

Oak cynipid gall inquilines of Iran (Hym.: Cynipidae: Synergini), with description of new species

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Abstract

Ten known cynipid inquiline species associated with oak cynipid galls (Hymenoptera, Cynipidae: Synergini and Cynipini), their distribution and host associations are given for the first time for the Iranian cynipid fauna: *Ceropales cerri* Mayr, *C. clavicornis* Hartig, *Saphonecrus haimi* (Mayr), *Synergus gallaeponiformis* (B. de Fonsc), *S. pallidipennis* Mayr, *S. pallipes* Hartig, *S. reinhardi* Mayr, *S. thaumacerus* (Dalman), *S. umbraculus* (Olivier) and *S. variabilis* Mayr. Five new species of cynipid inquiline, *Saphonecrus irani* Melika & Pujade-Villar sp. n., *Synergus acsi* Melika & Pujade-Villar sp. n., *Synergus bechtoldae* Melika & Pujade-Villar sp. n., *Synergus palmirae* Melika & Pujade-Villar sp. n. and *Synergus mikoi* Melika & Pujade-Villar sp. n. are described from Iran; the description and diagnosis of adults of these new species, their host associations and biology are given. Finally, galls that may induce by the inquiline *Synophrus olivieri* Kieffer have been collected.

Key words: cynipid inquiline, Synergini, *Synergus*, *Saphonecrus*, taxonomy, morphology, distribution, Iran

چکیده

ده گونه زنبور اینکوئیلین (inquiline) همیست با زنبورهای گالزای بلوط (خانواده Cynipidae) متعلق به قبیله‌های Cynipini و Synergini برای اولین بار از ایران گزارش می‌شوند. مناطق پراکنش و ارتباط میزبانی آنها نیز ارائه می‌گردد. این گونه‌ها عبارتند از: *Synergus haimi* (Mayr). *C. clavicornis* Hartig. *Ceropales cerri* Mayr. *S. reinhardi* Mayr. *S. pallipes* Hartig. *S. gallaeponiformis* (B. de Fonsc.) *S. variabilis* Mayr و *S. umbraculus* (Olivier). *S. thaumacerus* (Dalman) به علاوه پنج گونه‌ی جدید از این *Synergus acsi* Melika & Pujade-Villar sp.n. *Saphonecrus irani* Melika & Pujade-Villar sp.n. همیست‌ها، *Synergus palmirae* Melika & Pujade-Villar sp.n. و *Synergus bechtoldae* Melika & Pujade-Villar sp.n. همیست *Synergus mikoi* Melika & Pujade-Villar sp.n. از ایران برای دنیای علم توصیف می‌شوند. توصیف و تشخیص حشرات کامل این گونه‌های جدید، ارتباط میزبانی و بیولوژی آنها شرح داده شده است. گالهایی که احتمالاً بوسیله زنبور *Synophrus olivieri* Kieffer ایجاد می‌شوند نیز جمع آوری گردید.

واژگان کلیدی: زنبورهای *Saphonecrus*, *Synergus*, Synergini inquiline, تاکسونومی, مرفو‌لوژی, پراکنش, ایران

Introduction

The Irano-Turanian centre of endemism covers the interior of Turkey, extending eastwards from the beginning of the Central Anatolian Plateau into NW Iran. The oak cynipid gall wasp fauna (Hymenoptera, Cynipidae: Cynipini) of Iran remains little-studied (Chodjai 1980; Azizkhani *et al.*, in press; Sadeghi *et al.*, in press). A number of widespread oak gallwasps show their greatest genetic diversity in the eastern mediterranean, suggesting that the Irano-Turanian region may have acted as a major centre of speciation in this group in the past (estimates based on DNA sequence divergence suggest that such a radiation took place at least several million years ago) (Stone *et al.*, 2001; Rokas *et al.*, 2003). The same seems to be true for the cynipid inquilines (Cynipidae: Synergini) (Ács *et al.*, unpublished data). It remains unclear, however, how much Iranian forests lie within the true centre of this diversity, or whether they represent an eastern limit to the distributions of taxa otherwise found further west.

Thirty six species of oak cynipid gallwasps were recorded in Iran by Chodjai (1980), but many were erroneously identified and thus incorrectly cited for this region. Iran lies at the eastern limit of the Western Palaearctic, and recent surveys confirm that its cynipid fauna includes widespread Western Palaearctic species (such as *Andricus kollari* Hartig and *Cynips quercusfolii* Linnaeus), species limited to the eastern part of this region (such as the *insana* form of *Andricus quercustozae* Bosc, *Andricus megalucidus* Melika *et al.* and *Aphelonyx persica* Melika *et al.* (Melika *et al.*, 2005), and taxa currently unknown from Turkey that may represent Iranian endemics (9 new species from genera *Andricus* and *Dryocosmus*: Azizkhani *et al.*, in press; Sadeghi *et al.*, in press).

Inquiline cynipids have lost the ability to induce their own galls; nevertheless they are also phytophagous insects, like the gall wasps. Cynipid inquiline larvae can develop inside the gall-inducer chamber and then usually cause the death of the gall-inducer cynipid larvae, or locate and feed in the peripheral tissue of the gall and also can provoke or not the death of the gall inducer larvae, especially when the number of inquilines is high. They are placed in a separate tribe Synergini, between other 5 tribes of gall inducers within the Cynipinae subfamily of Cynipidae (Ronquist, 1999; Csóka *et al.*, 2004). Inquiline cynipids have a worldwide distribution, but the majority are found in the Holarctic region and they are represented by 7 genera: *Ceropales* Hartig, *Saphoneurus* Dalla Torre & Kieffer, *Synergus* Hartig, *Synophrus* Hartig and *Uro* Melika & Pujade-Villar (Melika *et al.*, in press) – all are inquilines in oak cynipid galls; *Periclistus* Foerster – inquilines in rose galls, and

Synophromorpha Ashmead – inquilines in *Diastrophus* galls on *Rubus*. Around 145 species of Synergini inquilines are known worldwide from which 38 are from the Western Palaearctic (Csóka *et al.*, 2004).

This is the first report on the Iranian cynipid inquilines, associated with oak gallwasps (Cynipini) based on the survey started from 2001 by a group of researchers of the Research Institute of Forest and Rangelands in Tehran, under the coordination and supervising of the first author. No cynipid inquilines were reported yet from Iran and the only reported species *Synophrus olivieri* Kierrer, which is an inquiline after Ronquist (1994), was mentioned by Chodjai (1980) as a gall-inducing cynipid. From the neighbouring Azerbaijan, which is in fact the northward continuation of the Iranian oak cynipid fauna, Belizin & Maisuradze (1965) listed 6 species of *Synergus*, with the description of 2 new species: *S. aliterus* Belizin & Maisuradze and *S. rubicundus* Belizin & Maisuradze. Other species mentioned by the authors for the Lenkoran Region of Azerbaijan were *Synergus umbraculus* (Olivier), *S. incrassatus* Hartig, *Synergus varius* Hartig and *Synergus rubricornis* Tavares. The current valid name of *S. varius* is *S. pallipes* Hartig (Pujade-Villar *et al.*, 2003). Listing of *Synergus rubricornis* Tavares, which is known on the basis of only one specimen described from Portugal and currently has an uncertain status (Pujade-Villar *et al.*, 2003), is very doubtful and probably is a misidentification of *S. umbraculus*, which is very closely related to this species. The original descriptions of *Synergus aliterus* and *S. rubicundus* are incomplete and by far not sufficient for identification purposes. Belizin & Maisuradze (1965) mentioned that types of both species were deposited in the collection of the Zoological Institute in St. Petersburg (Russia). The second author during his visit to this institution, together with the curator of Cynipoidea collection (Dr. O. Kovalev), were unable to find the types and, thus, *S. aliterus* and *S. rubicundus* are declared herein as species with uncertain status and we do not take them into account when described new species below.

Materials and methods

We follow the current terminology of morphological structures (Gibson, 1985; Ronquist & Nordlander, 1989). Abbreviations for fore 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. Width of radial cell measured along 2r. Drawings of some structures of adult wasps were taken with a digital camera, followed by processing in Adobe Photoshop 6.0. Line drawings were then prepared from hard copy printouts by the sixth author.

Descriptions of inquiline cynipid wasp species provided here represent the continuation of surveys to establish the cynipid fauna of Iran. Below one new species of *Saphonecrus*: *S. irani* Melika & Pujade-Villar, and four species of *Synergus*: *S. acsi* Melika & Pujade-Villar, *S. palmirae* Melika & Pujade-Villar, *S. mikoi* Melika & Pujade-Villar and *S. bechtoldae* Melika & Pujade-Villar are described and data on the distribution, biology and host associations of nine known Synergini species is given. For the species identification we used the recent keys (Pujade-Villar *et al.*, 2003).

From the majority of known and all the newly described Synergini species collected in Iran, specimens were taken which from nuclear DNA sequences for portion of 28S ribosomal RNA gene (D2 expansion region, 560 bp long) and two mitochondrial genes (cytochrome c oxidase subunit I, 660 bp long and cytochrome b, 433 bp long) were obtained (Ács *et al.*, unpublished data). The DNA sequences of known species derived from Iran agree with those sequences we got from specimens collected and reared in Hungary and also the sequences of new species showed that they are distinct from all known species, thus the molecular analysis support our newly described species and also the identification of specimens based on their morphology.

Sixteen cynipid inquilines associated with oak cynipid galls were found in Iran and are discussed below.

***Ceroptres* Hartig**

The European fauna of this genus has been revised in Pujade-Villar & Nieves-Aldrey (1993). Only two species are known from the Western Palaearctic region, *Ceroptres cerri* Mayr and *C. clavicornis* Hartig, both are inquilines in oak cynipid galls and sometimes in gall-midge galls which associate with oaks (Pujade-Villar *et al.*, 2003). Two other species, *C. kovalevi* Belizin and *C. masudai* Abe, were described from the Eastern Palaearctic, from Far East of Russia and Japan and Korea respectively (Belizin, 1973; Abe, 1997). The biology of *Ceroptres* species is poorly known. *Ceroptres clavicornis* always develops in galls associated with *Quercus* L. species from the section *Quercus* (*Q. robur*, *Q. petraea*, *Q. pubescens*, etc.), while *C. cerri* can be find in galls on *Q. cerris* (subgenus *Lepidobalanus*, section *Cerris*), or

on evergreen oaks with circummediterranean distribution, *Q. suber*, *Q. ilex* and *Q. coccifera* (subgenus *Lepidobalanus*, sections *Sclerophyllodrys* and *Cerris*) (Pujade-Villar *et al.*, 2003).

Ceroptris cerri Mayr

Material examined – Iran, Lorestan Prov., Ghelaie, *Q. brantii*, 2003, mid-summer, leg. M. Tavakoli, ex stem swelling-like gall of *Synophrus* sp.?, Lor, 43, 1 female; Iran, West Azarbaijan, *Q. brantii*, ex galls like *N. saliens*, AW 6qb1B3, 3 males.

The species was reared from unidentified galls on *Q. brantii*, which belongs to the section *Cerris* of *Quercus* in Lorestan and W. Azarbaijan. Supposedly has a much wider distribution in Iran and can be finding everywhere *Quercus* species of the section *Cerris* (*Q. brantii*, *Q. libani* and *Q. castaneifolia*) grow.

Ceroptris clavicornis Hartig

Material examined – Iran, Kermanshah, Gahvareh, *Q. infectoria*, 2003, mid-summer, leg. M. Tavakoli, ex unidentified branch galls, Lor24, 2 females and 3 males; Iran, Kermanshah, Gahvareh, *Q. infectoria*, 2003, mid-summer, leg. M. Tavakoli, ex *Andricus polycerus*, Lor70, 2 females.

The species was reared from *Andricus polycerus* (Giraud) and unidentified galls on *Q. infectoria* in Kermanshah province only. Probably has a much wider distribution in Iran and can be find everywhere oaks of the *Quercus* section grow.

Saphonecrus Dalla Torre & Kieffer

According Pujade-Villar *et al.* (2003) five valid species are known from the Western Palaearctic: *S. barbotini* Pujade-Villar & Nieves-Aldrey, *S. connatus* (Hartig), *S. haimi* (Mayr), *S. lusitanicus* (Tavares), and *S. undulatus* (Mayr). The biology of *Saphonecrus* species can be divided into three groups as it was showed by Pujade-Villar & Nieves-Aldrey (1990). The first group (*S. connatus*) includes species with one annual generation, and associated with galls on deciduous oaks of the subgenus *Leptobalanus*, section *Quercus*; the second group (*S. haimi* and *S. undulatus*), also univoltine, associated with galls on oaks from the subgenus *Leptobalanus*, section *Cerris*; and finally the third group, with some Mediterranean species, with bivoltine life cycles, associated with galls on evergreen oaks (*S. lusitanicus* and *S. barbotini*). In Iran we found *S. haimi* and one species new for science, both associated with galls on oaks from the subgenus *Leptobalanus*, section *Cerris*.

***Saphonecrus haimi* (Mayr)**

Material examined – Iran, Guilan Province, Rasht, *Q. castaneifolia*, ex leaf galls like *N. saliens*, 3 females and 4 males; Iran, Mazandaran Province, Behshahr (Hezarjerib), *Q. castaneifolia*, leg. H. Barimani, ex leaf galls like *N. saliens* MAZ 101, MAZ 102, 5 females and 4 males.

The species was reared from unknown cynipid leaf galls, like the sexual leaf galls of *Neuroterus saliens* (Kollar) on *Q. castaneifolia* from Guilan and Mazandaran provinces. Specimens collected in Iran have the antennae and legs very light (yellow to white), male's head is yellow to brown, except the frons and vertex which are reddish-brown to black; female's head usually reddish-brown around mouthparts; male's mesopleuron and propodeum are dark reddish-brown and the metasoma is light, reddish to brown. In specimens collected in Europe, the head and mesosoma are black, while antennae, legs and metasoma darker than those from Iran. Nevertheless, the morphology of the specimens collected in Iran do not differ from European specimens, so, in our opinion, it is only a chromatic variation of *S. haimi*. The distribution and host associations of this species are probably much wider and can be find everywhere oak species (*Q. brantii*, *Q. libani*, *Q. castaneifolia*) of the section *Cerris* grow.

***Saphonecrus irani* Melika & Pujade-Villar sp. n.**

(Figs 1-10)

Description – 1.2-1.9 mm. Female. Head and mesosoma entirely black, compound eyes silvery, antennae uniformly yellow to white, with F11 tip black; legs including all coxae, yellowish to white; wing veins light yellow, sometimes hardly traceable; metasoma usually dark brown to black, in some specimens light red. Head 2.3-2.5 times as wide as long from above, only 1.1-1.2 times as broad as high in front view, very slightly broader than mesosoma; gena not broadened behind eye (Figs 1-2); POL 2.3-2.5 times as long as OOL, LOL equal OOL, OOL 2.5 times as long as diameter of lateral ocellus, ocelli very small. Vertex, interocellar area, occiput, frons very delicately alutaceous; frons smooth, flat, without frontal lateral carinae; transfacial distance nearly equal to eye height, distance between antennal toruli slightly shorter than diameter of torulus, distance between inner margin of eye and antennal torulus slightly longer than diameter of torulus; compound eyes slightly converge inwards; lower face (including the slightly elevated central area) and malar space with very delicate striae irradiating from clypeus and reach compound eyes and antennal sockets; gena behind eye delicately alutaceous, length of malar space nearly equal to height of

compound eye (Figs 1-2). Antenna 13-segmented, F1 1.6-1.7 times as long as pedicel and 1.3 times as long as F2, F11 the longest flagellomere, 2.1 times as long as F10; flagellomeres consequently broadened till apex of antenna (Fig. 3). Mesosoma shiny, only slightly longer than high in lateral view (Fig. 8), pronotum dorsally delicately alutaceous, laterally with delicate striae, especially in posterodorsal part, lateral pronotal carina absent, submedian pronotal pit very small, rounded, separated by a distance 2.0 times as long as the cross length of a pit (Figs 5, 8), pronotum with dense white short setae along the anterior rim; scutum broader than long in dorsal view, with delicate interrupted transverse rugae, interspaces between rugae shiny, delicately alutaceous; notaui and median scutellar line absent (from 34 female paratypes only in two specimens notaui are traceable at the main base of scutum, in the posterior 1/4 of scutum length); anterior parallel lines short, distinct, parapsidal lines distinct, in a form of elevated short carinae (Fig. 6). Mesopleuron, including speculum with very delicate transverse striae, shiny; upper anterior part of mesopleural triangle shiny, smooth (Fig. 6). Scutellum slightly broader than long in dorsal view, with delicate transverse striae, area between striae shiny, delicately alutaceous, scutellar foveae absent or only in a form of very narrow transverse impression along transscutal articulation (Fig. 6). Metapleural sulcus reach mesopleuron in the upper 1/3 of its height, dorsellum very narrow, shiny, smooth; metanotal trough shiny, smooth, without setae, ventral impressed area of metanotum narrow, smooth, shiny (Fig. 8). Propodeum delicately alutaceous to smooth, shiny, lateral propodeal carinae nearly straight, parallel, central propodeal area smooth, shiny, in some specimens with very few delicate wrinkles; lateral propodeal area smooth, shiny with few short white setae. Forewing with pale, light yellow to white veins, margin with very short cilia; radial cell opened, very short (less than 2.0 times as long as broad), both R1 and Rs do not reach wing margin, M very indistinct, areolet absent (Fig. 9). Tarsal claws with basal lobe. Metasoma longer than head+mesosoma, longer than high, first tergum with weak carinae, fused terga 2+3 occupy the entire metasoma, fused tergites without punctures, smooth, shiny; prominent part of ventral spine of hypopygium very short with very few sparse white setae, which do not reach beyond the apex of the ventral spine; hypopygium with micropunctures (Fig. 9).

Male. Similar to female, but lower face always brown to light brown, metasoma always light brown, never black; antennae and legs dirty white; antenna 14-segmented, F1 very slightly curved, and slightly expanded apically and basally, F1 2.2 times as long as F2 (Fig. 4).

Diagnosis – Differs from all other known *Saphonecrus* species by a very short and peculiar morphology of the radial cell (Fig. 9). Moreover, *S. irani* differs from *S. haimi*, *S. connatus*, *S. barbotini* and *S. lusitanicus* by the carinated scutum. Besides, it can be distinguished from *S. barbotini* and *S. lusitanicus* by the colouration – it is black in *S. irani* sp. n. and amber in the other two. The most closely related species is *S. undulatus*. On the basis of the short ventral spine of the hypopygium and black colour, these two species seem to form a morphological group together with *S. haimi*, all obtained from galls on oaks from the subgenus *Leptobalanus*, section *Cerris*.

Four specimens of *S. irani* sp. n. were sequenced for two portions of 28S rRNA: D2 and D3-D5 expansion regions. On the basis of these sequences the most closely related species are *S. haimi* and *S. undulatus* (Mayr) but, without doubts, *S. irani* is a distinct species based on the DNA sequences.

Type material – Holotype female: Iran, Kermanshah Province, Dar-badam, *Q. brantii*, 2003, mid-summer, leg. M. Tavakoli, ex galls on terminal buds of *Q. brantii*, Lor119; 34 female and 45 male paratypes: 12 females and 4 males with the same labels as the holotype; 12 females and 33 males, Iran, Kermanshah Prov., Gahvareh, *Q. brantii*, 2003, mid-summer, leg. M. Tavakoli, ex small underside detachable leaf galls, like *N. saliens*, Lor29; 5 females and 3 males, Iran, Kermanshah Prov., Gahvareh, *Q. brantii*, 2003, mid-summer, leg. M. Tavakoli, ex galls of *Aphelonyx persica*, Lor8; 1 female, Iran, Kordestan Prov., Marivan, *Q. brantii*, 2003, end of summer, leg. M. Tavakoli, ex galls of *Neuroterus lanuginosus*, Lor111; 3 females and 3 males, Iran, Lorestan Prov., Ghelaie, *Q. brantii*, 2003, leg. M. Tavakoli, ex leaf galls, *Neuroterus ?saliens*, Lor15; 1 female, Iran, Lorestan Prov., Ghelaie, *Q. brantii*, 2003, leg. M. Tavakoli, ex gall of *Aphelonyx persica*, Lor74; 1 female and 4 males, Iran, Lorestan Prov., Nogian, *Q. brantii*, 2003, leg. E. Azizkhani, ex *Neuroterus lanuginosus*, Lor133; 1 female and 1 male, Iran, Lorestan, Prov., Ghelaie, *Q. brantii*, 2003, leg. M. Tavakoli, ex gall of gallmidge, *Dryomyia* sp., Lor 84; 1 female, Iran, West Azarbaijan, Sar Dasht (Vavan station), 2003.X.08, *Q. brantii*, leg. M. Zargaran, ex gall of *Aphelonyx persica*, AW12qb1B9.

Holotype female, 2 female and 2 male paratypes in the Hungarian Natural History Museum, Budapest (HNHM), 4 female and 4 male paratypes in the museum of Research Institute of Forests and Rangelands, Tehran, Iran (RIFR), 3 males and 3 females in Barcelona University (UB), and 28 female and 39 male paratypes in the cynipid collection of the

Systematic Parasitoid Laboratory, Plant Protection and Soil Conservation Service of County Vas, Kőszeg, Hungary (SPL).

Etymology – The species is named after the country, Iran, where it was collected.

Biology – Reared from galls of *Neuroterus lanuginosus* Giraud, *Aphelonyx persica* Melika, Stone, Sadeghi & Pujade-Villar, detachable rounded or elliptical galls, like *Neuroterus saliens*, from dipteran galls of *Dryomyia* sp. (Diptera: Cecidomyiidae), and from some other unidentified terminal bud galls – all galls associated with the section *Cerris* of *Quercus*, particularly with *Q. brantii*.

Distribution – Known from Iran only: West Azarbaijan, Kermanshah, Kordestan and Lorestan provinces.

Synergus Hartig

Synergus is the most species-rich genus within Synergini and has the most diverse host associations. 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 (Pujade-Villar *et al.*, 2003). Currently 26 valid species of *Synergus* are listed for the Western Palearctic (Pujade-Villar *et al.*, 2003; Stone *et al.*, in press). Species that we found in Iran are listed in alphabetical order.

Synergus acsi Melika & Pujade-Villar sp. n.

(Figs 11-19)

Description – 1.6-2.3 mm. Female. Head reddish brown, with dark brown to black interocellar area; frons dark brown to black medially, with brown stripes along compound eyes; vertex, occiput dark brown, head posteriorly dark brown; lower face and genae always much lighter, compound eyes silvery, mandibles light brown. Antennae uniformly yellow. Hind coxae black, mid- and fore coxae dark brown to black; hind femura black, mid- and fore femura brown, with very light apex; all trochanters, tibiae and tarsi yellowish white. Wing veins white, distinct. Pronotum dark brown; scutum, scutellum black; mesopleuron, metanotum and propodeum dark brown. Metasoma reddish brown, dorsally darker, hypopygium lighter. Head from above 2.1-2.3 times as wide as long, only 1.2-1.4 times as broad as high and trapezoid in front view, very slightly broader than thorax; gena slightly broadened behind eye (Figs 11-12); POL nearly 2.0 times as long as OOL, LOL nearly equal

OOL, OOL only slightly longer than the diameter of lateral ocellus. Vertex, interocellar area, occiput, frons delicately coriaceous, with deep, very distinct punctures; frons with frontal lateral carinae not strongly impressed but reach lateral ocelli; transfacial distance slightly longer than height of eye, distance between antennal toruli nearly equal to diameter of torulus, distance between inner margin of eye and antennal torulus slightly longer than diameter of torulus; inner margins of compound eyes parallel; lower face (including the slightly elevated central area), malar space and genae with strong striae irradiating from the tip of clypeus and reach compound eyes and antennal sockets; gena behind eye also striate, slightly broadened; length of malar space 0.5-0.7 times as long as height of compound eye (Figs 11-12). Antenna 14-segmented, pedicel nearly 2.0 times as long as broad, F1 the longest flagellomere, 1.7-1.9 times as long as pedicel and 1.4 times as long as F2, placodeal sensilla on F4-F12, located in two rows, absent on F1-F3 (Fig. 13). Mesosoma flattened in lateral view, 1.2 times as long as high (Fig. 17), pronotum dorsally coriaceous, laterally with delicate striae, especially in posterodorsal part, with dense white short setae along the anterior rim, lateral pronotal carina absent, submedian pronotal pit transversely elongate, separate by a distance nearly equal or slightly longer than the cross length of a pit; scutum broader than long in dorsal view (width measuring along the bases of tegulae), with distinct interrupte transverse rugae, interspaces between rugae broader than width of rugae, shiny but very delicately coriaceous or even alutaceous; notauli complete, reach pronotum, however, more deeper and distinct in the posterior 2/3, less impressed and narrower toward pronotum; median scutal line distinct, reach to 1/3 of the scutum length; anterior paralell line short, distinct, parapsidal line distinct (Fig. 15). Mesopleuron, including speculum with strong transverse striae, with shiny smooth area between them; upper anterior part of mesopleural triangle with some delicate wrinkles; acetabular carina narrow from lateral view (Fig. 17). Scutellum longer than broad in dorsal view, with strong transverse interrupt rugae, area between them delicately coriaceous; scutellar foveae transverse, distinctly delimited posteriorly, with shiny smooth bottom, separate by a narrow but distinct median carina (Fig. 15). Metapleural sulcus reach mesopleuron in the upper 1/3 of its height, dorsellum delicately coriaceous, shorter than the ventral impressed area; metanotal trough coriaceous, without setae; ventral impressed area of the dorsellum smooth, shiny, high, nearly reach scutellum (Fig. 16). Propodeum delicately coriaceous, lateral propodeal carinae straight and parallel, running inward till the base of propodeum, thus central propodeal area narrower at the base and broader at the anterior end; central propodeal area shiny, with very few delicate wrinkles; lateral propodeal area aside

with stronger coriaceous structure, which becoming delicately coriaceous toward lateral propodeal carina, with few short white setae; nucha with uniform longitudinal sulci. Forewing with pale, light yellow to white veins, margin with short cilia; radial cell 2.4 times as long as broad, Rs+M very indistinct, areolet invisible (in holotype), but in some specimens present, delimited with very indistinct veins (Fig. 18). Tarsal claws with basal lobe. Metasoma slightly longer than head+mesosoma, longer than high in lateral view, collar segment very superficially striate, sometimes appear to be smooth in some areas, fused terga 2+3 with a small patch of micropunctures only posterodorsally; subsequent tergites and hypopygium with dense micropunctures; prominent part of ventral spine of hypopygium very short with very few sparse white setae, which do not reach beyond apex of spine (Fig. 19).

Male. 1.4-2.3 mm. Similar to female, but antenna 15-segmented, F1 very slightly curved and slightly expanded apically and basally, F1 1.5-1.7 times as long as F2. (Fig. 14).

Diagnosis – *Synergus acsi sp. n.* belongs to the group of *Synergus* species without posterior band of punctures on the fused tergites 2+3 (*Section II* Mayr) and closely related to *S. variabilis* Mayr in that the lateral pronotal carina absent, lateral frontal carinae present, the posterior punctate area on the fused 2+3 metasomal terga is short. In *S. acsi sp. n.* OOL only slightly longer than the diameter of lateral ocellus, POL at least 2.0 times as long as OOL (Fig. 12); the pronotum in the anterolateral part with distinct striae, the median scutal line distinct, reach to 1/3 of the scutum length (Fig. 15); the acetabular carina much narrower, metanotal trough coriaceous; the ventral impressed area of the dorsellum high, nearly reach scutellum (Figs 16-17); the radial cell of the forewing broader, 2.4 times as long as broad (Fig. 18); F1 of male antenna only 1.5 times as long as F2 (Fig. 14).

In *S. variabilis* OOL 1.8-2.0 times as long as diameter of lateral ocellus, POL 1.3-1.5 times as long as OOL (Fig. 20); the pronotum in the anterolateral part coriaceous; the median scutal line absent or in a form of a short triangle (Fig. 21); the acetabular carina broader, metanotal trough smooth, shiny (Fig. 22); the ventral impressed area of the dorsellum short, its height less than height of dorsellum (Fig. 23); the radial cell of the forewing broader, more than 3.0 times as long as broad (Fig. 24), in male F1 nearly 2.0 times as long as F2 (Fig. 25). *Synergus acsi sp. n.* also very similar to below described *S. palmirae sp. n.* (see diagnosis to *S. palmirae*).

The 28S rRNA sequences (D2 region) of *S. acsi sp. n.* were almost identical to those of *S. variabilis* collected in Iran. However, the cytochrome oxidase I (COI) and cytochrome b gene sequences of *S. acsi* differ from those of *S. variabilis* by 27 bases at COI (4.1%) and 19

bases at cytochrome b (4.4%). Usually, the closely related species show more than 2% divergence in the mitochondrial cytochrome oxidase I gene (Hebert, 2003), therefore, the molecular data also support this newly described species, *S. acsi*.

Type material – Holotype female: Iran, Lorestan, Ghelaie, *Q. brantii*, 2003, mid-summer, leg. M. Tavakoli, ex galls of *Aphelonyx persica*, Lor59; 50 female and 41 male paratypes: 29 females and 25 males with the same labels as the holotype; 2 females and 3 males, Iran, Mazandaran, Sari, Shahid Zare park, *Q. castaneifolia*, 2004.IX.15, leg. H. Barimani, ex galls of *Aphelonyx persica*; 8 females and 7 males, Iran, Lorestan, Ghelaie, *Q. brantii*, 2003, summer, leg. M. Tavakoli, ex galls of *Pseudoneuroterus macropterus*, Lor61; 1 female and 1 male, Iran, Kermanshah, Gahvareh, *Q. brantii*, 2003, early spring, leg. M. Tavakoli, ex galls of *Andricus ceconii*, Lor49; 1 male, Iran, West Azarbaijan, Sar Dasht, 2003, leg. M. Zargaran, ex galls of *Aphelonyx persica*, AW5qb6B2; 8 females and 1 male, Iran, Kordestan, Kohkiloyeh, *Q. brantii*, 2003.VII.05, leg. E. Sadeghi, ex unknown root gall, KO4Qp1R8.

Holotype female, 2 female and 2 male paratypes in the HNHM, 4 female and 4 male paratypes in RIFR, 3 males and 3 females in the collection of UB, Barcelona, Spain, 41 female and 32 male paratypes in the cynipid collection of SPL.

Etymology – Named after Dr. Zoltan Ács, our friend and researcher of the Systematic Parasitoid Laboratory, Plant Protection and Soil Conservation Service of County Vas, Köszeg, Hungary.

Biology – Reared from galls of *Aphelonyx persica*, *Pseudoneuroterus macropterus* (Hartig), *Andricus ceconii* Kieffer and unknown root gall. All galls were collected on *Q. brantii* and *Q. castaneifolia*, thus from oak species of the section *Cerris* of *Quercus* only.

Distribution – Known from Iran only: Mazandaran, West Azarbaijan, Kermanshah, Kordestan and Lorestan provinces. Thus, we have two areas of distribution within Iran – in Mazandaran, along the Caspean seashore and in the Zagross Mountains. Probably present in the Transcaucases also.

Synergus bechtoldae Melika & Pujade-Villar sp. n.

(Figs 26-36)

Description – 2.1-3.3 mm. Female. Lower face, clypeus and malar space orange-yellow to reddish brown; mandibles orange-yellow with tooth reddish brown to black; genae, vertex, head posteriorly from black to dark brown (more often dark brown); interocellar area always

black; area between lateral frontal carinae reddish-brown to black; compound eyes and ocelli silver-white; palpi maxillaris and labialis yellow. Antenna uniformly yellow or very light brown. Mesosoma entirely black, tegulae reddish brown, in some specimens pronotum laterally and mesopleuron dark brown (in two paratype females mesosoma dark brown to black); pro- and mesocoxae yellow-brown to partially black, metacoxae always darker; femura with darker base and lighter apical half, rest of legs yellow or light brown. Metasoma always dark reddish brown (in some specimens dorsally to black), hypopygium always lighter. Wing veins light brown, distinct. Head 1.9-2.1 times as broad as long from above, 1.2 times as broad as high, transverse in front view, very slightly broader than mesosoma; gena dull rugose, not broadened behind eye, narrower than the cross diameter of eye (Figs 26-28); POL nearly 2.1-2.2 times as long as OOL, LOL slightly longer than OOL, OOL slightly larger than the diameter of lateral ocellus. Vertex, interocellar area, occiput coriaceous and punctuate, in some specimens dull rugose; frons with strong frontal lateral carinae reach lateral ocelli, coriaceous and punctate, in some specimens dull rugose; transfacial distance nearly equal to the height of eye, distance between antennal toruli nearly equal to the diameter of torulus and slightly less than distance between inner margin of eye and antennal torulus; inner margins of compound eyes nearly parallel; lower face and malar space with irradiating striae from the ventral tip of clypeus, reach compound eyes and stretch into the area between antennal toruli; central area of lower face rugose, without distinct striae, however with a slightly elevated central stripe; anterior tentorial pit distinct, small, rounded; epistomal sulcus and clypeo-pleurostomal line absent, indistinct and thus clypeus do not separated from lower face; malar space 0.5-0.6 times as long as height of eye (Figs 26-28). Antenna 14-segmented, pedicel slightly longer than broad, F1 the longest flagellomere, 2.1-2.6 times as long as pedicel, 1.25-1.3 times as long as F2 and 3.4-3.5 times as long as broad; F2-F4 equal in length, subsequent flagellomeres slightly shorter; F12 1.6 times as long as F10; placodeal sensilla on F3-F12, absent on F1-F2 (Fig. 29). Mesosoma flattened in lateral view, 1.3-1.4 times as long as high (Fig. 33), pronotum dull rugose laterally, pronotal collar behind submedian pronotal pits delicately alutaceous; submedian pronotal pit distinct, transverse, 2.0 times as long as high, separated by a distance slightly larger than the cross length of pit; lateral pronotal carina strong. Scutum as broad as long in dorsal view (width measuring along the bases of tegulae), with delicate uninterrupted transverse rugae, punctate at least in the anterior half, interspaces between rugae equal to striae width, delicately coriaceous, shiny; notauli complete, reach pronotum, slightly broader posteriorly, transverse striae crossing over

notauli bottom; median scutal line reach at least to half length of scutum (in some specimens it even longer); parapsidal line reach to the level of tegulae, narrow, smooth, shiny, anterior parallel line short, shiny, smooth (Fig. 31). Mesopleuron, including speculum with uniform transverse uninterrupted striae, with shiny, smooth or very delicately alutaceous area between them; mesopleural triangle with dense white setae, upper anterior part with some longitudinal wrinkles; acetabular carina with few longitudinal delicate wrinkles, short and narrow in lateral view (Fig. 33). Scutellum slightly longer than broad in dorsal view, dull rugose, scutellar foveae superficial, rounded, slightly broader than long, separated by a narrow median carina, indistinctly delimited by surface structure posteriorly, with delicate wrinkles on the bottom, area between them shiny, smooth (Fig. 32). Metapleural sulcus reach mesopleuron in the upper 1/4-1/5 of its height, area delimited by the inferior part of metapleural sulcus densely pubescent, with some delicate wrinkles; preaxilla, axilla and axillar carina wrinkled, axillula rounded, with dense white setae hidden the coriaceous sculpture of the bottom; subaxillular bar smooth, shiny, higher than height of metanotal trough; pit over propodeal spiracle deep, carina along anterior border of propodeal spiracle strongly arised; ventral bar of metanotal trough smooth and shiny, equal or in some specimens even broader than height of metanotal trough (Fig. 33). Dorsellum delicately coriaceous, very narrow, much shorter than height of ventral impressed area; metanotal trough shiny, smooth, with dense white setae; ventral impressed area of the dorsellum smooth, shiny, high, at least 2.2 times as high as the height of dorsellum medially (Fig. 34). Propodeum delicately coriaceous, lateral propodeal carinae slightly broader at the base, with very few setae, straight, running slightly inward toward the base of propodeum, thus central propodeal area narrower at the base and broader at the anterior end; central propodeal area with delicate wrinkles, smooth, shiny, with few short white setae in the upper half only; lateral propodeal area uniformly delicately coriaceous, with sparse white setae; nucha with uniform longitudinal sulci (Fig. 34). Forewing with light brown to pale veins, margin with short cilia; radial cell 2.3 times as long as broad, $Rs+M$ distinct in basal half, areolet light but present, delimited with distinct veins, R_1 straight, Rs very slightly curved in distal half (Fig. 35). Tarsal claws with basal lobe. Metasoma slightly longer than head+mesosoma, longer than high in lateral view, collar segment uniformly striated, fused terga 2+3 slightly incised dorsally, with very small patch of micropunctures posterodorsally, which absent laterally; subsequent tergites and hypopygium with dense micropunctures; prominent part of ventral spine of hypopygium very short with very few sparse white setae, which do not reach beyond the apex of the ventral spine (Fig. 36).

Male. 1.8-2.9 mm. Similar to female, but lower face and malar space always yellow, lighter than in female, antenna 15-segmented, F1 very slightly curved, incised medially, apically slightly broader than basally; F1 1.6-1.7 times as long as F2, placodeal sensilla on F3-F13, absent on F1-F2 (Fig. 30).

Diagnosis – Belongs to the group of *Synergus* species without posterior band of punctures on the fused tergites 2+3 (*Section II* Mayr). Most closely related to *Synergus gallaeponiformis* (Boyer de Fonscolombe), especially to the spring generation, which develops mainly in the sexual spring galls of *Biorhiza pallida* (Olivier) and the female and male individuals of which usually have lower face and clypeus orange red to yellowish. In *S. bechtoldae* sp. n. male antenna F1 less incised medially and only very slightly broader apically than basally and 1.6-1.7 times as long as F2 (Fig. 30), the mesopleuron with more delicate and numerous transverse striae; the posterior end of the subaxillular bar in the most posterior end higher than height of the metanotal trough (Fig. 33).

In *S. gallaeponiformis* male antenna F1 distinctly incised medially and the apical half at least 1.5 times broader than the basal half of the flagellomere and only 1.2-1.25 times as long as F2 (Fig. 38); the mesopleuron with stronger transverse striae which are less numerous; the posterior end of the subaxillular bar in the most posterior end shorter, nearly equal to the height of the metanotal trough (Fig. 39).

The mitochondrial cytochrome b gene sequences of *S. bechtoldae* sp. n. differ from those of the most closely related species, *S. gallaeponiformis* by 12 bp (2.8% difference), thus, *S. bechtoldae* is a good distinct species based on the molecular data as well.

Type material – Holotype female: Iran, Lorestan, Kakareza, *Q. infectoria*, 2003, leg. M. Tavakoli, ex galls of *Andricus stonei*, LOR46; 23 female and 7 male paratypes: 22 females and 5 males with the same labels as the holotype; 1 female and 2 males, Iran, Kermanshah, Gahvareh, *Q. infectoria*, 2003, mid-end summer, leg. M. Tavakoli, ex galls of *Andricus tomentosus*, LOR 7.

Holotype female, 3 female and 1 male paratypes in HNHM, 4 female paratypes in RIFR, 6 female and 4 male paratypes in the collection of the Barcelona University, Barcelona, Spain, 10 female and 2 male paratypes in the cynipid collection of SPL.

Etymology – Named after Ms. Maria Bechtold, our friend and colleague of the Systematic Parasitoid Laboratory, Plant Protection and Soil Conservation Service of County Vas, Kőszeg, Hungary.

Biology – Reared from galls of *Andricus* sp. n., recently described from Iran (Azizkhani *et al.*, in press) and *A. tomentosus* (Trotter).

Distribution – Known from Iran, Lorestan and Kermanshah Provinces.

***Synergus gallaeponiformis* (Boyer de Fonscolombe)**

(Figs 37-39)

Material examined – Iran, Kordestan, Marivan, 2003, mid-summer, *Q. infectoria*, leg. M. Tavakoli, ex galls of *Andricus curtisii*, LOR91, 21 females; Iran, Kermanshah, Sar Pol Zahab, 2003, mid-summer, *Q. infectoria*, leg. M. Tavakoli, ex galls of *Andricus polycerus*, LOR92, 1 female; Iran, Lorestan, Ghelaie, 2003, mid-summer, *Q. infectoria*, leg. M. Tavakoli, ex galls of *Andricus chodjaii*, LOR79, 2 females; Iran, Kermanshah, Gahvareh, 2003, mid-summer, *Q. infectoria*, leg. M. Tavakoli, ex galls of *Andricus tomentosus*, LOR7, 12 females and 7 males; Iran, Kordestan, Marivan, 2003, mid-summer, *Q. infectoria*, leg. M. Tavakoli, ex galls of *Andricus tomentosus*, LOR7, 15 females and 5 males; Iran, East Azarbaijan, Tabriz, Arasbaran forest, *Q. petraea*, 2003.V, leg. A. A. Dordaei, ex sexual galls of *Neuroterus quercusbaccarum*, 2 females and 1 male.

This species was reared in large numbers from the asexual galls of *Andricus* sp. n. recently described from Iran (Sadeghi *et al.*, in press), *Andricus curtisii* (Müller), *A. polycerus*, *A. tomentosus* and sexual galls of *Neuroterus quercusbaccarum* (Linnaeus). Known from East Azarbaijan, Kermanshah, Kordestan and Lorestan provinces. Probably widely distributed inquiline species in Iran.

***Synergus mikoi* Melika & Pujade-Villar sp. n.**

(Figs 50-60)

Description – 2.1-3.2 mm. Female. Head black, except reddish brown clypeus, in some specimens gena behind compound eye and head along inner eye margin reddish-brown; antenna light brown to yellow, mandibles yellow with tooth brown to black, palpi maxillaris and labialis yellow; compound eye silvery. Mesosoma entirely black, tegulae reddish brown; all coxae and hindfemur dark brown, rest of the legs yellow or light brown. Metasoma reddish brown, hypopygium always lighter. Wing veins light brown, distinct. Head 2.5 times as wide as long from above, 1.3 times as broad as high, transverse in front view, very slightly broader than mesosoma; gena dull rugose, not broadened behind eye, narrower than the cross diameter of eye (Figs 50-52); POL nearly 2.0-2.2 times as long as OOL, LOL equal OOL, OOL

slightly larger than the diameter of lateral ocellus. Vertex, interocellar area, occiput, dull rugose with some punctures between ocelli; frons with strong frontal lateral carinae reaching lateral ocelli (carinae weaker towards lateral ocelli), dull rugose, with distinct deep large punctures; transfacial distance nearly equal to the height of eye, distance between antennal toruli less than diameter of torulus and distance between inner margin of eye and antennal torulus; inner margins of compound eyes parallel; lower face (including the slightly elevated central area) and malar space with irradiating striae from the ventral tip of clypeus, reach compound eyes and stretch into the area between antennal toruli; malar space 0.5-0.6 times as long as height of compound eye (Figs 50-52). Antenna 14-segmented, pedicel slightly longer than broad, F1 the longest flagellomere, 3.0 times as long as pedicel, slightly longer than F2; F2 slightly longer than F3; F12 1.7 times as long as F11; placodeal sensilla on F4-F12, absent on F1-F3 (Fig. 53). Mesosoma flattened in lateral view, 1.3-1.4 times as long as high (Fig. 57), pronotum dull rugose dorsolaterally, delicately alutaceous medially, behind submedian pronotal pits; dull rugose laterally, lateral pronotal carina strong, submedian pronotal pit distinct, 2.0 times as long as high, separated by a distance at least 3.0 times as long as the cross length of pit. Scutum as broad as long in dorsal view (width measuring along the bases of tegulae), with strong uninterrupted transverse rugae, interspaces between rugae slightly broader than width of rugae, coriaceous, without punctures; notauli complete, reach pronotum, transverse striae crossing over notauli bottom; median scutal line reach at least to half length of scutum (in some specimens it even reach pronotum); parapsidal line reach to the level of tegulae, anterior parallel line short, smooth, shiny (Fig. 55). Mesopleuron, including speculum with strong uniform transverse uninterrupted striae, with shiny smooth area between them; upper anterior part of mesopleural triangle with some wrinkles; acetabular carina very short and narrow in lateral view (Fig. 57). Scutellum slightly longer than broad in dorsal view, dull rugose, scutellar foveae rounded, nearly as long as broad, separated by a distinct median carina, indistinctly delimited posteriorly, not delimited laterally, with delicate wrinkles on the bottom, area between them shiny, smooth (Fig. 55). Metapleural sulcus reach mesopleuron in the upper 1/4-1/5 of its height, area delimited by the inferior part of metapleural sulcus densely pubescent, with some wrinkles; preaxilla, axilla and axillar carina wrinkled, axillula rounded, with dense white setae hidden the coriaceous sculpture of the bottom; subaxillular bar smooth, shiny, higher than the height of metanotal trough; pit over propodeal spiracle deep, carina along anterior border of propodeal spiracle strongly arised; ventral bar of metanotal trough smooth and shiny, broader than height of metanotal trough

(Fig. 57). Dorsellum delicately coriaceous, with some delicate longitudinal wrinkles, very narrow, much shorter than the ventral impressed area; metanotal trough shiny, smooth, with few sparse setae; ventral impressed area of the dorsellum smooth, shiny, high, at least 2.0 times as high as the height of dorsellum medially (Fig. 56). Propodeum delicately coriaceous, lateral propodeal carinae with very few setae, straight, running slightly inward toward the base of propodeum, thus central propodeal area narrower at the base and broader in the anterior end; central propodeal area with delicate wrinkles, smooth, shiny, with few short white setae in the upper half; lateral propodeal area uniformly delicately coriaceous, with few strong transverse rugae and sparse white setae; nucha with uniform longitudinal sulci (Fig. 56). Forewing with light brown to pale veins, margin with short cilia; radial cell 2.3 times as long as broad, $Rs+M$ very indistinct, areolet present, delimited with indistinct veins (Fig. 58). Tarsal claws with basal lobe (Fig. 59). Metasoma slightly longer than head+mesosoma, longer than high in lateral view, collar segment uniformly sulcated, fused terga 2+3 slightly incised dorsally, with a narrow band of micropunctures in the posterior 1/6; subsequent tergites and hypopygium with dense micropunctures; prominent part of ventral spine of hypopygium very short with very few sparse white setae, which do not reach beyond the apex of the ventral spine (Fig. 60).

Male. 1.8-2.7 mm. Similar to female but coxae more darker, or even black; antenna 15-segmented, F1 very slightly curved, incised medially, slightly broader apically than basally; F1 equal F2 in length (Fig. 54).

Diagnosis – Belongs to the group of *Synergus* species with a band of punctures on the fused terga 2+3 (*Section I* Mayr). Most closely related to *Synergus diaphanus* Houard, known from Hungary and Austria only and reared from the asexual galls of *Andricus conificus* (Hartig) (Pujade-Villar *et al.*, 2003) and *A. infectorius* (Hartig) (Houard, 1911; Pujade-Villar & Ros-Farré, 1998) on *Quercus petraea* and *Q. robur*. In *S. mikoi* sp. n. the frons with numerous distinct deep micropunctures and the sculpture is dull rugose (Figs 50-51); all flagellomeres are more elongated, F12 1.7 times as long as F11 (Fig. 53), in male antenna F1 is less broadened apically and nearly as long as F2 (Fig. 54); scutellar foveae are more rounded (Fig. 55); the subaxillular bar higher than the height of metanotal trough (Fig. 57); the radial cell of the forewing is 2.3 times as long as broad (Fig. 58), the band of micropunctures on the fused terga 2+3 is very narrow, occupy nearly the 1/6 length of the fused tergites (Fig. 60).

In *S. diaphanus* the frons with very few micropunctures and the sculpture is more delicate (Figs 61-62); in the female antenna all flagellomeres are much less elongated, F12

only very slightly longer than F11 (Fig. 63), in male antenna F1 is more broadened apically and distinctly longer than F2 (Fig. 64); scutellar foveae are transverse (Fig. 65); the height of the subaxillular bar is nearly equal to the height of metanotal trough (Fig. 66); the radial cell of the forewing is 2.7-2.8 times as long as broad (Fig. 67), the band of micropunctures on the fused 2+3 tergites occupy nearly the half length of tergites (Fig. 68).

The cytochrome oxidase I sequences of *S. mikoi* sp. n. differ from those of the most closely related species, *S. diaphanus* reared from Hungary by 59 bp (9%) and cytochrome b sequences by 44 bp (10.1%) and both support the species position of *S. mikoi*.

Type material – Holotype female: Iran, Lorestan, Ghelaei, *Q. infectoria*, 2003, mid summer, leg. M. Tavakoli, ex *Andricus chodjaii*, Lor67; 18 female and 8 male paratypes: 5 females and 1 male with the same labels as the holotype; 1 female and 2 males, Iran, Lorestan, Ghelaei, *Q. infectoria*, 2003, mid summer, leg. M. Tavakoli, ex *Andricus chodjaii*, Lor50; 2 females, Iran, Kermanshah, Gahvareh, *Q. infectoria*, 2003, mid summer, leg. M. Tavakoli, ex galls of *Andricus curtisii*, LOR21; 4 females, Iran, Kermanshah, Gahvareh, *Q. infectoria*, 2003, mid summer, leg. M. Tavakoli, ex galls of *Andricus curtisii*, LOR28; 4 females and 3 males, Iran, Lorestan, Ghelaei, *Q. infectoria*, 2003, mid summer, leg. M. Tavakoli, ex *Andricus curtisii*, Lor73; 2 females and 2 males, Iran, Kermanshah, Gahvareh, *Q. infectoria*, 2003, mid summer, leg. M. Tavakoli, ex galls of *Andricus trunciculus*, Lor23.

Holotype female and 1 male paratype in HNHM, 4 female and 1 male paratypes in RIFR, 4 female and 2 male paratypes in the collection of the Barcelona University, Barcelona, Spain; 10 female and 4 male paratypes in SPL.

Etymology – Named after Dr. Istvan Mikó, our friend and researcher of the Systematic Parasitoid Laboratory, Plant Protection and Soil Conservation Service of County Vas, Köszeg, Hungary.

Biology – Reared from asexual galls of *Andricus* sp. n., recently described from Iran (Azizkhani *et al.*, in press) and *A. curtisii* (Müller).

Distribution – Known from Iran, Lorestan and Kermanshah Provinces.

Synergus pallidipennis Mayr

Material examined – Iran, Lorestan, Ghelaei, *Q. infectoria*, 2003, mid summer, leg. M. Tavakoli, ex *Andricus trunciculus*, LOR77, 1 female and 1 male; Iran, Kermanshah, Gahvareh, *Q. infectoria*, 2003, mid summer, leg. M. Tavakoli, ex galls of *Andricus trunciculus*, Lor23, 4 females and 4 males.

This species was reared from the asexual galls of *Andricus trunciculus* only in Kermanshah and Lorestan provinces. Probably has a much wider distribution.

Synergus pallipes Hartig

Material examined – Iran, East Azarbaijan, Andabil-Khalkhal, *Q. macranthera*, 2004.X.09, leg. D. Aligolizade, ex galls of *Cynips korsakovi*, 3 females and 2 males; Iran, East Azarbaijan, Khojin-Khalkhal, *Q. macranthera*, 2004.VIII.30, leg. D. Aligolizade, ex galls of *Cynips quercus*, 4 females and 1 male; Iran, E. Azarbaijan, Tabriz, Arasbaran forest, 2003.X, *Q. macranthera*, leg. A. A. Dordaei, ex galls of *Cynips korsakovi*, AE2qm11L143, 1 female and 1 male.

This species was reared from asexual galls of *Cynips korsakovi* Belizin and *Cynips quercus* (Fourcroy), found on *Q. macranthera* in East Azarbaijan only. Probably has a much wider distribution.

Synergus palmirae Melika & Pujade-Villar sp. n.

(Figs 40-49)

Description – 1.5-2.3 mm. Female. Head, mesosoma, antenna entirely light brown; central propodeal area slightly darker; metasoma also brown, darker than head and mesosoma, especially dorsally; in some paratypes hind coxae darker than the rest of the leg. Wing veins white, distinct. Head 1.6-1.8 times as wide as long from above; slightly higher than broad, rounded in front view, very slightly broader than mesosoma; gena delicately coriaceous, broadened behind eye, nearly as broad as cross diameter of eye (Figs 40-41); POL nearly 2.0-2.2 times as long as OOL, LOL equal OOL, OOL equal to the diameter of lateral ocellus. Vertex, interocellar area, occiput, frons delicately coriaceous, with sparse punctures; frons with very delicate frontal lateral carinae which reach or nearly reach lateral ocelli; transfacial distance nearly equal to the height of eye, distance between antennal toruli nearly equal to diameter of torulus and distance between inner margin of eye and antennal torulus; inner margins of compound eyes converging outwards; lower face (including the slightly elevated central area), malar space and genae with striae irradiating from the ventral tip of clypeus and reach compound eyes and antennal sockets; malar space 0.5-0.7 times as long as height of compound eye (Figs 40-41). Antenna 14-segmented, pedicel longer than broad, F1 the longest flagellomere, 1.5-1.6 times as long as pedicel and 1.3-1.4 times as long as F2, placodeal sensilla on F4-F12, located in two rows, absent on F1-F3. Mesosoma flattened in lateral view,

1.2 times as long as high (Fig. 42), pronotum dorsally alutaceous, laterally with very delicate striae, with very few sparse white short setae along the anterior rim, lateral pronotal carina absent, submedian pronotal pit indistinct, shallow, slightly longer than high, separate by a distance nearly 3.0 times as long as the cross length of a pit. Scutum broader than long in dorsal view (width measuring along the bases of tegulae), with distinct interrupted transverse rugae, interspaces between rugae 3-5 times as broad as width of rugae, shiny and alutaceous; notauli complete, reach pronotum, however, more deeper and distinct in the posterior 2/3, less impressed and narrower toward pronotum, anteriorly almost invisible; median scutal line in a form of short triangle posteriorly or absent; parapsidal line short, anterior parallel line short, smooth, shiny (Fig. 44). Mesopleuron, including speculum with delicate transverse striae, with shiny smooth area between them; upper anterior part of mesopleural triangle with some delicate wrinkles; acetabular carina narrow in lateral view (Fig. 47). Scutellum slightly longer than broad in dorsal view, with strong transverse interrupted rugae, area between them delicately coriaceous; scutellar foveae transverse, separated by a narrow but distinct median carina, distinctly delimited posteriorly, with delicate wrinkles on the bottom, area between them shiny, smooth (Fig. 45). Metapleural sulcus reach mesopleuron in the upper 1/4-1/5 of its height, dorsellum delicately coriaceous, very narrow, much shorter than the ventral impressed area; metanotal trough shiny, smooth, without setae; ventral impressed area of the dorsellum smooth, shiny, high, nearly reach scutellum (Fig. 46). Propodeum delicately coriaceous, lateral propodeal carinae straight, running inward toward the base of propodeum, thus central propodeal area narrower at the base and broader in the anterior end; central propodeal area with delicate wrinkles; lateral propodeal area uniformly delicately coriaceous, with few short white setae; nucha with uniform longitudinal sulci (Fig. 46). Forewing with pale, light yellow to white veins, margin with short cilia; radial cell around 3.0 times as long as broad, $Rs+M$ very indistinct, areolet light but present, delimited with indistinct veins (Fig. 48). Tarsal claws with basal lobe. Metasoma slightly longer than head+mesosoma, longer than high in lateral view, collar segment uniformly sulcated, fused terga 2+3 with a patch of micropunctures only posterodorsally; subsequent tergites and hypopygium with dense micropunctures; prominent part of ventral spine of hypopygium very short with very few sparse white setae, which do not reach beyond the apex of the ventral spine (Fig. 49).

Male. 1.3-2.0 mm. Similar to female, but mesosoma dorsally darker than laterally, antenna 15-segmented, F1 very slightly curved, incised medially, of the same width apically and basally, 1.5-1.6 times as long as F2 (Fig. 43).

Diagnosis – *Synergus palmirae sp. n.* belongs to the group of *Synergus* species without posterior band of punctures on the fused tergites 2+3 (*Section II* Mayr) and closely related to *S. variabilis* Mayr and *S. acsi sp. n.* in that the lateral pronotal carina absent, lateral frontal carinae present and the posterior punctate area on the fused 2+3 metasomal terga is short. In *S. palmirae sp. n.* the entire body is light brown; the head is rounded in front view, the frons, vertex and interocellar area are delicately coriaceous, with very few shallow punctures; inner margins of compound eyes converging outwards (Figs 40-41); the radial cell of the forewing 3.0 times as long as broad (Fig. 48); the median scutal line in a form of a short triangle; scutellar foveae ovate, with delicate wrinkles on the bottom (Figs 44-45); the lateral propodeal area delicately and uniformly coriaceous (Fig. 46); the metapleural sulcus reach the mesopleuron in the upper 1/4-1/5 of its height (Fig. 47).

In *S. acsi sp. n.* the body is mainly black or very dark brown; the head is trapezoid in front view; the frons, vertex, interocellar area with stronger sculpture and with distinct deep punctures, inner margins of compound eyes are parallel (Figs 11-12); the radial cell of the forewing only 2.4 times as long as broad (Fig. 18); the median scutal line reach to 1/3 of the scutum length; scutellar foveae transverse with shiny smooth bottom (Fig. 15); the lateral propodeal area with stronger coriaceous structure, which becoming delicately coriaceous toward the lateral propodeal carina (Fig. 16); the metapleural sulcus reach the mesopleuron in the upper 1/3 of its height (Fig. 17).

Type material – Holotype female: Iran, Mazandaran, Sari, Shahid Zare Park, *Q. castaneifolia*, 2004.IX.15, leg. H. Barimani, ex leaf gall of *Neuroterus* sp.?, MAZ109; 6 female and 4 male paratypes: 2 females with the same labels as the holotype; 3 females and 4 males, Iran, Mazandaran, Sari, Shahid Zare Park, *Q. castaneifolia*, 2004.IX.15, leg. H. Barimani, ex galls of *Pseudoneuroterus macropterus*, MAZ112.

Holotype female and 1 male paratype in HNHM, 1 female and 1 male paratypes in RIFR; 1 female and 1 male paratypes in the collection of the Barcelona University, Barcelona, Spain; 4 female and 2 male paratypes in the cynipid collection of SPL.

Etymology – Named after Ms. Palmira Ros-Farré, our friend and cynipidologist of the Department of Animal Biology, University of Barcelona, Barcelona, Spain.

Biology – Reared from galls of *Pseudoneuroterus macropterus* and unknown *Neuroterus* leaf galls on *Q. castaneifolia*, thus from oak species of the section *Cerris* of *Quercus* only.

Distribution – Known from Iran, Mazandaran province, along the Caspian Sea shore.

***Synergus reinhardi* Mayr**

Material examined – Iran, East Azarbaijan, Hatam-Big, *Q. macranthera*, 2003.IV.11-14, leg. D. Aligolizade, ex galls of *Andricus pseudoaries*, AR3qm38B1, 5 females and 3 males; Iran, East Azarbaijan, Tabriz, Arasbaran forest, *Q. macranthera*, 2003.IX, leg. A. A. Dordaei, ex galls of *Andricus pseudoaries*, AE2qm6B182, 3 females and 3 males.

The species was found only in East Azarbaijan province and reared from the asexual galls of *Andricus* sp. n., recently described from Iran (Sadeghi *et al.*, in press).

***Synergus thaumacerus* (Dalman)**

Material examined – Iran, East Azarbaijan, Tabriz, Arasbaran forest, *Q. macranthera*, 2003.VIII, leg. A. A. Dordaei, ex galls of *Cynips divisa*, AE6qm7L102, 2 males; Iran, East Azarbaijan, Tabriz, Arasbaran forest, *Q. petraea*, 2003.VIII, leg. A. A. Dordaei, ex galls of *Cynips divisa*, AE6qp2B 172, 4 females and 2 males.

The species was found only in East Azarbaijan province and reared from the asexual galls of *Cynips divisa* Hartig, collected from *Q. petraea* and *Q. macranthera*.

***Synergus umbraculus* (Olivier)**

Material examined – Iran, East Azarbaijan, Ardabil, Phandoghloo forest, 1300 m a.s.l., *Q. macranthera*, 2003.IX, leg. D. Aligolizade, ex *Andricus sadeghii*, 10 females and 11 males; Iran, Kordestan, Marivan, *Q. infectoria*, 2003, mid summer, leg. M. Tavakoli, ex galls of *Andricus curtisii*, LOR109, 1 female and 1 male; Iran, Lorestan, Ghelaei, *Q. infectoria*, 2003, mid summer, leg. M. Tavakoli, ex galls of *Andricus chodjaii*, LOR67, 1 female; Iran, Lorestan, Ghelaei, *Q. infectoria*, 2003, mid summer, leg. M. Tavakoli, ex galls of *Andricus quercustozae*, LOR6, 3 females and 2 males; Iran, Lorestan, Ghelaei, *Q. infectoria*, 2003, mid summer, leg. M. Tavakoli, ex galls of *Andricus mayri* (= *panteli*), LOR48, 13 females and 6 males; Iran, Kermanshah, Gahvareh, *Q. brantii*, 2003, early spring, leg. M. Tavakoli, ex catkin galls of *Andricus ceconii*, LOR17, 16 females and 26 males; Iran, East Azarbaijan, Tabriz, Arasbaran forest, 2003.IX, leg. A. A. Dordaei, ex galls of *Andricus pseudoaries*, AE1qp2B184, 1 female and 1 male.

The species is the most common and abundant in between *Synergus* species collected and reared in Iran. We found the species in East Azarbaijan, Kermanshah, Kordestan and Lorestan provinces. It was reared from the asexual galls of three newly described *Andricus*

species (Azizkhani *et al.*, in press; Sadeghi *et al.*, in press), *Andricus curtisii*, *Andricus quercustozae* (Bosc), and sexual galls of *Andricus ceconii*.

Five specimens of *S. umbraculus* from Iran were sequenced for 28S rRNA (D2 region), cytochrome oxidase I and cytochrome b genes. They belong to the same species. It is worth to note that the cytochrome oxidase sequences differ (1.3-7%) from those obtained from the European specimens. Differences in the sequences of mentioned three genes in the European specimens suggest that *S. umbraculus* form a group of sibling-species (Ács *et al.*, unpublished data).

Synergus variabilis Mayr

(Figs 20-25)

Material examined – Iran, Lorestan, Ghelaie, *Q. infectoria*, 2003, end of summer, leg. M. Tavakoli, ex galls of *Andricus megalucidus*, Lor13, 132 females and 18 males; Iran, Kermanshah, Marivan, *Q. infectoria*, 2003, mid summer, leg. M. Tavakoli, ex *Andricus chodjaii*, Lor16, 3 females and 2 males; Iran, Lorestan, Ghelaie, *Q. brantii*, 2003, summer, leg. M. Tavakoli, ex galls of *Andricus ceconii*, Lor37, 1 female; Iran, Kermanshah, Gahvareh, *Q. infectoria*, 2003, summer, leg. M. Tavakoli, ex galls of *Andricus polycerus*, Lor70, 8 females and 9 males; Iran, Kordestan, Marivan, 2003, end of summer, *Q. infectoria*, leg. M. Tavakoli, ex *Cynips cornifex*, Lor110, 2 males; Iran, Lorestan, Nogian, *Q. brantii*, 2003, leg. E. Azizkhani, ex *Neuroterus lanuginosus*, Lor132, 8 females and 9 males; Iran, East Azarbaijan, Tabriz, Arasbaran forest, 2002.VI, *Q. macranthera*, leg. A. A. Dordaei, ex asexual galls of *Neuroterus numismalis*, AE2qm3L91, 2 females and 1 male.

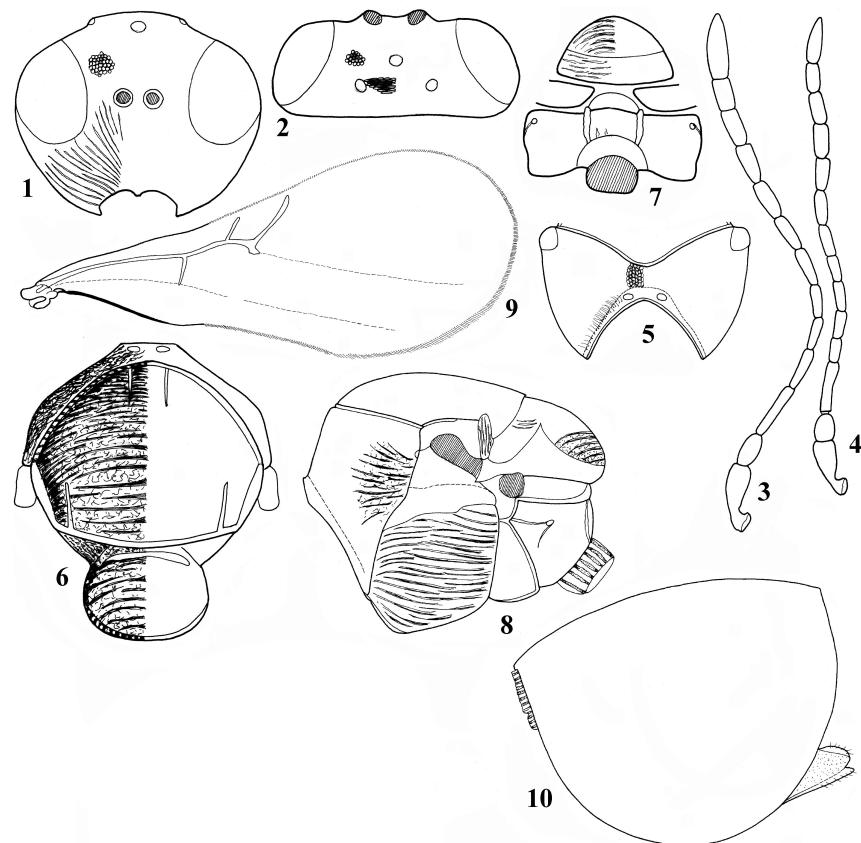
The species was reared from the asexual galls of *Andricus megalucidus* Melika, Stone, Sadeghi & Pujade-Villar, *A. polycerus* (Giraud), *Cynips cornifex* Hartig, *Neuroterus numismalis* (Geoffroy in Fourcroy), and *Andricus* sp. n., recently described from Iran (Azizkhani *et al.*, in press) on *Q. infectoria* and *Q. macranthera* and also from sexual galls of *Andricus ceconii* Kieffer on *Q. brantii*. Distributed in East Azarbaijan, Kermashah, Kordestan and Lorestan provinces.

Synophrus Hartig

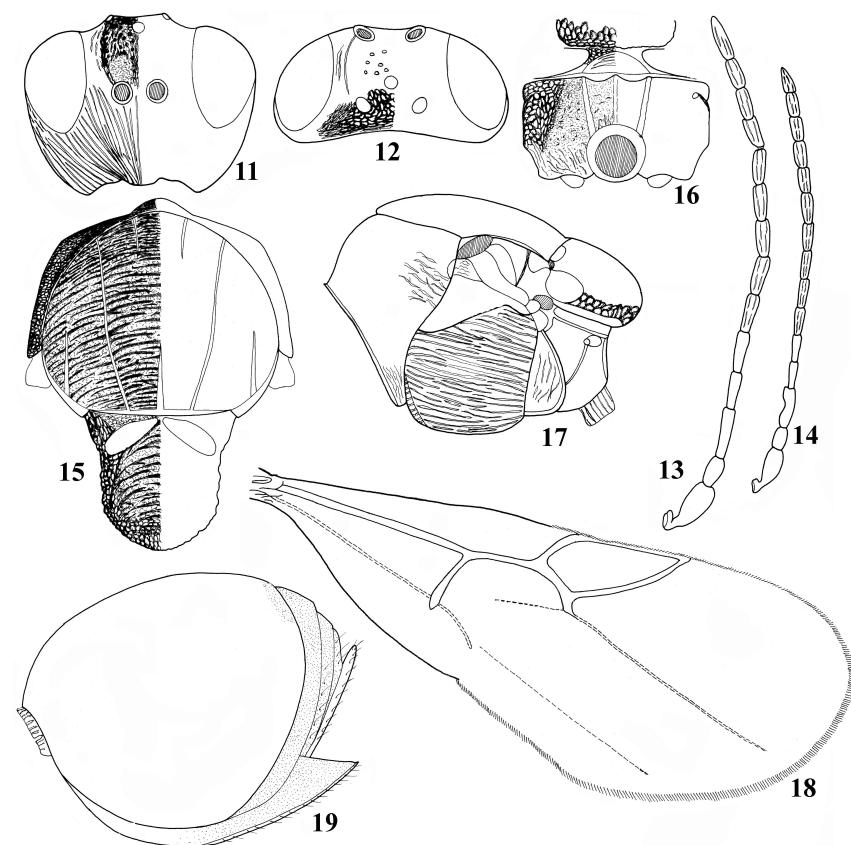
Originally, the genus *Synophrus* was described as a gall inducer, however, on the basis of the morphological characters of adults, with no doubt, this genus belongs to cynipid inquilines (Ronquist, 1994). It means that *Synophrus* species belong to inquilines, but they still have a

capacity to induce gall. Recently, Pujade-Villar *et al.* (2003) mention the first oak cynipid gall host for *Synophrus politus* Hartig, which attacks small galls of *Andricus burgundus* Giraud. 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 what was recently demonstrated for *S. politus* in the Iberian Peninsula (Pujade-Villar *et al.*, 2003). Three species are known from the Western-Palaearctic only: *S. olivieri* Kieffer (also, listed for Iran (Chodjai, 1980)), *S. pilulae* Houard (known from Austria and Hungary only (Houard, 1911; Pujade-Villar *et al.*, 2003)) and *S. politus* Hartig. We collected galls on *Q. castaneifolia* and *Q. brantii* which in their location, shape and size resemble those stem swellin-like galls, which from usually *Synophrus* species use to emerge. No adult *Synophrus* individuals were reared, however, we suspect that this genus is also present in Iran and Chodjai (1980) was correct, when he listed *S. olivieri* for the Iranian oak cynipid fauna.

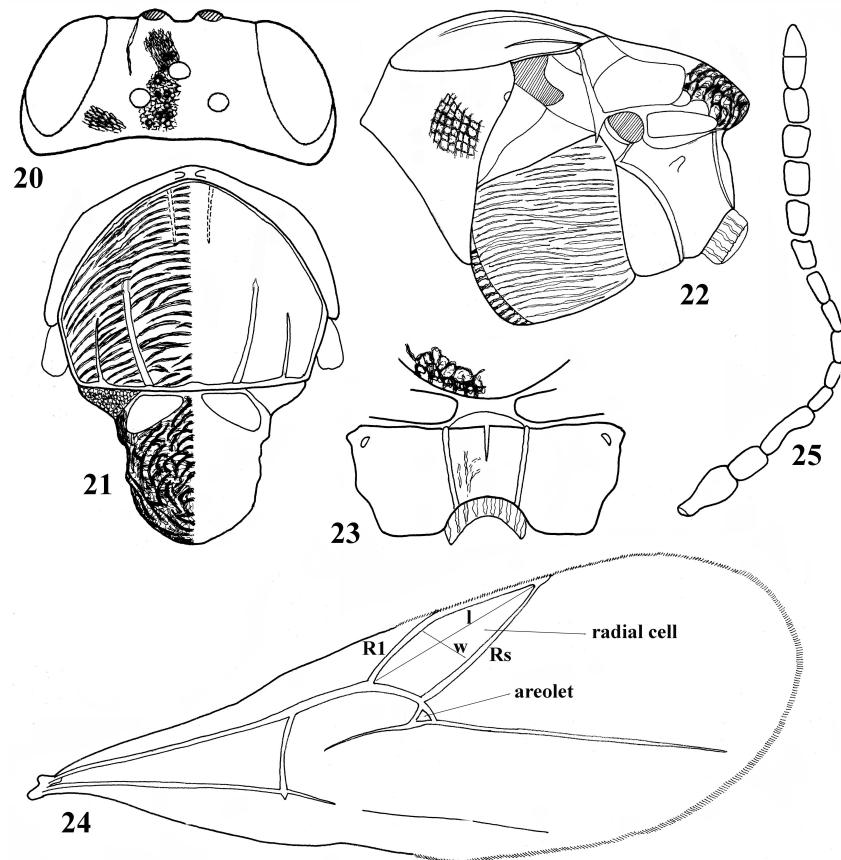
From 21 species of oak cynipid galls, 9 common Western-Palaearctic Synergini species were reared and 5 new species were described, total of 16 Synergini species were detected for the Iranian cynipid fauna during 2002-2005. It must be mentioned that a large number of Synergini specimens were reared from different oak cynipid galls from different provinces of Iran, which we were unable to identify yet. They might represent other undescribed Synergini species, however, for their precise identification further reared material is necessary. Thirty six species of Synergini, associated with oak cynipid galls are known from the Western Palaearctic, which from 5 species are probably endemics of the Iberian Peninsula and associated with oak cynipid galls developing on evergreen oaks only (Pujade-Villar *et al.*, 2003; Stone *et al.*, in press). Thus, from the rest 28 Western Palaearctic species of Synergini, associated with oak cynipid galls, 1/3 of species (11) were found in Iran and also 5 new species are described. No doubts, the cynipid inquiline fauna of oak cynipid galls is much richer and further research is necessary to detect other species.



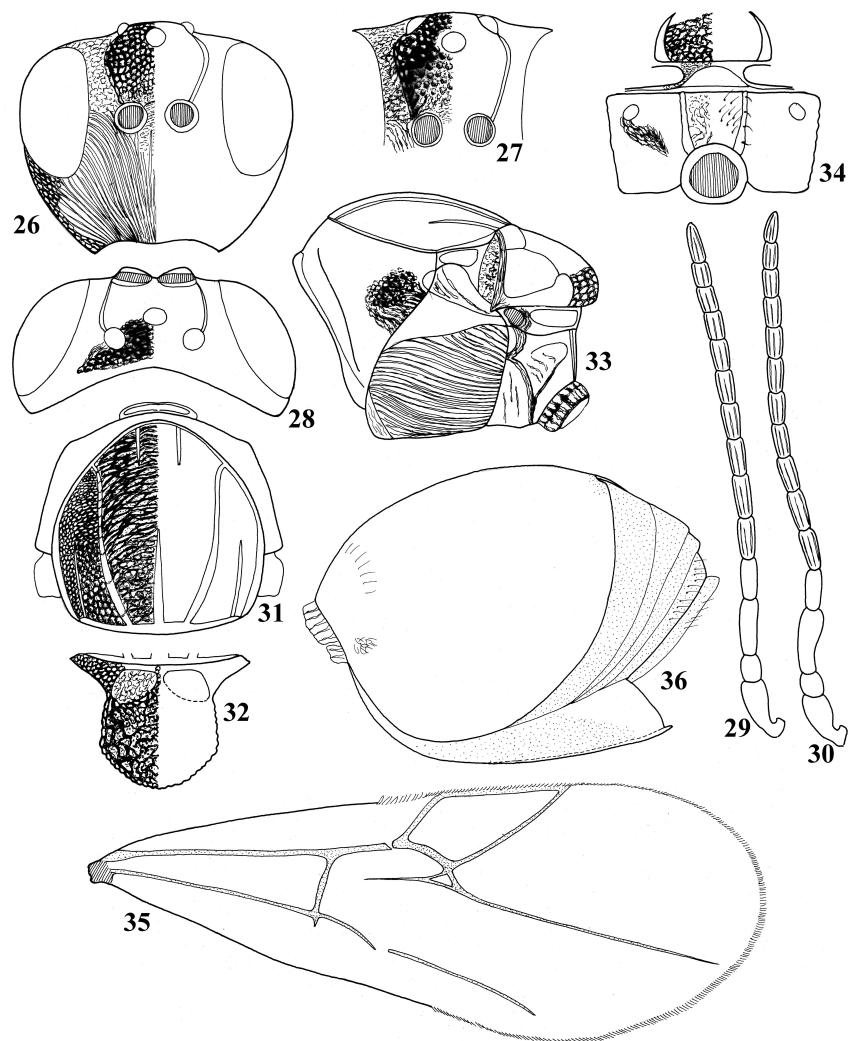
Figures 1-10. *Saphonecrus irani* sp. n. 1-2, head, female: 1, front view, 2, dorsal view. 3-4, antenna: 3, female, 4, male. 5-10, female: 5, pronotum, dorsal view, 6, scutum and scutellum, dorsal view, 7, propodeum and metascutellum, posterodorsal view, 8, mesosoma, lateral view, 9, forewing, 10, metasoma, lateral view.



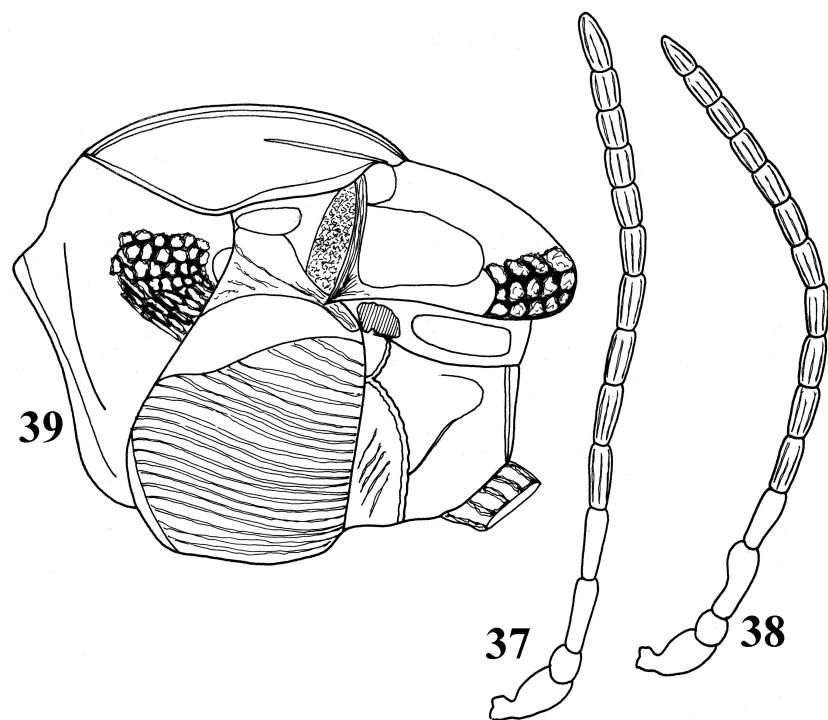
Figures 11-19. *Synergus acsi* sp. n. 11-12, head: 11, front view, 12, dorsal view. 13-14, antenna: 13, female, 14, male. 15-19, female: 15, scutum and scutellum, dorsal view, 16, propodeum and metascutellum, posterodorsal view, 17, mesosoma, lateral view, 18, forewing, 19, metasoma, lateral view.



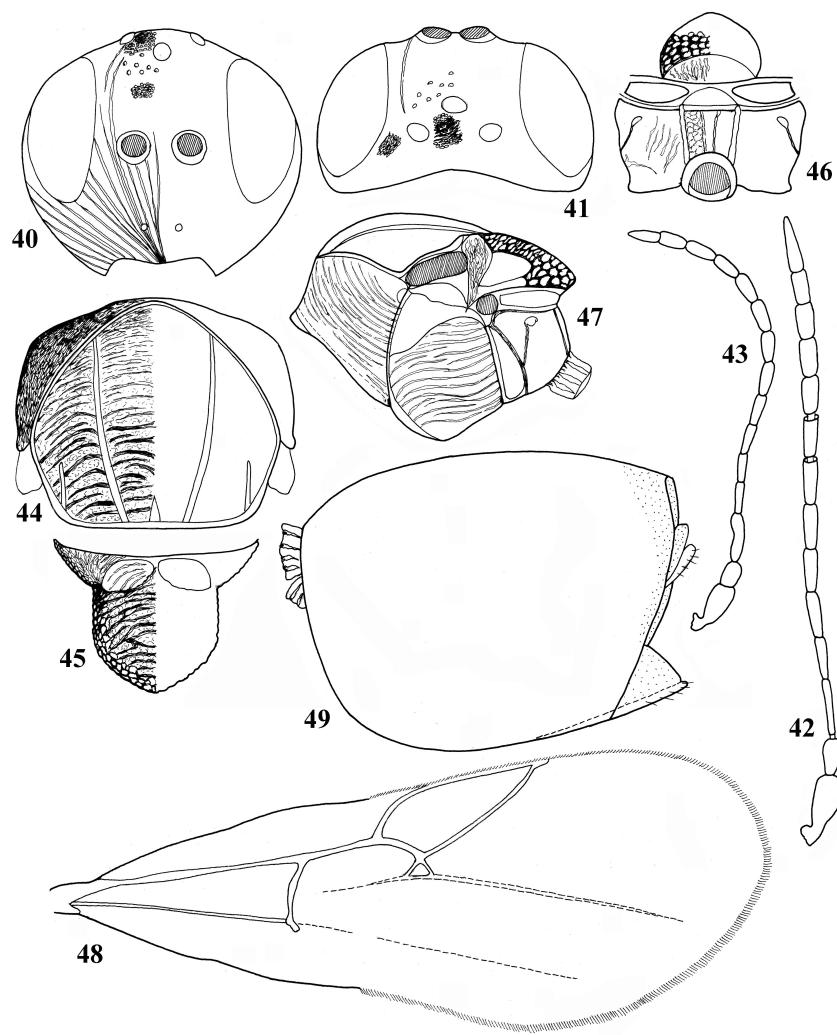
Figures 20-25. *Synergus variabilis*. 20-24, female: 20, head, dorsal view, 21, scutum and scutellum, dorsal view, 22, mesosoma, lateral view, 23, propodeum and metascutellum, posterodorsal view, 24, forewing. 25, antenna, male.



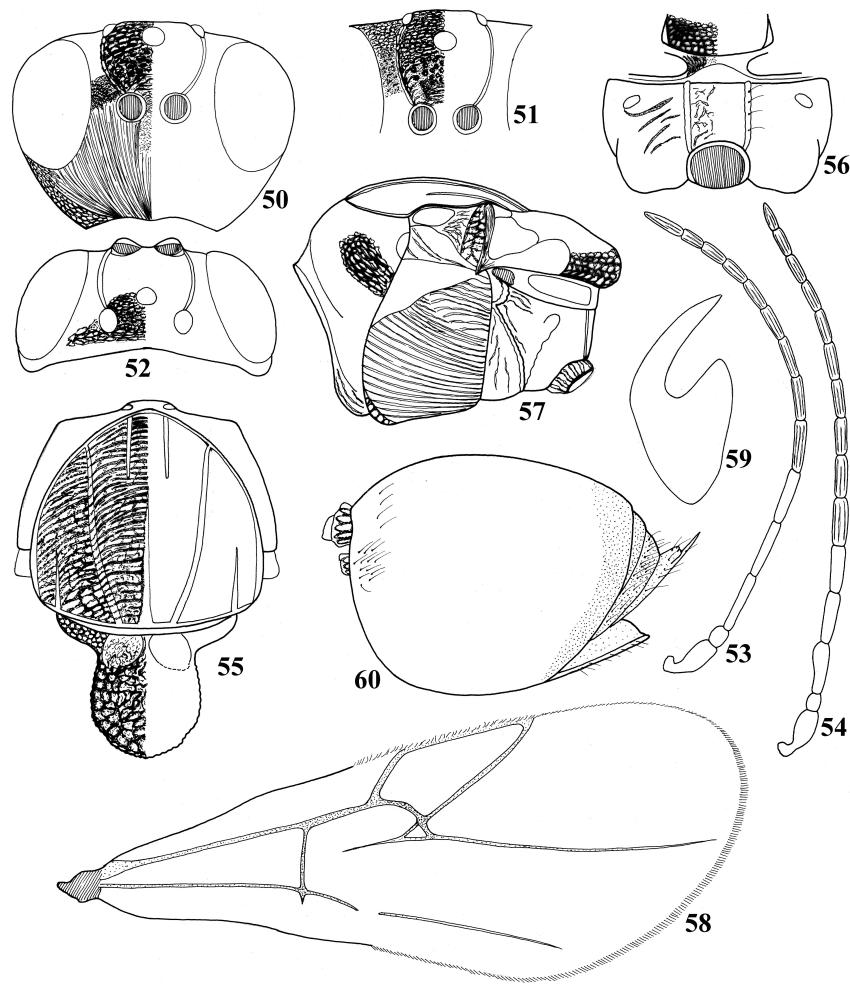
Figures 26-36. *Synergus bechtoldae* sp. n. 26-28, head, female: 26, front view, 27, frons, dorsal view, 28, dorsal view. 29-30, antenna: 29, female, 30, male. 31-36, female: 31, scutum, dorsal view, 32, scutellum, dorsal view, 33, mesosoma, lateral view, 34, propodeum and metascutellum, posterodorsal view, 35, forewing, 36, metasoma, lateral view.



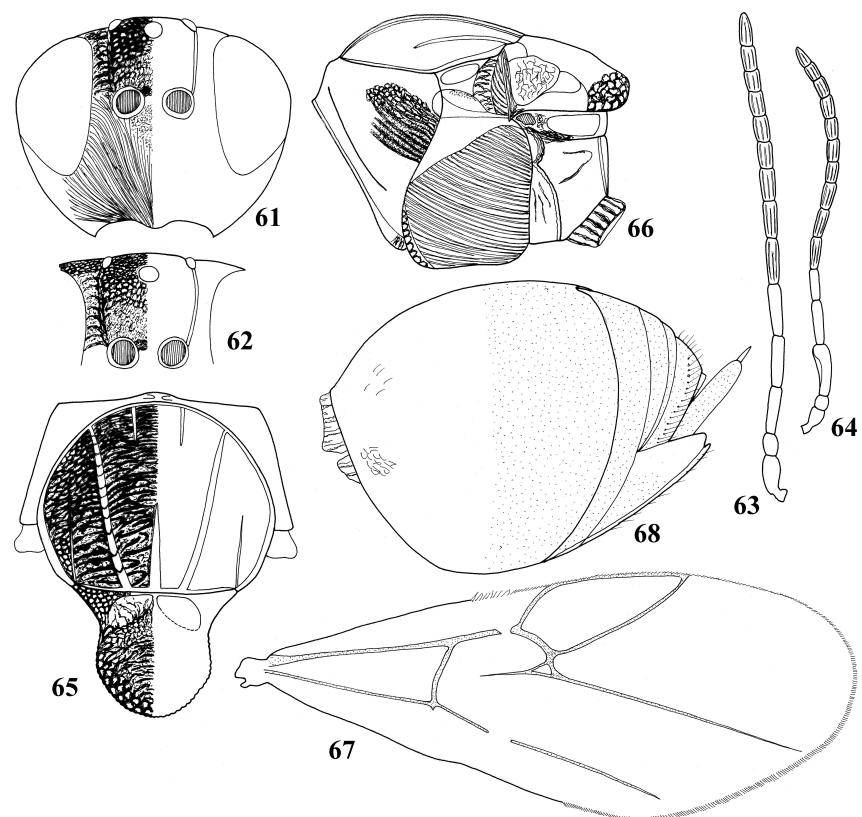
Figures 37-39. *Synergus gallaeponiformis*. 37-38, antenna: 37, female, 38, male. 39, mesosoma, female, lateral view.



Figures 40-49. *Synergus palmirae* sp. n. 40-41, head, female: 40, front view, 41, dorsal view. 42-43, antenna: 42, female, 43, male. 44-49, female: scutum, dorsal view, 45, scutellum, dorsal view, 46, propodeum and metascutellum, posterodorsal view, 47, mesosoma, lateral view, 48, forewing, 49, metasoma, lateral view.



Figures 50-60. *Synergus mikoi* sp. n. 50-52, head, female: 50, front view, 51, frons, front view, 52, dorsal view. 53-54, antenna: 53, female, 54, male. 55-60, female: 55, scutum and scutellum, dorsal view, 56, propodeum and metascutellum, posterodorsal view, 57, mesosoma, lateral view, 58, forewing, 59, tarsal claw, 60, metasoma, lateral view.



Figures 61-68. *Synergus diaphanus*. 61-62, head, female: 61, front view, 62, frons, front view. 63-64, antenna: 63, female, 64, male. 65-68, female: 65, scutum and scutellum, dorsal view, 66, mesosoma, lateral view, 67, forewing, 68, metasoma, lateral view.

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