central propodeal area coriaceous, without setae; lateral propodeal area delicately uniformly coriaceous, with relatively dense white setae; nucha relatively long, with parallel longitudinal wrinkles. Forewing longer than body, margin with long cilia; radial cell closed, 3.3 times as long as broad, Rs and R1 very slightly curved, areolet distinct, Rs+M distinct, nearly reaching basalis, projecting into middle of it. Metasoma nearly as long as head+mesosoma, distinctly longer than high in lateral view; metasomal tergites 2 and 3 fused, broadly punctate in dorso-posterior part, sometimes punctures indistinct; prominent part of ventral spine of hypopygium very short. Male. 1.7-2.1 mm. Similar to female but antenna 14-segmented, F1 only very slightly curved and swollen apically and equal in length to F2; placodeal sensilla on F2-F13; metasomal tergite 3 broadly punctate in dorso-posterior part, sometimes punctures indistinct.

Distribution. Probably throughout the Western Palaearctic Region. In Ukraine common everywhere.

Biology. This species usually attacks multilocular galls of *Diplolepis mayri* and *D. rosae*. Monovoltine species known from the sexual generation. Adults emerge from June till September.

Periclistus caninae (Hartig, 1840)

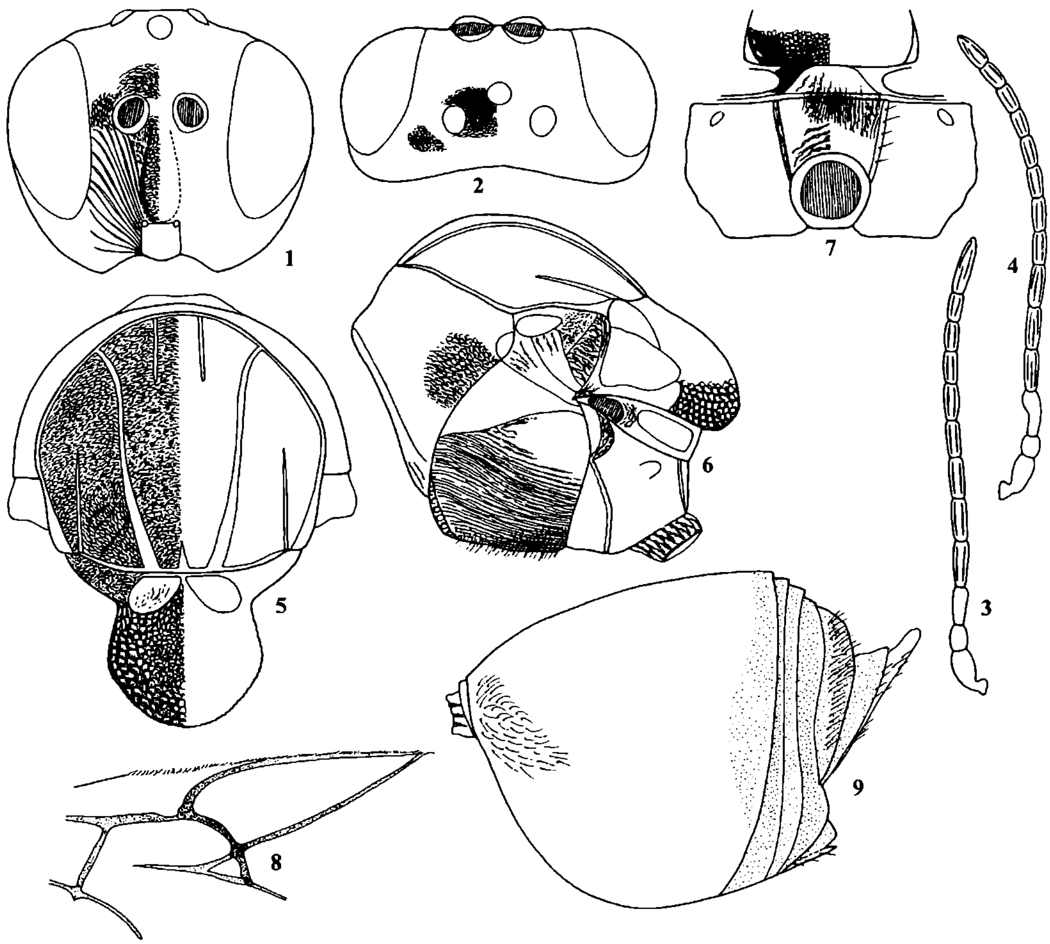
Figs 104.1-9.

Aylax caninae Hartig, 1840: 196 (female); *Aulax caninae*: Schenck, 1863: 218, 220 (female, male); *Periclistus caninae*: Förster, 1869: 337; *Aulax* (*P.*) *caninae*: Thomson, 1877: 800 (female, male); *Aulax germanus* Schenck, 1863: 134; *Periclistus rosarum* Dettmer, 1924b: 146 (female, male) (synonym in Pujade-Villar et al., 2003: 131).

Description. Female -- 2.0-2.5 mm, male – 1.4-1.8 mm. Similar to *P. brandtii* but POL 1.8 times as long as OOL; OOL nearly equal to diameter of lateral ocellus and LOL; F1 very slightly shorter than F2, F2 equal F3. Notauli incomplete, absent or very indistinct in anterior half; median mesoscutal line usually much shorter, never or rarely extending to half of scutum length, in some specimens present in a form of a short triangle; scutellar foveae more rounded postero-laterally. Mesopleron only partially striate, with smooth shining part dorso-posteriorly; central propodeal area with transverse rugae; radial cell slightly shorter; metasomal tergites 2+3 of female and tergite 3 of male without or with very narrow band of punctures dorso-posteriorly. F1 in males more curved and broadened apically.

Distribution. Probably throughout the Western Palaearctic Region. In Ukraine – common everywhere.

Biology. Usually attacks monolocular galls of *Diplolepis nervosa* and *D. eglanteriae*. Monovoltine species known from the sexual generation. Adults emerge in June and occurs till September.



Figs. 104.1-9. *Periclistus caninae*: 1-2, head, female: 1, front view, 2, from above. 3-4, antenna, 3, female, 4, male. 5-9, female: 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, forewing, part. 9, metasoma, lateral view.

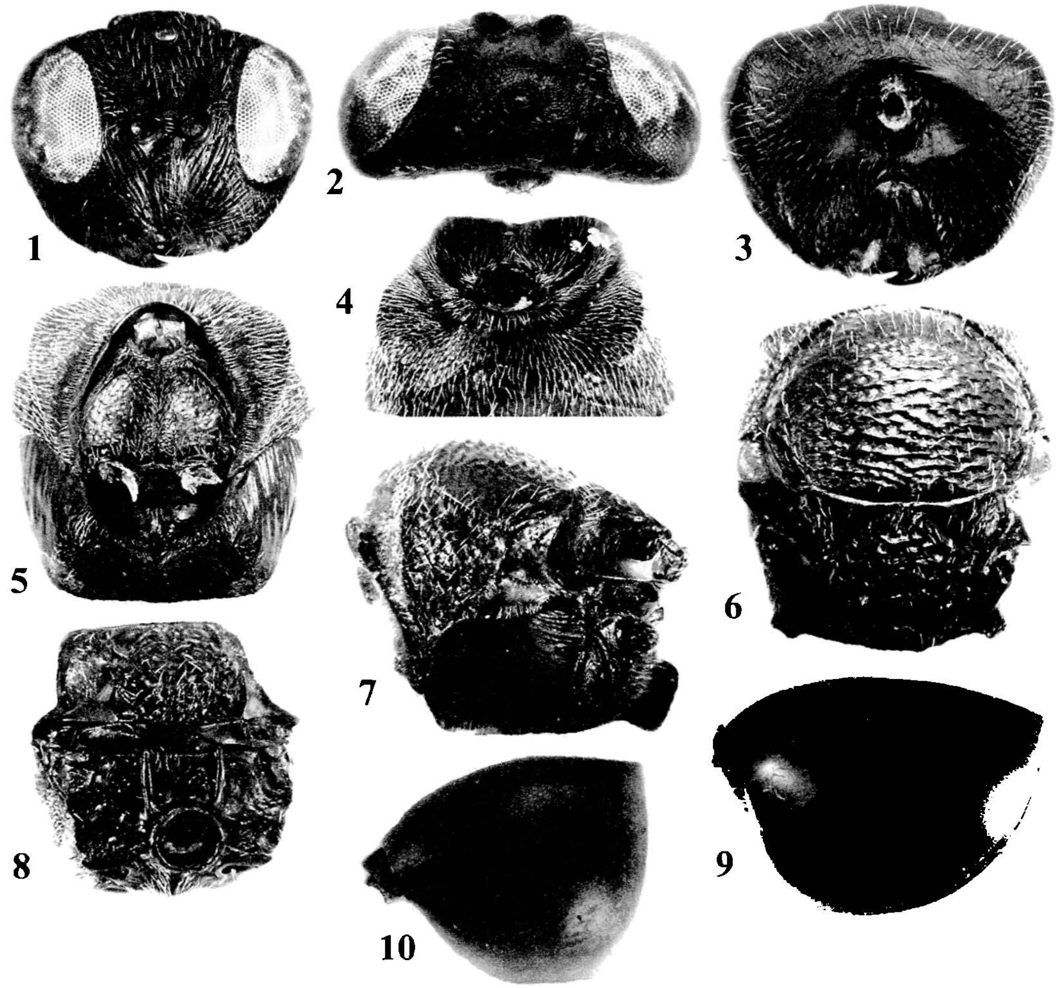
Saphonecrus Dalla Torre & Kieffer, 1910

Figs 105.1-10.

Saphonecrus Dalla Torre & Kieffer, 1910: 605. Type species: *Synergus connatus* Hartig, 1840.

Body from entirely black to yellowish or light brown. Head delicately coriaceous to alutaceous, nearly as high as broad in front view; gena not brodened behind eye; malar space nearly 2.0 times shorter than height of eye, with striae radiating from clypeus and reaching eye margin; lower face coriaceous, with striae radiating from clypeus and reaching eye and antennal sockets and often extending into area betwen antennal socket and inner margin of eye; median elevated area coriaceous. Clypeus small, with indistinct tentorial pits, clypeo-pleurostomal line and epistomal sulcus indistinct; ventrally projecting over mandibles, widely emarginated, incised or not medially, rounded or straight. POL much longer than OOL; OOL always longer than diameter of lateral ocellus. Transfacial distance shorter than height of eye. Inner margins of eyes parallel or slightly converging ventrally. Frons delicately coriaceous, lateral frontal carina absent or very indistinct; vertex and occiput delicately coriaceous. Antennae 13-14-segmented in female, 14-15-

segmented in males; F1 in males curved in middle and slightly expanded apically. Mesosoma flatenned dorso-ventrally, longer than high in lateral view. Pronotum uniformly delicately coriaceous; lateral pronotal carina absent or present, corners of pronotum dorsally rounded or strongly angled. Scutum with delicate interrupted transverse striae. Notauli incomplete or complete; median scutal line absent or in a form of a short triangle. Scutellum slightly elongated or rounded, uniformly rugose; slightly overhanging metanotum. Scutelar foveae small, transverse, separated by central carina. Mesopleuron striate, metapleural sulcus reaching mesopleuron in upper 1/3 of its height, Lateral propodeal carinae uniformly broad, straight, subparallel or slightly converging inwards ventrally; central propodeal area coriaceous, with white setae in anterior half; lateral propodeal area delicately uniformly coriaceous, with relatively dense white setae. Forewing longer than body, margin with short cilia; radial cell opened along wing margin. Metasoma equal or slightly longer than head+mesosoma; metasomal tergites 2 and 3 fused, without punctures, with few white setae antero-laterally; hypopygium with dense punctures, prominent part of ventral spine of hypopygium very short, with few short white setae.



Figs. 105.1-10. *Saphonecrus undulatus*: 1-8, female: 1-3, head: 1, front view, 2, from above, 3, posteriorly. 4, pronotum with submedian pronotal pits, dorsal view, 5, pronotum and propleura, front view, 6, scutum and scutellum, dorsal view, 7, propodeum and dorsellum, dorso-posterior view, 8, mesosoma, lateral view. 9-10, metasoma, lateral view: 9, female, 10, male.

Taxonomic comments. The genus *Saphonecrus* was established by Dalla Torre & Kieffer (1910) for the oak inquiline species with an open radial cell (in contrast to *Synergus*, where this cell is closed, except *S. plagiotrochi*). Although the separation of this genus from *Synergus* has subsequently been widely questioned (Eady & Quinlan, 1963; Ritchie, 1984; Kierych, 1988; Pujade-Villar & Nieves-Aldrey, 1990), the two genera have never been formally synonymised. Ritchie (1984) and Kierych (1988) regarded the characters distinguishing *Saphonecrus* from *Synergus* as apomorphic, and saw *Saphonecrus* as a specialised monophyletic lineage within *Synergus*. Pujade-Villar & Nieves-Aldrey (1990) revised the European species and maintained the genus, but also questioned its validity. We consider *Saphonecrus* to be paraphyletic and closely allied to *Synergus* (see chapter 4).

Seventeen species of *Saphonecrus* are known from the Holarctic Region: six western palaearctic species, *S. barbotini* Pujade-Villar & Nieves-Aldrey, 1985, *S. connatus* (Htg.), *S. haimi* (Mayr), *S. lusitanicus* (Tavares, 1902) (see Taxonomic comments to *S. gallaepomiformis*), *S. undulatus* (Mayr), and *S. irani* Melika & Pujade-Villar, 2006 (Sadeghi et al., 2006a); four nearctic species, *S. brevis* Weld, 1926, *S. brevicornis* (Ashmead, 1896), *S. favanus* Weld, 1944, and *S. gemmariae* Ashmead, 1885; seven species are described from the Eastern Palaearctic Region: *S. excisus* (Kieffer, 1904) from Bengal (Kurseong), reared from *Neuroterus haasi* Kieffer, 1904 on *Q. spicata* (Kieffer, 1904); two species, *S. serratus* Weld, 1926 and *S. areolatus* Weld, 1926 were described from the Philippines (Luzon Island) (Weld, 1926), one species, *S. sinicus* Belizin, 1968 from China, Sechuan and one species, *S. diversus* Belizin, 1968 from Primorskij Kraj, Russia, (Belizin, 1968); two species, *S. chaodongzhui* Melika, Ács & Bechtold, 2004 and *S. naiquanlini* Melika, Ács & Bechtold, 2004, have been recently described from China (Melika, Ács & Bechtold, 2004).

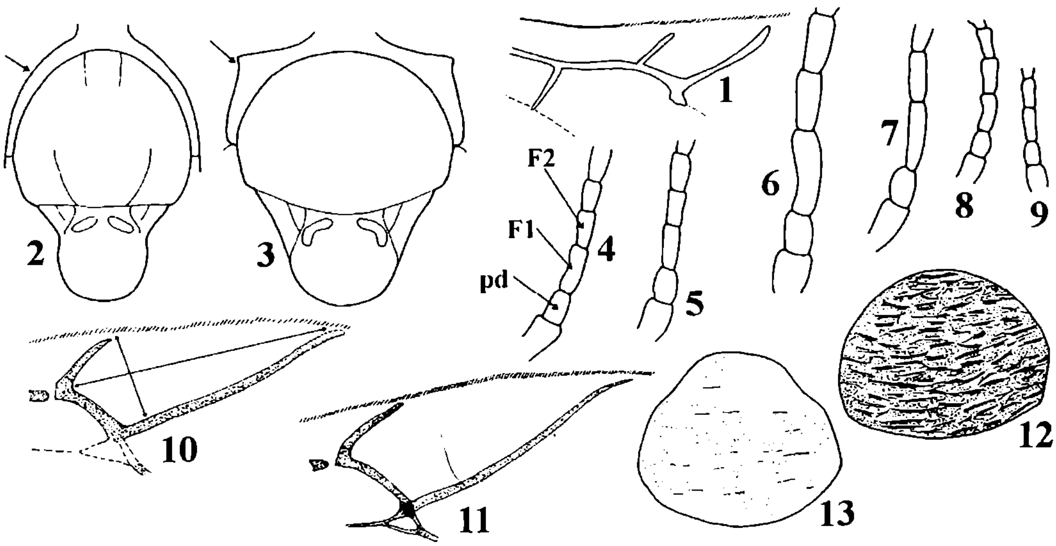
All the *Saphonecrus* species are inquilines in oak cynipid galls. The European species are associated mainly with galls induced on section Cerris oaks, including Mediterranean evergreen species (*Q. ilex*, *Q. suber*, *Q. coccifera*) and *Q. cerris* in Central Europe. Species associated with *Q. cerris* appear to be single brooded and emerge after one winter in the gall, while those on evergreen oaks have at least the potential for two generations in a year (Pujade-Villar & Nieves-Aldrey, 1990). The biology of *Saphonecrus* species can be divided into three groups as it was showed by Pujade-Villar & Nieves-Aldrey (1990). The first one includes species with one annual generation, and associated with galls on deciduous oaks of the *Leptobalanus* subgenus, section *Quercus*; the second one, also monovoltine, associated with galls on oaks from the *Leptobalanus* subgenus, section Cerris; and finally the third group, with some Mediterranean species, with bivoltine life cycles, associated with galls on evergreen oaks and not represented in the Ukrainian fauna.

Key to the western palaearctic *Saphonecrus* species

(species marked with (*) are unknown in the Ukrainian fauna)

1. Radial cell of forewing very peculiar and very short, less than 2.0 times as long as broad (Fig. 2.84.1) .... ***irani****
-- Radial cell usually shaped, longer, never less than 2.0 times as long as broad 2
2. Lateral pronotal carina absent (Fig. 106.2); F1 less than 2.0 times as long as pedicel (Figs 106.3-8), in males curved in middle and slightly expanded apically and basally (Figs 106.4, 6, 8); radial cell 2.5-3.0 times as long as broad; Rs reaching wing margin, straight or only slightly curved (Fig. 106.10) 3

-- Lateral pronotal carina present (Fig. 106.3); F1 more than 2.0 times as long as pedicel (Figs 106.10-13), in males slightly more expanded apically than basally; radial cell 2.0-2.5 times as long as broad; Rs not reaching wing margin, evenly curved (Fig. 106.11) 5
3. Entire body mostly black; notauli distinct at least in posterior half .... ***connatus***
-- Body yellow-red or amber, if black, then at least face red; notauli visible but only in posterior 1/3 4



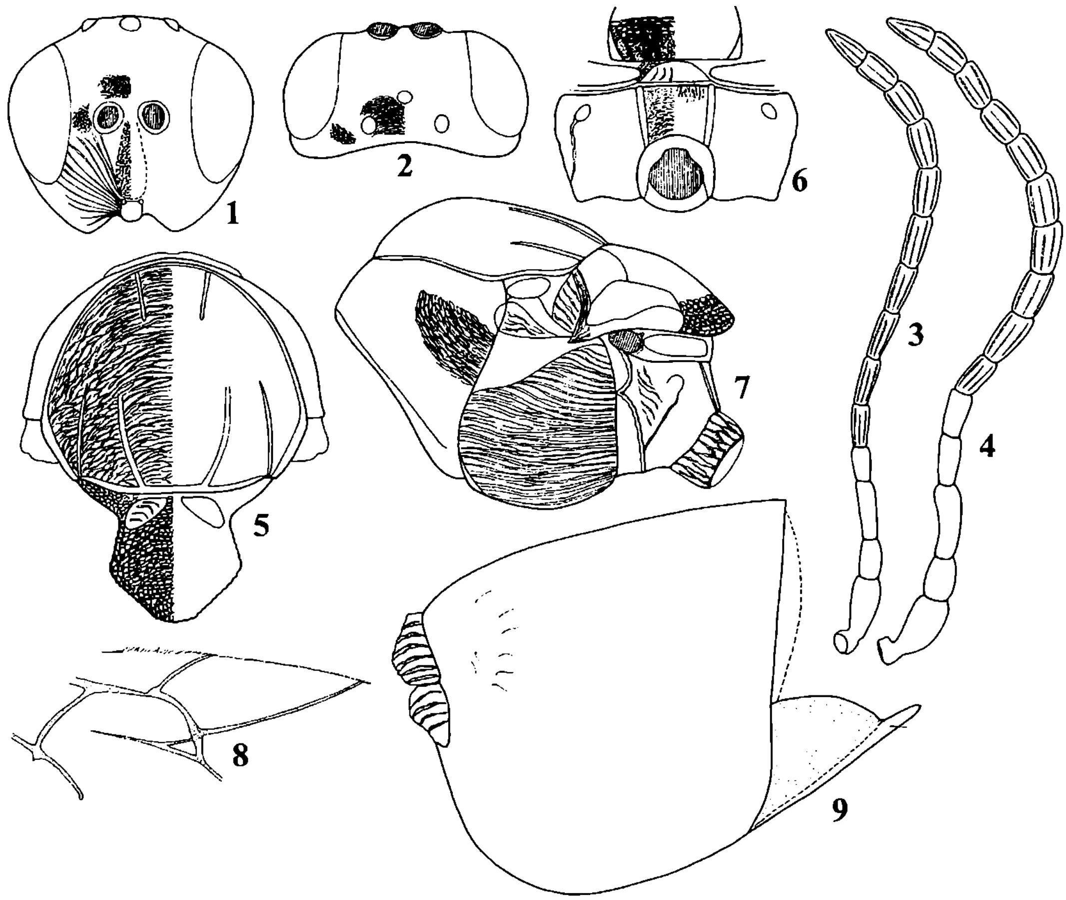
Figs 106.1–13. 1, forewing, part, *Saphonecrus irani*, 2-3, mesosoma, dorsal view (arrows indicate the position of lateral pronotal carina). 2, *S. lusitanicus*. 3, *S. undulatus*. 4-9, first antennomeres: 4, *S. connatus*, male. 5, *S. connatus*, female. 6, *S. lusitanicus*, male. 7, *S. lusitanicus*, female. 8, *S. barbotini*, male. 9, *S. barbotini*, female. 10-11, radial cell (rc, radial cell; arrows indicate the length and width of the radial cell: 10, *S. connatus*. 11, *S. undulatus*. 12-13, scutum, dorsal view: 12, *S. undulatus*. 13, *S. haimi*.

4. Mesosoma long and narrow in dorsal view; long and flattened laterally; propodeum forming obtuse angle with scutellum in lateral view; F1 1.5-2.0 times as long as pedicel (Figs 106.6-7); metasomal tergites 3 and 4 minutely punctate posteriorly .... ***lusitanicus****
-- Mesosoma shorter and broader, relatively short and deep in lateral view; propodeum forming less obtuse angle (near 90°) with scutellum in lateral view; F1 less than 1.5 times as long as pedicel (Figs 106.8-9); metasomal tergites 3 and 4 without punctures .... ***barbotini****
5. Mesoscutum with strong interrupted transverse rugae (Fig. 106.12); metasomal tergites 3 and 4 with patch of punctures dorso-posteriorly; body length 2-3 mm .... ***undulatus***
-- Mesoscutum with weak interrupted transverse rugae (Fig. 106.13); metasomal tergites 3 and 4 posteriorly without punctures; body length 1.0-1.3 mm .... ***haimi***

Saphonecrus connatus (Hartig, 1840)

Figs 107.1-9.

Synergus connatus Hartig, 1840: 198 (female, male), Dalla Torre & Kieffer, 1910: 606 (female, male); *Sapholytus connatus*: Mayr, 1872: 681(female, male); *Saphonecrus connatus luteipes* Tavares, 1920b: 58 (synonym in Pujade-Villar & Nieves-Aldrey, 1990: 49).



Figs. 107.1-9. *Saphonecrus connatus*: 1-2, head, female: 1, front view, 2, from above. 3-4, antenna, 3, female, 4, male. 5-9, female: 5, scutum and scutellum, dorsal view, 6, propodeum and dorsellum, dorso-posterior view, 7, mesosoma, lateral view, 8, forewing, part. 9, metasoma, lateral view.

Description. Female. 1.1-2.3 mm. Head black, except light brown to yellow mandibles, antenna uniformly light brown; mesosoma black, legs light brown, except partially black coxae. Metasoma very dark brown. Wing veins distinct, brown. Body with sparse white setae. Head delicately coriaceous, nearly rounded in front view, with sparse white setae, more dense on lower face; 1.8 times as broad as long from above; slightly broader than high in front view and slightly broader than mesosoma. Gena delicately coriaceous, not broadened behind eye, invisible in front view behind eye, converging ventrally. Malar space 0.45 times as long as height of eye, with delicate striae radiating from clypeus and nearly reaching eye. POL 2.0 times as long as OOL; OOL 1.6 times as long as diameter of lateral ocellus and equal to LOL. Transfacial distance 0.85 times as long as height of eye; diameter of antennal torulus 2.3-2.4 times as large as distance between them and 1.5 times as long as distance between torulus and eye margin. Inner margins of eyes parallel. Lower face with striae, radiating from clypeus and reaching eye and antennal sockets; median elevated area coriaceous, without striae. Clypeus quadrangular, alutaceous, with distinct small anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line; ventrally widely emarginated and incised medially. Frons delicately coriaceous, lateral frontal carina absent; vertex and occiput uniformly weakly coriaceous. Antennae 14-segmented, longer than head+mesosoma; pedicel elongated, 1.8 times as long as broad; F1 1.5 times as long as pedicel and 1.6 times as long as F2; F2 slightly shorter than F3; subsequent flagellomeres nearly equal in length and slightly shorter than F3; placodeal sensilla on F3-F12. Mesosoma flatenned dorso-ventrally, longer than high in lateral view, with white setae. Pronotum uniformly delicately coriaceous; lateral pronotal carina absent, corners of pronotum dorsally rounded, not angled. Scutum with delicate interrupted transverse striae, interspaces smooth, shining; slightly broader than long (width measured across the basis of tegulae). Notauli incomplete, extending at most to 1/2 of scutum length; median mesoscutal line absent; parapsidal lines distinct, reaching slightly above the level of the base of tegulae; anterior parallel lines distinct, short. Scutellum slightly elongated, broadest part in posterior 1/3, where from narrowing down to posterior median edge; uniformly rugose; slightly overhanging metanotum. Scutelar foveae small, laterally as high as broad, indistinctly delimited posteriorly, with delicately wrinkled bottom, without setae; separated by distinct, broad coriaceous central carina. Mesopleuron completely uniformly striate, interspaces smooth, shining; mesopleural triangle uniformly coriaceoous, with dense setae. Metapleural sulcus reaching mesopleuron in upper 1/3 of its height; axillula elongated, alutaceous, with few setae; subaxillular bar smooth, shining, in the most posterior end nearly as high as height of metanotal trough. Dorsellum absent or very short medially; metanotal trough very delicately coriaceous to alutaceous, with few white setae; ventral impressed area high, shining, with few weak longitudinal wrinkles. Lateral propodeal carinae uniformly broad, straight, slightly converging inwards ventrally, without setae; central propodeal area uniformly delicately coriaceous, with white setae in anterior half; lateral propodeal area delicately uniformly coriaceous, with relatively dense white setae; nucha long, with irregular longitudinal wrinkles. Forewing longer than body, margin with short cilia; radial cell opened along wing margin, 2.8 times as long as broad, Rs and R1 slightly curved, areolet distinct. Metasoma slightly longer than head+mesosoma, nearly rounded, as high as long in lateral view; metasomal tergites 2 and 3 fused, without punctures, with few white setae antero-laterally; hypopygium with dense punctures, prominent part of ventral spine of hypopygium around 2.0 times as long as broad. Male. 1.0-2.2 mm. Similar to female but antenna 15-segmented, slightly longer than body length, F1 curved in middle and slightly expanded apically and basally and 1.5 times as long as F2; subsequent flagellomeres nearly of equal length; placodeal sensilla on F4-F13.

Diagnosis. Easily distinguishable from *S. undulatus* and *S. haimi* by the absence of the lateral pronotal carina.

Distribution. Probably throughout the Western Palaearctic Region. In Ukraine known from Transcarpathian Region only.

Biology. Reared from galls associated with oaks of the *Quercus* section; attacks some *Andricus* species and galls of *Callirhytis glandium* [b], *Cynips quercusfolii* [a], *Neuroterus anthracinus* [a], *N. quercusbaccarum* [b], and also *Aphelonyx cerricola* [a] which, however, associates with *Q. cerris* (Pujade-Villar et al., 2003).

Saphonecrus haimi (Mayr, 1872)

Figs 108.1-9.

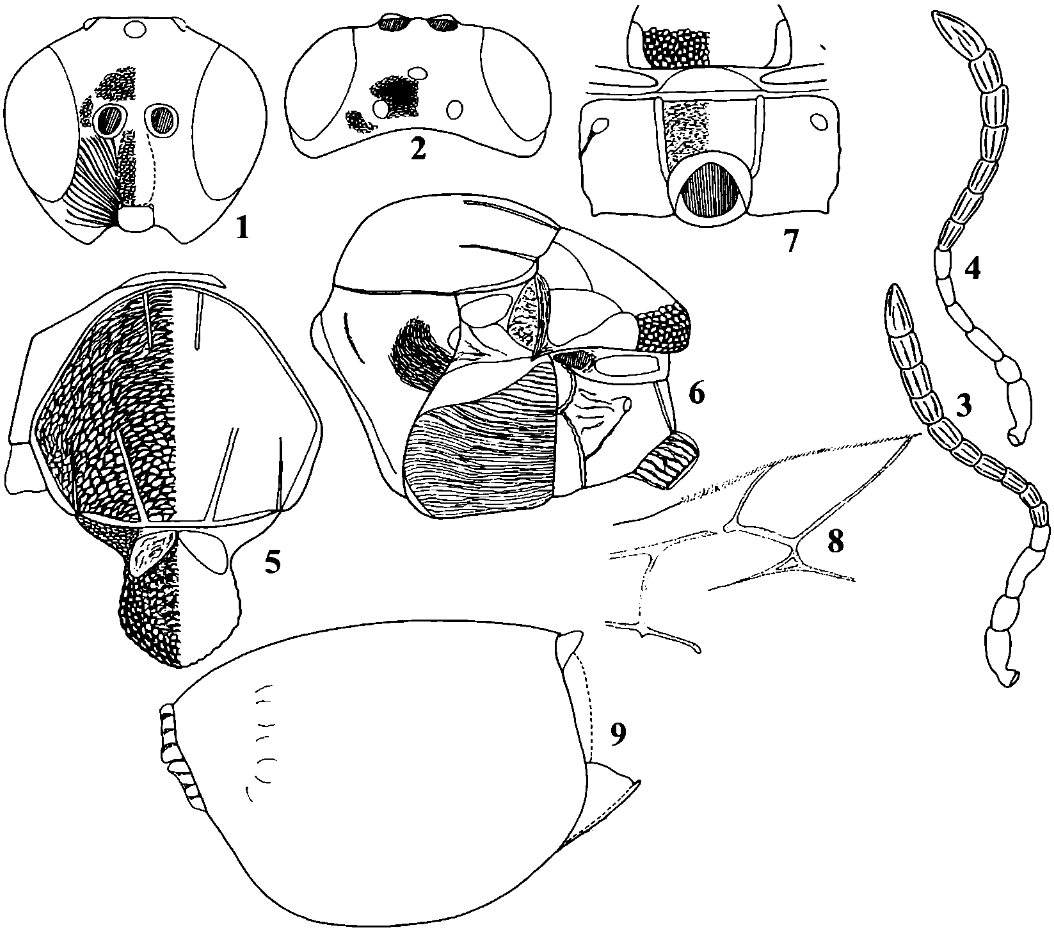
Saphlytus Haimi Mayr, 1872: 723 (female, male); *Saphonecrus haimi*: Dalla Torre & Kieffer, 1910: 606 (female, male); *Synergus clavatus* Giraud in Houard, 1911: 333 (synonym in Pujade-Villar & Ros-Farré, 1998b: 530); *Synergus haymi*: Pujade-Villar & Nieves-Aldrey, 1990: 53 (transcription error).

Description. Female. 0.9-1.3 mm. Head black, compound eyes silvery, mandibles and palpi yellowish; antenna yellowish, with much darker distal flagellomeres. Mesosoma black, legs entirely yellowish to yellow-brown. Metasoma chestnut brown to dark brown. Wing veins pale, indistinct. Body with sparse white setae. Head delicately coriaceous, slightly transverse in front view, with sparse very short white setae, more dense and longer on lower face; 1.8-1.9 times as broad as long from above; 1.1 times as broad as high. Gena delicately coriaceous, not broadened behind eye. Malar space very short, 0.3 times as long as height of eye, with delicate striae radiating from clypeus and reaching eye. POL 1.8-1.9 times as long as OOL; OOL 1.6 times as long as diameter of lateral ocellus and nearly equal LOL. Transfacial distance 0.7-0.9 times as long as height of eye; diameter of antennal torulus 2.25 times as large as distance between them and 2.25 times as long as distance between torulus and eye margin. Lower face with distinct striae, radiating from clypeus and reaching eye and antennal sockets, median elevated area without striae, coriaceous. Clypeus quadrangular, coriaceous, rounded ventrally, with small anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal lines indistinct. Frons, vertex and occiput uniformly weakly coriaceous. Antennae 13-segmented, pedicel subglobose, slightly longer than broad; F1 1.8-2.0 times as long as pedicel and slightly longer than F2; F2 slightly longer than F3; subsequent flagellomeres nearly equal in length and slightly shorter than F2; distal flagellomeres broadened; placodeal sensilla distinctly visible on F5-F11. Mesosoma slightly flatenned dorso-ventrally, nearly as high as long in lateral view, with white setae. Pronotum delicately uniformly coriaceous; lateral pronotal carina present (in some specimens very delicate and weak, short), anterior corners of pronotum angled. Scutum with weak interrupted transverse rugae, slightly broader than long (width measured across the basis of tegulae). Notauli absent or incomplete and indistinct, extending to 1/2 of scutum length; median mesoscutal line absent or rarely present in a form of very small indistinct triangle basally; parapsidal lines indistinct, reaching to the level of the base of tegulae; anterior parallel lines distinct, short. Scutellum small, nearly 2.0 times shorter than scutum, slightly elongated, broadest part in posterior 1/3; rugose, with more delicate sculpture towards center of scutellar disk; slightly overhanging metanotum. Scutellar foveae transversely ovate, only slightly broader than high, very indistinctly delimited posteriorly; with coriaceous bottom; scutellar foveae not separated by central carina, anteriorly reaching one another. Mesopleuron with uniform delicate transverse parallel striae, without setae; mesopleural triangle delicately coriaceous, with sparse short white setae. Metapleural sulcus reaching mesopleuron in upper 1/3 of its height; axillula ovate, shining, coriaceous, with few setae; subaxillular bar smooth, shining, in the most posterior end nearly 2.0 times as high as height of metanotal trough; propodeal spiracle only slightly elevated, ovate; ventral bar of metanotal trough coriaceous, nearly 1.5 times narrower than height of metanotal trough measuring above propodeal spiracle. Dorsellum medially absent, ventral impressed area reach scutellum, metanotal trough alutaceous, with few white setae; ventral impressed area high, smooth, shining, without wrinkles. Lateral propodeal carinae very weak, nearly straight, without setae; central propodeal area delicately coriaceous to alutaceous, without setae; lateral propodeal area alutaceous, with relatively dense white setae. Forewing longer than body, margin with long cilia; radial cell opened, 2.7-2.9 times as long as broad, Rs and R1 reaching wing margin, areolet small, sometimes indistinct; Rs+M distinct, extending to 2/3 of distance between areolet and basalis, projecting into middle of it. Metasoma longer than head+mesosoma, longer than high in lateral view; metasomal tergites 3 and 4 fused, posteriorly without punctures, with few short white setae antero-laterally; prominent part of ventral spine of hypopygium very short. Male. 0.8-1.2 mm. Similar to female but antenna 14-segmented, F1 slightly curved and swollened apically and 2.0 times as long as F2; subsequent flagellomeres nearly of equal length, distal flagellomeres broadened; placodeal sensilla on F3-F12.

Diagnosis. Belong to the group of *Saphonecrus* species in which the lateral pronotal carina is present. In *S. haimi* F1 in females 1.8-2.0 times as long as pedicel; the mesoscutum with weak interrupted transverse rugae, metasomal tergites 3 and 4 without punctures posteriorly, antennae slightly broadened in the distal half, the body only 0.9-1.3 mm long, while in *S. undulatus* F1 in females 2.9-3.2 times as long as pedicel; the mesoscutum with strong interrupted transverse rugae; metasomal tergites 3 and 4 with a band of punctures dorso-posteriorly, the distal half of the antenna not broadened; the body is larger, 2.0-3.7 mm long.

Distribution. Central Europe, North Africa and Asia Minor; known from AT (Mayr, 1872), HU (Pujade-Villar et al., 2003), IL (Sternlicht, 1968b), FR (Corsica, Pujade-Villar et al., 2000) and DZ (Dalla Torre & Kieffer, 1910). In Ukraine – Transcarpathian Region only (Kosino, Julijivski Hory, Rafajlovo, where *Q. cerris* grows, author).

Biology. Reared from oak cynipid galls on the section Cerris oaks; attacks galls of *Dryocosmus nitidus* [a], some *Neuroterus* and *Andricus* galls and also a gall midge, *Janetia cerris* (Diptera: Cecidomyiidae).



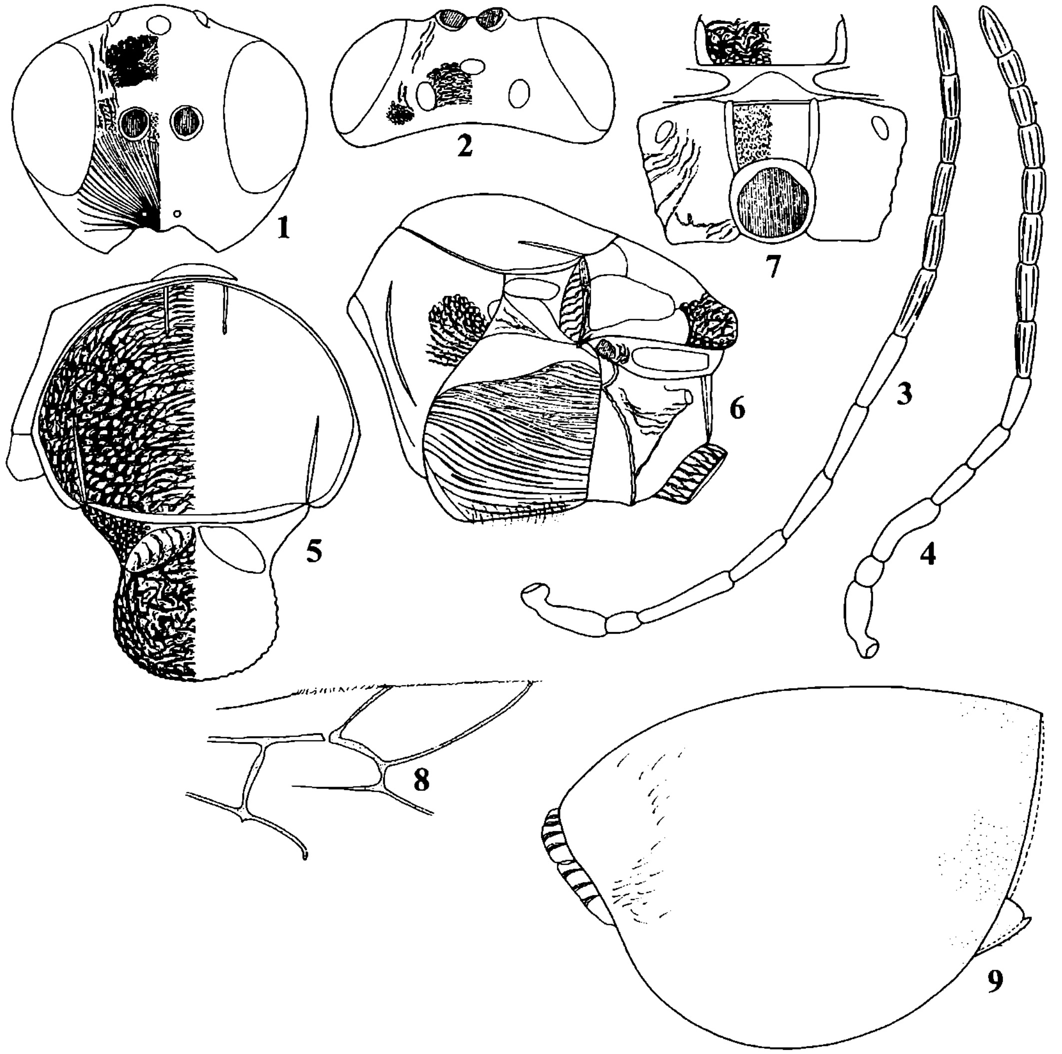
Figs. 108.1-9. *Saphonecrus haimi*: 1-2, head, female: 1, front view, 2, from above. 3-4, antenna, 3, male, 4, female. 5-9, female: 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, forewing, part. 9, metasoma, lateral view.

Saphonecrus undulatus (Mayr, 1872)

Figs 109.1-9.

Sapholytus undulatus Mayr, 1872: 723 (female, male); *Saphonecrus undulatus*: Dalla Torre & Kieffer, 1910: 605 (female, male); *Synergus apertus* Giraud in: Houard, 1911: 329 (synonym in Pujade-Villar & Nieves-Aldrey, 1990: 52); *Saphonecrus giraudi* Pujade-Villar, 1985b: 42 (female, male) (synonym in Pujade-Villar & Nieves-Aldrey, 1990: 52).

Description. Female. 2.3-3.7 mm. Head black, sometimes lower face dark brown; mandibles and palpi light brown; antenna uniformly light brown to yellowish-brown. Mesosoma black, sometimes very dark brown; legs brown, coxae partially black; sometimes tibiae dark brown. Metasoma chestnut brown to dark brown, hypopygium always lighter. Wing veins distinct, light brown. Body with sparse white setae. Head delicately coriaceous, slightly transverse in front view, with sparse short white setae, which more dense on lower face; 2.0 times as broad as long from above; 1.2-1.3 times as broad as high. Malar space 0.4 times as long as height of eye, with delicate striae radiating from clypeus and reaching eye. POL 2.0 times as long as OOL; OOL nearly equal to diameter of lateral ocellus and LOL. Transfacial distance 0.8 times as long as height of eye; diameter of antennal torulus 1.7-1.9 times as large as distance between them and distance between torulus and eye margin. Inner margins of eyes diverging ventrally. Lower face, icluding slightly



Figs. 109.1-9. *Saphonecrus undulatus*: 1-2, head, female: 1, front view, 2, from above. 3-4, antenna, 3, female, 4, male. 5-9, female: 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, forewing, part. 9, metasoma, lateral view.

elevated median area with delicate numerous striae, reaching eye and antennal sockets and continuing into clypeus. Clypeus hardly, separable from lower face, only anterior tentorial pits indicate limits of clypeus; ventrally clypeus slightly rounded, without incision. Frons delicately coriaceous, with distinct micropunctures, especially in the upper half; with some paralell wrinkles along inner orbits of eyes. Vertex and occiput uniformly weakly coriaceous, with micropunctures. Antennae 13-segmented, longer than head+mesosoma; pedicel subglobose, only slightly longer than broad; F1 3.0 times as long as pedicel and 1.5 times as long as F2; F2 equal F3; F4 and F5 nearly equal in length to F3, subsequent flagellomeres shorter; distal half of antenna not broadened; placodeal sensilla distinctly visible on F6-F11, absent or indistinct on F1-F5. Mesosoma flatenned dorso-ventrally, slightly longer than high in lateral view, with white setae.

Pronotum delicately coriaceous, with some delicate wrinkles on the level of mesopleuron; lateral pronotal carina strong, anterior corners of pronotum strongly angled. Scutum with strong interrupted transverse rugae, slightly broader than long (width measured across the basis of tegulae). Notauli and median mesoscutal line absent; parapsidal lines distinct, reaching slightly above the level of the base of tegulae; anterior parallel lines distinct, very short. Scutellum rounded, uniformly dull rugose. Scutelar foveae transversely ovate, broader than high, well-delimited around, with wrinkles on the bottom, without setae; separated by distinct, narrow coriaceous central carina. Mesopleuron completely and uniformly striate, with long white setae ventrally (in some specimens postero-dorsal part of mesopleuron smooth, shining, without striae); mesopleural triangle uniformly delicately coriaceous, slightly lighter than mesopleuron, with very few short setae. Metapleural sulcus reaching mesopleuron in upper 1/4-1/5 of its height; axillula ovate, shining, delicately coriaceous, with very few short setae; subaxillular bar smooth, shining, in the most posterior end nearly 2.0 times as high as height of metanotal trough; propodeal spiracle strongly elevated, ovate; area between spiracle and metapleural sulcus with strong irregular wrinkles, with sparse white setae; ventral bar of metanotal trough coriaceous, slightly narrower than height of metanotal trough measuring above propodeal spiracle. Dorsellum smooth, shining, without sculpture; nearly 2.0 times as short as height of ventral impressed area; metanotal trough alutaceous to smooth, with few white setae; ventral impressed area shining, smooth, without wrinkles. Lateral propodeal carinae indistinct, weak, nearly straight, uniformly broad, without setae; central propodeal area smooth or alutaceous, without setae; lateral propodeal area delicately uniformly coriaceous to alutaceous, with few white setae. Forewing longer than body, margin with long cilia; radial cell opened, 2.6 times as long as broad, Rs and R1 reaching wing margin, areolet absent. Metasoma nearly as long as head+mesosoma, slightly longer than high in lateral view; metasomal tergites 3 and 4 fused, with a band of punctures dorso-posteriorly, with few white setae antero-laterally; hypopygium with distinct dense punctures, prominent part of ventral spine of hypopygium very short. <u>Male</u>. 2.0-2.6 mm. Similar to female but antenna 14-segmented, slightly longer than body length, F1 curved and slightly incised medially, not broadened apically and basally, 1.6 times as long as F2; F3-F7 nearly of equal length, subsequent flagellomeres shorter, distally very slightly broadened; placodeal sensilla on F5-F12.

Diagnosis. Most closely related to *S. haimi* (see Diagnosis to *S: haimi*).

Distribution. Central Europe; known from AT (Mayr, 1872), HU (Pujade-Villar et al., 2003) and RO (Ionescu, 1955). In <u>Ukraine</u> – Transcarpathian Region only (Kosino, Julijivski Hory, Rafajlovo, author).

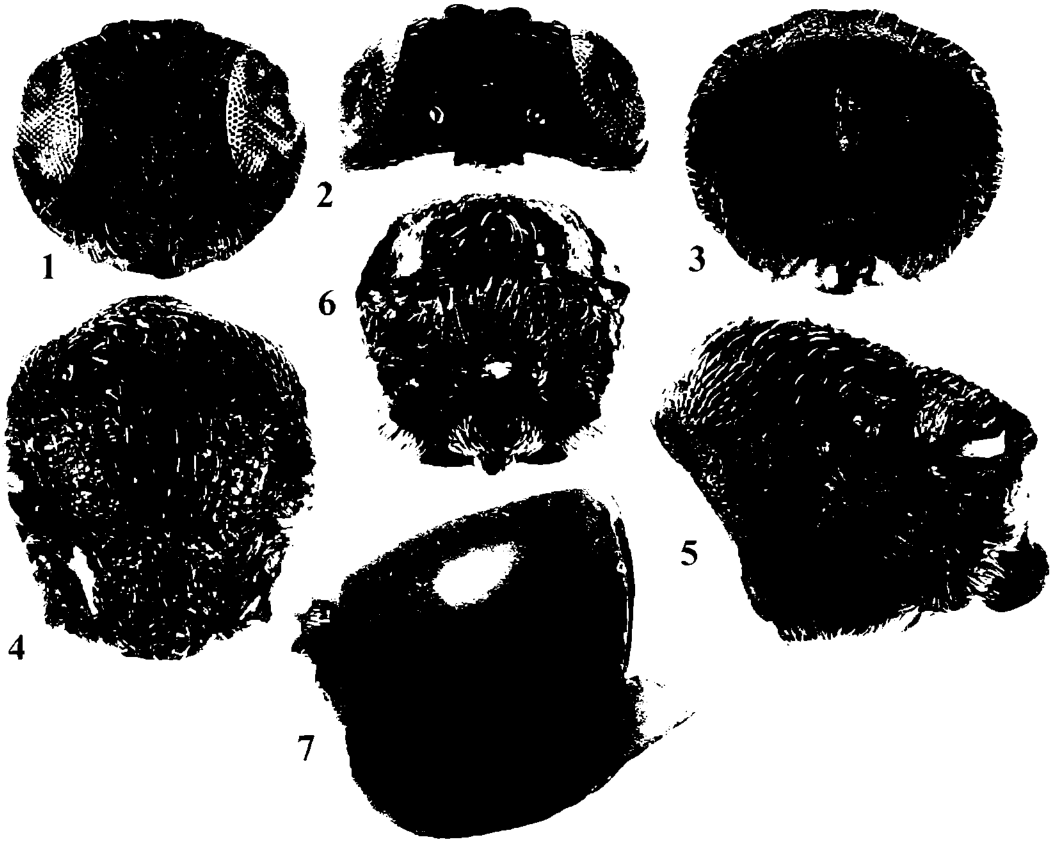
Biology. Reared only from *Aphelonyx cerricola, Dryocosmus nitidus* [a] and *Synophrus politus* galls.

Synergus Hartig, 1840

Figs 110.1-7, 111.1-10, 112.1-6.

Synergus Hartig, 1840: 186. Type species: *Synergus vulgaris* Hartig, 1840. *Sapholytus* Förster, 1869: 337 (synonym in Dalla Torre & Kieffer, 1910).

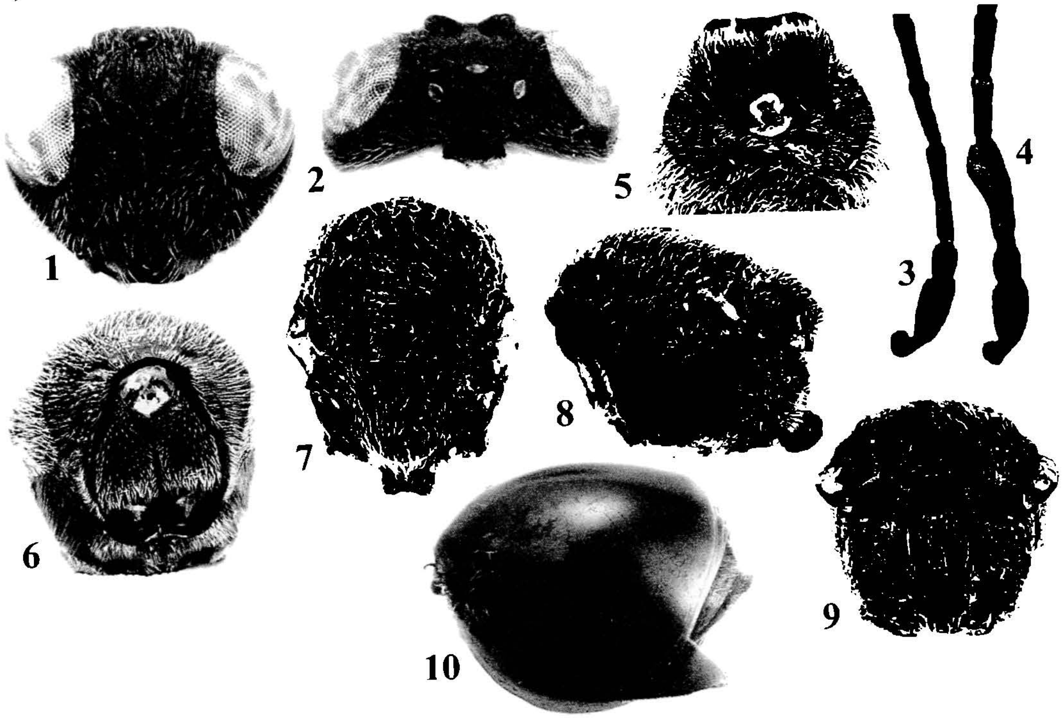
Body length 0.8-4.5 mm, with sparse white setae. Predominantly black, chestnut brown or orange brown, antenna and legs always much lighter than body. Wing veins dark to pale brown. Head alutaceous to dull rugose, transverse in front view, with sparse white setae, nearly 2.0 times as broad as long from above and always broader than high in front view, slightly broader than mesosoma. Gena coriaceous, not broadened behind eye, invisible in front view behind eye, converging ventrally. Malar space nearly 2.0 times shorter than height of eye, with striae radiating from clypeus and reaching eye. POL around 2.0 times as long as OOL. Transfacial distance longer than height of eye. Lower face with more or less strong striae radiating from ventral margin of clypeus and usually reaching eye and antennal sockets. Clypeus with radiating striae, delimited from lower face by distinct anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line; ventrally usually straight. Frons coriaceous to dull rugose, with or without punctures; lateral



Figs. 110.1-7. *Synergus apicalis*, female: 1-3, head: 1, front view, 2, from above, 3, posteriorly. 4, scutum and scutellum, dorsal view, 5, mesosoma, lateral view, 6, propodeum and dorsellum, dorso-posterior view, 7, metasoma, lateral view.

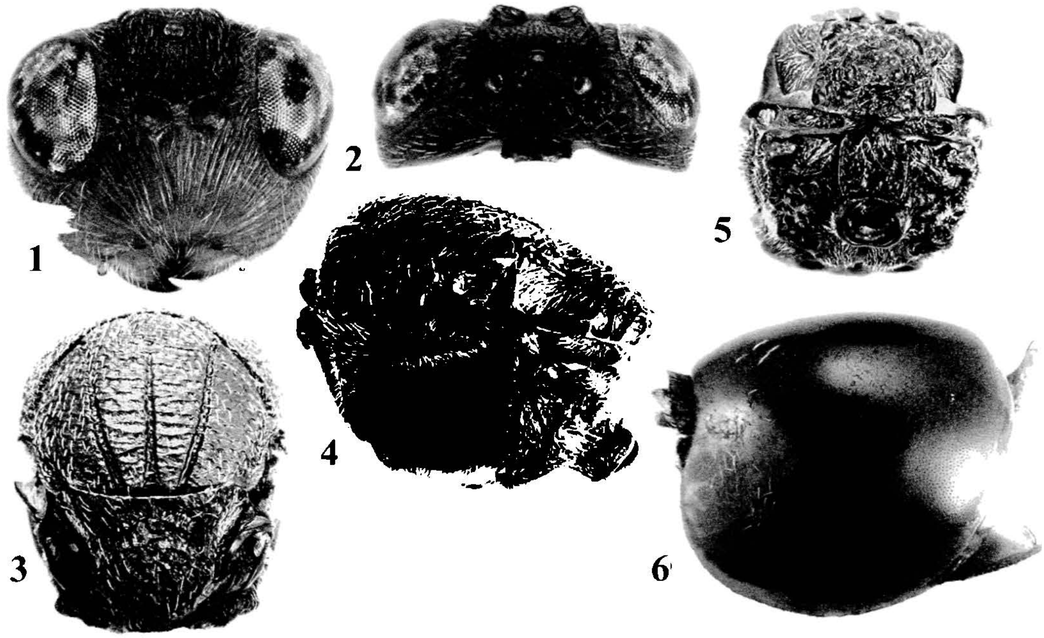
frontal carinae strong or delicate, indistinct. Vertex and occiput dull rugose to delicately coriaceous, with or without punctures. Antennae 14-segmented in female and 15-segmented in male; F1 in male straight or modified, excavated and curved medially, broadened apically and/or basally. Mesosoma flattened dorso-ventrally, slightly longer than high in lateral view, with white setae. Pronotum coriaceous to rugose, with white setae, lateral pronotal carina strong or absent, lateral corners of pronotum strongly angled or rounded. Scutum with or without transverse rugae, but always distinctly with tamsversely orientated sculpture. Notauli complete, deeply impressed or indistinct, incomplete, shallowly impressed; median mesoscutal line extending to half or more length of scutum or present in a form of short triangle only. Scutellum rounded, dull rugose to delicately coriaceous, slightly overhanging metanotum. Scutellar foveae present, separated by a more or less broad central carina. Mesopleuron striate. Metapleural sulcus reaching mesopleuron in upper one-third of its height. Lateral propodeal carinae nearly straight, subparallel or slightly converging inwards in the most posterior part. Forewing margin with cilia; radial cell closed, except partially closed in *S. plagiotrochi*. Metasomal tergites 2+3 fused, with more or less broad band of punctures posteriorly; prominent part of ventral spine of hypopygium very short.

Mayr (1872) subdivided *Synergus* into two sections: Section I contain those species in which fused metasomal tergites 2+3 are with a more or less broad band of punctures posteriorly and Section II – species, in which fused metasomal tergites 2+3 have only a small dorso-posterior patch of punctures. This division is artificial and does not reflect the phylogenetic relationships, however, it was useful for the separation and classification of the species. Recent phylogenetic analysis of Synergini, with involving molecular analysis, showed that the genus *Synergus* subdividing into two distinct subclades: a) the first includes only those species in which the lateral propodeal carina is absent and cynipid gallwasp hosts, without exceptions, are on section Cerris oaks: *Synergus plagiotrochi, S. variabilis, S. flavipes* and 2 recently described species from Iran (Sadeghi et al., 2006a); b) the second group includes all other species of *Synergus* without lateral propodeal carina and associated with section *Quercus* s. str. oaks (more details in chapter 4).



Figs. 111.1-10. *Synergus gallaepomiformis*: 1-2, head, female: 1, front view, 2, from above. 3-4, antenna (first 5 antennomeres): 3, female, 4, male. 5-10, female: 5, pronotum with submedian pronotal pits, dorsal view, 6, pronotum and propleura, front view, 7, scutum and scutellum, dorsal view, 8, mesosoma, lateral view, 9, propodeum and dorsellum, dorso-posterior view, 10, metasoma, lateral view.

Synergus is the most species-rich inquiline cynipid genus, with a long and complex history of taxonomic revision. Gillette (1896) revised 24 nearctic *Synergus* species known at that time and another 29 species had been described by the time Burks (1979) surveyed the nearctic fauna. Ninety-nine species of *Synergus* have been described worldwide, although some of these taxa may represent synonyms, especially in betwen unrevised nearctic species. Of the currently recognised species, 57 are listed for North and Central America (Ritchie, 1984), 34 for the Western Palaearctic, and 8 species are known from the Eastern Palaearctic Region. Of the latter, six are known only from Japan and two have recently been described from China (Melika et al., 2004). Monzen (1953) listed six species of *Synergus* from Japan: *S. atamiensis* Ashmead, 1904, *S. gifuensis* Ashmead, 1904, *S. hakonensis* Ashmead, 1904, *S. japonicus* Walker, 1874, S. *jezoensis* Uchida & Sakagami, 1948, and *S. mizunarae* Shinji, 1940. However, the only species to have been recorded after its description is *Synergus japonicus*, and the status of the remaining species is thus uncertain. Masuda (1959) recognised two forms of *S. japonicus*: type "A" and type "B", based on differences in life cycles and the impact the species have on host gall structure. Later, Abe (1990, 1992) extended biological studies on the "*S. japonicus*" species complex. He found the biological differences found by previous authors to be supported by morphological characters, and separated the "*Synergus japonicus*" complex into 2 species: *Synergus japonicus* and *S. gifuensis* Ashmead, 1904 (Pujade-Villar et al., 2002). One very common and abundant European species, *Synergus gallaepomiformis* (Boyer de Fonscolombe, 1832) has been reared from galls of *Andricus symbioticus* Kovalev, 1965 and *A. attractus* Kovalev, 1965 collected from *Q. mongolicus*, near Lake Khasan (Primorskij Kraj), on the border with China (Kovalev, 1965).



Figs. 112.1-6. *Synergus umbraculus*, female: 1-2, head: 1, front view, 2, from above. 3, scutum and scutellum, dorsal view, 4, mesosoma, lateral view. 5, propodeum and dorsellum, dorso-posterior view, 6, metasoma, lateral view.

The *Synergus* genus is the richest one in species and has the most diverse host associations. Detail host associations for all known western palaearctic species are given in Stone, Melika & Csóka (in press). *Synergus* species related to cynipid galls on *Quercus* spp., except two nearctic species related to cynipid galls on *Castanopsis*. The majority of *Synergus* species are found in galls on deciduous *Quercus* species, two species in the Mediterranean region attack only galls on evergreen oaks and three species associate with galls on both, deciduous and evergreen oak species. Majority of species of the Section I (Mayr, 1872) are monovoltine and usually attacks woody, lignified galls; in the case when they have two annual generations, the adult's morphology does not varied significantly (Nieves-Aldrey & Pujade-Villar, 1985; Pujade-Villar, 1992b). The majority of species from the Section II are bivoltine (occasionally with a third partial generation) and rarely attack large and woody galls and adult's morphology of different generations can vary significantly (Nieves-Aldrey & Pujade-Villar, 1985; Pujade-Villar, 1992b).

Synergus species attack galls on *Quercus* spp. with the exceptions of *S. castanopsidis* (Beutenmüller), which attacks staminate galls of *Dryocosmus castanopsidis* on *Castanopsis* spp. in Oregon and California (Burks, 1979). An unnamed Japanese *Synergus* species has also been reared from galls of *Dryocosmus kuriphilus* on chestnut, *Castanea* (Otake et al., 1982). Two western palaearctic species (*S. ilicinus* and *S. plagiotrochi*) are associated exclusively with evergreen section Cerris oaks, and particularly with galls of *Plagiotrochus* spp. (Nieves-Aldrey & Pujade-Villar, 1986; Pujade-Villar, 1992b). *Synergus crassicornis* has been reared predominantly from cynipid galls on evergreen oaks on the Iberian Peninsula, but occurs on deciduous oaks in the rest of Europe (Nieves-Aldrey & Pujade-Villar, 1985; Pujade-Villar & Ros-Farré, 1998a; Pujade-Villar et al., 2003), while *S. physocerus* has been reared predominantly from cynipid galls on deciduous oaks in Europe, but occurs on evergreen oaks in Greece (Pujade-Villar et al., 2002). The remaining *Synergus* species are associated with deciduous oaks although some, such as *S. apicalis* and *S. tibialis*, are occasionally reared from galls on cork oak, *Q. suber* (Pujade-Villar & Ros-Farré, 1998a). In addition to the usual cynipids host galls, *Synergus variabilis* Mayr has been also reared from galls of the cecidomyiid gall midges *Janetia cerris* (Kollar) and *Dryomyia circinnans* Giraud (Diptera, Cecidomyiidae) (Askew, 1999a; Pujade-Villar et al., 2003).

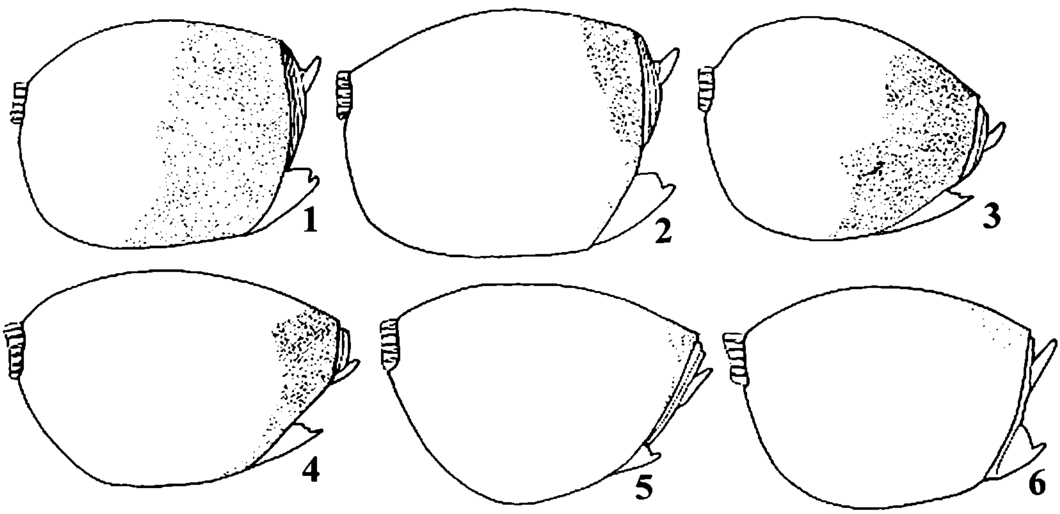
Section I *Synergus* species tend to be single brooded, overwinter inside the host galls as late-instar larvae or pupae, and emerge early in the following summer. Some nearctic species can remain in diapause for up to six years (Ritchie, 1984). In contrast, the species belonging to Section II usually produce at least two broods a year, and the emerging adults of successive generations are often quite different in appearance, particularly in colouration (Ross, 1951; Wiebes-Rijks, 1979; Nieves-Aldrey & Pujade-Villar, 1986).

Below a key is given to those western palaearctic *Synergus* species only, which are known or presumably occurs in the Ukrainian fauna. A key to all western palaearctic species of *Synergus* are given in Pujade-Villar et. al. (2003) and Stone , Melika & Csóka (in press).

Key to *Synergus* species

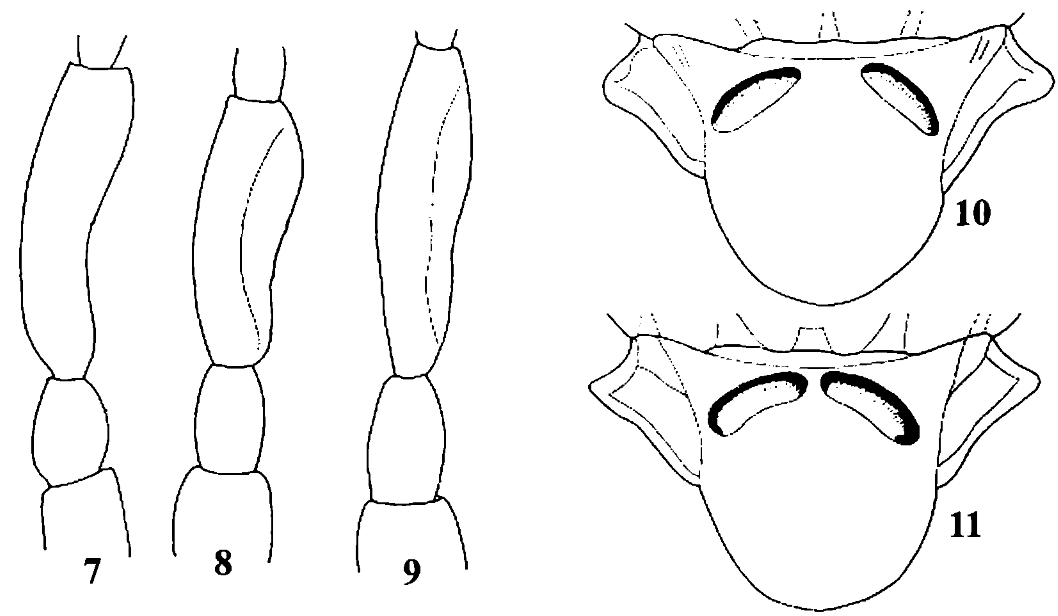
(species marked with (*) presumably occur in the Ukrainian fauna)

1. Metasomal tergites 2+3 fused and minutely punctate posteriorly, sculpture forming a band of variable width, extending for at least 1/4 length of fused tergites, and always reaching ventral edge of tergite (Figs 113.1-4); *Synergus* Section I (Mayr, 1872) 2
- Metasomal tergites 2+3 without punctures posteriorly, or if present, than limited to apical dorsal patch or indistinct narrow band not reaching ventral edge of tergite (Figs 113.5-6); *Synergus* Section II (Mayr, 1872 11
2. Median mesoscutal line absent or very short and shallow, triangular, extending for not more than 1/8 of length of scutum; lateral frontal carinae weak, usually incomplete and indistinct near lateral ocelli 3
-- Medial mesoscutal line extending for at least half length of scutum; lateral frontal carinae distinct and reaching lateral ocelli 6
3. Face entirely yellow-red; apical punctures of fused tergites 2+3 extending dorsally to 1/4 length of tergites and much less ventrally; frons with scattered and shallow punctures; lateral pronotal carina absent or very weak, indistinct; corners of pronotum rounded and not angled in dorsal view .... ***flavipes***
-- Head black, at most reddish near mouth; apical punctures of fused tergites 2+3 extending dorsally for at least 1/3 length of tergites; frons with dense distinct punctures; lateral pronotal carina present, strong; corners of pronotum strongly angled in dorsal view 4



Figs 113.1–6. Metasoma in lateral view: 1, *Synergus umbraculus*, 2, *S. pallidipennis*, 3, *S. reinhardi*, 4, *S. ruficornis*, 5, *S. radiatus*, 6, *S. gallaepomiformis*.

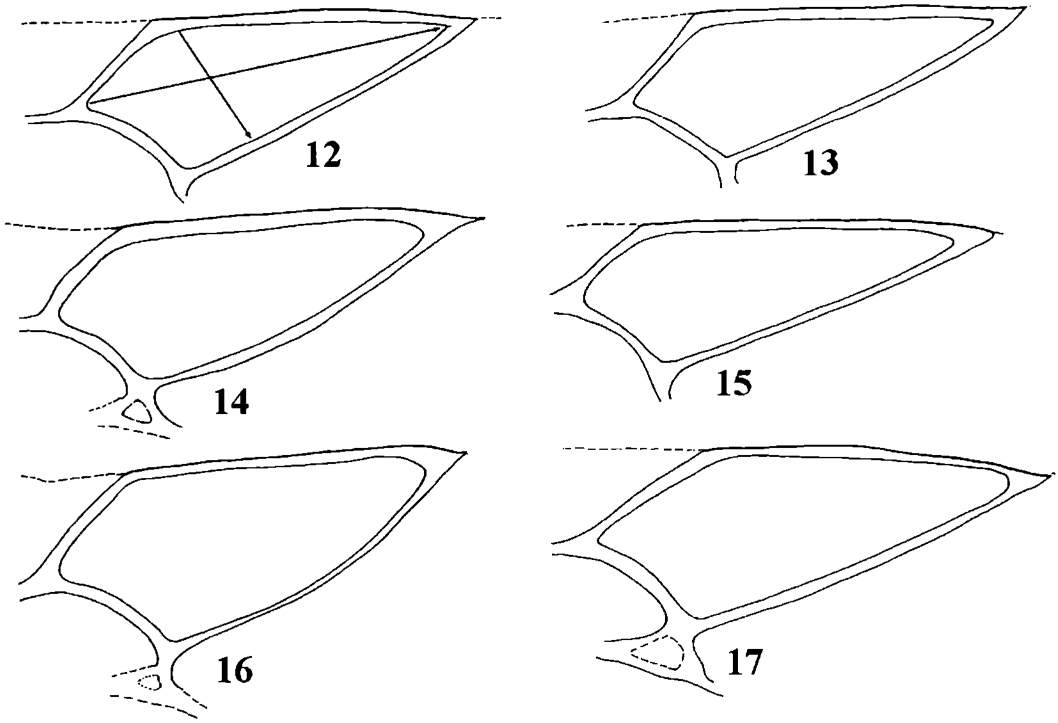
4. Scutum transverselly rugose, not sharply carinate, with distinct coriaceous sculpture between rugae; scutellar foveae posteriorly weakly delimited; F1 of male curved and expanded basally and apically (Fig. 113.7) .... ***dacianus****
-- Scutum sharply carinate especially medially, without or with very weak coriaceous sculpture in interspaces; scutellar foveae posteriorly sharply delimited; F1 of male different, less curved and expanded (Figs 113.8-9) 5



Figs 113.7–11. 7-9, first antennomeres, male: 7, *Synergus dacianus*, 8, *S. crassicornis*, 9, *S. clandestinus*. 10-11, scutellum, dorsal view: 10, *S. crassicornis*, 11, *S. clandestinus*.

5. F1 of male distinctly expanded basally and apically (Fig. 113.8); scutellar foveae separated by broad carina (Fig. 113.10); notauli weakly impressed posteriorly, very indistinct or absent anteriorly .... ***crassicornis***

-- F1 of male not expanded, slightly curved and with inner surface of curve flattened (Fig. 113.9); scutellar foveae separated by narrow carina, which not as broad as width of foveae (Fig. 113.11); notauli deeper posteriorly .... ***clandestinus***



Figs 113.12–17. 12-17, Radial cell of forewing (arrows indicate the length and width of the radial cell): 12, *S. pallidipennis*, 13, *S. diaphanus*, 14, *S. umbraculus*, 15, *S. ibericus*, 16, *S. hayneanus*, 17, *S. reinhardi*.

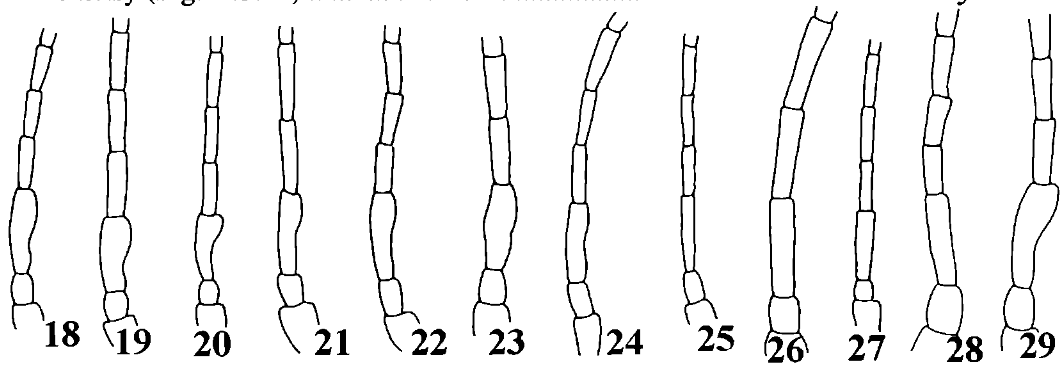
6. Radial cell 2.5-3.0 times as long as broad (Figs 113.12-15); F1 of male strongly expanded apically (Figs 113.18-21) 7
-- Radial cell 2.0-2.5 times as long as broad (Figs 113.16-17); F1 of male weakly expanded apically and basally, slightly curved in middle (Figs 113.22-24) 9
7. Apical punctures of metasoma forming relatively narrow band, extending for not more than 1/4 of the length of fused tergites 2+3 (Fig. 113.2); F1 at least 1.5 times as long as F2, pedicel distinctly longer than broad (Figs 113.18, 25); veins pale, radial cell 2.5-2.8 times as long as broad (Fig. 113.12); face and mesosoma black in both sexes .... ***pallidipennis***
- Apical punctures forming relatively wide band, extending for 1/2-1/3 length of fused tergites 2+3 (Fig. 113.1); antennomere F1 as long as or only slightly longer than F2, pedicel as long as broad or only slightly longer than broad, usually spherical in male (Figs 113.19-21, 26-27); other characters variable 8
8. Radial cell not more than 2.5 times as long as broad (Fig. 113.14); veins dark brown; antennomere F1 of male strongly expanded apically (Fig. 113.19); face (especially in male) and often mesosoma (especially in female) partially yellow, orange or red .... ***umbraculus***
-- Radial cell 2.5-2.7 times as long as broad (Fig. 113.13); veins pale; antennomere F1 of male less expanded apically (Fig. 113.20); face and mesosoma black in both sexes .... ***diaphanus***

9. Apical band of punctures on metasoma, measured subdorsally, extending for at most 1/4 length of fused tergites 2+3, ventrally and laterally much less (Fig. 113.4); mesoscutum weakly sculptured; F1 of male almost 2.0 times as long as F2, weakly expanded basally and moderately expanded apically (Fig. 113.22) .... ***ruficornis***

-- Apical band of punctures on metasoma extending to 1/2-1/3 length of fused tergites 2+3 (Fig. 113.3); mesoscutum with stronger sculpture, with raised transverse carinae; F1 of male weakly expanded apically and/or basally, less than 1.5 times as long as F2 10

10. Lower face with strong median carina, raised above striae in lateral view; radial cell more than 2.0 times as long as broad, Rs weakly curved (Fig. 113.17); face black in both sexes; F1 of male slightly modified, delicately notched in middle and weakly expanded apically (Fig. 113.23) .... ***reinhardi***

- Lower face with strong median carina, not raised above striae from lateral view; radial cell at most slightly more than 2.0 times as long as broad; Rs fairly strongly curved (Fig. 113.16); face yellow-red in males; F1 of male expanded apically and basally (Fig. 113.24) .... ***hayneanus***



Figs 113.18–29. 18-24, first antennomeres, male: 18, *Synergus pallidipennis*, 19, *S. umbraculus*, 20, *S. diaphanus*, 21, *S. ibericus*, 22, *S. ruficornis*, 23, *S. reinhardi*, 24, *S. hayneanus*. 25-27, first antennomeres, female: 25, *S. pallidipennis*, 26, *S. umbraculus*, 27, *S. diaphanus*. 28-29, *Synergus pallicornis*: 28, female, 29, male.

11. Head, especially of female, trapezoid in front view, gena nearly straight, face long; lateral frontal carinae strong and branched near ocelli; subparallel carinae running transversely between lateral ocelli, and obliquely from each posterior ocellus to margin of occiput; antennomere F1 in female nearly 2.0 times as long as F2 (Fig. 113.28); curved in middle and weakly expanded distally in male (Fig. 113.29) .... ***pallicornis***

-- Head transversely ovate or rounded in front view, with gena strongly converging and shorter face; vertex around and between ocelli and occiput punctate, rugose or coriaceous; antennomere F1 variable 12

12. Lateral pronotal carina absent, pronotum rounded or slightly angled in lateral corners in dorsal view .... ***variabilis***

- Lateral pronotal carina always present, pronotum strongly angled in lateral corners in dorsal view 13

13. Mesoscutum with interrupted sharp and widely spaced transverse rugae, interspaces shining, smooth or very delicately sculptured; pedicel usually longer than broad; frons sparsely punctate between lateral frontal carinae and near frontal ocellus 14

-- Mesoscutum coriaceous or with weak and not interrupted transverse rugae; pedicel as broad as long; frons with or without punctures 16

14. Median mesoscutal line extending for at least 1/2-3/4 length of mesoscutum, lateral frontal carinae strong and complete; pedicel usually as broad as long; all flagellomeres of same width; F1 in female slightly broadened apically; in male very strongly expanded apically .... ***incrassatus***

-- Median mesoscutal line extending for at least 1/4 length of scutum; lateral frontal carinae weak and incomplete; pedicel longer than broad; all flagellomeres clearly tapered distally; shape of F1 different in both sexes 15

15. Notauli extend forward for 1/4 length of scutum; radial cell 3.0 times as long as broad, Rs only slightly curved; face red to yellow in male; red brown to black with some red areas around mouth and lower gena in female; legs yellow to yellow-brown, hind and sometimes midcoxae black .... ***apicalis***

-- Notauli extend forward for 3/4 length of mesoscutum; radial cell 2.1-2.7 times as long as broad, sometimes opened, Rs strongly curved; face black in both sexes, except for some red areas sometimes around mouth; legs mostly dark brown to black, coxae black, femur partially black .... ***tibialis***

16. Frons coriaceous, with punctures, vertex conspicuously punctate or punctate and rugulose; median mesoscutal line extending for at least 3/4 length of mesoscutum, broad posteriorly; face usually yellow to orange red or red; antenna and legs entirely yellow or yellow-red 17

-- Frons and vertex coriaceous or coriaceous-rugulose, not punctate or very occasionally with sparse indistinct punctures; median mesoscutal line shallow, narrow and extending for half or less of length of mesoscutum; face black, except in *S. consobrinus*; antenna and legs darker, coxae usually black 19

17. F1 of male weakly excavated, flattened basally and moderately expanded apically, F2 to F5 2.0-3.0 times as long as broad; F1 of female not more than 1.5 times as long as F2 .... ***gallaepomiformis***

[specimens emerging in spring, summer and autumn from first year galls have face yellow-red to red, antenna and legs yellow to orange; specimens emerging in spring from asexual galls of previous year are darker, face black, antenna and legs dark]

\- F1 of male strongly inflated distally and rounded, remaining flagellomeres short, usually not more than 1.5-2.0 times as long as broad; F1 of female more than 1.5 times as long as F2 18

18. F1 of male abruptly inflated distally, basal notch forming more acute angle; F1 of female less than 2.0 times as long as F2; frons and vertex with shallow and scattered punctures; face yellow to red or almost black; antenna and legs yellowish .... ***thaumacerus***

\- F1 of male not abruptly inflated distally, basal notch forming less acute angle; F1 of female more than 2.0 times as long as F2; frons and vertex with weaker and more sparse punctures; head black, antenna and legs yellow-brown .... ***physocerus***

19. Lateral frontal carinae strong and complete, extending to lateral ocellus; face of male yellowish, red in female .... ***consobrinus***

-- Lateral frontal carinae weak, often not extended to lateral ocellus; face black in both sexes 20

20. Antennal pedicel usually longer than broad in both sexes, F1 of male flattened on the inner surface, not strongly curved or apically expanded no more than basally .... ***radiatus***

-- Antennal pedicel as long as broad or only slightly longer than broad; F1 of male concave on the inner surface, twisted and expanded apically .... ***pallipes***

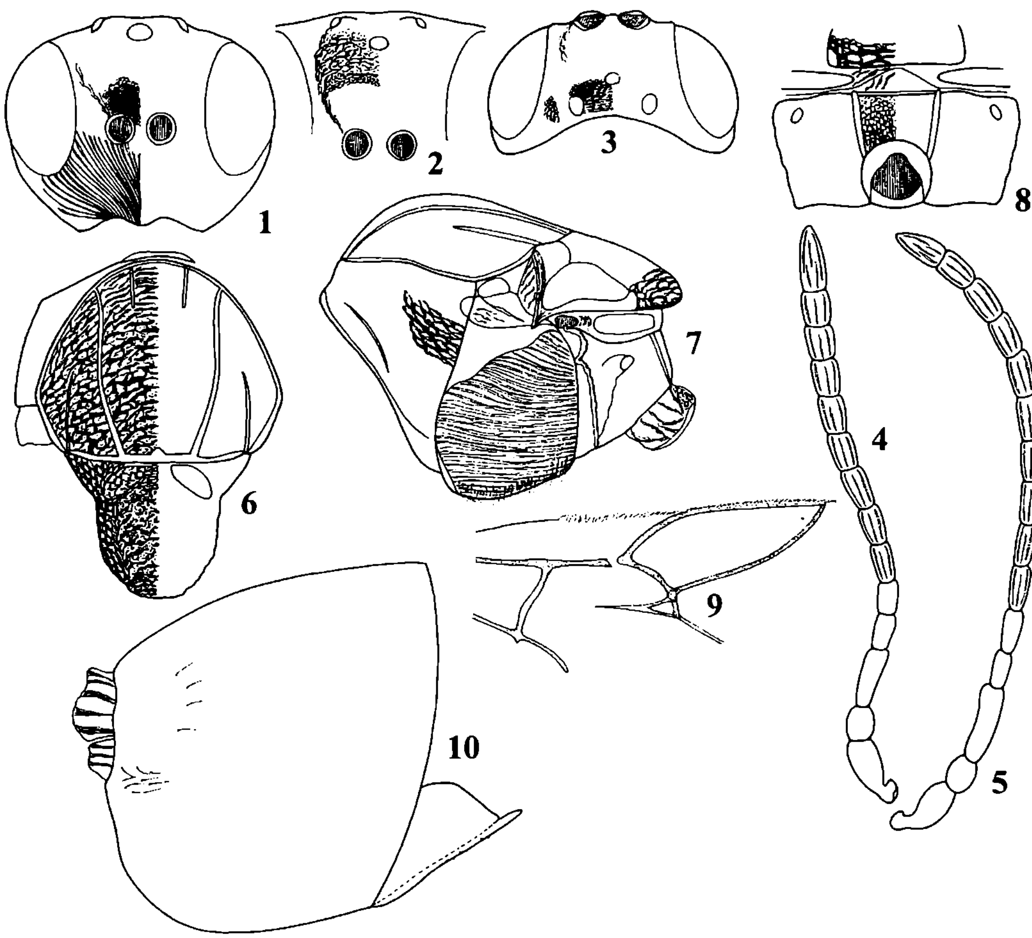
Synergus apicalis Hartig, 1841

Figs 114.1-10.

Synergus apicalis Hartig, 1841: 349 (female, male); *Sapholytus apicalis*: Förster, 1869: 338; *Synergus punctatus* Vassileva-Samnalieva, 1984c: 62 (female, male) (synonym of *S. samnalievae* Pujade-Villar & Melika, 2003: 163); **syn. n.**

Description. Female. 1.4-3.6 mm. Head black, except lower face and gena which are red brown to black, with some red areas around mouthparts; antenna yellow to light brown. Mesosoma black; legs yellow to yellow-brown, hind and sometimes midcoxae black. Metasoma chetsnut brown to very dark brown, hypopygium always slightly lighter. Wing veins light brown. Body with sparse white setae. Head transversely ovate in front view, delicately coriaceous, with sparse white setae, more dense on lower face; 1.7 times as broad as long from above; 1.2 times as broad as high and slightly broader than mesosoma. Gena strongly converging and shorter than height of lower face, delicately coriaceous. Malar space 0.5 times as long as height of eye, with delicate striae radiating from clypeus and reaching eye. POL 2.0 times as long as OOL; OOL only slightly longer than diameter of lateral ocellus and equal LOL. Transfacial distance nearly as long as height of eye; diameter of antennal torulus 3.0 times as large as distance between them and nearly as long as distance between torulus and eye margin. Lower face and elevated median area with uniform delicate striae, radiating from ventral margin of clypeus and reaching eye and antennal socket. Clypeus striate, indistinctly delimited by anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line indistinct, ventrally nearly straight. Frons delicately coriaceous to alutaceous with few or without punctures; lateral frontal carinae absent or very weak, indistinct, not reaching lateral ocellus. Vertex, interocellar area and occiput uniformly weakly coriaceous, without punctures. Antennae 14-segmented, longer than head+mesosoma; pedicel subglobose, only slightly longer than broad; F1 1.7 times as long as pedicel and 1.7 times as long as F2; F2 slightly longer or equal F3; subsequent flagellomeres shorter; distal flagellomeres slightly broadened; F12 1.9 times as long as F11; placodeal sensilla on F3-F12. Mesosoma flatenned dorso-ventrally, not convex, slightly longer than high in lateral view, with white setae. Pronotum delicately coriaceous, with some delicate wrinkles on the level of mesopleural triangle; lateral pronotal carina present, anterior corners of pronotum strongly angled in dorsal view. Scutum with interrupted sharp and widely spaced transverse rugae, especially internotauli area, interspaces shining, smooth or very delicately sculptured, slightly broader than long (width measured across the basis of tegulae). Notauli extending forward for 1/4 length of scutum, although sometimes reaching pronotum but very weakly impressed and barely traceable; median mesoscutal line usually in a form of short triangle basally (in some specimens can extending at most to 1/4 of scutum length); parapsidal lines indistinct, reaching slightly above the level of the base of tegulae; anterior parallel lines short, extending to 1/5 of scutum length. Scutellum 1.5-1.7 times shorter than scutum, elongated, broadest part in the middle; dull rugose, with more delicate sculpture towards center of scutellar disk and in between scutellar foveae. Scutelar foveae transversely ovate, only slightly broader than high, very indistinctly delimited around, with delicately coriaceous bottom, without setae; separated by broad, coriaceous central carina. Mesopleuron completely striate; mesopleural triangle uniformly delicately coriaceous, with few setae. Metapleural sulcus reaching mesopleuron in upper 1/4 of its height; axillula ovate, shining, coriaceous, with piliferous points; subaxillular bar smooth, shining, in the most posterior end nearly as high as height of metanotal trough. Dorsellum very short, especially medially; metanotal trough very delicately coriaceous to alutaceous, with few white setae; ventral impressed area shining, with distinct weak longitudinal wrinkles. Lateral propodeal carinae nearly straight, without setae and equal in width; central propodeal area delicately coriaceous, without setae; lateral propodeal area delicately coriaceous to alutaceous, with relatively dense white setae. Forewing longer than body, margin with long cilia; radial cell closed, 2.8-3.0 times as long as broad, Rs slightly curved; areolet large, distinct; Rs+M distinct, extending to half distance between areolet and basalis, projecting into middle of it.

Metasoma nearly as long as head+mesosoma or slightly shorter, as long as high in lateral view; metasomal tergites 3 and 4 fused, posteriorly without punctures (or very small patch of indistinct punctures present dorso-posteriorly only), with few sparse short white setae antero-laterally; hypopygium without punctures, prominent part of ventral spine of hypopygium very short. Male. 1.3-3.2 mm. Similar to female but lower face and gena red to yellow; antenna 15-segmented, slightly longer than body length, F1 slightly curved, incised, not swollened basally and apically, 2.1 times as long as F2; subsequent flagellomeres nearly of equal length, distal flagellomeres slightly broadened; placodeal sensilla distinctly visible on F4-F13.



Figs. 114.1-10. *Synergus apicalis*: 1-3, head, female: 1, front view, 2, frons, front view, 3, from above. 4-5, antenna, 3, female, 4, male. 6-10, female: 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part. 10, metasoma, lateral view.

Diagnosis. Belongs to the Section II species group of *Synergus*. See also Diagnosis to *S. incrassatus*. Most closely related to *S. tibialis*. In *S. apicalis* notauli extending at most to 1/4 of scutum length or present in a form of a very short triangle; the radial cell 3.0 times as long as broad, Rs only slightly curved; the face is red to yellow in male; red brown to black with some red areas around mouthparts and lower gena in female; legs yellow to yellow-brown, hind and sometimes midcoxae black, while in *S. tibialis* notauli extending to 3/4 of scutum length; the radial cell 2.1-2.7 times as long as broad, sometimes opened, Rs strongly curved; the face is black in both sexes, except for some red areas sometimes around mouthparts; legs mostly dark brown to black, coxae black, femur partially black. *Synergus apicalis* and *S. tibialis* are very closely related species and their morphological limits are not always clear. In *S. apicalis* the punctures are less conspicuous, lateral frontal carinae are shorter and the female metasoma is nearly flat-topped, while in *S. tibialis* the punctures usually are more conspicuous, lateral frontal carinae are longer and the female metasoma is curved dorsally.

Taxonomic comments. *Synergus punctatus* described by Vassileva-Samnalieva (1984c) from Bulgaria was reared from *Andricus multiplicatus* galls on *Q. cerris*. The name "*punctatus*" was preoccupied by *Synergus punctatus* Hartig, 1841, *Synergus punctatus* Gillette, 1896 and *S. punctatus* Dettmer, 1924. For this reason it was renamed to *S. samnalievae* in honour of the author of this species and was placed in between species with uncertain status, because the types were not revised (Pujade-Villar et al., 2003). Recently the type series of *S. punctatus* (1 holotype female and 5 paratype males) were loaned from the Department of Biology, University of Plovdiv, Bulgaria. After the examination of types we concluded, that *S. carinatus* is a **syn. n.** of *S. apicalis*.

Distribution. Widespread in the Western Palaearctic Region. Known from Kursk Region of Russia also (specimens collected by Belizin in the collection of SIZK). In Ukraine – Transcarpathian Region only; rare.

Biology. Reared from galls of *Andricus* spp, *Aphelonyx cerricola*, *Callirhytis rufescens* [b], *Neuroterus albipes* and sexual galls of *Plagiotrochus amenti* (Pujade-Villar, 1992b). Brischke (1882) associated this species with two *Cynips* species, however, this data must be confirmed. Host plants: *Quercus faginea, Q. petraea, Q. pubescens, Q. pyrenaica, Q. robur.*

Synergus clandestinus Eady, 1952

Figs 115.1-9.

Synergus clandestinus Eady, 1952: 142, 148 (female, male).

Description. Female. 2.8-3.1 mm. Similar to *S. crassicornis* but frons with more distinct punctures, coriaceous, with some wrinkles between eye and lateral frontal carina; vertex, interocellar area and occiput with deeper punctures. F1 2.5 times as long as pedicel and 1.3 times as long as F2; placodeal sensilla distinctly visible on F4-F11. Notauli deeper posteriorly; scutellar foveae separated by a narrow median carina. Metasomal tergites 3+4 posteriorly with more broader band of punctures, extending to half or even more length of fused tergites. Male. 2.2-3.0 mm. Similar to female and male of *S. crassicornis* but F1 not expanded, slightly curved and with inner surface of curve flattened and 2.5-2.6 times as long as F2; placodeal sensilla distinctly visible on F2-F12.

Diagnosis. See Diagnosis to *S. crassicornis* and *S. dacianus*.

Distribution. Western Palaearctic Region: known from ES (Nieves-Aldrey & Pujade-Villar, 1985; Nieves-Aldrey, 1988a) to FI (Forsius, 1927) and GB (Niblett, 1945; Eady, 1952; Eady & Quinlan, 1963; Hollier, 1989). Known also from RU (Belgorod Region, specimens collected by Belizin in the collection of SIZK). In Ukraine – the lowland part of the Transcarpathian Region and vicinities of Kiev (examined specimens in the collection of SIZK).

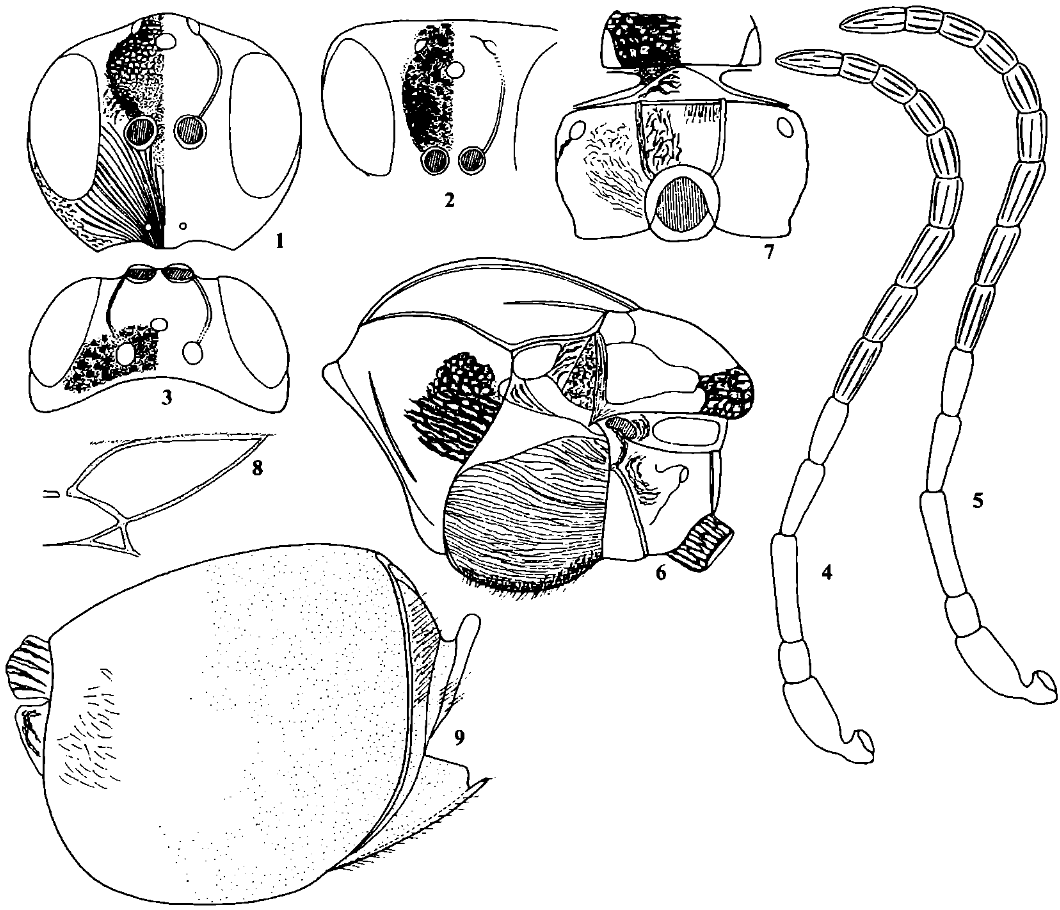
Biology. Reared from *Andricus legitimus* which is known to induce stone galls in acorns of the section *Quercus* and also from acorn stone galls of *Callirhytis glandium* [a]. Host plants: *Quercus canariensis, Q. faginea, Q. petraea, Q. pubescens, Q. pyrenaica, Q. robur.*

Synergus consobrinus Giraud in Houard, 1911

Figs 116.1-10.

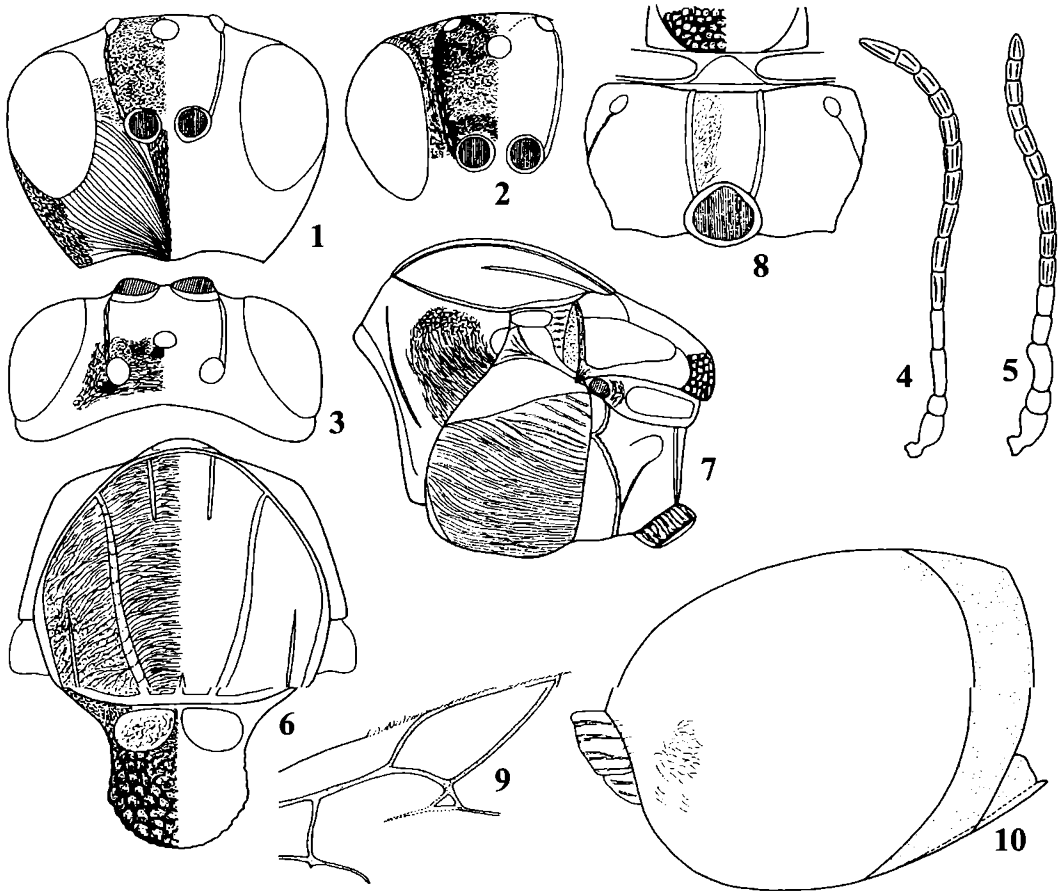
Synergus consobrinus Giraud in Houard, 1911: 333 (female, male). This species was recovered from "oblivion" by Pujade-Villar & Ros-Farré, 1998b: 536 (female, male).

Description. Female. 1.4-3.6 mm. Head black, except red lower face; antenna light brown, legs light brown, except partially black coxae. Mesosoma black, metasoma dark brown, hypopygium lighter. Wing veins pale. Body with sparse white setae. Head coriaceous, slightly transverse in front view, with sparse white setae; 1.8 times as broad as long from above; 1.3 times as broad as high. Gena delicately coriaceous, not broadened behind eye, invisible in front view behind eye, converging ventrally. Malar space 0.5 times as long as height of eye, with delicate striae radiating from clypeus and reaching eye. POL 2.0 times as long as OOL; OOL slightly



Figs. 115.1-9. *Synergus clandestinus*: 1-3, head, female: 1, front view, 2, frons, front view, 3, from above. 4-5, antenna, 4, female, 5, male. 6-9, female: 6, mesosoma, lateral view, 7, propodeum and dorsellum, dorso-posterior view, 8, forewing, part. 9, metasoma, lateral view.

longer than diameter of lateral ocellus and LOL. Transfacial distance nearly as long as height of eye; diameter of antennal torulus 2.0 times as large as distance between them and nearly equal to distance between torulus and eye margin. Lower face with delicate striae radiating of ventral margin of clypeus and reaching eye and antennal socket; median elevated area coriaceous, without striae. Clypeus striate, hardly separable from lower face, limits indicated by anterior tentorial pits; epistomal sulcus and clypeo-pleurostomal line instinct, ventrally straight. Frons uniformly delicately coriaceous, without punctures, lateral frontal carinae strong and complete, extending to lateral ocellus. Vertex, interocellar area and occiput coriaceous, without punctures. Antennae 14-segmented, pedicel globose, as long as broad; F1 2.5 times as long as pedicel and slightly longer than F2; F2 slightly longer than F3; subsequent flagellomeres nearly equal in length and slightly shorter than F2; distal flagellomeres distinctly broadened, placodeal sensilla on F3-F12. Pronotum delicately coriaceous, with some delicate striae on the level of mesopleural triangle; lateral pronotal carina strong, anterior corners of pronotum angled in dorsal view. Scutum coriaceous, sometimes with very weak and not interrupted transverse rugae, nearly as broad as long (width measured across the basis of tegulae). Notauli complete, weakly impressed; median mesoscutal line shallow, narrow and extending for half or less of of scutum length, often in a form of a short triangle; parapsidal lines distinct, reaching to the level of the base of tegulae; anterior parallel lines distinct, extending to 1/4 of scutum length. Scutellum slightly elongated, with parallel sides, rugose, with more delicate sculpture towards center of scutellar disk. Scutelar foveae ovate,



Figs. 116.1-10. *Synergus consobrinus*: 1-3, head, female: 1, front view, 2, frons, front view, 3, from above. 4-5, antenna: 3, female, 4, male. 6-10, female: 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part. 10, metasoma, lateral view.

slightly broader than high, well-delimited around, with delicately coriaceous bottom, without setae; separated by narrow coriaceous central carina. Mesopleuron completely uniformly striate, interspaces smooth. shining; mesopleural triangle uniformly coriaceous, with few setae. Metapleural sulcus reaching mesopleuron in upper 1/3 of its height; axillula elongated, shining, coriaceous, with few piliferous points; subaxillular bar smooth, shining, in the most posterior end nearly 2.0 times as high as height of metanotal trough; propodeal spiracle slightly elevated, ovate. Dorsellum uniformly coriaceous, very short medially; metanotal trough very delicately coriaceous to alutaceous, with few white setae; ventral impressed area high, smooth, shining, without wrinkles. Lateral propodeal carinae very slightly converging inwards, uniformly broad, without setae; central propodeal area delicately coriaceous, without setae; lateral propodeal area delicately uniformly coriaceous, with relatively dense white setae. Forewing longer than body, with pale veins, margin with long cilia; radial cell 2.6-2.8 times as long as broad, areolet small, indistinct; Rs+M indistinct or even invisible, extending to 1/3 of distance between areolet and basalis. Metasoma nearly as long as head+mesosoma, longer than high in lateral view; tergites 3+4 with few short white setae antero-laterally, with an apical small patch of punctures postero-dorsally; subsequent tergites and hypopygium with punctures; prominent part of ventral spine of hypopygium very short. Male. 1.3-3.2 mm. Similar to female but lower face yellowish, antenna 15-segmented, F1 slightly curved and strongly broadened apically and 1.6 times as long as F2;

subsequent flagellomeres nearly of equal length, distal flagellomeres slightly broadened; placodeal sensilla on F4-F13.

Diagnosis. *Synergus consobrinus* together with *S. radiatus* and *S. pallipes* belongs to the Section II of *Synergus*, which in the scutum is coriaceous or with weak and not interrupted transverse rugae; frons and vertex are coriaceous or coriaceous-rugulose, do not punctate or very occasionally with sparse indistinct punctures; the median mesoscutal line is shallow, narrow and extending to the half or less of the scutum length. In *S. consobrinus* lateral frontal carinae are strong and complete, extending to lateral ocellus; F1 of males only slightly longer than F2, expanded distally; the face in male is yellowish, in the female – red, while in *S. radiatus* and *S. pallipes* lateral frontal carinae are weak, often not extending to the lateral ocellus; F1 of males 1.3-1.5 times as long as F2, less expanded distally; the face is black in both sexes.

Distribution. Known only from AT (Giraud in Houard, 1911; Pujade-Villar & Ros-Farré, 1998b) and HU (Pujade-Villar et al., 2003). In Ukraine – Transcarpathian Region only (Kosino, Julijivski Hory, Rafajlovo, author).

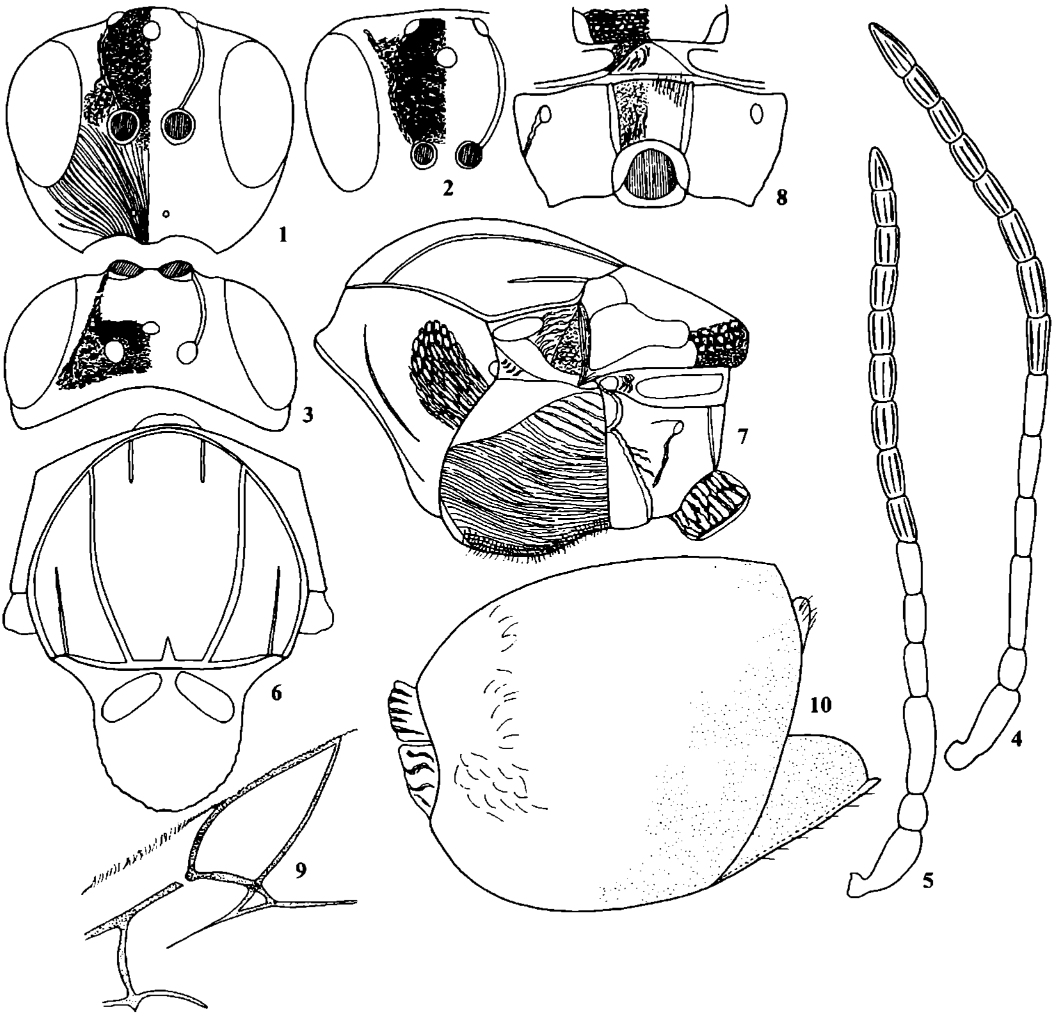
Biology. Reared only from sexual galls of *Andricus grossulariae* on *Q. cerris*.

Synergus crassicornis (Curtis, 1838)

Figs 117.1-10.

Cynips crassicornis Curtis, 1838: 688; *Synergus evanescens* Mayr, 1872: 699 (female, male) (synonym in Quinlan & Fergusson, 1981: 253); *Synergus evanescens fidelis* Tavares, 1920b: 19-20 (synonym in Nieves-Aldrey & Pujade-Villar, 1985: 232); *Synergus carinulatus* Dettmer, 1924b: 148 (female, male) (synonym in Pujade-Villar et al., 2003: 158).

Description. Female. 1.4-3.6 mm. Head black, except red lower face, gena and frons. Mandibles, except black tip, palpi are red to yellow; antenna reddish brown. Mesosoma black, legs dark brown. Metasoma chestnut brown to very dark brown. Wing veins distinct, brown. Body with white setae, more dense on metanotum and propodeum. Head coriaceous, slightly transverse in front view, with sparse white setae, more dense on lower face; 1.6-1.8 times as broad as long from above; 1.1 times as broad as high and slightly broader than mesosoma. Gena coriaceous, not broadened behind eye, invisible in front view behind eye, converging ventrally. Malar space 0.45-0.6 times as long as height of eye, with striae radiating from clypeus and reaching eye. POL 1.5-1.7 times as long as OOL; OOL 1.5-1.6 times as long as diameter of lateral ocellus and 1.2 times as long as LOL. Transfacial distance nearly as long as height of eye; diameter of antennal torulus 2.0 times as large as distance between them and 1.6-1.8 times as long as distance between torulus and eye margin. Lower face, including median elevated area with striae radiating from ventral margin of clypeus and reaching eye and antennal sockets. Clypeus hardly separable from lower face, only anterior tentorial pits indicate its limits; epistomal sulcus and clypeo-pleurostomal line indistinct; clypeus ventrally nearly straigh, only very slightly rounded, without emargination and incision medially. Frons delicately coriaceous, with dense distinct deep punctures, lateral frontal carina weak, sometimes do not reach lateral ocellus; vertex, interocellar area and occiput coriaceous, with distinct punctures. Antennae 14-segmented, longer than head+mesosoma; pedicel subglobose, 1.3 times as long as broad; F1 2.4 times as long as pedicel and 1.6 times as long as F2; F2 nearly equal F3; F3 to F7 nearly equal in length, subseqeunt flagellomeres shorter; F12 1.9 times as long as F11; distal flagellomeres not broadened; placodeal sensilla distinctly visible on F5-F11. Mesosoma flattened dorso-ventrally, longer than high in lateral view, with white setae. Pronotum coriaceous, lateral pronotal carina strong, anterior corners of pronotum strongly angled. Scutum with sharp transverse striae, especially medially in between notauli, without or with very weak coriaceous sculpture in interspaces; nearly as broad as long (width measured across the basis of tegulae). Notauli weakly impressed posteriorly, very indistinct or absent anteriorly; median mesoscutal line present in a form of short triangle; parapsidal lines distinct, reaching slightly above the level of the base of tegulae; anterior parallel lines distinct but very short. Scutellum 1.6-1.8 times shorter than scutum, rounded, rugose. Scutelar foveae transversely ovate, much broader than high, well-delimited around, with smooth, shining deep bottom, without setae; separated by broad median coriaceous carina. Mesopleuron completely uniformly striate, ventrally with dense



Figs 117.1-10. *Synergus crassicornis*: 1-3, head, female: 1, front view, 2, frons, front view, 3, from above. 4-5, antenna, 4, female, 5, male. 6-10, female: 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part. 10, metasoma, lateral view.

white setae; mesopleural triangle uniformly coriaceous, with very dense setae. Metapleural sulcus reaching mesopleuron in upper 1/3 of its height; axillula ovate, shining, coriaceous, with piliferous points; subaxillular bar smooth, shining, in the most posterior end nearly as high as height of metanotal trough; metapleuron with dense white setae. Dorsellum uniformly coriaceous; metanotal trough very delicately coriaceous to alutaceous, with few white setae; ventral impressed area reaching scutellum, with distinct weak longitudinal wrinkles. Lateral propodeal carinae nearly straight, uniformly broad, without setae; central propodeal area delicately coriaceous, anterior half with setae; lateral propodeal area delicately uniformly coriaceous, with dense white setae. Forewing longer than body, margin with short cilia; radial cell closed along wing margin, 2.6 times as long as broad, areolet distinct, large; Rs+M distinct, extending to 2/3 of distance between areolet and M, projecting into middle of it. Tarsal claws with basal lobe. Metasoma nearly as long as head+mesosoma, longer than high in lateral view; metasomal tergites 3+4 with posterior band of punctures extending at least to 1/3 of tergites length, especially in ventro-lateral part; with few sparse short white setae antero-laterally; subsequent tergites and hypopygium also densely punctate. Male. 1.3-3.2 mm. Similar to female but antenna 15-segmented, slightly longer than body length, F1 of male expanded basally and apically and 1.8 times as long as F2; subsequent flagellomeres nearly of equal length, distal flagellomeres not broadened; placodeal sensilla visible on F5-F13.

Diagnosis. Belongs to the Section I of *Synergus*, *S. crassicornis*, *S. clandestinus* and *S. dacianus* (see also Diagnosis to *S. dacianus*) group of species, with a very short median mesoscutal line, which is extending for not more than 1/8 of the scutum length; with a black head. Most closely related to *S. clandestinus*, however, in *S. crassicornis* F1 of the male expanded basally and apically; scutellar foveae separated by a broad carina; notauli are weakly impressed posteriorly, very indistinct or absent anteriorly, while in *S. clandestinus* F1 of the male not expanded, slightly curved and with inner surface of curve flattened; scutellar foveae separated by a very narrow carina; notauli are much deeper posteriorly.

Distribution. Western Palaearctic Region. Known from ES (Pujade-Villar, 1992b) to GB (Askew, 1961). Known also from North Africa (Algeria, Dalla Torre & Kieffer, 1910) and Western Kazakhstan (Vyrzhikovskaya, 1954). In Ukraine – Transcarpathian lowland and vicinities of Kiev (Klavdievo, 4 specimens in the collection of SIZK).

Biology. In galls on evergreen oaks in the Iberian Peninsula and also in galls on deciduous *Quercus* species in the rest of Europe; reared from *Andricus* spp, *Callirhytis glandium* [a], and *Plagiotrochus* galls. Host plants: *Quercus petraea*, *Q. pubescens*, *Q. robur*, *Q. coccifera*, *Q. ilex*.

Synergus dacianus Kierych, 1985*

Synergus dacianus Kierych, 1985: 305 (female, male).

Description. Females and males are similar to *S. crassicornis* and *S. clandestinus* (see Diagnosis below).

Diagnosis. Belongs to the Section I of *Synergus* species-group with a very short median mesoscutal line which is extending for not more than 1/8 of the scutum length; with a black head. Most closely related to *S. crassicornis* and *S. clandestinus*, however, in *S. dacianus* the scutum is transversell rugose, not sharply carinate, with a distinct coriaceous sculpture between rugae; scutellar foveae posteriorly are weakly delimited, while in *S. crassicornis* and *S. cladestinus* the scutum is sharply carinate especially medially, without or with a very weak coriaceous sculpture in interspaces; scutellar foveae posteriorly sharply delimited.

Distribution. Central Europe, known only from AT, BG and RO (Kierych, 1985). Presumably occurs in the Transcarpathian Region of Ukraine.

Biology. Reared only from *Andricus multiplicatus* [b] on *Quercus cerris* (Kierych, 1985).

Synergus diaphanus Houard, 1911

Figs 118.1-10.

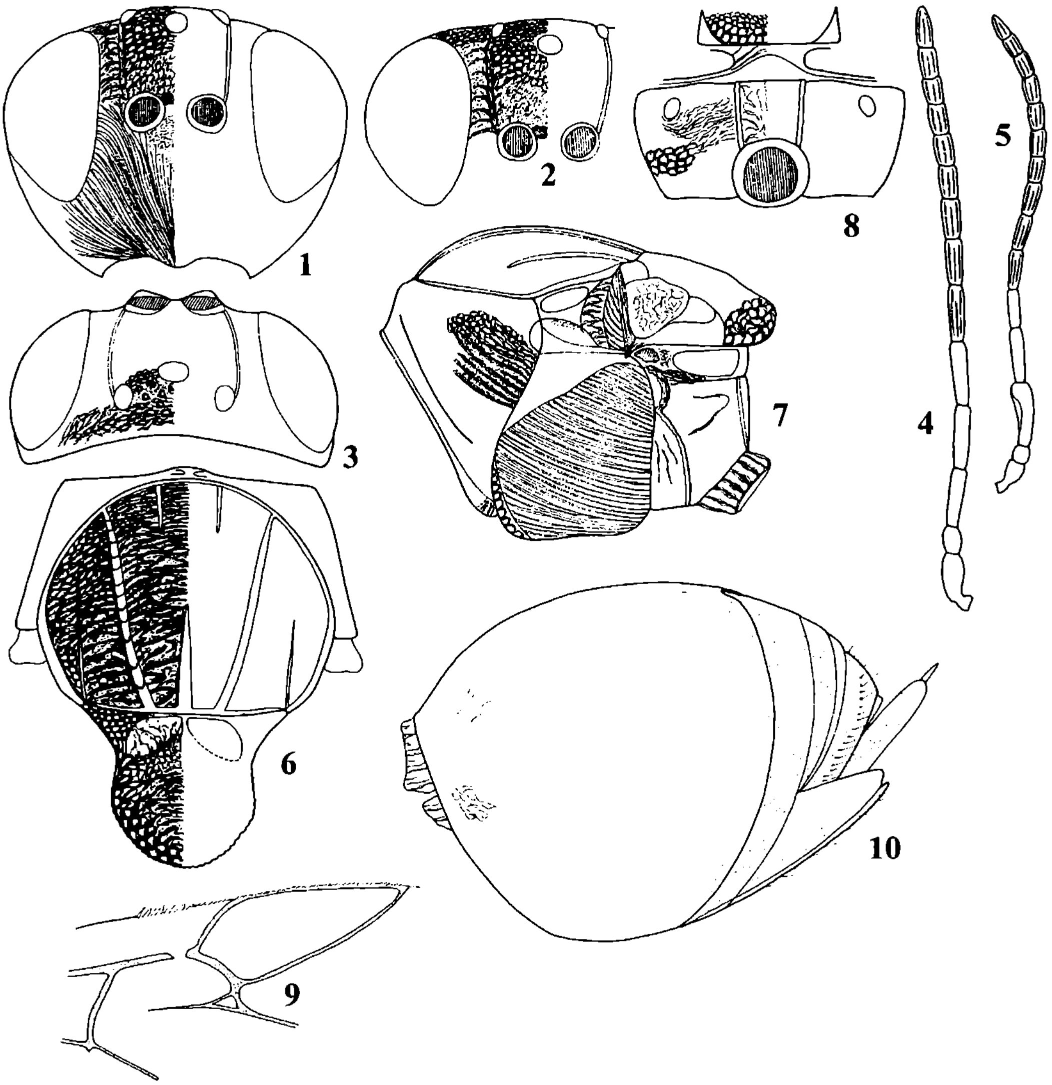
Synergus diaphanus Houard, 1911: 317-318 (female, male). This species was recovered from "oblivion" by Pujade-Villar & Ros-Farré, 1998b: 536.

Description. Female. 3.0-3.6 mm. Head uniformly black; mandibles and palpi yellowish brown to red brown; antenna red brown. Mesosoma black, legs light brown, except partially black coxae, femura much darker than tarsus. Metasoma dark chestnut brown. Compound eyes and ocelli always silvery. Wing veins pale brown. Body with sparse white setae. Head transverse in front view, with sparse white setae, more dense on lower face; 1.8-1.9 times as broad as long from above; 1.2-1.3 times as broad as high and slightly broader than mesosoma. Gena delicately coriaceous, not broadened behind eye, invisible in front view behind eye, converging ventrally. Malar space 0.5 times as long as height of eye, with delicate striae radiating from clypeus and reaching eye. POL 2.0-2.2 times as long as OOL; OOL slightly longer than diameter of lateral ocellus and nearly equal LOL. Transfacial distance 0.8-0.9 times as long as height of eye; diameter of antennal torulus 1.8 times as large as distance between them and slightly longer than distance between torulus and eye margin. Inner margins of eyes parallel, slightly diverging in the ventral 1/4. Lower face with delicate striae radiating from ventral margin of clypeus; median elevated area with delicate striae in the lower half, not reaching antennal sockets; upper half of elevated median area delicately coriaceous. Clypeus striate, hardly separable from lower face, its limits indicated by indistinct anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line indistinct, ventrally nearly straight. Frons coriaceous above antennal sockets and rugose in the upper half, with some indistinct punctures below ocelli, lateral frontal carinae distinct, strongly raised and reaching lateral ocelli. Vertex and occiput finely rugose, with distinct deep punctures. Antennae 14-segmented, longer than head+mesosoma; pedicel subglobose, slightly longer than broad; F1 2.0 times as long as pedicel and slightly shorter than F2; F2 slightly longer than F3; subsequent flagellomeres shorter than F3; distal flagellomeres not broadened; placodeal sensilla distinctly visible on F4-F12. Mesosoma flattened dorso-ventrally, longer than high in lateral view, with white setae. Pronotum coriaceous, with some delicate wrinkles along mesopleural triangle; lateral pronotal carina strong, lateral corners of pronotum strongly angled in dorsal view. Scutum with strong interrupted transverse rugae, distance between rugae larger than width of rugae; intespaces between rugae coriaceous; broader than long (width measured across the basis of tegulae). Notauli complete, broad, deeply impressed, with some transverse rugae on bottom; median mesoscutal line extending to half or more length of scutum; parapsidal lines distinct, reaching slightly above the level of the base of tegulae; anterior parallel lines distinct, extending to 1/4 of scutum length. Scutellum 1.5 times shorter than scutum, slightly longer than broad, broadest part in posterior 1/3; dull rugose laterally and posteriorly, with more delicate sculpture towards center of scutellar disk; slightly overhanging metanotum. Scutellar foveae transversely ovate, slightly broader than high, well-delimited around, deep, with some wrinkles on the bottom, without setae; separated by distinct, narrow coriaceous central carina. Mesopleuron completely uniformly striate, striae not interrupted, interspaces between striae shining, smooth; mesopleural triangle smooth or alutaceous, with few sparse setae. Metapleural sulcus reaching mesopleuron in upper 1/3 of its height; axillula ovate, shining, smooth, with few setae; subaxillular bar smooth, shining, in the most posterior end slightly higher than height of metanotal trough; propodeal spiracle strongly elevated, ovate; ventral bar of metanotal trough coriaceous, nearly 3.0 times narrower than height of metanotal trough measuring above propodeal spiracle. Dorsellum with some delicate wrinkles, smooth, shining, less than 2.0 times as short as height of ventral impressed area; metanotal trough smooth, shining, with few white setae; ventral impressed area shining, smooth, without wrinkles. Lateral propodeal carinae straight, uniformly broad, without setae; central propodeal area delicately coriaceous, without setae; lateral propodeal area delicately coriaceous between lateral propodeal carina and spiracle, however, dull rugose around and below spiracle and laterally from spiracle, with relatively dense white setae. Forewing longer than body, margin with relatively short cilia; radial cell closed, 2.5-2.7 times as long as broad, areolet distinct, small; Rs+M distinct, extending to 2/3 of distance between areolet and basalis, projecting into middle of it. Metasoma longer than head+mesosoma, 1.5 times as long as high in lateral view; fused tergites 3 and 4 with wide band of punctures extedning to half of fused tergites length, with few short white setae antero-laterally; subsequent tergites with dense punctures, hypopygium with sparse punctures only; prominent part of ventral spine of hypopygium very short. Male. 2.5-3.0 mm. Similar to female but antenna 15-segmented, pedicel globose; F1 slightly curved and only slightly expanded apically and 1.6 times as long as F2; F3 shorter than F2 and subseqeunt flagellomeres nearyl equal in length to F3; placodeal sensilla on F3-F13.

Diagnosis. Belongs to the Section I of *Synergus*, particularly to a group of species with the medial mesoscutal line extending for at least to the half length of the scutum; the radial cell 2.5-3.0 times as long as broad and F1 of the male strongly expanded apically. Most closely related to *S. umbraculus* and *S. pallidipennis* (see Diagnosis to *S. umbraculus* and *S. pallidipennis*) and the Iberian species, *S. ibericus* Tavares, 1920. In *S. diaphanus* the radial cell 2.5-2.7 times as long as broad, Rs slightly curved, wing veins are pale; antennae brown; last flagellomeres 1.5 times as long as broad; frons and vertex with weak sculpture and the face is black, while in *S. ibericus* the radial cell 3.0 times as long as broad, Rs straight, wing veins are pale; antennae pale orange, last flagellomeres almost 2.0 times as long as broad; frons and vertex coarsely rugoso-punctate.

Distribution. Central Europe, known from AT (Houard, 1911; Pujade-Villar & Ros-Farré, 1998b) and HU (Pujade-Villar et al., 2003). In Ukraine – Transcarpathian lowland oak forests only, reared from *A. conificus* and *A. infectorius* by the author.

Biology. Species closely related to *S. ibericus* (Pujade-Villar & Ros-Farré, 1998b); the only oak cynipid galls which from was reared are *Andricus infectorius* and *A. conificus*. Host plants: *Quercus petraea* and *Q. robur*.



Figs 118.1-10. *Synergus diaphanus*: 1-3, head, female: 1, front view, 2, frons, front view, 3, from above. 4-5, antenna, 4, female, 5, male. 6-10, female: 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part. 10, metasoma, lateral view.

Synergus flavipes Hartig, 1843

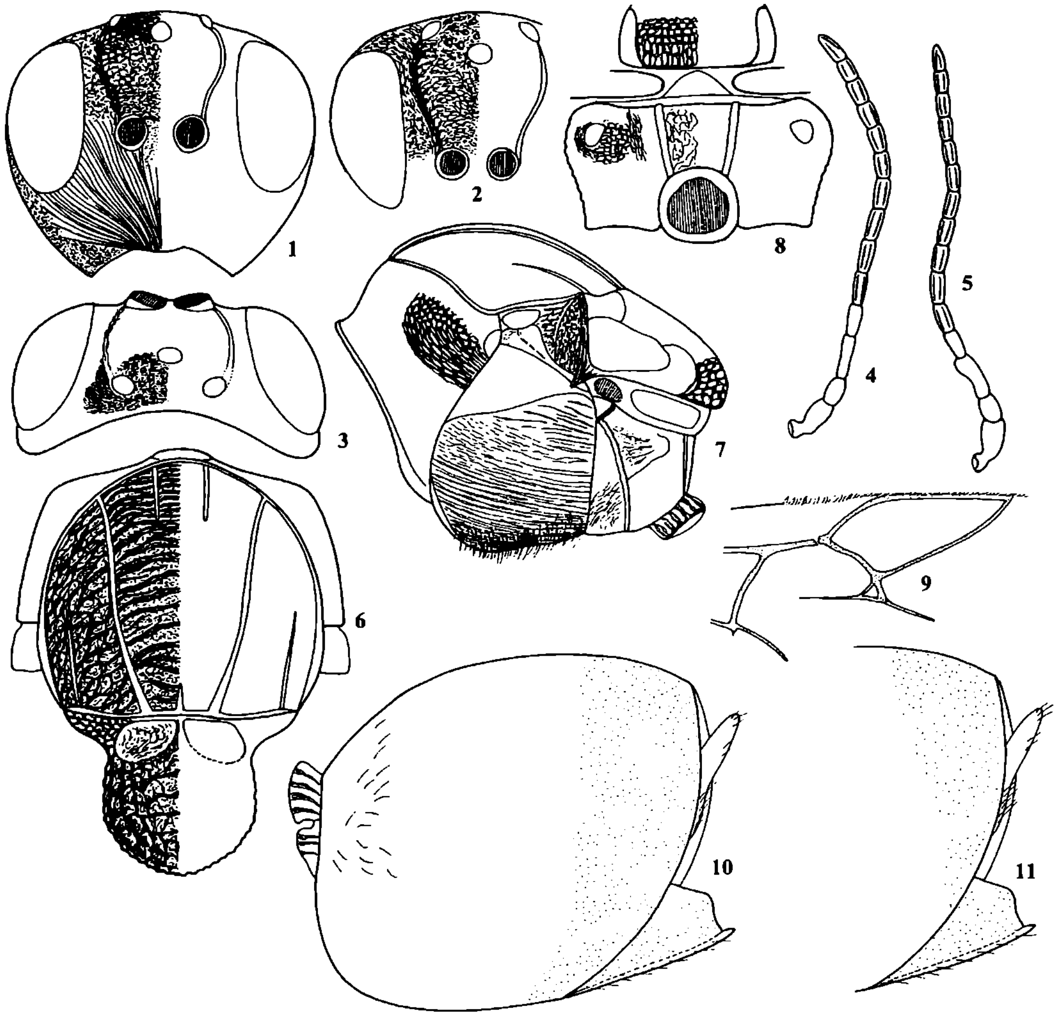
Figs 119.1-11.

Synergus flavipes Hartig, 1843: 413 (female, male).

Description. Female. 2.0-2.6 mm. Head usually posteriorly, vertex and interocellar area dark brown, frons lighter, lower face, gena light brown to orange brown; mandibles, except black tips, palpi yellowish brown; antenna red to yellow brown. Scutum, scutellum, propodeum, metapleuron and nucha usually black or very dark brown; pronotum usually light brown, mesopleuron slightly darker. Legs yellow, except dark brown hind coxae. Metasoma red brown. Wing veins distinct, brown. Body with sparse white setae. Head slightly transverse in front view, with sparse white setae, more dense on lower face; 1.9-2.0 times as broad as long from above; 1.1 times as broad as high and slightly broader than mesosoma. Gena delicately coriaceous, not broadened behind eye, invisible in front view behind eye. Malar space delicately coriaceous, 0.6 times as long as height of eye, with delicate striae radiating from clypeus and reaching eye. POL 1.9 times as long as OOL; OOL 1.6-1.8 times as long as diameter of lateral ocellus and nearly equal LOL, ocelli large. Transfacial distance nearly equal to height of eye; diameter of antennal torulus slightly larger than distance between them and distance between torulus and eye margin. Lower face and median elevated area uniformly with striae, radiating from ventral margin of clypeus and reaching eye and antennal sockets. Clypeus hardly separable from lower face, its limits indicated by very indistinct anterior tentorial pits; epistomal sulcus and clypeo-pleurostomal line indistinct; ventrally clypeus straight. Frons, especially upper half in front of central ocellus, with scattered and shallow punctures; lateral frontal carinae weak, usually incomplete and indistinct near lateral ocelli. Vertex, inteocellar area and occiput delicately coriaceous, with more distinct punctures than on frons. Antennae 14-segmented, longer than head+mesosoma; pedicel subglobose, slightly longer than broad; F1 only 1.5 times as long as pedicel and slightly longer than F2; F2=F3, subsequent flagellomeres slightly shorter; placodeal sensilla distinctly visible on F3-F11. Mesosoma flattened dorso-ventrally, slightly longer than high in lateral view, with white setae. Pronotum coriaceous; lateral pronotal carina absent or very weak, indistinct and short; corners of pronotum slightly rounded and not angled in dorsal view. Scutum with complete transverse rugae, especially between notauli; distance between them 2.0 times or more than width of rugae; interspaces coriaceous, shining; slightly longer than broad (width measured across the basis of tegulae). Notauli complete, although sometimes weakly impressed, with smooth, shining bottom; median mesoscutal line in a form of a short triangle, extending for not more than 1/8 of length of scutum; parapsidal lines distinct, reaching slightly above the level of the base of tegulae; anterior parallel lines distinct, extending to 1/5 of scutum length. Scutellum rounded, dull rugose, with more delicate sculpture behind and in between scutellar foveae; distinctly overhanging metanotum. Scutelar foveae transversely ovate, broader than high, well-delimited around, with mat, delicately coriaceous bottom, without setae; separated by distinct, narrow coriaceous central carina. Mesopleuron completely striate, striae longer and uniform in ventral half, more interrupted and irregular in upper half; mesopleural triangle alutaceous to smooth, with few seate. Metapleural sulcus reaching mesopleuron in upper 1/4 of its height; axillula elongated, shining, coriaceous, with piliferous points; subaxillular bar smooth, shining, in the most posterior end nearly 2.0 times as high as height of metanotal trough. Dorsellum uniformly coriaceous, very short medially; metanotal trough smooth, with few short, white setae; ventral impressed area shining, without wrinkles. Lateral propodeal carinae nearly straight, uniformly broad, without setae; central propodeal area with very weak delicate wrinkles, shining, without setae; lateral propodeal area delicately coriaceous, with more dull sculpture around spiracle, with few setae. Forewing longer than body, with distinct brown veins, margin with relatively long cilia; radial cell closed, 2.6-3.0 times as long as broad, Rs slightly curved, areolet very small, sometimes indistinct; Rs+M extending to 1/3—1/2 of distance between areolet and M, projecting into lower half of it. Metasoma nearly as long as head+mesosoma, only very slightly longer than high in lateral view; apical punctures of fused tergites 2+3 extending dorsally to 1/3-1/4 length of tergites and much less ventrally, with few short white setae antero-laterally; subsequent tergites and hypopygium with punctures; prominent part of ventral spine of hypopygium very short. Male. 1.3-2.7 mm. Similar to female but antenna 15-segmented, F1 slightly curved and swollened apically and 1.6 times as long as F2; subsequent flagellomeres nearly of equal length, distal flagellomeres not broadened; placodeal sensilla on F3-F13.

Diagnosis. Most closely related to the Mediterranean *S. ilicinus* (Barbotin, 1972). In *S. flavipes* the pronotum and mesopleuron usually are yellow to red; the metasoma is shorter than head+mesosoma; fused tergites 2+3 not excised dorso-apically; wing veins are pale, the radial cell 2.6-3.0 times as long as broad; the areolet inconspicuous, while in *S. ilicinus* the pronotum is black; the metasoma as long as head+mesosoma; fused tergites 2+3 excised dorso-apically; forewing veins are yellow-brown, the radial cell 2.5 times as long as broad; the areolet present.

Differs from all other species of the Section I *Synergus* species group also by the absence or a very indistinct and short weak lateral pronotal carina.



Figs 119.1-11. *Synergus flavipes*: 1-3, head, female: 1, front view, 2, frons, front view, 3, from above. 4-5, antenna, 4, female, 5, male. 6-11, female: 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part. 10-11, metasoma, lateral view (width of posteriot band of punctures is showed).

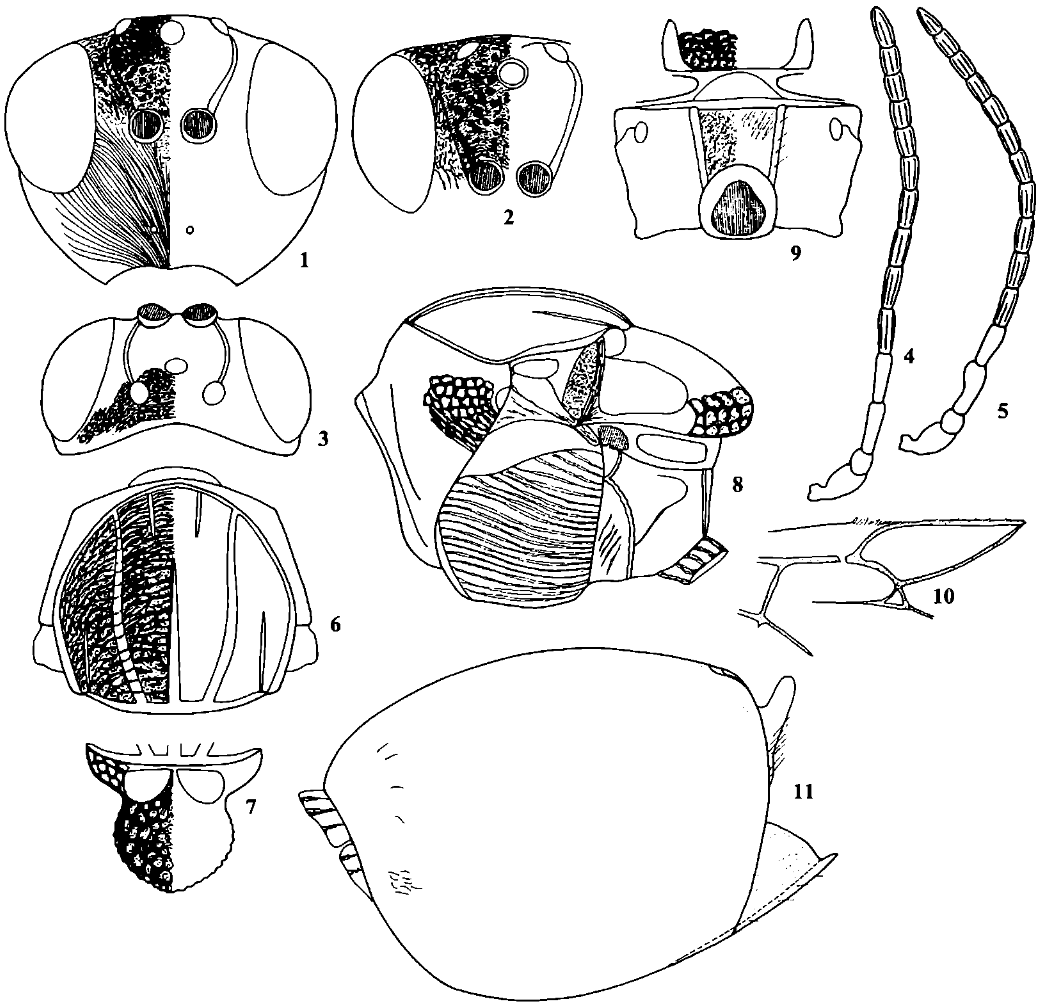
Distribution. Central Europe, known only from AT (Mayr, 1872) and HU (Pujade-Villar et al., 2003). In Ukraine – Transcarpathian Region only (Kosino, Julijivski Hory, Rafajlovo, author).

Biology. Reared from galls of *Aphelonyx cerricola* [a], *Dryocosmus nitidus* (Giraud) [a], *Neuroterus saliens* [a, b] and *Pseudoneuroterus macropterus* [a]. Host plant: *Quercus cerris.*

Synergus gallaepomiformis (Boyer de Fonscolombe, 1832)

Figs 120.1-11.

Diplolepis gallae-pomiformis Boyer de Fonscolombe, 1832: 195; *Synergus facialis* Hartig, 1840: 199 (female, male); *Synergus vulgaris* Hartig, 1840: 198 (female, male) (synonym in Ross, 1951: 88); *Synergus basalis* Hartig, 1840: 198 (female) (synonym in Pujade-Villar et al., 2003: 157); *Synergus palliceps* Hartig, 1841: 349 (synonym in Pujade-Villar et al., 2003: 159); *Synergus bispinus* Hartig, 1841: 347; *Synergus australis* Hartig, 1843: 414 (synonyms in Pujade-Villar et al., 2003: 157); *Aulax albinervis* Snellen van Vollenhoven, 1869: 126; *Synergus pomiformis* Kieffer, 1898: 264 (synonym in Dalla Torre & Kieffer, 1910: 621); *Synergus pomiformis* var. *minima* Kieffer, 1899: 358 (female, male) (synonym in Tavares, 1920b); *Synergus gallae-pomiformis gallae-pomiformis* Dalla Torre & Kieffer, 1910: 621 (synonym in Tavares, 1920b); *Synergus gallae-pomiformis gallicus* Dalla Torre & Kieffer, 1910: 622 (synonym in Tavares, 1920b); *Synergus gallae-pomiformis minimus* Dalla Torre & Kieffer, 1910: 622 (synonym in Tavares, 1920b); *Synergus maculatus* Tavares, 1920b: 47-49 (synonym in Nieves-Aldrey & Pujade-Villar, 1986: 149); *Synergus maculosus* Tavares, 1925: 97 (new name for *Synergus maculatus* Tavares, synonym in Pujade-Villar et al., 2003: 148); *Synergus longiventris* Giraud in Houard, 1911:318-319 (synonym in Pujade-Villar & Ros-Farré, 1998b: 535); *Synergus faciatus albifaciatus* Dettmer, 1924b: 148; *Synergus albifasciatus* Dettmer, 1924 (emendation for *Synergus faciatus albifaciatus* Dettmer, 1924b: 148) (synonym in Pujade-Villar et al., 2003: 149).



Figs 120.1-11. *Synergus gallaepomiformis*: 1-3, head, female: 1, front view, 2, frons, front view, 3, from above. 4-5, antenna, 4, female, 5, male. 6-11, female: 6, scutum, dorsal view, 7, scutellum, dorsal view, 8, mesosoma, lateral view, 9, propodeum and dorsellum, dorso-posterior view, 10, forewing, part. 11, metasoma, lateral view.

Description. Female. 1.7-3.4 mm. Head black, except lower face which usually yellow to orange red or red; mesosoma black, antenna and legs entirely yellow or yellow-red. Metasoma black dorsally and brown laterally. Wing veins distinct, brown. Body with sparse white setae.

Usually specimens emerging in spring, summer and autumn from first year galls have face yellow-red to red, antenna and legs yellow to orange; specimens emerging in spring from asexual galls of previous year are darker, face black, antenna and legs dark. Head coriaceous, slightly transverse in front view, with sparse white setae; 1.7-1.9 times as broad as long from above; 1.2 times as broad as high in front view. Gena delicately coriaceous, not broadened behind eye. Malar space 0.6 times as long as height of eye, with delicate striae radiating from clypeus and reaching eye. POL 1.9 times as long as OOL; OOL nearly equal to diameter of lateral ocellus and LOL. Transfacial distance nearly equal to height of eye; diameter of antennal torulus 2.0 times as large as distance between them and slightly longer than distance between torulus and eye margin. Inner margins of eyes parallel, slightly converging outwards in the most ventral part. Lower face with median elevated area uniformly coriaceous. Clypeus striate, hardly separable from lower face, only distinct large anterior tentorial pits indicate its limits; epistomal sulcus and clypeo-pleurostomal line indistinct; ventrally straight. Frons coriaceous, with distinct deep punctures, lateral frontal carina distinct, reaching lateral ocelli; vertex, interocellar area and occiput conspicuously punctate and rugulose. Antennae 14-segmented, longer than head+mesosoma; pedicel as broad as long; F1 2.1 times as long as pedicel and slightly longer or equal F2; F2 equal F3; distal flagellomeres not or only very indistinctly broadened; placodeal sensilla on F3-F13. Mesosoma flattened dorso-ventrally, slightly longer than high in lateral view, with white setae. Pronotum coriaceous; lateral pronotal carina strong, distinct; lateral corners of pronotum strongly angled in dorsal view. Scutum coriaceous or with weak and not interrupted transverse rugae, slightly broader than long (width measured across the basis of tegulae). Notauli complete, bottom with rugae; median mesoscutal line extending for at least 3/4 length of scutum, broad posteriorly; parapsidal lines distinct, reaching the level of the base of tegulae; anterior parallel lines distinct, broad, short. Scutellum rounded, uniformly dull rugose; slightly overhanging metanotum; scutelar foveae ovate, slightly broader than high, well-delimited around, with smooth, shining deep bottom, without setae; separated by distinct, narrow coriaceous central carina. Mesopleuron completely striate, distance between striae at least equal to width of ruga; intespaces shining, smooth; mesopleural triangle uniformly delicately coriaceous, with longitudinal wrinkles, few setae. Metapleural sulcus reaching mesopleuron in upper 1/3 of its height; axillula elongated, shining, coriaceous, with few white setae; subaxillular bar smooth, shining, in the most posterior end slightly higher than height of metanotal trough. Dorsellum uniformly coriaceous, very short medially; nearly 4.0-5.0 times as short as height of ventral impressed area; metanotal trough smooth or alutaceous, with few white setae; ventral impressed area shining, smooth, without wrinkles. Lateral propodeal carinae straight, uniformly broad, with setae; central propodeal area delicately coriaceous, with dense setae in anterior half; lateral propodeal area delicately uniformly coriaceous, with relatively dense white setae. Forewing longer than body, margin with long cilia; radial cell 2.8-3.0 times as long as broad, areolet large, always distinct; Rs+M distinct, extending to 2/3 of distance between areolet and M, projecting into middle of it. Metasoma longer than head+mesosoma, longer than high in lateral view; fused tergites 2+3 posteriorly with small dorsal patch of punctures; hypopygium densely punctate; prominent part of ventral spine of hypopygium very short, with few short setae. Male. 1.3-2.5 mm. Similar to female but antenna 15-segmented, F1 weakly excavated, flattened basally and strongly or moderately expanded apically and 2.2-2.3 times as long as F2; F2 to F5 2.0-3.0 times as long as broad;subsequent flagellomeres nearly of equal length, distal flagellomeres not broadened; placodeal sensilla on F3-F13.

Diagnosis. Belongs to the Section II of *Synergus*, to a group of species which in the scutum is coriaceous or with weak and not interrupted transverse rugae; the frons also coriaceous, with some shallow punctures, the vertex conspicuously punctate or punctate and rugulose; the median mesoscutal line extending for at least 3/4 length of the scutum, broad posteriorly; the face usually yellow to orange red or red; antennae and legs entirely yellow or yellow-red. The two most closely related species are *S. thaumacerus* and *S. physocerus*, however, in *S. gallaepomiformis* F1 of males weakly excavated, flattened basally and moderately expanded apically, F2 to F5 2.0-3.0 times as long as broad; F1 of femalse not more than 1.5 times as long as F2, while in *S. thaumacerus* and *S. physocerus* F1 of males strongly inflated distally and rounded, remaining flagellomeres short, usually not more than 1.5-2.0 times as long as broad; F1 of female more than 1.5 times as long as F2.

Taxonomic comments. Recent examination of Boyer de Fonscolombe's types of *Diplolepis gallaepomiformis* which are deposited in the Genève Museum of Natural History (Switzerland), showed that they belong to the genus *Saphonecrus* and a new combination, *Saphonecrus gallaepomiformis* was proposed (Pujade-Villar, 2005). Moreover, morphologically and biologically it is identical with *Saphonecrus lusitanicus* (Tavares, 1902b); and thus *Saphonecrus lusitanicus* (Tavares, 1902b) was synonymized to *Saphonecrus gallaepomiformis,* which according to the rules of ICZN, must be considered as a new valid name for the well-established *Saphonecrus lusitanicus* name (Pujade-Villar, 2005). *Synergus facialis* Hartig, 1840 [= *S. vulgaris* Hartig, 1840 (part) = *S. basalis* Hartig, 1840] as the valid species name was established for the denomination of "*Synergus gallaepomiformis*" specimens (Pujade-Villar, 2005). "*Synergus gallaepomiformis*" is a very well-established name and its changing might cause confusions and thus, here we prefer to leave this name unchanged and use "*Synergus gallaepomiformis*" for the denomination of this species.

Distribution. One of the most common and abundant *Synergus* species in the Western Palaearctic Region (throughout Europe, Iran and North Africa). Known also from Far East of Russia (Kovalev, 1965), and Western Kazakhstan (Vyrzhikovskaya, 1954). In Ukraine – common and abundant everywhere (about 150 specimens were examined in the collection in SIZK).

Biology. Reared from galls of 44 *Andricus* species, *Biorhiza pallida* [b], *Callirhytis glandium*, *Dryocosmus nitidus* [a], 6 *Cynips* species, 8 *Neuroterus* species and *Trigonaspis* galls. Host plants: *Quercus cerris*, *Q. faginea*, *Q. petraea*, *Q. pubescens*, *Q. pyrenaica*, *Q. robur*. This species can develop as a non-lethal inquiline, inducing secondary larval chambers in the outer parenchyma of large host galls such as the sexual generation of *B. pallida*. It can also develop as a lethal inquiline in the host larval chambers of smaller galls. For example, when *S. gallaepomiformis* attacks the sexual generation galls of *Trigonaspis* species, the entire host larval cell is replaced by up to 12 inquiline larval cells.

Synergus hayneanus (Ratzeburg, 1833)

Figs 121.1-10.

Cynips hayneanus Ratzeburg, 1833: 154 (female, male); *Synergus Hayneanus*: Hartig, 1841: 347 (female, male); *Synergus rugulosus* Hartig, 1841: 348(female); *Synergus scaber* Hartig, 1856: 375 (female, male) (synonym in Pujade-Villar & Bellido, 2000: 260); *Synergus evanescens tudensis* Tavares, 1920b: 20 (synonym in Nieves-Aldrey & Pujade-Villar, 1985: 227); *Synergus carinatus* Vassileva-Samnalieva, 1985b: 66 (female, male) (synonym of *S. vassilevaensis* Pujade-Villar & Melika, 2003: 164), **syn. n.**

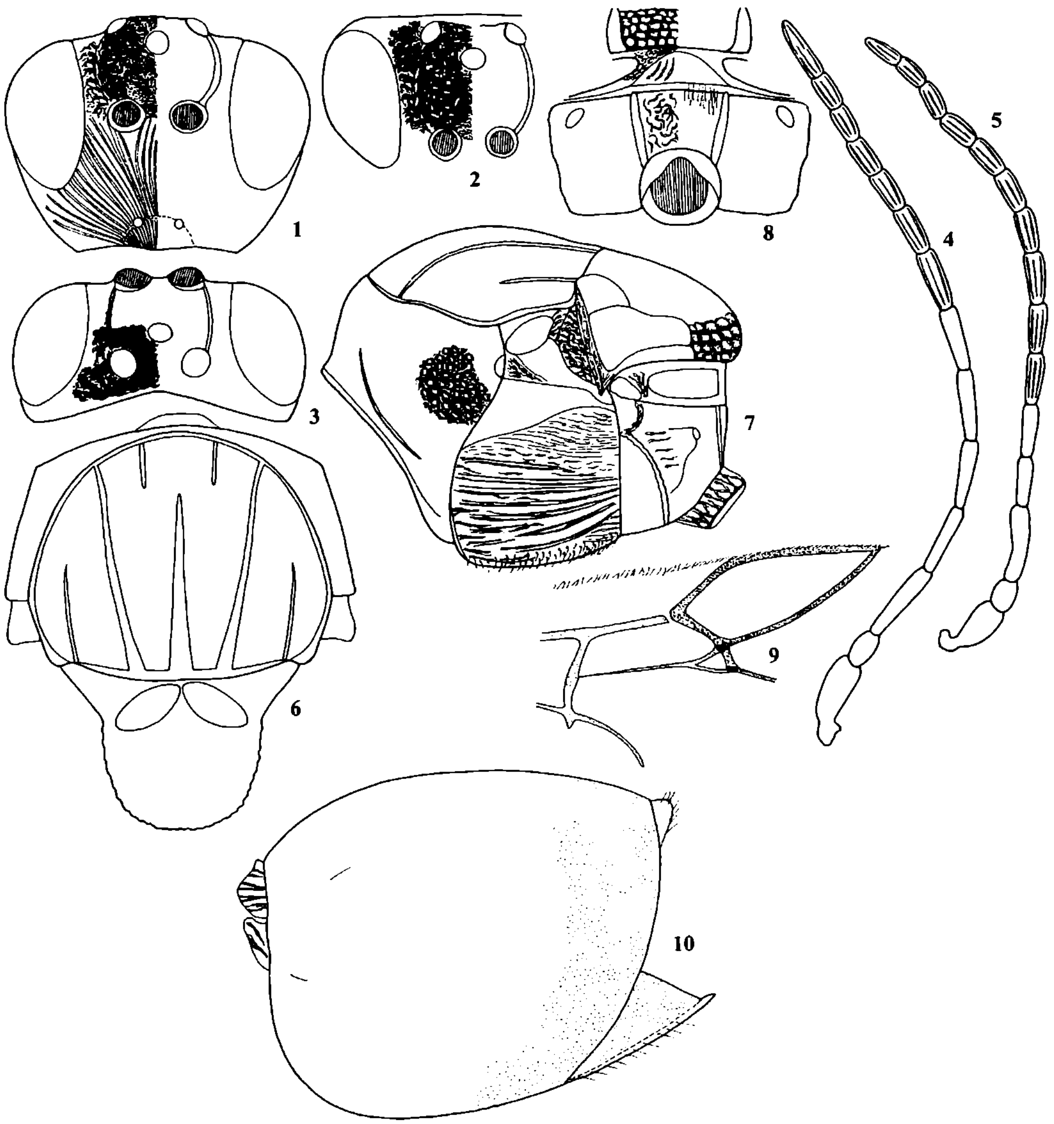
Description. Female. 2.8-3.8 mm. Head black, antenna dirty dark brown. Mesosoma black, legs dark brown, coxae and femura partially black. Metasoma dark brown, darker dorsally, lighter ventrally, hypopygium always lighter. Wing veins distinct, brown. Body with sparse white setae. Head slightly transverse in front view, with sparse white setae, which more dense on lower face; 1.8-1.9 times as broad as long from above; 1.2-1.3 times as broad as high and slightly broader than mesosoma. Gena delicately coriaceous, not broadened behind eye, converging ventrally. Malar space with strong striae radiating from clypeus and reaching eye, 0.5 times as long as height of eye. POL 1.8-1.9 times as long as OOL; OOL slightly shorter than diameter of lateral ocellus and equal LOL. Transfacial distance slightly shorter than height of eye; diameter of antennal torulus 1.6-1.8 times as large as distance between them and distance between torulus and eye margin. Lower face including median elevated area with striae radiating from ventral margin of clypeus and reaching eye and antennal sockets, median carina strong but not raised above striae from lateral view. Clypeus hardly separable from lower face, its limits indicated by anterior tentorial pits, and indistinct epistomal sulcus and clypeo-pleurostomal line; ventrally clypeus straight. Frons dull coriaceous, with strong deep punctures, lateral frontal carina distinct, strongly raised and reaching lateral ocelli; vertex, interocellar area and occiput uniformly coriaceous, with distinct deep punctures. Antennae 14-segmented, longer than head+mesosoma; pedicel subglobose, slightly longer than broad; F1 2.0 times as long as pedicel and 1.2 times as long as F2; F2 slightly longer than F3; F3–F6 nearly equal in length, subseqeunt flagellomeres slightly shorter; F12 1.9 times as long as F11; distal flagellomeres not broadened; placodeal sensilla distinctly visible on F5-F11. Mesosoma flattened dorso-ventrally, longer than high in lateral view, with white setae. Pronotum coriaceous; lateral pronotal carina strong, lateral corners of pronotum strongly angled in dorsal view. Scutum with strong raised transverse carinae; interspaces usually broader than striae, shining, smooth. Notauli complete, with smooth, shining bottom; median mesoscutal line extending to 2/3 or more of scutum length; parapsidal lines distinct, reaching slightly above the level of the base of tegulae; anterior parallel lines distinct, but very short. Scutellum rounded, dull rugose, slightly overhanging metanotum. Scutelar foveae transversely ovate, at least 2.0 times as broad as high, indistinctly delimited around, with coriaceous, mat bottom, without setae; separated by a very narrow central carina; anteriorly nearly reaching one another. Mesopleuron completely striate, striae in ventral half much stronger than in upper half, ventrally with dense white setae; mesopleural triangle smooth, mat, with few setae. Metapleural sulcus reaching mesopleuron in upper 1/3 of its height; axillula elongated, shining, with piliferous points; subaxillular bar smooth, shining, in the most posterior end nearly 2.0 times narrower than height of metanotal trough. Dorsellum uniformly delicately coriaceous, very narrow medially; nearly 5.0-6.0 times as short as height of ventral impressed area; metanotal trough smooth, with few white setae; ventral impressed area of dorsellum shining, with distinct irregular longitudinal wrinkles. Lateral propodeal carinae nearly straight, without setae, uniformly broad and slightly converging posteriorly; central propodeal area coriaceous, with irregullar dense wrinkles, with setae in the anterior 1/3; lateral propodeal area delicately uniformly coriaceous, with relatively dense white setae. Forewing margin with relatively long cilia; radial cell closed and short, 2.2-2.5 times as long as broad; Rs fairly strongly curved; areolet distinct; Rs+M distinct, reaching basalis (in some specimens slightly shorter), projecting into middle of it. Metasoma longer than head+mesosoma, much longer than high in lateral view; apical band of punctures extending to 1/3 or less length of fused tergites 2+3; subsequent tergites and hypopygium punctate; prominent part of ventral spine of hypopygium short, usually 2.0 times as long as broad. Male. 2.7-3.0 mm. Similar to female but face yellow-red, antenna 15-segmented, F1 expanded basally and more apically and slightly longer than F2; placodeal sensilla distinct on F4-F12.

Diagnosis. See Diagnosis to *S. reinhardi* and *S. ruficornis*.

Taxonomic comments. *Synergus carinatus* described by Vassileva-Samnalieva (1985b) from Bulgaria was reared from galls of *Andricus lignicolus* and *A. mitratus*. The name "*carinatus*" was preoccupied by *Synergus carinatus* Hartig, 1841. For this reason it was renamed to *S. vassilevaensis* and placed in between species with uncertain status, because the types were not revised (Pujade-Villar et al., 2003). Recently the type series of *S. carinatus* (2 females with red label "tipus", 1 male with red label "tipus", 1 female with red label "paratipus" and 4 females and 1 male from the same series, without red "tipus" label) were loaned from the Department of Biology, University of Plovdiv, Bulgaria. After the examination of the types, we concluded, that *S. carinatus* is a synonym of *S. hayneanus*.

Distribution. Western Palaearctic Region. Known from many European countries and also from DZ (Dalla Torre & Kieffer, 1910). In Ukraine – Transcarpathian Region only, large series were reared from *Andricus conglomeratus* galls by the author.

Biology. Usually attacks large, lignified asexual galls of *Andricus* species. Host plants: *Quercus canariensis, Q. faginea, Q. petraea, Q. pubescens, Q. pyrenaica, Q. robur. Synergus hayneanus* is a typical lethal inquiline, and is also a common inquiline in the asexual galls of *A. kollari*. As many as 12 larvae can be found inside the gall inducer's larval chamber, separated from each other by thin, translucent membranes. The inquiline cells have a hexagonal shape and are closely packed, occupying the entire host larval chamber. The central chamber is often substantially enlarged relative to that usually occupied by the gall inducer.



Figs 121.1-10. *Synergus hayneanus*: 1-3, head, female: 1, front view, 2, frons, front view, 3, from above. 4-5, antenna, 4, female, 5, male. 6-10, female: 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part. 10, metasoma, lateral view.

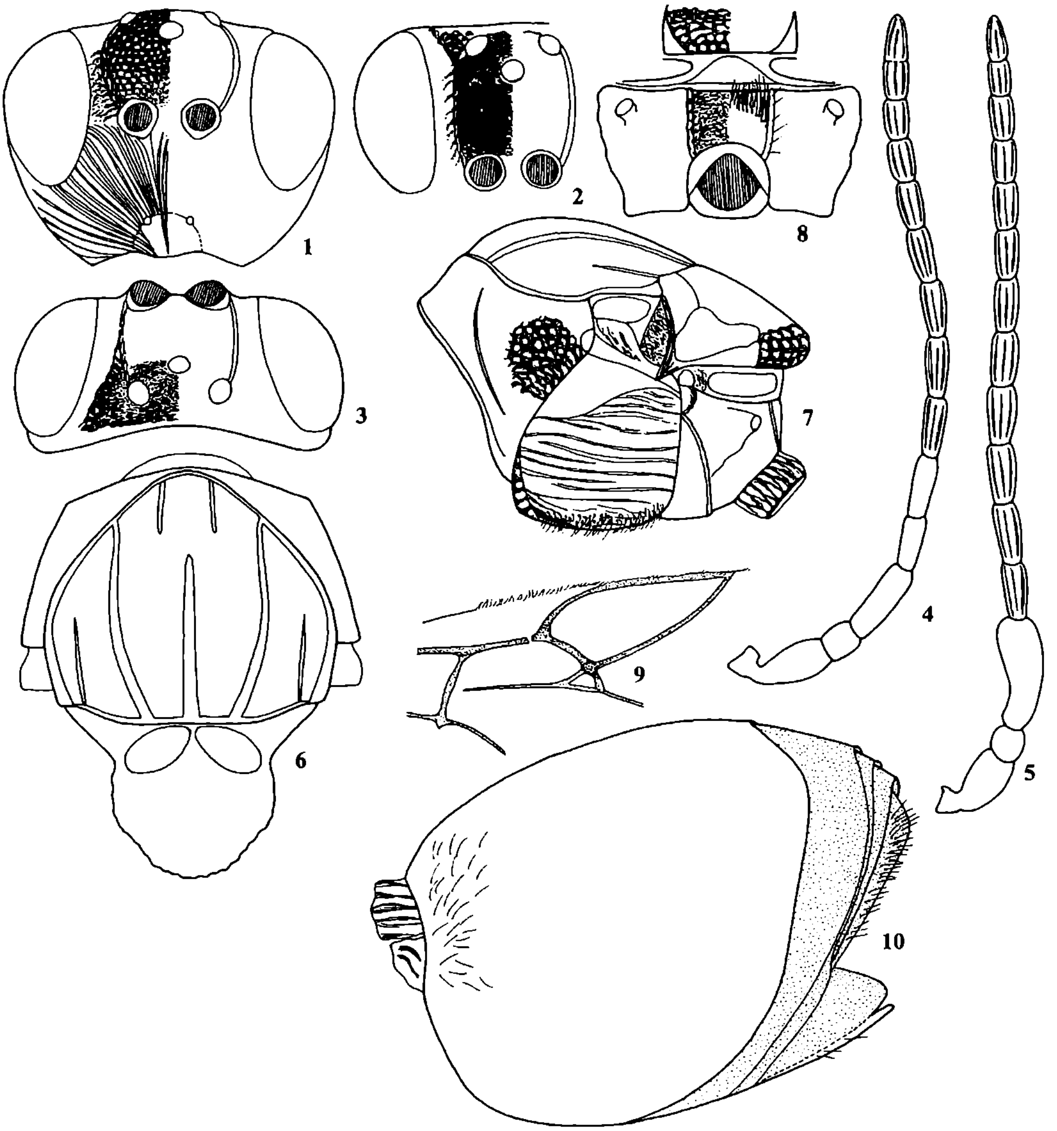
Synergus incrassatus Hartig, 1840

Figs 122.1-10.

Synergus incrassatus Hartig, 1840: 199 (male); *Synergus bipunctatus* Hartig, 1841: 347 (female) (synonym in Pujade-Villar et al., 2003: 149); *Synergus crassicornis* Hartig, 1843: 414 (male) (non *S. crassicornis* Curtis, 1838) (synonym in Pujade-Villar et al., 2003: 149).

Description. Female. 2.5-3.9 mm. Head black, sometimes lower face, frons along eye margins and gena brown; basal half of mandibles yellow, anterior part dark brown with black tips; palpi yellow; antenna yellow to dirty light brown. Mesosoma black, legs yellow, with slightly darker coxae. Metasoma red, dorsally always darker. Wing veins distinct, brown. Body with sparse white setae. Head coriaceous, transverse in front view, with sparse white setae, more dense on lower face; 1.9-2.1 times as broad as long from above; 1.3 times as broad as high and slightly broader than mesosoma. Gena coriaceous, not broadened behind eye, converging ventrally. Malar space 0.6-0.7 times as long as height of eye, with delicate striae radiating from clypeus and reaching eye. POL 1.4-1.6 times as long as OOL; OOL 1.6 times as long as diameter of lateral ocellus and 1.6 times as long as LOL. Transfacial distance equal to height of eye; diameter of antennal torulus 1.8 times as large as distance between them and 1.4 times as long as distance between torulus and eye margin. Lower face and elevated median area with uniformly broad striae radiating from clypeus and reaching eye and antennal sockets. Clypeus coriaceous, broader than high, with distinct anterior tentorial pits, distinct epistomal sulcus and clypeo-pleurostomal line, ventrally nearly straight. Frons dull coriaceous, with distinct punctures, especially below ocelli; lateral frontal carinae strong and complete; area between lateral frontal carina and inner margin of eye more delicately sculptured. Vertex and occiput uniformly coriaceous, with distinct punctures. Antennae 13-14-segmented (sometimes suture between F11 and F12 indistinct), longer than head+mesosoma; pedicel globose, as long as broad (in some specimens slightly longer than broad); F1 2.3 times as long as pedicel and 1.5 times as long as F2, in some specimens slightly broadened apically; F2 slightly shorter than F3; subsequent flagellomeres nearly equal in length and slightly shorter than F2; distal flagellomeres very slightly broadened; placodeal sensilla distinctly visible on F4-F12. Mesosoma flattened dorso-ventrally, slightly longer than high in lateral view, with white setae. Pronotum rugose; lateral pronotal carina strong, anterior corners of pronotum strongly angled. Scutum with interrupted sharp and widely spaced transverse rugae, interspaces shining, smooth or very delicately sculptured. Notauli complete, with smooth, shining bottom; median mesoscutal line extending for at least 1/2-3/4 length of scutum; parapsidal lines distinct, reaching slightly above the level of the base of tegulae; anterior parallel lines distinct, very short. Scutellum 1.6 times shorter than scutum, rounded, slightly broader than long; dull rugose, slightly overhanging metanotum. Scutelar foveae transversely ovate, broader than high, well-delimited around, with smooth, shining deep bottom, without setae; separated by distinct, narrow coriaceous central carina; in some specimens scutellar foveae anteriorly nearly reaching one another. Mesopleuron completely striate, striae more dense in ventral half, distance between them more than 2.0 times longer than striae width, interspaces shining, smooth; striae in upper half more interrupted, less strong; ventrally mesopleuron with dense white setae; mesopleural triangle uniformly coriaceous, with dense white setae. Metapleural sulcus reaching mesopleuron in upper 1/4 of its height; metapleuron with dense white setae. Dorsellum uniformly coriaceous, medially very short; nearly 4.0 times as short as height of ventral impressed area; metanotal trough smooth, with few white setae; ventral impressed area shining, smooth, without wrinkles. Lateral propodeal carinae straight, very slightly converging posteriorly, uniformly broad, with few setae; central propodeal area delicately coriaceous, with dense setae in upper half and especially laterally, along lateral propodeal carina; lateral propodeal area delicately uniformly coriaceous, with relatively dense white setae. Forewing longer than body, margin with short dense cilia; radial cell closed, 2.7 times as long as broad, Rs slightly curved, areolet large, distinct; Rs+M distinct, nearly reaching M. Metasoma slightly longer than head+mesosoma, longer than high in lateral view; metasomal tergites 3 and 4 fused, posteriorly without punctures, (in some specimens small patch of punctures present dorso-posteriorly); with few short white setae antero-laterally; subsequent tergites and hypopygium with dense punctures. Male. 2.2-3.2 mm. Similar to female but antenna 15-segmented, F1 slightly curved and strongly expanded apically, 1.9-2.0 times as long as F2; subsequent flagellomeres nearly equal in length to F2; placodeal sensilla on F2-F13.

Diagnosis. Belongs to a group of species (*S. incrassatus*, *S. apicalis* and *S. tibialis*) in which the scutum with interrupted sharp and widely spaced transverse rugae, interspaces shining, smooth or very delicately sculptured; the frons sparsely punctate between lateral frontal carinae and near frontal ocellus. In *S. incrassatus* the median mesoscutal line extending for at least 1/2-3/4 length of the scutum, lateral frontal carinae strong and complete; pedicel usually as broad as long; all flagellomeres of same width; F1 in females slightly broadened apically; in males very strongly expanded apically, while in *S. apicalis* and *S. tibialis* the median mesoscutal line extending for at least 1/4 length of the scutum; lateral frontal carinae weak and incomplete; pedicel longer than broad; all flagellomeres clearly tapered distally; shape of F1 different in both sexes.



Figs 122.1-10. *Synergus incrassatus*: 1-3, head, female: 1, front view, 2, frons, front view, 3, from above. 4-5, antenna, 4, female, 5, male. 6-10, female: 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part. 10, metasoma, lateral view.

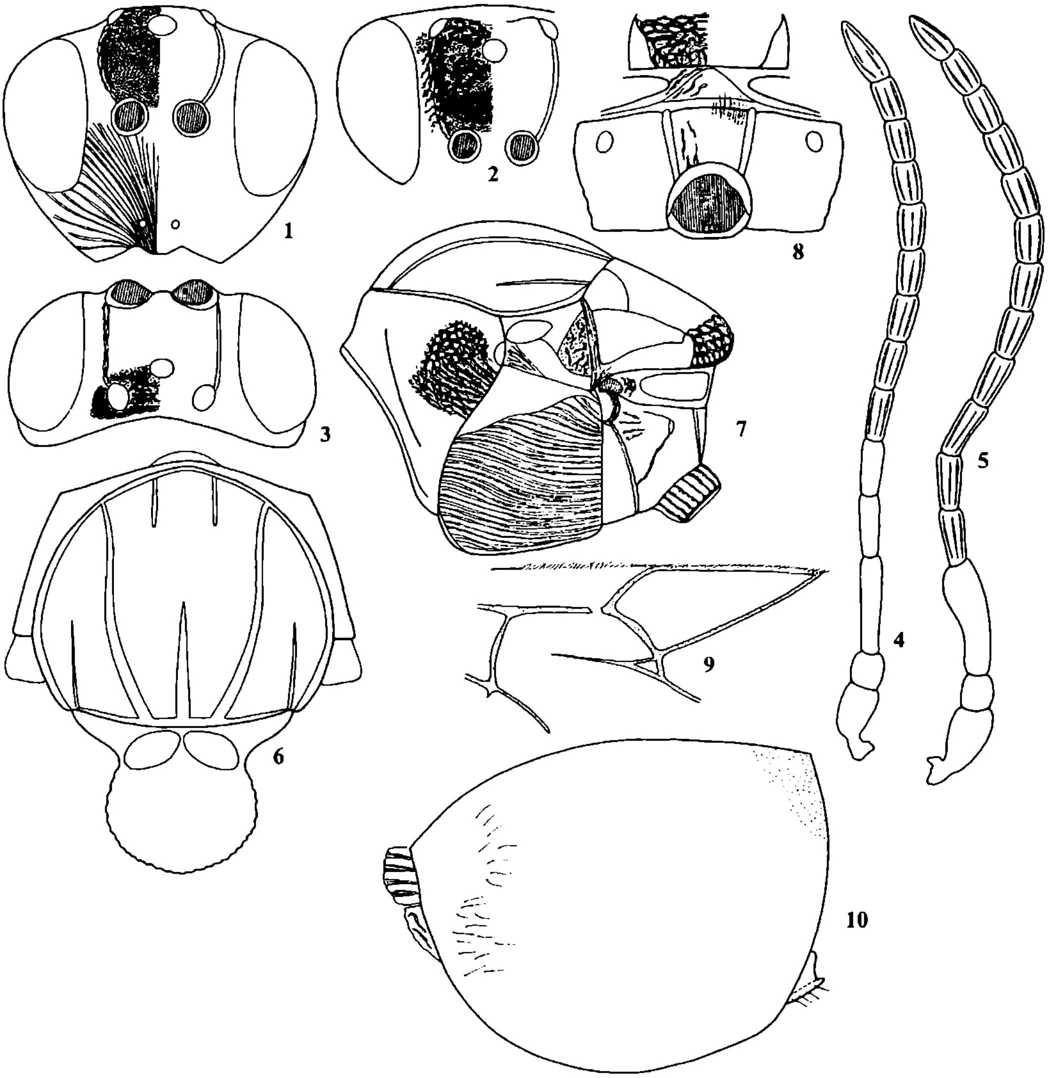
Distribution. Probably throughout the Western Palaearctic Region. Known from many European countries. Collected also in the vicinity of Moscow (Russia) by Belizin (specimens examined from the collection of SIZK). In Ukraine – Transcarpathian Region only, reared from asexual galls of *Andricus quercusradicis* (author).

Biology. Attacks asexual galls of some *Andricus* species, more rarely in galls of *Biorhiza pallida* [b] and *Cynips divisa* [a]. Host plants: *Quercus faginea, Q. petraea, Q. pubescens, Q. pyrenaica, Q. robur.*

Synergus pallicornis Hartig, 1841

Figs 123.1-10.

Synergus pallicornis Hartig, 1841: 348 (female, male); *Synergus pallidicornis* Dalla Torre, 1893: 113; *Synergus palicornis*: Hoffmeyer, 1925: 7 (misspelling).



Figs 123.1-10. *Synergus pallicornis*: 1-3, head, female: 1, front view, 2, frons, front view, 3, from above. 4-5, antenna, 4, female, 5, male. 6-10, female: 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part. 10, metasoma, lateral view.

Description. Female. 1.6-2.9 mm. Head black, except light brown mandibles and palpi; antenna light brown. Mesosoma black, legs light brown, except darker coxae and femura. Metasoma chestnut red, dorsally darker. Wing veins distinct, brown. Body with sparse white setae. Head coriaceous, trapezoid in front view, with sparse white setae; 1.2 times as broad as high, 1.8 times as broad as long from above. Gena coriaceous, nearly straight, not broadened behind eye. Malar space 0.6 times as long as height of eye, with delicate striae radiating from clypeus and reaching eye. POL 2.0-2.1 times as long as OOL; OOL equal in length to diameter of lateral ocellus and LOL. Transfacial distance slightly shorter than height of eye; diameter of antennal torulus only slightly larger than distance between them and distance between torulus and eye margin. Inner margins of eyes parallel. Lower face long, with uniform striae radiating from ventral margin of clypeus and reaching eye and antennal sockets. Clypeus striate, hardly separable from lower face, only anterior tentorial pits indicate its limits; epistomal sulcus and clypeo-pleurostomal line indistinct, ventral margin nearly straight. Frons delicately coriaceous, without punctures, lateral frontal carinae strong and branched near ocelli; subparallel transverse carinae running between lateral ocelli, and obliquely from each posterior ocellus to margin of occiput. Vertex, interocellar area and occiput rugose, without or with few indistinct punctures. Antennae 14-segmented, longer than head+mesosoma; pedicel globose, as long as broad; F1 2.8-3.0 times as long as pedicel and 1.6 times as long as F2; F2 slightly longer than F3; subsequent flagellomeres nearly equal in length and slightly shorter than F2; distal flagellomeres very slightly broadened; placodeal sensilla on F4-F12. Mesosoma flattened dorso-ventrally, only slightly longer than high in lateral view. Pronotum coriaceous; lateral pronotal carina present, anterior corners of pronotum strongly angled in dorsal view. Scutum with weak interrupted transverse rugae. Notauli complete, well impressed; median mesoscutal line extending at least to half length of scutum; parapsidal lines reaching slightly above the level of the base of tegulae; anterior parallel lines short. Scutellum rounded; uniformly rugose. Scutelar foveae transversely ovate, slightly broader than high, indistinctly delimited posteriorly, with coriaceous shallow bottom, without setae; separated by distinct very narrow central carina. Mesopleuron completely and uniformly striate; mesopleural triangle smooth, with few setae. Metapleural sulcus reaching mesopleuron in upper 1/4 of its height. Dorsellum with longitudinal wrinkles, absent medially; metanotal trough smooth to alutaceous, with few white setae; ventral impressed area of dorsellum high, reaching scutellum, with distinct longitudinal wrinkles. Lateral propodeal carinae straight, uniformly broad, without setae; central propodeal area smooth, with delicate irregular wrinkles, with dense setae in anterior half; lateral propodeal area alutaceous, with some weak transverse irregular wrinkles, with few white setae. Forewing margin with short cilia; radial cell 2.87-2.9 times as long as broad, areolet distinct, small. Metasoma longer than head+mesosoma, much longer than high in lateral view; metasomal tergites 3+4, posteriorly with small patch of puncture postero-dorsally, with sparse short white setae antero-laterally. Male. 1.5-2.2 mm. Similar to female but antenna 15-segmented, F1 curved in middle and weakly expanded distally, 2.0 times as long as F2; subsequent flagellomeres nearly of equal length, distal flagellomeres not broadened; placodeal sensilla on F2-F13.

Diagnosis. The only species in Section II of *Synergus* (without band of punctures on the fused metasomal tergites 2+3) in which the head, especially that of females, trapezoid in front view, the gena nearly straight, face long; lateral frontal carinae strong and branched near ocelli; subparallel transverse carinae running between lateral ocelli, and obliquely from each posterior ocellus to margin of occiput. In all other species of this group the head transversely ovate or rounded in front view, with gena strongly converging and shorter face; thhe vertex around and between ocelli and occiput punctate, rugose or coriaceous.

Distribution. Common species probably throughout the Western Palaearctic Region. In Ukraine –vicinities of Kiev, Transcarpathian and Kherson (Chernomorskij Natural Reserve) Regions (about 35 specimens examined in the collection of SIZK).

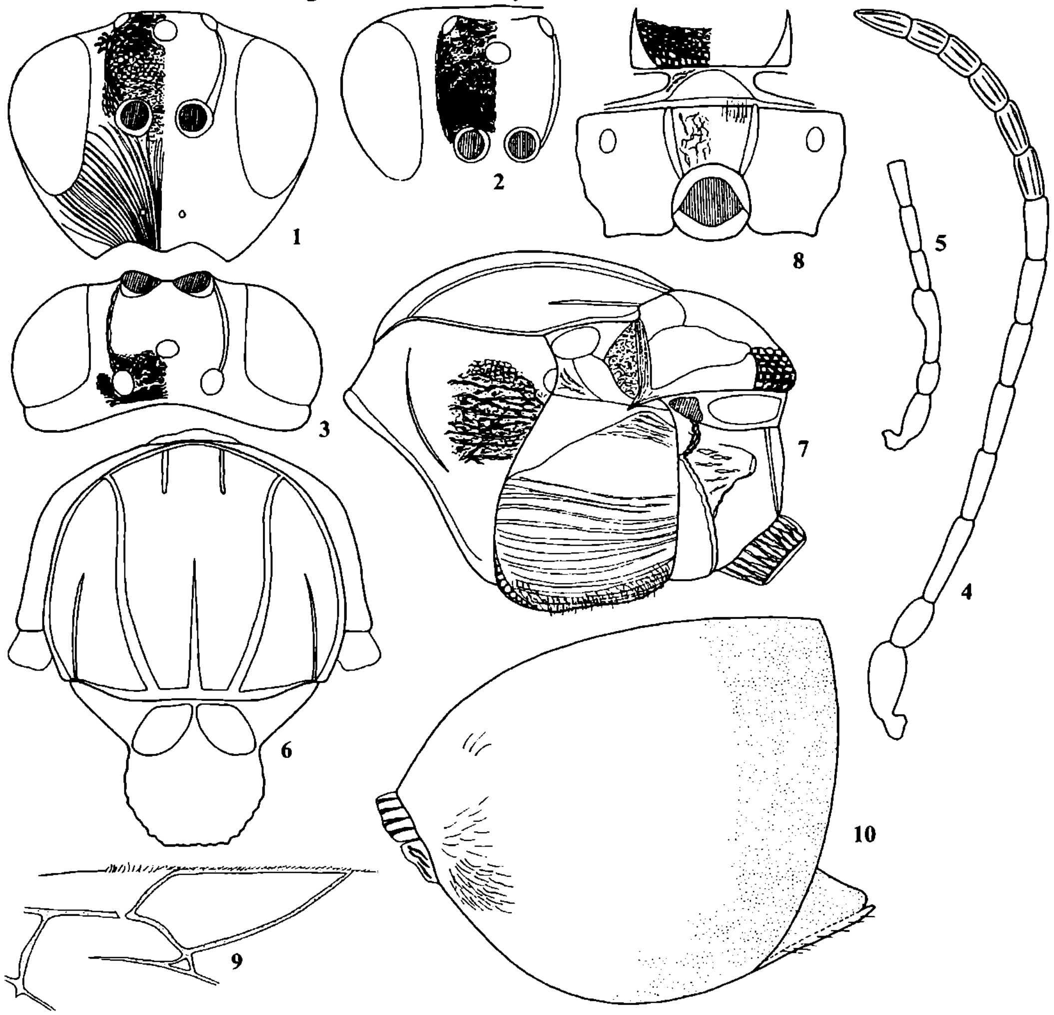
Biology. Reared from about 35 species of gall wasps; in galls of many *Andricus* species, also in *B. pallida*, *Cynips* spp., *Neuroterus* spp. and *Trigonaspis synaspis*. Host plants: *Quercus faginea*, *Q. petraea*, *Q. pubescens*, *Q. pyrenaica*, *Q. robur*.

Synergus pallidipennis Mayr, 1872

Figs 124.1-10.

Synergus pallidipennis Mayr, 1872: 699 (female, male).

Description. Female. 2.5-2.8 mm. Head and mesosoma entirely and uniformly black; mandibles dark brown, palpi yellow; antenna dark brown; legs brown, with darker coxae and femura. Propodeum in some specimens dark brown. Metasoma dark red brown. Wing veins pale. Head coriaceous, slightly transverse in front view, with sparse white setae, genae much stronger converging ventrally than in other closely related species; 1.9 times as broad as long from above; 1.2-1.3 times as broad as high. Gena delicately coriaceous, not broadened behind eye, slightly



Figs 124.1-10. *Synergus pallidipennis*: 1-3, head, female: 1, front view, 2, frons, front view, 3, from above. 4-5, antenna, 3, female, 4, male. 6-10, female: 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part. 10, metasoma, lateral view.

converging ventrally. Malar space 0.5 times as long as height of eye, with striae radiating from clypeus and reaching eye. POL 2.0 times as long as OOL; OOL slightly shorter than diameter of lateral ocellus and slightly shorter than LOL. Transfacial distance slightly shorter than height of eye; diameter of antennal torulus 1.7 times as large as distance between them and distance between torulus and eye margin. Lower face including median elevated area with delicate striae radiating from ventral margin of clypeus and reaching eye and antennal sockets. Clypeus hardly separable from lower face, its limits indicated by distinct anterior tentorial pits; epistomal sulcus and clypeo-pleurostomal line indistinct, ventral margin very slightly rounded, nearly straight. Frons above antennal sockets coriaceous, dull rugose with some indistinct punctures below ocelli; lateral frontal carinae distinct, strongly raised, reaching lateral ocelli. Vertex, inteocellar area and occiput uniformly delicately coriaceous, with punctures. Antennae 14-segmented, longer than head+mesosoma; pedicel 1.8-1.9 times as long as broad; F1 1.6 times as long as pedicel and 1.3 times as long as F2; F2 nearly equal F3; subsequent flagellomeres nearly equal in length to F3;

distal flagellomeres slightly shorter; placodeal sensilla distinctly visible from F7 only. Mesosoma flattened dorso-ventrally, slightly longer than high in lateral view. Pronotum coriaceous, with some delicate wrinkles on the level of mesopleural triangle; lateral pronotal carina strong, anterior corners of pronotum strongly angled in dorsal view. Scutum with interrupted transverse rugae. Notauli complete, although sometimes weakly impressed, with smooth, shining bottom; medial mesoscutal line extending for at least half length of scutum (in some specimens shorter); parapsidal lines distinct, reaching well above the level of the base of tegulae; anterior parallel lines extending to 1/6 of scutum length. Scutellum rounded or very slightly elongated, uniformly rugose; slightly overhanging metanotum. Scutelar foveae transversely ovate, not or only slightly broader than high, well-delimited around, with smooth, shining deep bottom, without setae; separated by narrow coriaceous central carina. Mesopleuron with long transverse non-interrupted striae in lower half, intespaces shining, smooth; without or very indistinct striae in upper half; mesopleural triangle uniformly coriaceous. Metapleural sulcus reaching mesopleuron in upper 1/3 of its height. Dorsellum uniformly coriaceous, very narrow medially, nearly 4.0-4.5 times as short as height of ventral impressed area; metanotal trough smooth to alutaceous, with few white setae; ventral impressed area shining, smooth, without wrinkles. Lateral propodeal carinae nearly straight, only slightly curved outwards in the middle, slightly broader in the middle than on the ends, without setae; central propodeal area with delicate wrinkles, with dense setae in the upper half, especially along lateral propodeal carina; lateral propodeal area alutaceous, with very few short white setae. Forewing margin with short cilia; radial cell 2.6-2.8 times as long as broad, areolet small, distinct; Rs+M extending to 2/3 of distance between areolet and M. Apical punctures on metasomal tergites 2+3 forming relatively narrow band, extending for not more than 1/4 of fused tergites length; subsequent tergites and hypopygium with punctures. Male. 1.8-2.5 mm. Similar to female but antenna 15-segmented, F1 strongly expanded apically, 1.8 times as long as F2; subsequent flagellomeres nearly of equal length, distal flagellomeres not broadened; placodeal sensilla barely traceable on flagellomeres and distinctly visible on F5-F13 only.

Diagnosis. Belongs to the Section I of *Synergus*, particularly to a group of species with the median mesoscutal line extending for at least to the half length of the scutum; the radial cell 2.5-3.0 times as long as broad and F1 of the male strongly expanded apically. Most closely related to *S. umbraculus* and *S. diaphanus*, however, in *S. pallidipennis* apical punctures of the metasoma forming relatively narrow band, extending for not more than 1/4 of the length of fused tergites 2+3; F1 at least 1.5 times as long as F2, the pedicel distinctly longer than broad, while in *S. umbraculus* and *S. diaphanus* apical punctures forming relatively wide band, extending for 1/2-1/3 length of fused tergites 2+3; F1 as long as or only slightly longer than F2, the pedicel as long as broad or only slightly longer than broad, usually spherical in male.

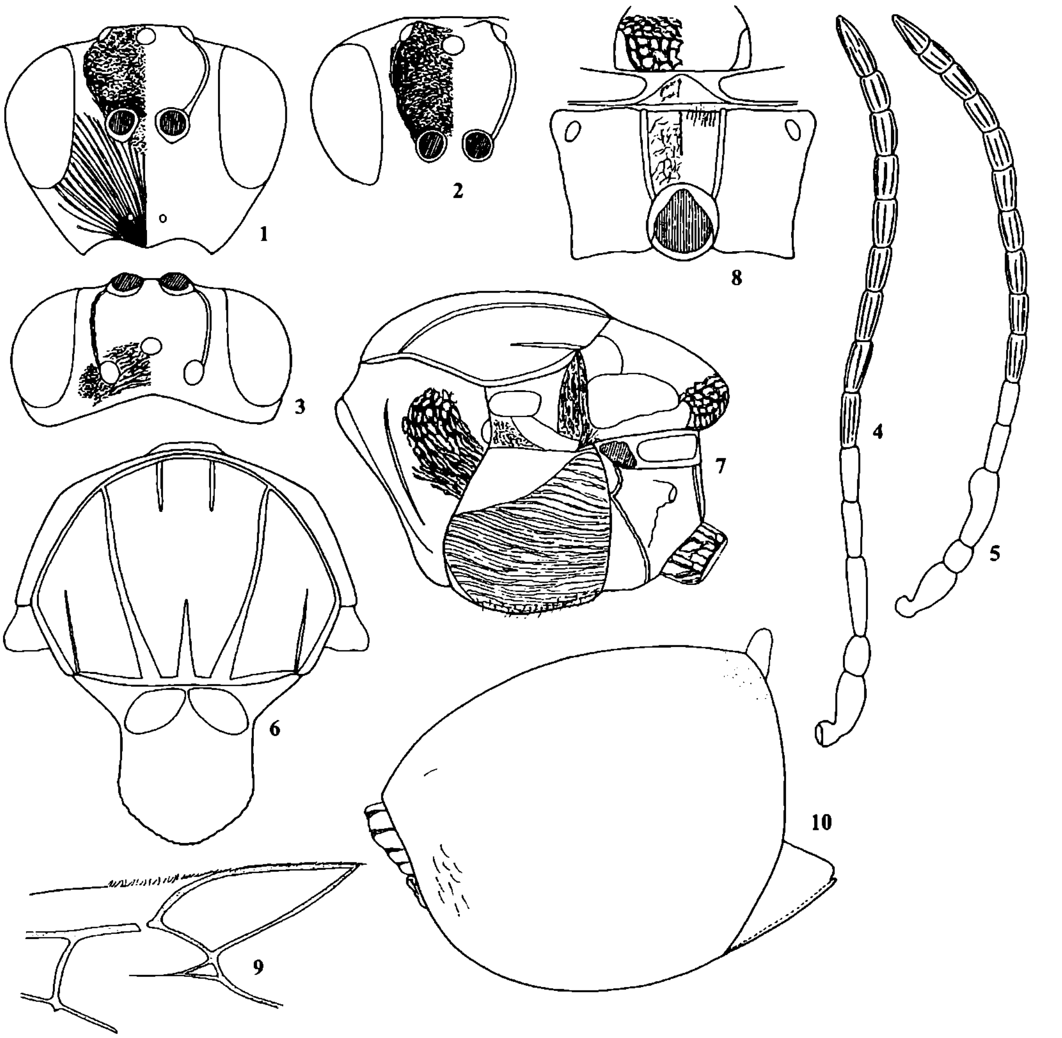
Distribution. Probably throughout the Western Palaearctic Region. In Ukraine – Transcarpathian Region only.

Biology. Usually develops in large lignified asexual galls of *Andricus* species from deciduous *Quercus* species. Host plants: *Quercus faginea, Q. petraea, Q. pubescens, Q. pyrenaica, Q. robur.*

Synergus pallipes Hartig, 1840

Figs 125.1-10.

Synergus pallipes Hartig, 1840: 198 (female, male) (status nova in Pujade-Villar et al., 2003: 150); *Synergus flavicornis* Hartig, 1840: 198 (female, male) (synonym in Pujade-Villar et al., 2003: 155); *Synergus nigripes* Hartig, 1840: 197 (female) (synonym in Pujade-Villar et al., 2003: 159); *Synergus nervosus* Hartig, 1840: 197 (female, male) (synonym in Pujade-Villar et al., 2003: 158); *Synergus albipes* Hartig, 1841: 349 (female, male) (synonym in Pujade-Villar et al., 2003: 157); *Synergus erythrocerus* Hartig, 1841: 349 (female, male) (synonym of *S. albipes* in Kieffer, 1897-1901: 368); *Synergus xanthocerus* Hartig, 1841: 350 (male) (synonym in Pujade-Villar et al., 2003: 160); *Synergus variolosus* Hartig, 1841: 349 (female) (synonym in Pujade-Villar et al., 2003:160); *Synergus varius* Hartig, 1841: 349 (female, male) (synonym in Pujade-Villar et al., 2003: 160); *Synergus tristis* Mayr, 1872: 715 (female, male) (synonym of *S. albipes* in Eady, 1952: 151); *Synergus tscheki* Mayr, 1872: 708 (female) (synonym in Pujade-Villar et al., 2003: 150) (erroneously synonymized with *S. nervosus* in Eady, 1952: 151); *Synergus pallidipes* Dalla Torre, 1893: 113 (unjustified emendation); *Synergus nervosus* f. *albipes* Ross, 1951: 91(female, male) (synonym of *S. albipes* in Eady, 1952: 151); *Synergus nervosus* f. *tristis* Ross, 1951: 93 (female, male) (synonym of *S. albipes* in Eady, 1952: 151); *Synergus mutabilis* Dettmer, 1924b: 147 (female, male) (synonym of *S. albipes* in Wiebes-Rijks, 1979: 318); *Synergus fulvipes* Dettmer, 1924b: 147 (female, male) (synonym in Pujade-Villar et al., 2003: 150); *Synergus hartigi* Giraud, in Houard, 1911: 332 (synonym of *S. albipes* in Pujade-Villar & Ros-Farré, 1998b: 534).



Figs 125.1-10. *Synergus pallipes*: 1-3, head, female: 1, front view, 2, frons, front view, 3, from above. 4-5, antenna, 3, female, 4, male. 6-10, female: 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part. 10, metasoma, lateral view.

Description. Female. 1.6-2.8 mm. Very similar to *S. consobrinus* but lower face black; POL 2.5 times as long as OOL; OOL equal to diameter of lateral ocellus and LOL. Transfacial distance equal to height of eye and 1.3 times as long as height of lower face (distance between antennal rim and ventral margin of clypeus). Lower face, including median elevated area, with delicate uniform striae radiating from ventral margin of clypeus and reaching eye and antennal socket. Lateral frontal carinae weak, often not reaching lateral ocellus. Pedicel as long as broad or slightly longer; F1 2.0 times as long as pedicel and 1.4 times as long as F2; F2 equal F3; placodeal sensilla on F4-F12. Median mesoscutal line usually longer, extending for at least to half length of scutum; scutellar foveae with smooth, shining bottom, separated by narrower central carina, sometimes scutellar foveae anteriorly nearly reaching one another. Mesopleuron ventrally with dense setae; ventral impressed area of dorsellum with delicate wrinkles. Central propodeal area with dense setae in anterior half; in some specimens anterior central longitudinal rugae extending to half length of propodeum. Radial cell usually slightly longer, 2.9 times as long as broad, areolet larger. Metasoma shorter, only very slightly longer than high in lateral view. Male. 1.3-2.3 mm. Similar to female of own species and male of *S. consobrinus*, but F1 concave on the inner surface, twisted and expanded apically and 1.2 times as long as F2.

Diagnosis. See Diagnosis to *S. consobrinus* also. This species most closely related to *S. radiatus*, however, in *S. pallipes* the pedicel as long as broad or only slightly longer than broad; F1 of males concave on the inner surface, twisted and expanded apically, while in *S. radiatus* the pedicel usually is longer than broad in both sexes, F1 of males flattened on the inner surface, not strongly curved or apically expanded no more than basally. *Synergus radiatus* and *S. pallipes* are very closely related species, often confused, have more than one generation per year, and also show geographical variation and, thus frequently cannot be satisfactory distinguished morphologically.

Distribution. Probably common and widespread throughout the Western Palaearctic Region. Known from many European countries, including Russia (northwards to Leningrad Region, Kursk; North Caucasus, specimens collected by Belizin and deposited in the collection of SIZK). In Ukraine –Crimea, vicinities of Kiev; Transcarpathian, Mykolajiv and Chernihiv Regions (about 35 specimens examined in the collection of SIZK).

Biology. In galls of deciduous *Quercus*, reared from many *Andricus* species, mainly from asexual galls; *Cynips* spp. (asexual galls), *Neuroterus* spp. and *Trigonaspis* galls. Host plants: *Quercus canariensis, Q. faginea, Q. petraea, Q. pubescens, Q. pyrenaica, Q. robur, Q. suber.*

Synergus physocerus Hartig, 1843

Figs 126.1-10.

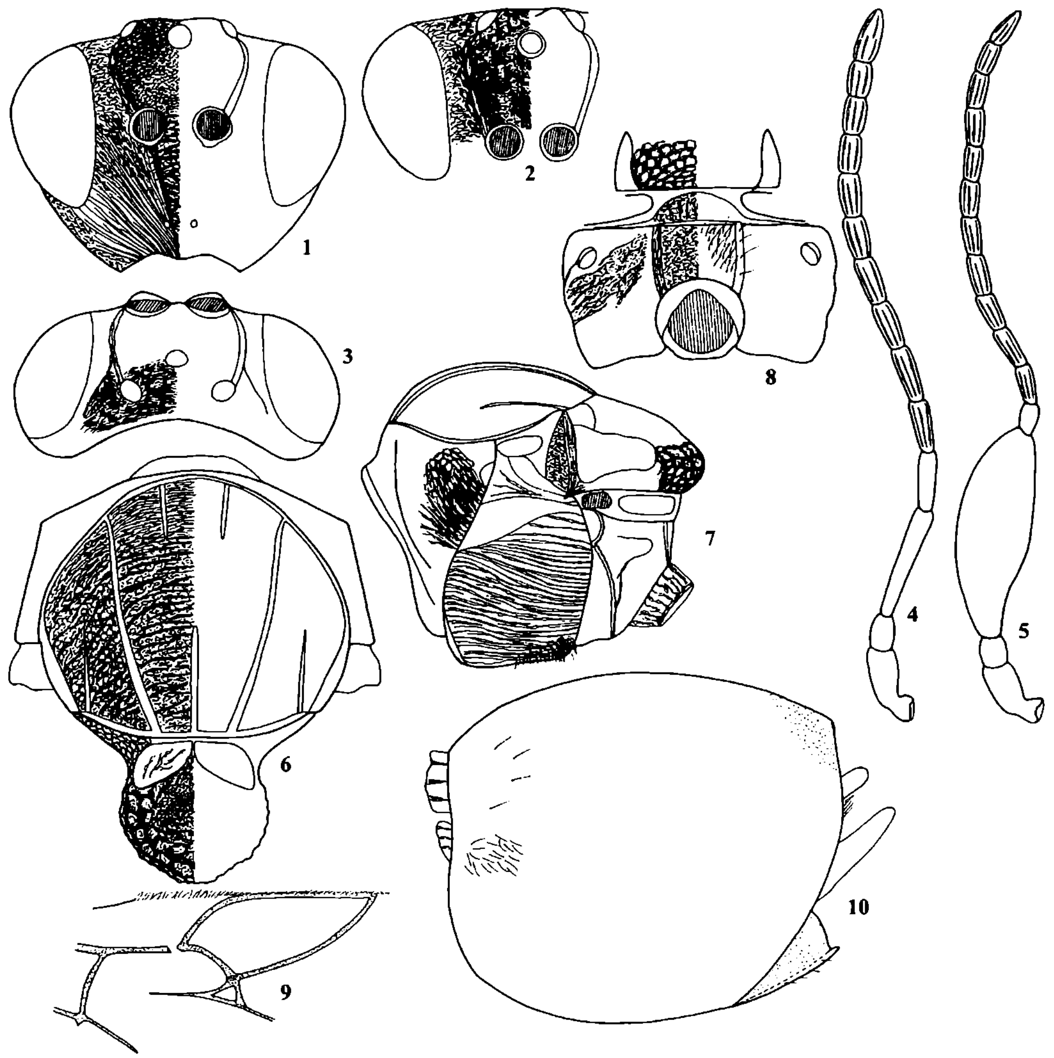
Synergus physoceras (!) Hartig, 1843: 413 (female, male).

Description. Female. 1.4-2.5 mm. Very similar to *S. thaumacerus*, but head entirely black, antenna and legs yellow-brown. Malar space only 0.5 times as long as height of eye. POL 2.0 times as long as OOL; OOL slightly longer than diameter of lateral ocellus and slightly shorter than LOL. Median elevated area of lower face coriaceous, with transverse wrinkles, not striate as the rest of lower face laterally. Frons, vertex, interocellar area with weaker and more sparse punctures; lateral frontal carina strongly raised, more distinct; F1 2.0 times or more as long as F2. Scutum with stronger transverse striae; median mesoscutal line usually shorter; disk of scutellum with more delicate sculpture; scutelar foveae anteriorly nearly reaching one another. Ventral impressed area of dorsellum delicately coriaceous; lateral propodeal carinae slightly converging in the most posterior part; central propodeal area with setae going along lateral propodeal carina into posterior half of propodeum. Radial cell shorter, only 2.5 times as long as broad. Male. 1.5-2.2 mm. Similar to female of own species and male of *S. thaumacerus* but F1 not abruptly inflated distally, basal notch forming less acute angle.

Diagnosis. See Diagnosis to *S. thaumacerus.*

Distribution. Probably throughout the Western Palaearctic Region. Known from AT, ES (Nieves-Aldrey, 2001a) and HU (Pujade-Villar et al., 2003). Also occurs in Georgia (Sochi, one specimen in the collection of SIZK). In Ukraine – Transcarpathian Region only, reared from galls of *C. quercus* only (author).

Biology. Rare species, reared only from galls of *Trigonaspis synaspis* [a], *Cynips quercus* [a], *Synophrus politus* (Pujade-Villar et al., 2003), and from *Plagiotrochus kiefferianus* and *P. panteli*: in Greece (Pujade-Villar et al., 2002). Host plants: *Quercus cerris, Q. pyrenaica, Q. robur.*



Figs 126.1-10. *Synergus physocerus*: 1-3, head, female: 1, front view, 2, frons, front view, 3, from above. 4-5, antenna, 3, female, 4, male. 6-10, female: 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part. 10, metasoma, lateral view.

Synergus radiatus Mayr, 1872

Synergus radiatus Mayr, 1872: 718 (female, male) (status nova in Pujade-Villar et al., 2003: 150); *Synergus radiatus radiatus* Dalla Torre & Kieffer, 1910: 622 (female, male) (synonym in Pujade-Villar et al., 2003: 150; erroneously synonymized with *S. nervosus* in Nieves-Aldrey & Pujade-Villar, 1986: 158); *Synergus radiatus testaceipes* Tavares, 1900: 25 (female, male) (synonym in Pujade-Villar et al., 2003: 150; erroneously synonymized with *S. nervosus* in Nieves-Aldrey & Pujade-Villar, 1986: 158); *Synergus tscheki* f. *radiatus* Ross, 1951: 89 (female, male) (synonym in Pujade-Villar et al., 2003. 150; erroneously synonymized with *S. nervosus* in Eady, 1952: 151, see in Pujade-Villar et al., 2003: 150 for *S. radiatus* and *S. tscheki*).

Description. Female and male are very similar to *S. pallipes*, but antennal pedicel usually longer than broad in both sexes, F1 of male flattened on the inner surface, not strongly curved or apically expanded no more than basally.

Diagnosis. See Diagnosis to *S. pallipes* and *S. consobrinus*.

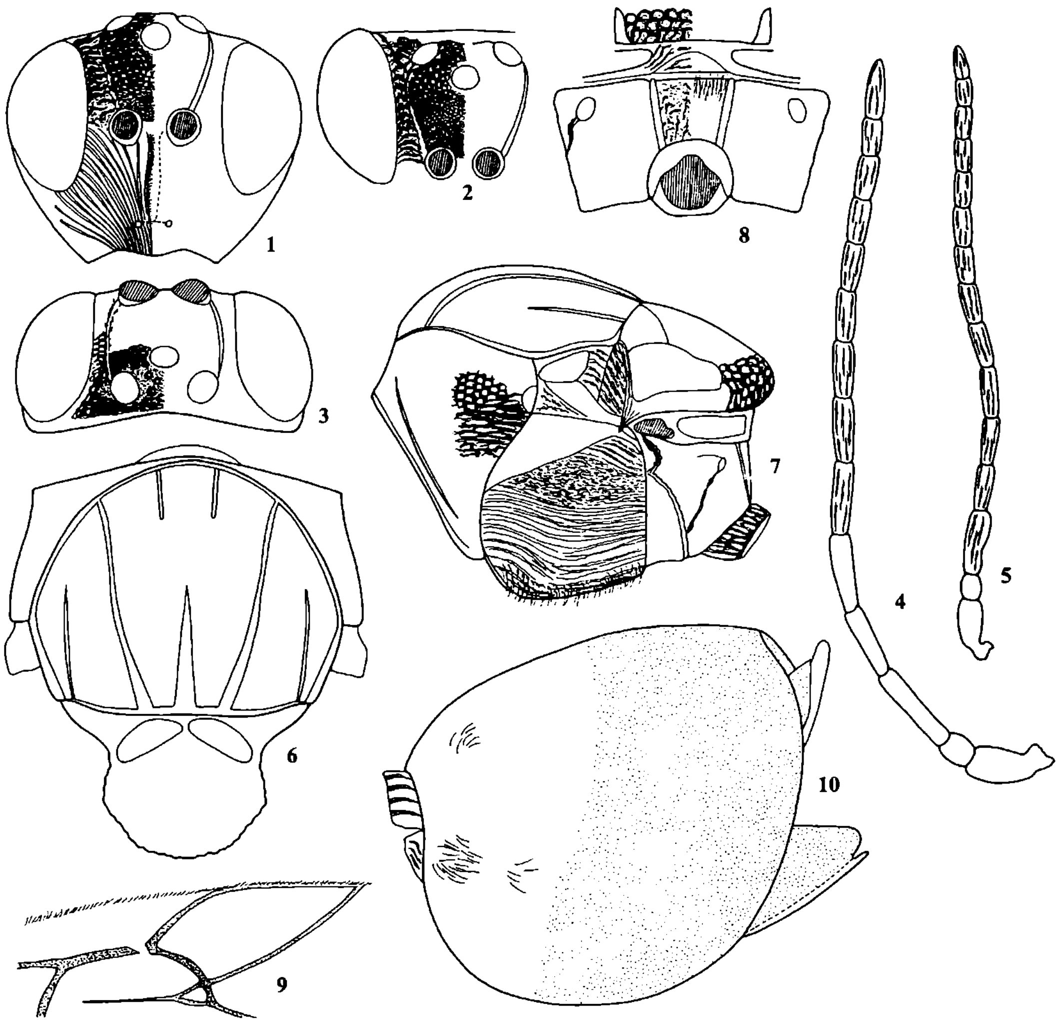
Distribution. Probably throughout the Western Palaearctic Region. Known from many European countries and North Africa (Dalla Torre & Kieffer, 1910). In Ukraine – Transcarpathian Region (Plishka hill) and vicinities of Kiev (27 specimens examined in the collection of SIZK).

Biology. In galls of many *Andricus* species, in some *Cynips* spp, *Neuroterus* spp and *Trigonaspis* species. Host plants: *Quercus canariensis, Q. faginea, Q. petraea, Q. pubescens, Q. pyrenaica, Q. robur.*

Synergus reinhardi Mayr, 1872

Figs 127.1-10.

Synergus Reinhardi Mayr, 1872: 698 (female, male).



Figs 127.1-10. *Synergus reinhardi*: 1-3, head, female: 1, front view, 2, frons, front view, 3, from above. 4-5, antenna, 3, female, 4, male. 6-10, female: 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part. 10, metasoma, lateral view.

Description. Female. 3.0-3.7 mm. Very similar to *S. hayneanus*, but POL only 1.3 times as long as OOL. Lower face with strong median carina, raised above striae in lateral view. Frons with more strong sculpture, lateral frontal carina more strongly raised, area between lateral frontal carina and inner margin of eye with strong transverse rugae, vertex, interocellar area and occiput with larger and deeper punctures. Pedicel globose, as long or only very slightly longer than broad; F1 2.8-3.0 times as long as pedicel and 1.3 times as long as F2; F2 slightly shorter than F3; placodeal sensilla distinctly visible on F4-F11. Scutelar foveae transversely separated by broader central carina, anteriorly they do not reaching one another. Mesopleuron uniformly striate in ventral half, in the upper half without distinct striae, dull rugose, with transverse interrupted rugae. Metapleural sulcus reaching mesopleuron in upper 1/4 of its height. Dorsellum with irregular delicate wrinkles, higher, at most 2.0 times as short as height of ventral impressed area; metanotal trough higher. Radial cell slightly longer, 2.6-2.8 times as long as broad. Apical band of punctures on fused tergites 3+4 extended to half length of fused tergites. Male. 3.0-3.2 mm. Similar to own species female and to male of *S. hayneanus*, but lower face black, with strong median carina, raised above striae in lateral view; F1 slightly modified, delicately notched in middle and expanded apically; placodeal sensilla distinctly visible on all flagellomeres.

Diagnosis. Belongs to the Section I of *Synergus*, particularly to a group of species (*S. ruficornis*, *S. hayneanus* and *S. reinhardi*) with the median mesoscutal line extending for at least to the half length of the scutum; the radial cell 2.0-2.5 times as long as broad (see Diagnosis also to *S. ruficornis*). Most closely related to *S. hayneanus*, however, in *S. reinhardi* the lower face with a strong median carina, raised above striae in lateral view; the radial cell always more than 2.0 times as long as broad, Rs weakly curved; the lower face is black in both sexes; F1 of the male slightly modified, delicately notched in middle and weakly expanded apically, while in *S. hayneanus* the lower face with a strong median carina, not raised above striae from lateral view; the radial cell at most slightly more than 2.0 times as long as broad; Rs fairly strongly curved; the face is yellow-red in males; F1 of the male expanded apically and basally.

Distribution. Probably throughout the Western Palaearctic Region. Known from many European countries and North Africa (Dalla Torre & Kieffer, 1910). In Ukraine – Transcarpathian Region only, from asexual galls of *A. kollari*.

Biology. Reared from large lignified asexual galls of 16 *Andricus* species. Host plants: *Quercus petraea*, *Q. pubescens*, *Q. robur*.

Synergus ruficornis Hartig, 1840

Synergus ruficornis Hartig, 1840: 198 (female, male).

Description. Female. 2.0-2.3 mm. Very similar to *S. hayneanus* and *S. reinhardi* but head and mesosoma uniformly black, while metasoma chestnut brown, antennae yellowish, legs light chestnut brown, except partially black coxae. Frons and vertex rugose, with dense punctures; lateral frontal carina complete, reaching lateral ocellus. Antenna 14-segmented, pedicel 1.5 times as long as broad, F1 1.3 times as long as F2. Lateral pronotal carina distinct, strongly raised; scutum with weak interrupted transverse striae; notauli complete. Radial cell shorter, areolet invisible. Apical band of punctures on metasoma, measured subdorsally, extending for at most 1/4 length of fused tergites 2+3, ventrally and laterally much less. Male. 2.1 mm. Similar to the female of own species and also to males of *S. hayneanus* -- *S. reinhardi*, except F1 almost 2.0 times as long as F2, weakly expanded basally and moderately expanded apically.

Diagnosis. Belongs to the Section I of *Synergus*, particularly to a group of species (*S. ruficornis*, *S. hayneanus* and *S. reinhardi*) with the median mesoscutal line extending for at least to the half length of the scutum; the radial cell 2.0-2.5 times as long as broad. In *S. ruficornis* the apical band of punctures on the metasoma, measured subdorsally, extending for at most 1/4 length of fused tergites 2+3, ventrally and laterally much less; the scutum weakly sculptured; F1 of male almost 2.0 times as long as F2, while in *S. hayneanus* and *S. reinhardi*, which are the most closely related species, the apical band of punctures on the metasoma extending to 1/2-1/3 length of fused tergites 2+3; the scutum with stronger sculpture, with raised transverse carinae; F1 of male weakly expanded apically and/or basally, less than 1.5 times as long as F2.

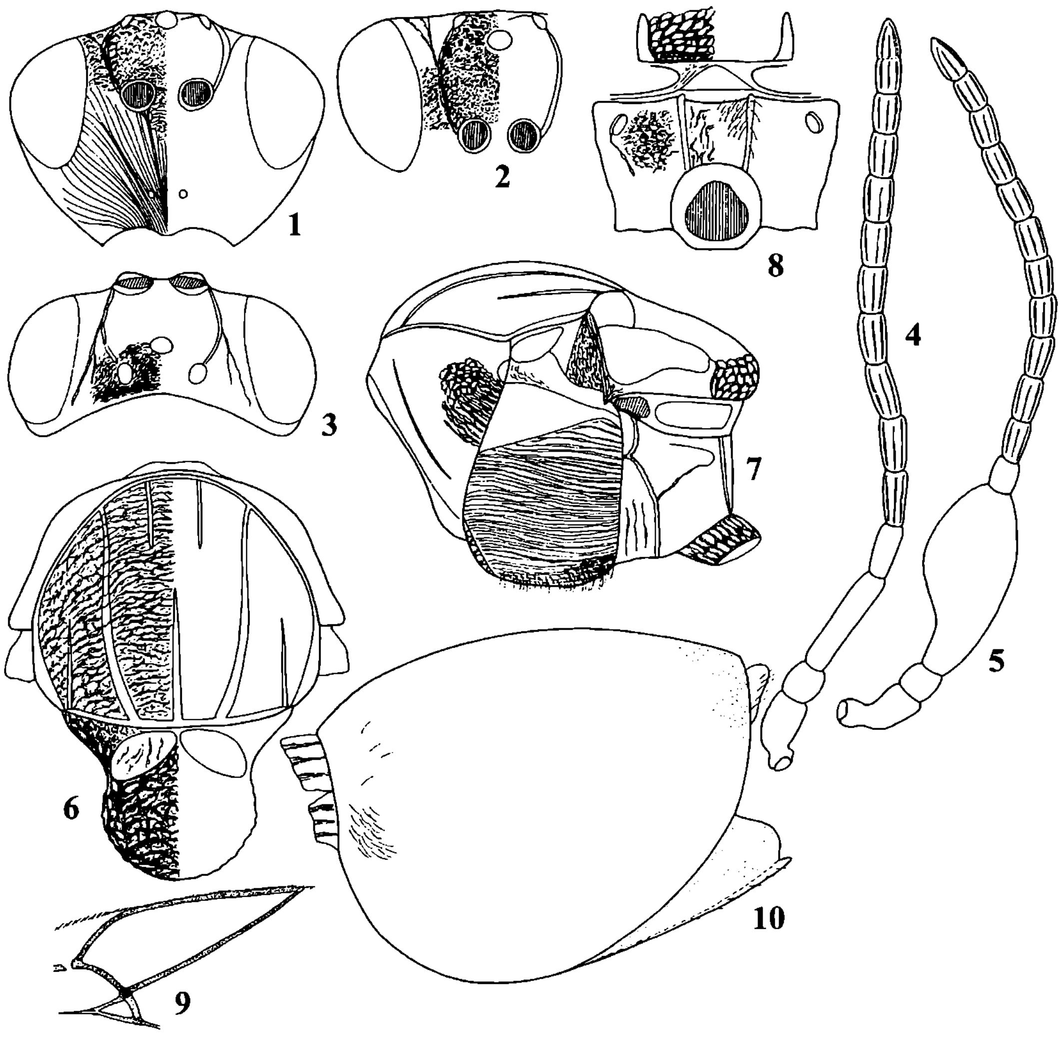
Distribution. Rare species. Probably throughout the Western Palaearctic Region. Known also from Western Kazakhstan (Vyrzhikovskaya, 1954). In Ukraine – Transcarpathian Region only (some specimens were reared from galls of *Andricus curvator* [a] and *A. inflator* [a] by the author).

Biology. Rare species. Reared from 6 *Andricus* species and *Neuroterus anthracinus* [a]. Host plants: *Quercus faginea, Q. petraea, Q. pubescens.* Mainly associated with *A. inflator*, asexual galls.

Synergus thaumacerus (Dalman, 1823)

Figs 128.1-10.

Cynips thaumacera Dalman, 1823: 96 (male); *Synergus luteus* Hartig, 1840: 199 (female, male); *Synergus Klugii* Hartig, 1840: 199 (female, male); *Synergus carinatus* Hartig, 1841: 348 (female); *Xystus testaceus* Hartig, 1841: 352 (female) (synonym in Pujade-Villar et al., 2003: 151); *Synergus thaumatocerus* Dalla Torre, 1893: 114 (unjustified emendation); *Synergus inflatus* Giraud in Houard, 1911: 324-325 (synonym in Pujade-Villar & Ros-Farré, 1998b: 532); *Synergus vesiculosus* Giraud in Houard, 1911: 323-324 (synonym in Pujade-Villar & Ros-Farré, 1998b: 532); *Synergus inflatus* Dettmer, 1924b: 147(female, male) (synonym in Pujade-Villar et al., 2003: 151).



Figs 128.1-10. *Synergus thaumacerus*: 1-3, head, female: 1, front view, 2, frons, front view, 3, from above. 4-5, antenna, 4, female, 5, male. 6-10, female: 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part. 10, metasoma, lateral view.

Description. Female. 1.4-2.5 mm. Head black, lower face and gena often yellow to red; antenna yellowish; mesosoma black, legs yellowish; metasoma red. Wing veins distinct, brown. Head slightly transverse in front view, with sparse white setae; 1.8-1.9 times as broad as long from above; 1.3 times as broad as high. Malar space 0.7 times as long as height of eye, with delicate striae radiating from clypeus and reaching eye. POL 1.3 times as long as OOL; OOL 2.0 times as long as diameter of lateral ocellus and nearly equal LOL. Transfacial distance 1.2 times as long as height of eye; diameter of antennal torulus 1.7 times as large as distance between them and nearly as long as distance between torulus and eye margin. Inner margins of eyes slightly diverging ventrally. Lower face with elevated median area uniformly delicately striate. Clypeus striate, barely traceable, its limits indicate by anterior tentorial pits; epistomal sulcus and clypeo-pleurostomal line indistinct; ventral margin of clypeus straight. Frons coriaceous, with punctures, lateral frontal carina distinctly raised, reaching lateral ocellus. Vertex, interocellar area and occiput conspicuously punctate and rugulose. Antennae 14-segmented, pedicel globose, as long as broad; F1 3.0 times as long as pedicel and 2.0 times as long as F2; F2 equal F3; subsequent flagellomeres nearly equal in length and slightly shorter than F2; distal flagellomeres only very slightly broadened; placodeal sensilla on F3-F12. Pronotum coriaceous; lateral pronotal carina present, anterior corners of pronotum strongly angled in dorsal view. Scutum coriaceous or with weak interrupted transverse rugae. Notauli complete, although sometimes weakly impressed anteriorly; median mesoscutal line extending for at least 3/4 length of scutum, broad posteriorly; parapsidal lines reaching to the level of the base of tegulae; anterior parallel lines extending to 1/4 of scutum length. Scutellum rounded, slightly narrowed down on the level of scutellar foveae; dull rugose. Scutelar foveae transversely ovate, broader than high, well-delimited around, with some irregular delicate wrinkles on the bottom, without setae; separated by distinct very narrow central carina. Mesopleuron completely uniformly striate, interspaces shining; mesopleural triangle alutaceous to delicately coriaceous, with few setae. Metapleural sulcus reaching mesopleuron in upper 1/3 of its height; axillula elongated, shining, coriaceous, with piliferous points and long dense white setae; subaxillular bar smooth, shining, in the most posterior end slightly higher than height of metanotal trough. Dorsellum coriaceous, with some irregular delicate wrinkles, very short, at least 4.0 times as short as height of ventral impressed area; metanotal trough smooth, with few white setae; ventral impressed area shining, smooth, without wrinkles. Lateral propodeal carinae straight, uniformly thick, with setae; central propodeal area with delicate wrinkles, anterior half with dense setae; lateral propodeal area uniformly coriaceous, with dense setae. Forewing margin with long cilia; radial cell 2.8-3.1 times as long as broad, areolet large. Metasomal tergites 2+3 posteriorly with a small dorsal patch of punctures; hypopygium punctate. Male. 1.5-2.2 mm. Similar to female but antenna 15-segmented, F1 abruptly inflated distally, basal notch forming more acute angle, about 5.0 times as long as F2; placodeal sensilla on F3-F13.

Diagnosis. *Synergus thaumacerus* together with *S. physocerus* and *S. gallaepomiformis* belongs to the Section II of *Synergus*, to a group of species which in the scutum is coriaceous or with weak and not interrupted transverse rugae; the frons also coriaceous, with some shallow punctures, the vertex conspicuously punctate or punctate and rugulose; the median mesoscutal line extending for at least 3/4 length of the scutum, broad posteriorly; the face usually yellow to orange red or red; antennae and legs entirely yellow or yellow-red (see also Diagnosis to *S. gallaepomiformis*). Most closely related to *S. physocerus*, however, in *S. thaumacerus* F1 of males more abruptly inflated distally, the basal notch forming a more acute angle; F1 of females less than 2.0 times as long as F2; the frons and vertex with shallow and scattered punctures; the radial cell nearly 2.5 times as long as broad; the lower face yellow to red or almost black; antennae and legs yellowish, while in *S. physocerus* F1 of males not abruptly inflated distally, the basal notch forming a less acute angle; F1 of females more than 2.0 times as long as F2; the frons and vertex with weaker and more sparse punctures; the radial cell almost 3.0 times as long as broad; the head black, antennae and legs yellow-brown.

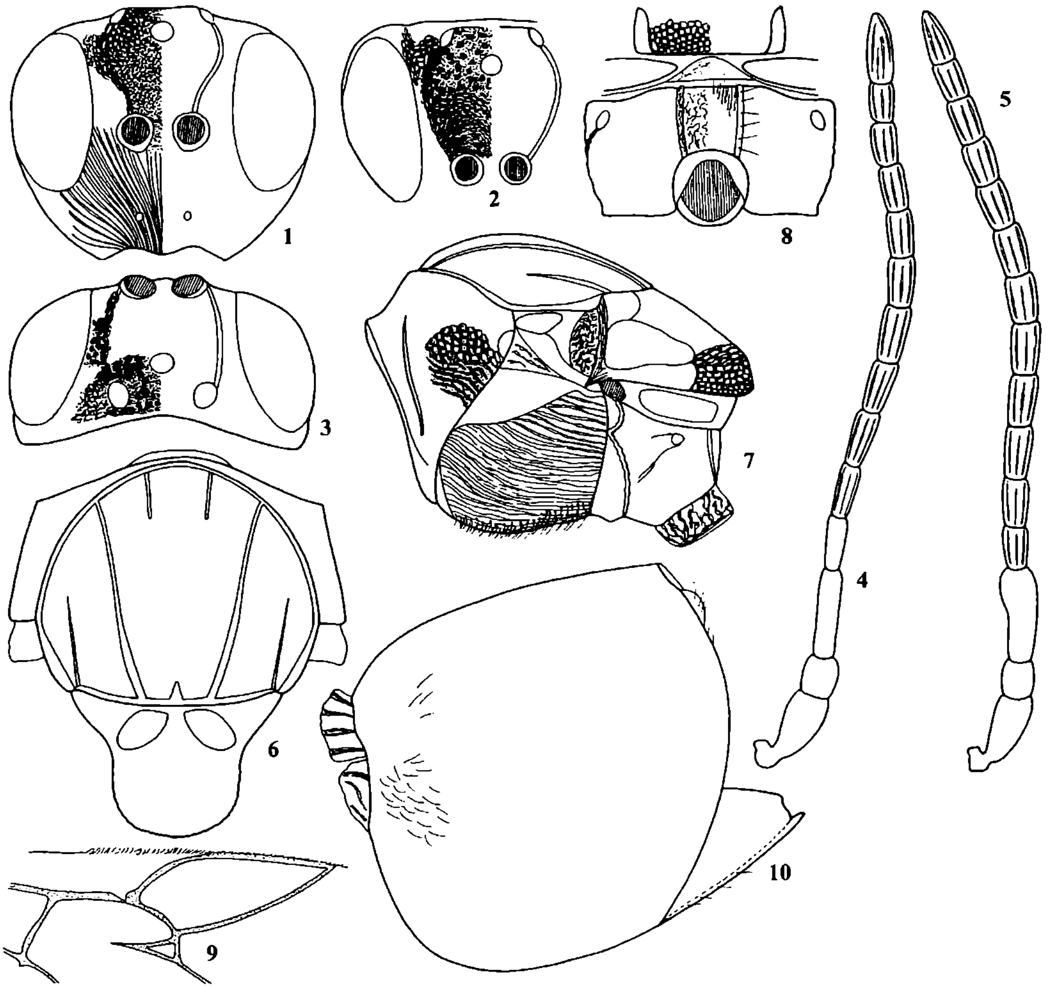
Distribution. Probably throughout the Western Palaearctic Region. In Ukraine – Transcarpathian Region (Kosino, Julijivski Hory, Plishka and Rafajlovo) and vicinities of Kiev.

Biology. Reared from some galls of *Andricus* spp, *Aphelonyx cerricola* [a], *Dryocosmus nitidus* [a], *Dryocosmus cerriphilus* [a, b], *Cynips* galls; some *Neuroterus* and *Trigonaspis* species. This species preferably inhabit cynipid galls associated with Cerris oak section. Host plants: *Quercus cerris,* ocassionally *Q. faginea, Q. petraea, Q. pubescens, Q. pyrenaica, Q. robur.*

Synergus tibialis Hartig, 1840

Figs 129.1-10.

Synergus tibialis Hartig, 1840: 197 (female, male) (status nova in Pujade-Villar et al., 2003: 151); *Synergus immarginatus* Hartig, 1841: 348 (female, male) (synonym in Pujade-Villar et al., 2003: 151); *Synergus erythrostomus* Hartig, 1841: 348 (female) (synonym in Pujade-Villar et al., 2003: 151); *Synergus rotundiventris* Mayr, 1872: 70 (female, male) (synonym in Pujade-Villar et al., 2003: 151).



Figs 129.1-10. *Synergus tibialis*: 1-3, head, female: 1, front view, 2, frons, front view, 3, from above. 4-5, antenna, 3, female, 4, male. 6-10, female: 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part. 10, metasoma, lateral view.

Description. Female and male are very similar to *S. apicalis* (see Description of *S. apicalis* also) but face black in both sexes, except for some red areas sometimes around mouth; legs mostly dark brown to black, coxae black, femur partially black. POL only 1.8 times as long as OOL, frons, interocellar area and vertex with distinct micropunctures; lateral frontal carinae stronger. Notauli extending for 3/4 of scutum length or even reaching pronotum, however, weakly impressed; ventral impressed area without wrinkles, coriaceous, mat; central propodeal area broader, lateral propodeal carina with distinct long setae. Marginal cilia on forewing longer; radial cell 2.1-2.7 times as long as broad, sometimes opened, Rs curved.

Distribution. Probably throughout the Western Palaearctic Region. In Ukraine -- Transcarpathian (Plishka hill) and Kherson (Chermorskij Natural Reserve) Regions (12 specimens examined in the collection of SIZK).

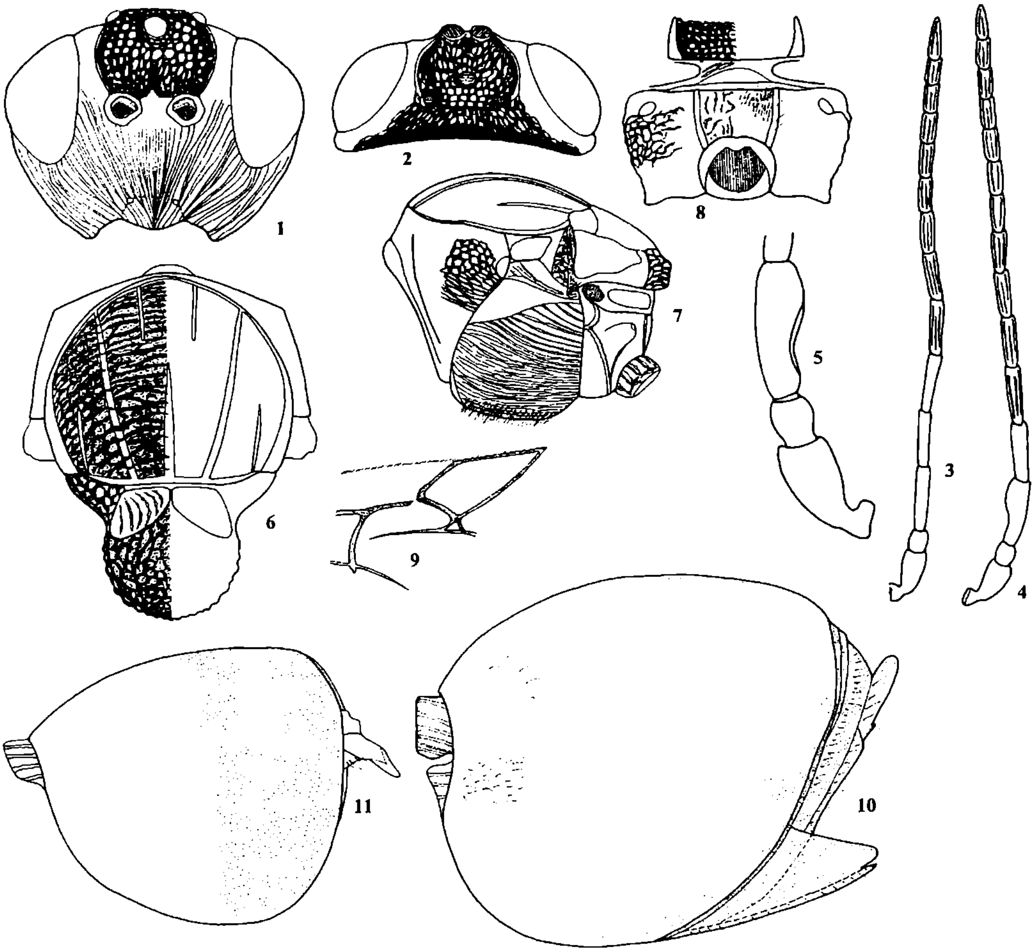
Biology. Reared from 16 *Andricus* species, some *Callirhytis, Pseudoneuroterus macropterus* [a], and *Plagiotrochus amenti* [b] galls. Host plants: *Quercus faginea, Q. pubescens, Q. pyrenaica, Q. robur.*

Synergus umbraculus (Olivier, 1791)

Figs 130.1-11.

Diplolepis umbraculus Olivier, 1791: 282 (female); *Diplolepis gallaeumbraculatae* D'Anthoine, 1794: 35; *Diplolepis rufipes* Boyer de Fonscolombe, 1832: 193; *Synergus orientalis* Hartig, 1841: 347 (female, male); *Synergus socialis* (Kollar in MS) Hartig, 1843: 413 (female, male); *Synergus melanopus* Hartig, 1843: 414 (female, male); *Synergus umbraculus* var. *histrio* Kieffer, 1897-1901: 341 (female); *Synergus umbraculus* var. *minor* Kieffer, 1897-1901: 342; *Synergus umbraculus* var. *mixta* Kieffer, 1897-1901: 342 (female); *Synergus umbraculus umbraculus* Dalla Torre & Kieffer, 1910: 615 (female, male) (synonym in Nieves-Aldrey & Pujade-Villar, 1985: 223); *Synergus umbraculus histrio* Dalla Torre & Kieffer, 1910: 615 (female) (synonym in Nieves-Aldrey & Pujade-Villar, 1985: 223); *Synergus umbraculus minor* Dalla Torre & Kieffer, 1910: 616 (synonym in Nieves-Aldrey & Pujade-Villar, 1985: 223); *Synergus umbraculus mixtus* Dalla Torre & Kieffer, 1910: 616 (female) (synonym in Nieves-Aldrey & Pujade-Villar, 1985: 223); *Synergus umbraculus pseudohistrio* Tavares, 1920b: 12 (synonym in Nieves-Aldrey & Pujade-Villar, 1985: 223); *Synergus punctatus* Dettmer, 1924b: 146 (female, male) (synonym in Pujade-Villar et al., 2003: 151) (non *S. punctatus* Gillette, 1896).

Description. Female. 1.4-3.9 mm. Head entirely black but often, especially in the spring generation, lower face, frons and gena yellow, orange or red; mandibles and palpi yellow or red; antenna red or light brown. Mesosoma black, legs dirty brown, with dark brown coxae and femura. Metasoma chestnut brown to red. Wing veins distinct, dark brown. Body with sparse white setae. Head coriaceous to rugose, transverse in front view, with sparse white setae, more dense on lower face; 2.0 times as broad as long from above; 1.3 times as broad as high. Gena coriaceous, not broadened behind eye, converging ventrally. Malar space 0.6 times as long as height of eye, with delicate striae radiating from clypeus and reaching eye. POL 2.0 times as long as OOL; OOL 2.0 times as long as diameter of lateral ocellus and 1.6 times as long as LOL. Transfacial distance 1.2 times as long as height of eye; diameter of antennal torulus 1.5 times as large as distance between them and 1.5 times as long as distance between torulus and eye margin. Lower face and median elevated area with uniformly delicate striae radiating from ventral margin of clypeus and reaching eye and antennal sockets. Clypeus with radiating striae, delimited from lower face by distinct anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line; ventral margin of clypeus straight. Frons dull rugose, with indistinct punctures, hiding by dull rugose sculpture; lateral frontal carinae strongly raised and reaching lateral ocelli. Vertex and occiput uniformly rugose. Antennae 14-segmented, longer than head+mesosoma; pedicel subglobose, only very slightly longer than broad; F1 3.0 times as long as pedicel and only 1.2 times as long as F2; F2 equal F3 in length; subsequent flagellomeres shorter; distal flagellomeres not broadened; placodeal sensilla on F4-F12. Mesosoma flattened dorso-ventrally, slightly longer than high in lateral view, with white setae. Pronotum rugose, with white setae, lateral pronotal carina strong, lateral corners of pronotum strongly angled. Scutum with strong interrupted transverse rugae, interspaces coriaceous; slightly. Notauli complete, deeply impressed, with rugae on bottom; median mesoscutal line extending for at least to half length of scutum; parapsidal lines reaching slightly above the



Figs 130.1-11. *Synergus umbraculus*: 1-2, head, female: 1, front view, 2, from above. 3-4, antenna: 3, female, 4, male. 5, first antennomeres, male. 6-9, female: 6, scutum and scutellum, dorsal view, 7, mesosoma, lateral view, 8, propodeum and dorsellum, dorso-posterior view, 9, forewing, part. 10-11, metasoma, lateral view: 10, female, 11, male.

level of the base of tegulae; anterior parallel lines extending to 1/3 of scutum length. Scutellum rounded, dull rugose, with slightly more delicate sculpture towards center of scutellar disk; slightly overhanging metanotum. Scutelar foveae transversely ovate, only slightly broader than high, well-delimited around, with delicate wrinkles on shining bottom, without setae; separated by very narrow central carina; sometimes scutellar foveae anteriorly nearly reaching one another. Mesopleuron completely striate, distance between striae larger in the most upper part of mesopleuron; interspaces smooth, shining, ventrally with dense white setae; mesopleural triangle smooth, with few setae. Metapleural sulcus reaching mesopleuron in upper 1/3 of its height; axillula ovate, shining, coriaceous, with piliferous points; subaxillular bar smooth, shining, in the most posterior end nearly 2.0 times as high as height of metanotal trough; propodeal spiracle strongly elevated, ovate; area between spiracle and metapleural sulcus shining, smooth, with some wrinkles and sparse white setae; ventral bar of metanotal trough coriaceous, shining, nearly 2.0 times narrower than height of metanotal trough measuring above propodeal spiracle. Dorsellum wrinkled; nearly 2.0 times as short as height of ventral impressed area; metanotal trough smooth, shining, with few white setae; ventral impressed area shining, smooth, without wrinklres. Lateral propodeal carinae nearly straight, slightly converging inwards in the most posterior part, with some setae, uniformly broad; central propodeal area with delicate wrinkles, mat, with dense setae in anterior half, especially along lateral propodeal carina; lateral propodeal area rugose, with more dull sculpture outwards of spiracle, with relatively dense white setae. Forewing margin with very short cilia; radial cell 2.5-2.6 times as long as broad, areolet distinct; Rs+M distinct, nearly reaching basalis. Metasoma longer than head+mesosoma, longer than high in lateral view; fused metasomal tergites 2+3 with very few white long setae antero-laterally; apical punctures forming a broad band, extending for 1/2 length of fused tergites 2+3; subsequent tergites and hypopygium uniformly and densely punctate; prominent part of ventral spine of hypopygium very short. Male. 1.3-3.8 mm. Similar to female but lower face and mesosoma often partially yellow, orange or red (in the first generation, in spring, lower face and mesosoma usually black); antenna 15-segmented, F1 strongly expanded apically and only very slightly longer than F2; subsequent flagellomeres shorter, distal flagellomeres not broadened; placodeal sensilla on F3-F13; metasomal tergites 2+3 without setae antero-laterally.

Diagnosis. Belongs to the Section I of *Synergus*, particularly to a group of species with the median mesoscutal line extending for at least to the half length of the scutum; the radial cell 2.5-3.0 times as long as broad and F1 of the male strongly expanded apically (see Diagnosis to *S. pallidipennis* also). Most closely related to *S. diaphanus*, however, in *S. umbraculus* the radial cell not more than 2.5 times as long as broad; wing veins are dark brown; F1 of the male strongly expanded apically; the lower face (especially in males) and often the mesosoma (especially in females) partially yellow, orange or red, while in *S. diaphanus* the radial cell 2.5-2.7 times as long as broad; wing veins are pale; F1 of the male is less expanded apically; the lower face and mesosoma are always black in both sexes.

Distribution. One of the most common *Synergus* species, widespread throughout the Western Palaearctic Region, from Europe to Iran (Sadeghi et al., 2006a). In Ukraine – Transcarpathian Region only, common and abundant in many asexual *Andricus* galls.

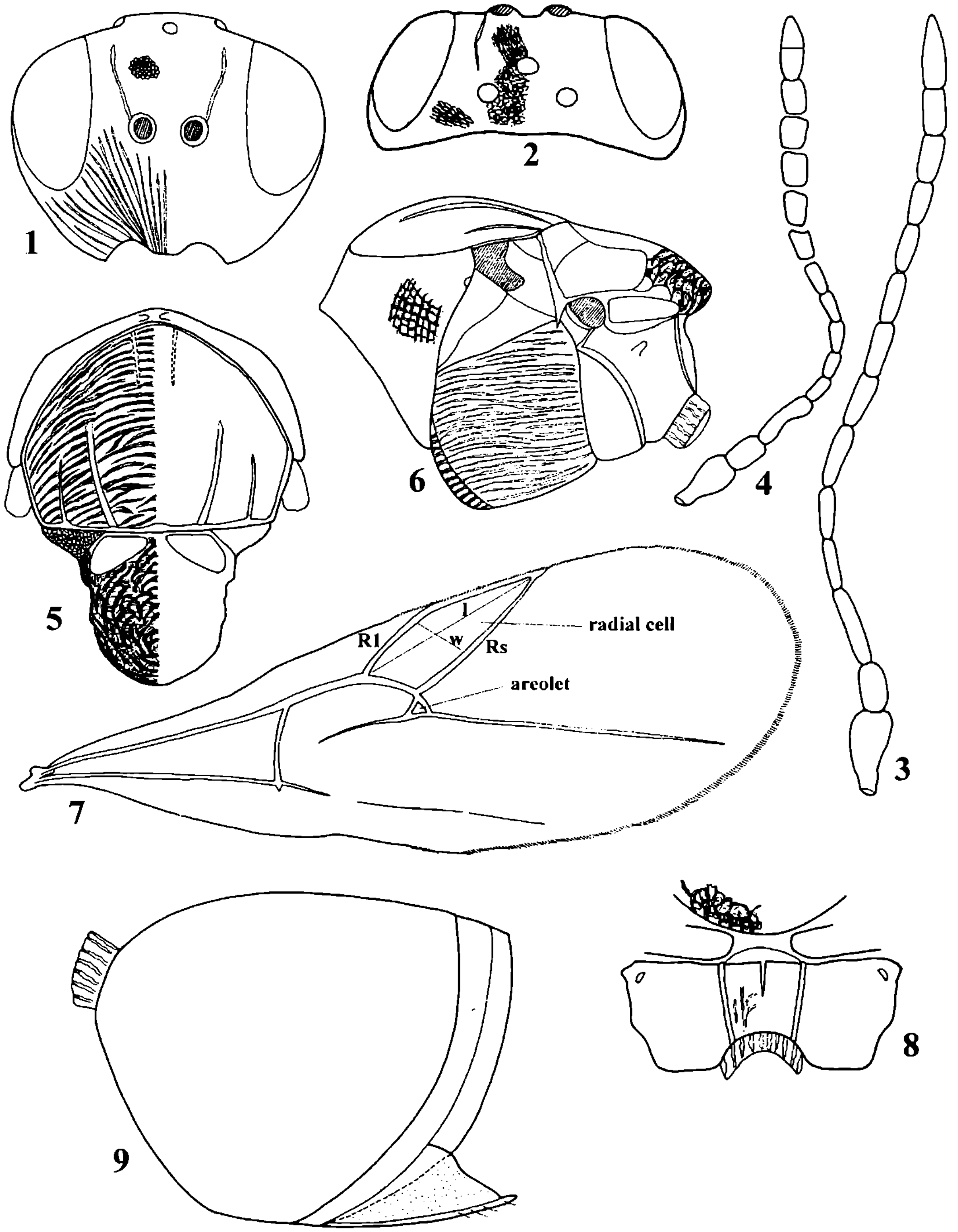
Biology. Very wide range of hosts, reared from 32 species of *Andricus* (mainly asexual galls), *B. pallida* [b]; 4 *Cynips* species, *Neuroterus albipes* [b], *N. politus* [b], *Trigonaspis megaptera* [a & b], and *T. mendesi* [a]. This species is typically a non-lethal inquiline inhabiting a secondary larval chamber that develops in the parenchyma surrounding the host larval chamber. The species is particularly abundant in the galls of the asexual generations of the *Andricus kollari* species complex. Recent DNA analysis showed that "*S. umbraculus*" is a complex of sibling species (Ács et al., 2006b; Pénzes et al., 2006).

Synergus variabilis Mayr, 1872

Figs 131.1-9.

Synergus variabilis Mayr, 1872: 702 (female, male); *Synergus cerridis* Giraud in Houard, 1911: 331-332 (synonym in Pujade-Villar & Ros-Farré, 1998b: 531); *Synergus conformis* Giraud in Houard, 1911: 333-334 (synonym in Pujade-Villar & Ros-Farré, 1998b: 531); *Synergus cerricolus* Vassileva-Samnalieva, 1986: 66-69 (female, male) (synonym in Pujade-Villar & Ros-Farré, 1998b: 531). This species was recovered from "oblivion" by Pujade-Villar & Ros-Farré, 1998b: 531.

Description. Female. 1.4-2.2 mm. Head black or very dark brown; mandibles and palpi yellow; antenna light brown to yellow. Mesosoma black or very dark brown, legs yellow, coxae light brown. Metasoma light brown, dorsally darker, hypopygium always lighter. Wing veins pale. Body with sparse white setae. Head transverse in front view, with sparse white setae, more dense on lower face; 2.1 times as broad as long from above; 1.2-1.3 times as broad as high. Gena delicately coriaceous, not broadened behind eye, converging ventrally. Malar space 0.5 times as long as height of eye, with delicate striae radiating from clypeus and nearly reaching eye. POL 1.6 times as long as OOL; OOL slightly longer than diameter of lateral ocellus and LOL. Transfacial distance equal to height of eye; diameter of antennal torulus nearly equal to distance between them and distance between torulus and eye margin. Inner margins of eyes parallel. Lower face and elevated median area with delicate striae radiating from ventral margin of clypeus and reaching or nearly reaching eyes and antennal sockets. Clypeus striate, delimited from lower face by indistinct anterior tentorial pits; epistomal sulcus and clypeo-pleurostomal line invisible; ventral margin straight. Frons very delicately coriaceous, without punctures (in some large specimens frons with



Figs. 131.1-9. *Synergus variabilis*: 1-2, head, female: 1, front view, 2, from above. 3-4, antenna, 3, female, 4, male. 5-9, female: 5, scutum and scutellum, dorsal view, 6, mesosoma, lateral view, 7, forewing, part, 8, propodeum and dorsellum, dorso-posterior view, 9, metasoma, lateral view.

sparse punctures), lateral frontal carina only partially present, very indistinct, weakly raised, short, never reaching ocelli. Vertex, interocellar area and occiput uniformly weakly coriaceous, with few indistinct punctures. Antennae 14-segmented, pedicel 1.5 times as long as broad; Fl 1.7-1.9 times as long as pedicel and 1.6 times as long as F2; F2 equal F3; subsequent flagellomeres nearly equal in length to F3; distal flagellomeres distinctly broadened; placodeal sensilla very indistinct. Pronotum alutaceous dorsally, very delicately coriaceous laterally; lateral pronotal carina absent, anterior corners of pronotum rounded in dorsal view. Scutum with interrupted sharp and widely-spaced transverse rugae, interspaces shining, smooth. Notauli incomplete, extending to 3/4 of scutum length, shallow; median mesoscutal line absent or in a from of short triangle; parapsidal lines reaching to the level of the base of tegulae; anterior parallel lines indistinct, very short. Scutellum ovate, very slightly longer than broad, uniformly rugose. Scutelar foveae transversely ovate, only slightly broader than high, indistinctly delimited posteriorly, with smooth, shining bottom, without setae; separated by distinct, coriaceous central carina. Mesopleuron completely uniformly striate, striae interrupted, delicate (in some specimens mesopleuron ventrally smooth and shining); mesopleural triangle alutaceous, with few setae. Metapleural sulcus reaching mesopleuron in upper 1/4 of its height; subaxillular bar smooth, shining, in the most posterior end nearly 2.0 times as high as height of metanotal trough. Dorsellum uniformly coriaceous, slightly higher than height of ventral impressed area; metanotal trough smooth, with few white setae; ventral impressed area of dorsellum shining, smooth, without wrinkles. Lateral propodeal carinae straight, uniformly thick, without setae; central propodeal area with delicate irregular wrinkles, with short median carina anteriorly, without setae. Forewing margin with short cilia; radial cell 2.7-2.9 times as long as broad, areolet small, indistinct. Tarsal calw with very small indistinct basal lobe, hidden by arolium. Metasoma nearly as long as head+mesosoma, longer than high in lateral view; metasomal tergites 2+3 without apical patch of punctures, without setae antero-laterally; hypopygium with indistinct micropunctures. Male. 1.3-2.0 mm. Similar to female but antenna 15-segmented, pedicel much longer than broad, broader than subseqeunt flagellomeres; Fl nearly 2.0 times as long as pedicel and 2.5 times as long as F3, curved and broadened apically and slightly basally; subsequent flagellomeres nearly of equal length, distal flagellomeres strongly broadened; placodeal sensilla very indistinct on all flagellomeres.

Diagnosis. Differs from all other species of *Synergus*, Section II-group by the absence of the lateral pronotal carina on the pronotum. The only other known European species of *Synergus*, which lack the lateral pronotal carina is the Iberian *S. plagiotrochi* Nieves Aldrey & Pujade-Villar, 1987, however, in *S. variabilis* the radial cell closed; pronotum in dorsal view angled in lateral corners; the frons with very few or wihout punctures, delicately alutaceous; the lateral frontal carina always distinct and inhabits oak cynipid galls associated with Cerris section of *Quercus*, while in *S. plagiotrochi* the radial cell is opened on margin; pronotum in dorsal view rounded; the frons with distinct punctures, coriaceous, the lateral frontal carina indistinct or absent; occurs on the Iberian Peninsula only, associates with *Plagiotrochus* species only on evergreen oaks.

Distribution. Known from AT (Mayr, 1872), BG (Vassileva-Samnalieva, 1986), HU (Pujade-Villar et al., 2003), IL (Sternlicht, 1968a), RO (Ionescu, 1955, 1957), GB (England, Maidenhead Ticket, leg. M. Chinery & R.Williams, unpublished data), RU (Belgorod Region, 4 specimens collected by Belizin and deposited in the collection of SIZK). In Ukraine – Transcarpathian Region only (Kosino, Julijivski Hory and Rafajlovo, reared from *A. grossulariae* and *Aphelonyx cerricola* galls by the author).

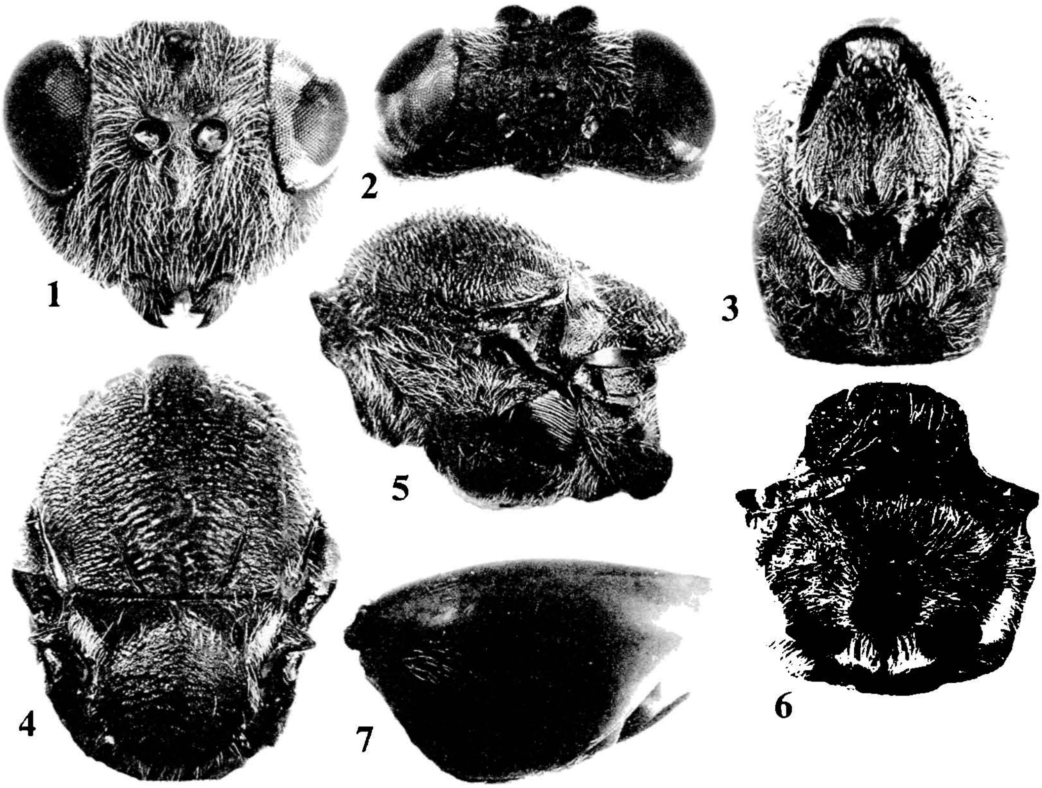
Biology. Restricted to a few galls collected on *Q. cerris*: *Andricus grossulariae* [b], *Aphelonyx cerricola* [a], *Dryocosmus nitidus* [a], *Dryocosmus cerriphilus* [a], *Pseudoneuroterus macropterus* [a] and *Synophrus politus* [b] and also from gall midge, *Janetia cerris* (Cecidomyiidae).

Synophrus Hartig, 1843

Figs 132.1-7.

Synophrus Hartig, 1843: 411. Type species: *Synophrus politus* Hartig, 1843.

Body length 2.5-6.0 mm, predominantly black, with dense and long setae. Wing veins distinct, dark brown. Head quadrangular, ovate or slightly higher than broad in front view, delicately coriaceous, with sparse white setae. Gena not broadened behind eye. Malar space 0.5-0.7 times as long as height of eye, with striae radiating from clypeus and nearly reaching eye. POL 1.5 times as long as OOL. Transfacial distance slightly longer than height of eye. Inner margins of eyes parallel, slightly converging in the most ventral part. Lower face, including slightly elevated median area with strong interrupted striae, radiating from ventral margin of clypeus and reaching eye and antennal sockets. Clypeus indistinctly delimited from lower face, ventral margin of clypeus straight, without incision and emargination; epistomal sulcus and clypeo-pleurostomal line invisible because of striae. Frons delicately coriaceous, with or without punctures, without lateral frontal carina. Vertex and interocellar area coriaceous, with some distinct deep punctures; occiput uniformly weakly coriaceous. Palpus maxillaris 4-segmented, palpus labialis – 3-segmented. Gular sulci merged ventrally, diverging before occipital foramen; occipital foramen height nearly equal to gula height and 1.5 times as short as hypostomal foramen. Antennae 13-segmented in both sexes, longer than head+mesosoma; pedicel globose, as long as broad; F1 of male curved and swollened apically. Mesosoma flatenned dorso-ventrally, longer than high in lateral view, with white setae. Pronotum without submedian pronotal pits, lateral pronotal carina absent, corners of pronotum rounded in dorsal view. Scutum with weak interrupted transverse rugae; notauli incomplete; median mesoscutal line in a form of short triangle. Scutellum at least 1.5 times shorter than scutum, nearly rounded, rugose, with more delicate sculpture and some weak wrinkles towards center of scutellar disk. Scutellar foveae broad, nearly as high as broad, separated by narrow median carina or confluent and separated by one contact point. Mesopleuron transversely striate, with or without setae. Metapleural sulcus reaching mesopleuron in upper 1/3 of its height. Lateral propodeal carinae slightly converging inwards ventrally; central propodeal area shining,



Figs 132.1-7. *Synophrus politus*, female: 1-2, head: 1, front view, 2, from above. 3, pronotum and propleura, front view, 4, scutum and scutellum, dorsal view, 5, mesosoma, lateral view, 6, propodeum and dorsellum, postero-dorsal view, 7, metasoma, lateral view.

alutaceous, without setae; lateral propodeal area coriaceous, with relatively dense white setae. Forewing longer than body, margin with short cilia; radial cell opened, more than 3.0 times as long as broad, areolet distinct, large, Rs+M distinct, nearly reaching basal vein. Tarsal claws with basal lobe. Metasoma longer than head+mesosoma, longer than high in lateral view; fused metasomal tergites 2+3 with a small dorso-lateral patch of punctures posteriorly; subsequent tergites and hypopygium without punctures; prominent part of ventral spine of hypopygium very short.

Taxonomic comments. The genus *Synophrus* currently includes three palaearctic species. There was only one named nearctic species, *Synophrus mexicanus* (Gillette, 1896), recently transferred to the *Synergus* genus (Pujade-Villar & Melika, 2005), making *Synophrus* a purely palaearctic genus. *Synophrus* species appear to be closely allied to *Saphonecrus*. Distinguishing features of the *Synophrus* are the first metasomal tergite that is smooth medially and sulcate laterally and the relatively lower position of anterior end of metapleural sulcus.

Of the three palaearctic *Synophrus* species, two, *S. politus* and *S. pilulae*, have been recorded from the Mediterranean regions and central Europe, while *S. olivieri* is known only from northern Africa, Iran and Israel. *Synophrus politus* is associated with the galls of the sexual generation of *Andricus burgundus* on *Q. suber* and *Q. cerris*. Galls and insects very similar to *S. politus* have also been collected from *Q. trojana* in northern Greece, and from *Q. ithaburensis*, *Q. brantii* and *Q. castaneifolia* in Turkey and Iran, however, the host galls are unknown. *Synophrus pilulae* develops in a smaller, as yet unidentified gall only on *Q. cerris*. The third species, *S. olivieri* Kieffer, 1898 was collected from *Q. ithaburensis* and *Q. suber*, known from DZ, MA, IL (Dalla Torre & Kieffer, 1910; Mimeur, 1949; Sternlicht, 1968a) and IR (Chodjai, 1980), with unknown gall and unknown phenology.

Hartig (1843) and most subsequent authors believed *Synophrus* to be true gall inducers. However, adult morphology clearly places this genus within the Synergini. Recent observations show that *S. politus* is a true inquiline that attacks, at a very early stage, tiny sexual generation cynipid galls induced by species in the *Andricus burgundus* complex (Pujade-Villar et al., 2003). The development of the gall begins in May or June, they mature by late summer, and the adult emerges in the early spring of the second year. *Synophrus* has never been a subject to detailed research and, thus, it is possible that they represent inquilines, which haven't completely lost their gall-inducing capability. Some examinations of the early stage of gall development suggest that *Synophrus* species 'hijack' the development of a host gall very early in its development.

Key to the western palaearctic *Synophrus* species

(species marked with (*) are unknown in the Ukrainian fauna)

1. Head higher than broad in front view, gena not broadened behind eye; mesopleuron glabrous; fused metasomal tergites 2+3 occupying almost 3/4 of metasoma; gall multilocular, about 30 mm in diameter .... ***olivieri****

-- Head quadrangular or ovate in front view, gena broadened behind eye; mesopleuron pubescent; fused metasomal tergites 2+3 occupying entire metasoma; gall monolocular, less than 30 mm in diameter 2

2. Scutellar foveae broad and separated by distinct central carina; head quadrangular in front view; usually with delicate sculpture; body with dense and long setae; mesopleuron densely pubescent; antennae, tegulae and legs black or dark brown, sometimes tibiae brown; body length 4.0-6.0 mm; galls 10-20 mm in diameter .... ***politus***

-- Scutellar foveae narrow and separated by one contact point; head ovate in front view; with distinct punctures; body with sparse and short setae; mesopleuron with glabrous central area; tegulae and legs yellow-red or amber; antenna usually red; male hind femora always reddish; body length 2.5-4.0 mm; galls 3.0-5.0 mm in diameter .... ***pilulae****

Synophrus pilulae Giraud in Houard, 1911*

Synophrus pilulae Giraud in Houard, 1911. This species was recovered from "oblivion" by Pujade-Villar et al., 2003: 153.

Description. Female. 2.8-4.0 mm. Similar to *S. politus*, however, head ovate in front view, with punctures; mesopleuron with glabrous central area; scutellar foveae narrow and separated by one contact point; body with sparse and short setae; tegulae and legs yellow-red or amber; antenna usually red. Male. 2.5.3.8 mm. Similar to female and male of *S. politus* but hind femora always reddish. See also Diagnosis to *S. politus*.

Distribution. Central Europe. Known from AT (Giraud in Houard, 1911) and HU (Pujade-Villar et al., 2003). Possible in Ukraine, Transcarpathian Region, where galls like *S. pilulae* were collected by the author, however, no adults were reared.

Biology. Reared from galls on *Q. cerris* only, hosts are unknown. Galls are relatively small, 3.0-5.0 mm.

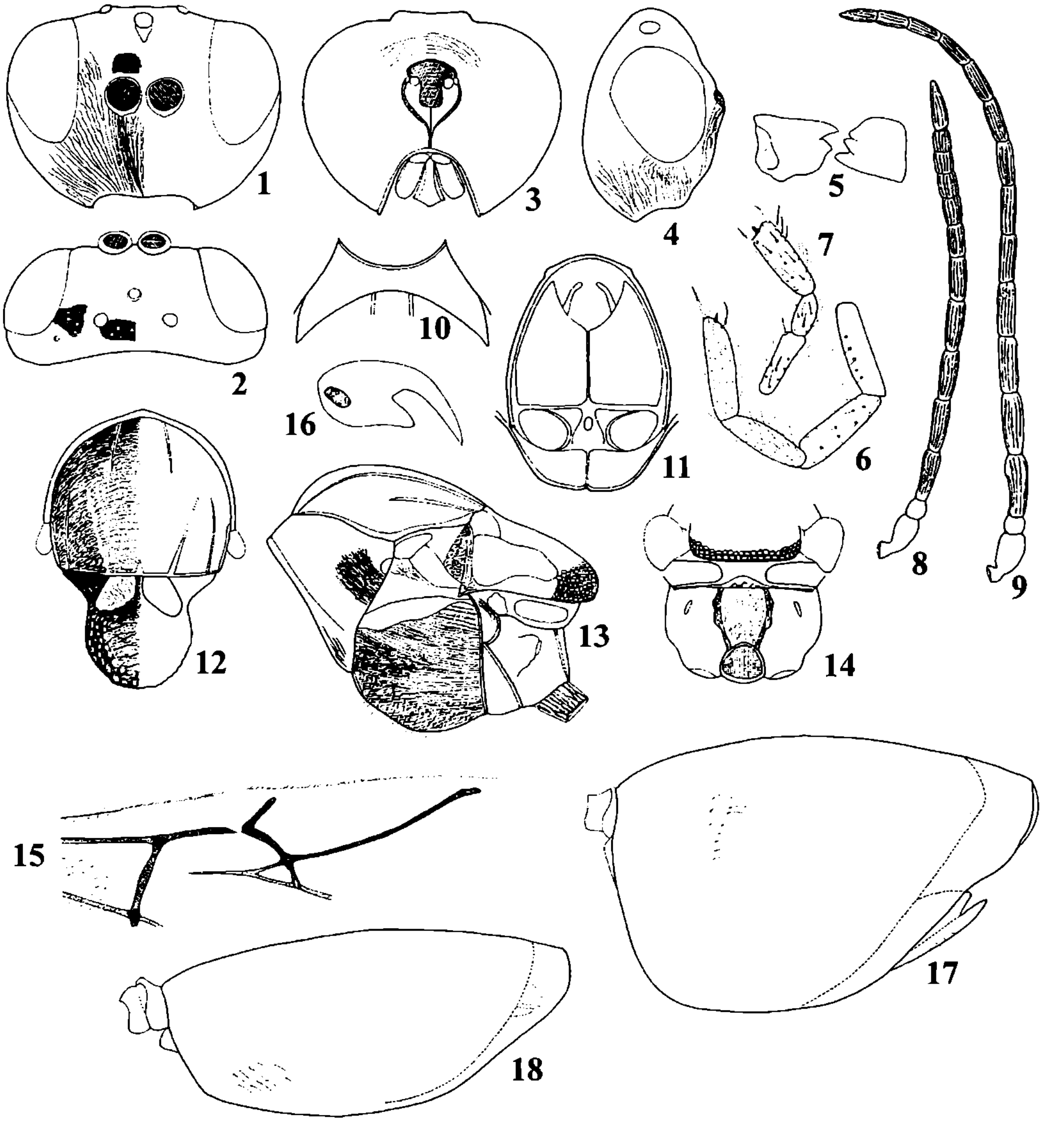
Synophrus politus Hartig, 1843

Figs 133.1-18.

Synophrus politus Hartig, 1843: 412 (female); *Cynips politus*: Kaltenbach, 1867: 63.

Description. Female. 4.0-6.0 mm. Head, including mandibles and palpi black; antenna black to dark brown. Mesosoma black, legs dark brown, except black coxae and trochanters. Metasoma dark brown to black dorsally and light brown latero-ventrally and ventrally. Body with dense and long setae. Wing veins distinct, dark brown. Head quadrangular in front view, delicately coriaceous, with sparse white setae, more dense on lower face; 2.0 times as broad as long from above; 1.3 times as broad as high. Postocciput around occipital foramen impressed, dull coriaceous; posterior tentorial pits deep, rounded; gular sulci merged, however, diverging before occipital foramen; occipital foramen height nearly equal to gula height and 1.5 times as short as hypostomal foramen. Gena delicately coriaceous with delicate wrinkles, not broadened behind eye, invisible in front view behind eye. Malar space 0.5-0.7 times as long as height of eye, with delicate striae radiating from clypeus and nearly reaching eye. POL 1.5 times as long as OOL; OOL 2.3 times as long as diameter of lateral ocellus and 1.2-1.4 times as long as LOL. Transfacial distance slightly longer than height of eye; diameter of antennal torulus 7.5 times as large as distance between them and 1.6 times as long as distance between torulus and eye margin. Inner margins of eyes parallel, slightly converging in the most ventral part. Lower face, including slightly elevated median area with strong interrupted striae, radiating from ventral margin of clypeus and reaching eye and antennal sockets. Clypeus delimited from lower face by very indistinct anterior tentorial pits; ventrally clypeus nearly straight, without incision and emargination; epistomal sulcus and clypeo-pleurostomal line invisible because of striae. Frons very delicately coriaceous, without punctures, without lateral frontal carina. Vertex and interocellar area delicately coriaceous, with some distinct deep punctures; occiput uniformly weakly coriaceous. Palpus maxillaris 4-segmented, palpus labialis – 3-segmented. Antennae 13-segmented, longer than head+mesosoma; pedicel globose, as long as broad; F1 2.7-2.9 times as long as pedicel; F1=F2=F3; subsequent flagellomeres shorter; placodeal sensilla on all flagellomeres. Mesosoma flatenned dorso-ventrally, longer than high in lateral view, with white setae. Propleuron black, delicately coriaceous. Pronotum without submedian pronotal pits, delicately uniformly coriaceous, lateral pronotal carina absent, corners of pronotum rounded in dorsal view. Scutum with weak interrupted transverse rugae, interspaces coriaceous; slightly longer than broad (width measured across the basis of tegulae). Notauli incomplete, although sometimes weakly impressed, usually extending to 1/2-1/3 of scutum length;

median mesoscutal line in a form of short triangle; parapsidal lines distinct, reaching slightly above the level of the base of tegulae; anterior parallel lines extending to 1/3 of scutum length. Scutellum 1.6-2.0 times shorter than scutum, nearly rounded, rugose, with more delicate sculpture



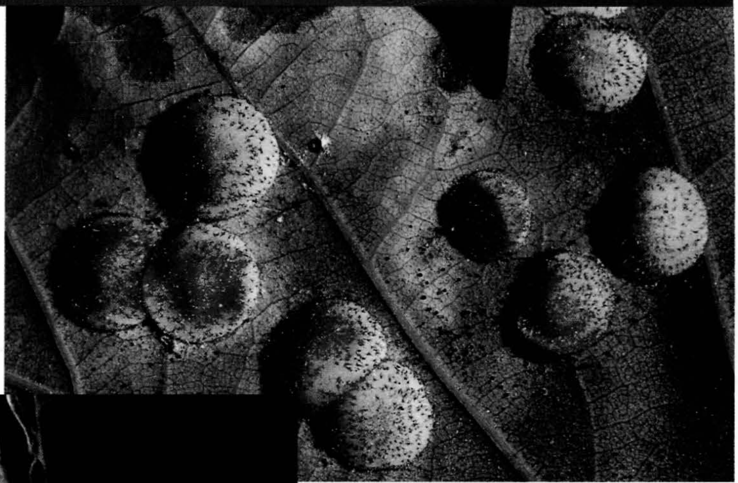
Figs 133.1-18. *Synophrus politus*: 1-4 head, female: 1, front view, 2, from above, 3, posteriorly, 4, lateral view. 5-7, female: 5, mandibles, 6, palpus maxillaris, 7, palpus labialis. 8-9, antenna: 8, female, 9, male. 10-16, female: 10, pronotum, dorsal view, 11, pronotum and propleura, front view, 12, scutum and scutellum, dorsal view, 13, mesosoma, lateral view, 14, propodeum and dorsellum, postero-dorsal view, 15, forewing, part, 16, tarsal claw. 17-18, metasoma, lateral view: 17, female, 18, male.

and some weak wrinkles towards center of scutellar disk. Scutellar foveae broad, nearly as high as broad, separated by very narrow median carina, not distinctly delimited posteriorly, with delicately coriaceous bottom, without setae. Mesopleuron completely striate and densely pubescent; mesopleural triangle uniformly coriaceous, with dense setae. Metapleural sulcus reaching mesopleuron in upper 1/3 of its height, areas delimited by the inferior and superior parts of metapleural sulcus alutaceous, with dense white setae; preaxilla and lateral axillar area delicately coriaceous; axillar carina very narrow, with longitudinal distinct striae; axillula ovate, shining, coriaceous, with piliferous points; subaxillular bar smooth, shining, in the most posterior end nearly as high as height of metanotal trough; propodeal spiracle strongly elevated, ovate; pit above spiracle shallow, shining, without wrinkles; area between spiracle and metapleural sulcus shining, smooth, with dense white setae; ventral bar of metanotal trough coriaceous, nearly 2.5 times narrower than height of metanotal trough measuring above propodeal spiracle. Dorsellum smooth, shining, with some indistinct weak wrinkles, nearly 2.0 times shorter than height of ventral impressed area; metanotal trough very delicately coriaceous to alutaceous, with few white setae; ventral impressed area of dorsellum shining, with distinct weak longitudinal wrinkles. Lateral propodeal carinae irregular in width, slightly converging ventrally, without setae; central propodeal area shining, alutaceous, without setae; lateral propodeal area delicately uniformly coriaceous, with relatively dense white setae; nucha long, with longitudinal wrinkles. Forewing longer than body, margin with short dense cilia; radial cell opened, 3.4 times as long as broad, Rs and R1 not reaching wing margin, areolet distinct, large, Rs+M distinct, nearly reaching basalis, projecting into upper half of it. Tarsal claws with basal lobe. Metasoma longer than head+mesosoma, 2.5 times or more as long as high in lateral view; fused metasomal tergites 2+3 with a small patch of punctures posteriorly in dorso-lateral part only; subsequent tergites and hypopygium without punctures; prominent part of ventral spine of hypopygium very short. Male. 3.8-5.5 mm. Similar to female but antenna 15-segmented, F1 curved and swollened apically, equal in length to F2; subsequent flagellomeres only very slightly shortening till distal flagellomeres; placodeal sensilla on all flagellomeres.

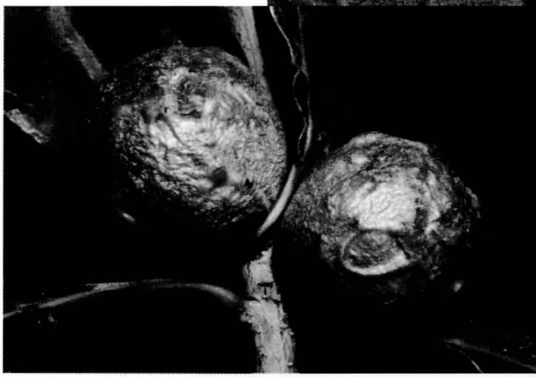
Diagnosis. Most closely related to *S. pilulae*. In *S. politus* scutellar foveae are broad and separated by a distinct median longitudinal carina; the head is quadrangular in front view and usually with delicate sculpture; the body with dense and long setae; the mesopleuron densely pubescent; antennae, tegulae and legs are black or dark brown, sometimes tibiae brown; the body length 4.0-6.0 mm; galls which from the adults emerge are 10-20 mm in diameter, while in *S. pilulae* scutellar foveae are narrow and separated by one contact point; the head is ovate in front view, with distinct punctures; the body less pubescent; the mesopleuron with glabrous central area; tegulae and legs are yellow-red or amber; antennae usually red; male hind femora always reddish; the body length 2.5-4.0 mm; galls are only 3.0-5.0 mm in diameter. DNA sequences of many *Synophrus* specimens collected in the same localities (for example, in Hungary) definitely showed that at least two different species exist and, thus it is supporting the differentiation of European *Synophrus* species at least onto two different species (unpublished data).

Distribution. Central and Southern Europa, North Africa and Israel. Known also from IR and SY (Stone, Melika & Csóka, in press). In Ukraine – Transcarpathian Region only (Kosino, Julijivski Hory, Rafajlovo).

Biology. The gall infested by *S. politus* develops from lateral or apical buds, on leaf petioles or even occasionally on catkins. The gall is spherical, with a very hard wall, ca. 15 mm in diameter. The gall surface is bark-coloured, covered in small whitish tubercles and may be ornamented by small spikes. Often surrounds the stem and sometimes a leaf petiole. The inner chamber is centrally positioned. Its wall is white and fused to the hard tissue of the gall, which resembles that of the branch. Galls which are several years old turn black. The larva matures in autumn. The gall stays on the tree and adults eclose in March. Host oaks: *Q. cerris, Q. ithaburensis, Q. suber, Q. castaneifolia, Q. brantii* and *Q. libani*.



Neuroterus quercusbaccarum



Andricus infectorius

Andricus hungaricus

Andricus lucidus

Andricus kollari

Neuroterus quercusbaccarum

Photos by G. Csóka