

FIRST RECORD OF *ANDRICUS TROTTERI* KIEFFER FROM ROMANIA (HYMENOPTERA, CYNIPIDAE)

Juli Pujade-Villar¹, Marcos Roca-Cusachs¹ & Ion Schiopu²

¹ Universitat de Barcelona. Facultat de Biologia. Departament de Biologia Animal. Avda. Diagonal, 645. 08028-Barcelona. (España). — jpujade@ub.edu — marcosroca@sachs@gmail.com

² Phytosanitary Quarantine Inspectorate, Constanta Port-900900 (Romania). — romcleansion@yahoo.com

Abstract: So far *Andricus trotteri*, a gall-forming Cynipidae, has been reliably recorded only from Italy. The species, which has not been reported since its description in 1898, has been collected recently in Romania. The original description is short and does not include some important characters. In this study, the species is re-described and figured. It is also differentiated from closely related species, and a key is provided.

Key words: Hymenoptera, Cynipoidea, Cynipini, *Andricus trotteri*, redescription, Romania.

Primera cita de *Andricus trotteri* Kieffer para Rumania (Hym., Cynipidae)

Resumen: *Andricus trotteri* es una especie de Cynipidae gallícola con citas fiables únicamente de Italia. Esta especie, colectada recientemente en Rumania, no ha sido mencionada desde su descripción en 1898. La descripción original es corta y no incluye algunos caracteres importantes. En este estudio se redescrive e ilustra la especie. También se diferencia de especies estrechamente relacionadas y se proporciona una clave.

Palabras clave: Hymenoptera, Cynipoidea, Cynipini, *Andricus trotteri*, redescrípción, Rumania.

Introduction

Andricus Hartig, 1840 (Hymenoptera: Cynipidae) is a Holarctic (and probably also Oriental) genus that includes around 350 species (Melika, 2006); 83 occur in Europe (Melika & Pujade-Villar, unpublished data) of which around 70 are present in Romania (Ionescu, 1957, 1973).

After the knowledge of the alternating generations (Adler, 1881; Benson, 1953), different genera (*Andricus*, *Cynips* non Linnaeus, *Adleria*, etc.) were joined together forming a single macrogenus with rather large morphological variations.

Andricus trotteri is a very interesting species with very few collected specimens. It was first described from Italy (Kieffer, 1898), with posterior records from Hungary (Ambrus, 1974) and Great Britain (Bagnall & Harrison, 1918) which must, nevertheless, be confirmed. In fact the presence of this species in Hungary and Britain has never been confirmed, and it has not been included in their faunas (Melika, 2006 and Eady & Quinlan, 1963, respectively). Therefore, the discovery of this species in Romania constitutes the second record from Europe although some authors report having collected similar galls in Croatia (Kwast, 2012) and in Turkey (Mutun & Dinç, 2015).

Andricus trotteri had a short original description (Kieffer, 1898). On the other hand, the genus *Andricus* is quite large, with very variable morphology, and then a redescription of this species is needed to clarify its position and to define some important characters not mentioned in Kieffer (1898) or in Dalla Torre & Kieffer (1910).

Material and methods

Adults were obtained from galls collected in *Q. pubescens* by the last author in Dobrudja province, South East Romania. The insects emerged in breeding boxes in laboratory conditions.

The description of morphological structures follows Liljeblad & Ronquist (1998) and Melika (2006). Venation abbreviations of the forewing are taken from Ronquist & Nordlander (1989). The terminology of the cuticle surface is taken from Harris (1979).

Abbreviations used are as follows:

F1–F12: first and subsequent flagellomeres;

LOL: lateral-frontal ocellar distance, distance between lateral and frontal ocelli;

OOL: ocellar-ocular distance, distance from the outer edge of a posterior ocellus to the inner margin of the compound eye;

POL: post-ocellar distance, distance between the inner margins of the posterior ocelli;

R1: first branch of the radial vein;

Rs: second branch of the radial vein.

The pictures were taken by the second autor, using a Leica DFC450 camera coupled to a binocular Leica MZ160A lense. 18-80 photographs were combined using the free image stacking program Helicon Focus 6.2.2.

The material is deposited in J.P.-V col., J. Pujade-Villar collection, provisionally deposited in Barcelona University (UB).

Results

Andricus trotteri Kieffer

Andricus trotteri Kieffer, 1898: 142-3.

Fig. 1-2.

LIFECYCLE. Probably heteroecic cycle. Only the asexual generation is currently known on *Quercus* section (in *Q. pubescens*); sexual galls probably on *Cerris* section. Galls develop in summer in lateral buds and adults emerge in November and December. Many galls fall to the ground before the emergence of the adult.

ASEXUAL GALL. Unilocular. The gall occurs in the lateral buds of the thin branches, having the appearance of a small ellipsoidal egg (3 x 2 mm) placed on a pad (0.5 mm). The wall is thin, sub-ligneous, irregular, dull, slightly rough and grey in colour. The gall has a transverse disposition to the branch (like as one recumbent egg) and is fixed by the extreme of its smaller diameter in the centre of the bearing. The output hole is located in one of the poles of the gall. Galls fall soon after the adult emergence, when the pat dries out; it is very fragile and can also fall because of occasional contact.

DIAGNOSIS OF THE ASEXUAL FORM. It belongs to the 'non *Adleria*' asexual females group, since it has the metasoma glabrous or at most pubescent laterally, only metasomal tergite II with broad band of pubescence and gena strongly broadened behind compound eye. Also it is characterized by having head and mesosoma mostly black or blackish-brown; frons and lower face without punctuation; F1 longer than F2; mesoscutum coriaceous-rugose, without dense setae and without punctures in between sculpture, mesopleuron partially smooth and shiny as *A. quercuscorticis* and *A. inflator*. Nevertheless, it differs from *A. quercuscorticis* because the first flagellomeres are not broadened apically, the mesoscutum has not piliferous points, the medial mesoscutal line is absent and the metasomal segments are smooth (first flagellomeres clearly broadened apically, mesoscutum with piliferous points between notauli, medial mesoscutal line present and 3rd and following metasomal segments micro-punctate in *A. quercuscorticis*). It differs from *A. inflator* in the characters indicated in the key (see discussion) and in the number of flagellomeres (12 in *A. trotteri* and usually 11 in *A. inflator*, rarely 12 flagellomeres in *A. inflator*). It also differs from both species mentioned by the shape of the gall (see discussion).

REDESCRIPTION

Length. Agamic female: 2.5-2.8 mm (n = 2).

Coloration (Figs 1-2). Specimens dark. Head black except for the reddish marks in the vertex around the compound eyes; mandibles testaceous with black teeth. Antennae dark. Mesoscutum laterally black, except a testaceous area in the upper corner of the pronotum; mesoscutum dark brown with reddish marks in the areas next to the pronotum and inferiorly in the area between the notauli; scutellum reddish, black in the area of the foveae. Propodeum black. Metasoma black, posteriorly and hypopygial area lighter. Legs with all coxae, trochanters and femora testaceous; tibiae and tarsi dark. Forewings without smoky areas, with brown veins.

Head (Figs. 1c-e). Delicately coriaceous, with few white setae, 2.6 times as broad as long seen from above, 1.3 times as broad as high and as broad as or very slightly broader than mesosoma in frontal view. Gena very delicately coriaceous, weakly broadened behind the eye; malar space very delicately coriaceous, with some striae, around 0.2 times as long as height of eye. POL nearly 3 times as broad as OOL; OOL 1.3 times as long as length of lateral ocellus and 0.7 times as long as LOL (POL:OOL:LOL = 6.2:3, diameter of lateral ocellus 1.5). Transfacial distance as broad as height of eye; diameter of antennal torulus larger than the distance between them, distance between torulus and inner margin of eye equal to the diameter of torulus; lower face dull, with sparse white setae, with alutaceous sculpture, median elevated area coriaceous. Clypeus trapezoidal, short, coriaceous, with a very small elevated central area, ventrally widely emarginated, without a median incision and slightly projected over

the mouthparts; anterior tentorial pits big, epistomal sulcus and clypeo-pleurostomal line distinct, deep. Frons coriaceous, with few white setae. Vertex, interocellar area and occiput coriaceous and shiny.

Antenna (Fig. 2a). 14-segmented; longer than head + mesosoma; scapus slightly compressed and short, 1.4 times as long as pedicel; pedicel slightly compressed, 1.7 times as long as broad; F1 1.15 times as long as F2, 2.3 times as long as pedicel; F3-F6 subsequently shorter, F7-F12 shorter than F4-F6, all equal in length and slightly longer than wide; placodeal sensilla on F4-F12, absent on F1-F3, obscured by setae. Antennal formula is 5: 3.5 (x2): 8: 7: 6: 5: 4: 3.5: 3: 3: 3: 3: 3: 3.

Mesosoma (Figs 1c, 2b-d, 2f). 1.2 times as long as high; with uniform short white setae. Pronotum weakly and densely carinate, with sparse white short setae; anterior rim of pronotum black, narrow. Mesoscutum uniformly coriaceous to delicately microreticulate; 1.3 times as long as broad in dorsal view (largest width measured across mesoscutum at the level of the base of tegulae). Notauli complete, deep and narrow, distinctly impressed, slightly converging, not broadened at the posterior end; anterior parallel lines alutaceous, glabrous and shiny, extending to the level of the tegula; parapsidal lines distinct, smooth and broad, glabrous, starting at posterior margin and extending to 2/3 length of mesoscutum; median mesoscutal line absent. Mesoscutellum 0.7 times as long as mesoscutum, uniformly coriaceous, with lateral sides curved and short white setae, elongated in dorsal view, longer than broad, overhanging metanotum; scutellar foveae present, subrectangular, separated by a thin central carina, bottom alutaceous, shiny and glabrous, only smooth, shining. Mesopleuron uniformly delicately coriaceous to weakly reticulate in the anterior half, smooth and shining posteriorly; mesopleural triangle pubescent; dorsal axillar area and lateral axillar area alutaceous to weakly coriaceous, densely pubescent; axillula alutaceous to weakly coriaceous, with dense white setae; subaxillular bar smooth, shining, broader than height of metanotal trough; postalar process long, strong, with parallel strong striae; metapleural sulcus reaching mesopleuron in the upper 2/3 of its height. Metascutellum dark brown, uniformly alutaceous-coriaceous, strongly curved basally, metanotal trough alutaceous with short white setae; ventral bar to metanotal trough microcoriaceous, twice narrower than height of metanotal trough; ventral impressed area as long as height of metascutellum, alutaceous; metascutellum coriaceous, strongly constricted medially; central propodeal area smooth, shiny, with many irregular wrinkles; lateral propodeal carinae short, pubescent, curved outwards in posterior 1/3; height of central propodeal area very short, as high as metanotal height; lateral propodeal area alutaceous, with few long white setae. Nucha short, with irregular wrinkles.

Legs. Anterior surface of fore tibia with short, scattered and applied setae; tarsal claws with a strong basal lobe.

Forewings (Fig. 1f). Forewing 1.5 times longer than body, hyaline, with short dense cilia on margin, radial cell 4.5 times as long as broad; R1 not reaching wing margin, Rs nearly straight, nearly reaching wing margin; areolet large, triangular, closed and distinct. M reaching basalis at half its height.

Metasoma (Figs. 2e). Slightly longer than head + mesosoma, longer than high in lateral view, shiny; only 2nd metasomal tergite with few short white setae (only laterally),

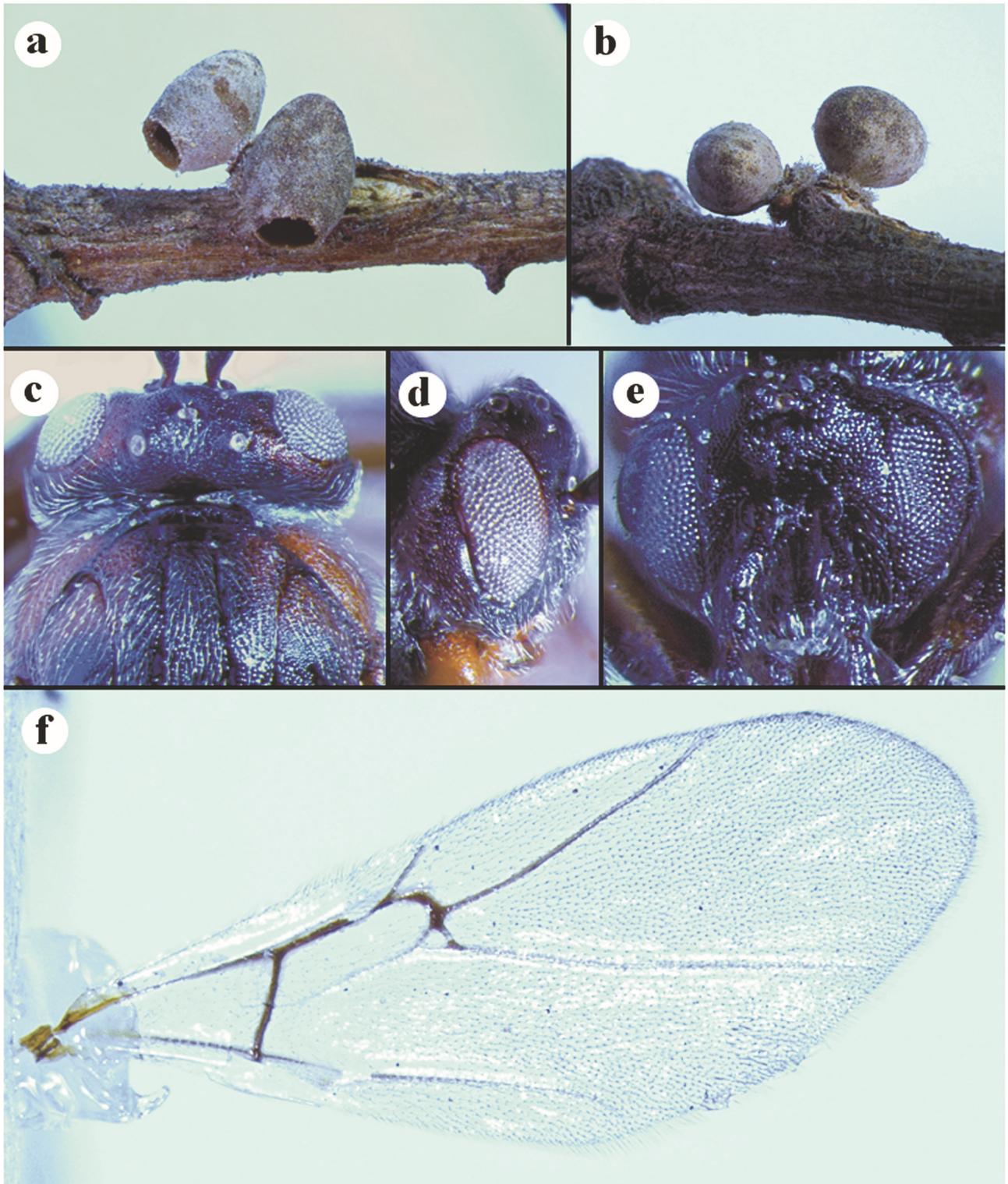


Fig. 1. *Andricus trotteri*: (a) gall with emergence holes, (b) posterior view of galls, (c) head and anterior part of mesosoma in dorsal view, (d) head in lateral view, (e) head in frontal view, (f) forewing. / *Andricus trotteri*: (a) agalla con agujeros de emergencia, (b) vista posterior de agallas, (c) cabeza y parte anterior del mesosoma en vista dorsal, (d) cabeza en vista lateral, (e) cabeza en vista frontal, (f) ala anterior.

all other tergites without setae, smooth, shining; 2nd metasomal tergite occupying $\frac{3}{4}$ of the length of metasoma in dorsal view; 3rd metasomal tergite and following segments with unobvious, very scarce micropunctuation dorsally. Ventral spine of hypopygium slender, prominent part around 7.0 times as long as broad, with sparse, white setae laterally, not extending beyond the apex of spine and not forming a tuft.

STUDIED MATERIAL. Esecchio forest 44° 3' N 27° 24' E (Constanta County, Dobrudja Province, Romania), Ex *Quercus pubescens*, (3.xi. 2013) 5.xii.2013: 2ð.

DISTRIBUTION. Europe, here in Romania, second valid record of this species from Europe. It had been recorded previously from Hungary (Ambrus, 1974, rare; the record requires confirmation – Melika *et al.*, 2000); Italy (Kieffer, 1898; Dalla Torre & Kieffer 1910); Croatia (Kwast, 2012); Great Britain (Bagnall & Harrison, 1918), still unconfirmed (Eady & Quinlan 1963); Turkey (Mutun & Dinç, 2015), dubious mention.

HOST. Known to occur on *Q. pubescens*. The mentions from *Q. robur* by Bagnall & Harrison (1918) and *Q. infectoria* by Mutun & Dinç (2015) must be confirmed.

Discussion

Andricus trotteri is only known from its asexual form; the sexual generation is unknown. In *Andricus* two distinct morphological groups of asexual females can be differentiated: (i) specimens with the metasoma conspicuously pubescent, posterior margin of all metasomal segments with a whitish band of dense pubescence (the ‘*Adleria* group’), and specimens (ii) with the metasoma glabrous or at most pubescent laterally, only metasomal tergite II with broad band of pubescence (the ‘non-*Adleria* group’). Also the *Adleria* group is further divided morphologically into two groups according to the pilosity of the anterior surface of the fore tibia: (i) short and applied or faintly oblique setae (the ‘*Adleria-kollari* group’, and (ii) long and oblique setae (the ‘*Adleria-non kollari* group’). The species studied here, *Andricus trotteri* Kieffer, is an asexual from belonging to the ‘non-*Adleria* group’. The species belonging to the “non-*Adleria*-group” related to *A. trotteri* can be differentiated with the following key:

1. Head and mesosoma mostly black or blackish brown, sometimes with more or less extensive lighter brown areas; metasoma reddish brown, sometimes black **2**
 - Body amber, yellowish or reddish, sometimes with small dark marks (patches).....
 - **remaining species of the “non-*Adleria* group”** [*alniensis*, *amenti* (= *giraudianus*), *callidoma*, *clementinae*, *gemmeus*, *glandulae*, *hystrix*, *legitimus*, *malpighii*, *paradoxus* (= *albopunctatus*), *quadrilineatus*, *quercuscorticis*, *quercusradicis*, *rhyzomae*, *seckendorffii*, *seminationis*, *serotinus*, *sieboldi*, *solitarius* and *superfetationis*]
2. Mesoscutum without piliferous points, almost smooth or alutaceous, glabrous and shiny **3**
 - Mesoscutum punctate, coriaceous or rugose, sometimes alutaceous or smooth, more or less pubescent **5**
3. Mesoscutum at least in posterior 2/3 in between notauli smooth, sometimes finely alutaceous only in anterior 1/3 and laterally to notauli; pronotum laterally and mesoscutum dorsally sometimes with lighter brown patches..... **curvator**

- Mesoscutum entirely alutaceous; pronotum and mesoscutum entirely and uniformly black or blackish brown, without lighter brown patches..... **4**
- 4. Prominent part of ventral spine of hypopygium about 2.0-3.0 times as long as broad; scutellar foveae ovate; antennae 15-segmented **gallaurnaeformis**
 - Prominent part of ventral spine of hypopygium about 6.0 times as long as broad; scutellar foveae transverse; antennae 14-segmented **quercusramuli**
- 5. Mesoscutum alutaceous or smooth, with piliferous points; frons and lower face punctate **foecundatrix**
 - Mesoscutum coriaceous or rugose, with or without punctures and setae between the sculpture; frons and lower face without punctuation..... **6**
- 6. Mesopleuron with more or less extensive smooth and shining areas, punctate or not; mesoscutum coriaceous, with setae projecting from punctures in between sculpture **7**
 - Mesopleuron entirely and uniformly rugose, not shining; mesoscutum coriaceous-rugose, without setae and punctures in between sculpture **9**
- 7. First flagellomeres clearly broadened apically; mesoscutum with some visible piliferous points between notauli; medial mesoscutal line visible; mesopleura pubescent; 3rd and following metasomal segments micro-punctate **quercuscorticis**
 - First flagellomeres very slightly broadened apically or not; mesoscutum without piliferous points or with shallow punctures; medial mesoscutal line absent; mesopleura glabrous or almost glabrous; metasomal segments smooth **8**
- 8. POL 1.7 times as long as OOL; mesoscutum with shallow piliferous points; mesopleuron smooth or with a very weak alutaceous sculpture; metasoma lighter, reddish brown **inflator**
 - POL longer, around 3.0 times as long as OOL; mesoscutum without piliferous points; mesopleuron partially sculptured, coriaceous to weakly reticulate in the anterior part; metasoma black **trotteri**
- 9. Second metasomal tergite smooth or alutaceous, without punctures **grossulariae** (= *mayri*)
 - Second metasomal tergite with punctures **lucidus**

As has been mentioned, both in *A. trotteri*'s diagnosis and here in the key, this species is morphologically similar to the asexual forms of *A. quercuscorticis* and *A. inflator*. Nevertheless, the galls are absolutely different. The gall of *A. quercuscorticis* lies within a crater in the bark, penetrating quite deeply into the stem, the base of the *A. inflator* gall is concealed among the bud scales, while the apex of the gall ends in a pointed tip. In both cases the galls are bigger than *A. trotteri*'s and not pedunculated.

Andricus trotteri galls cannot be confused with any other. Small egg-shaped galls exist in some sexual forms of *Cynips* and in *Neuroterus aggregatus* (Wachtl, 1880), but in *Cynips* the surface is covered with minute projecting scales or pustules and in *N. aggregatus* the surface is smooth with developing longitudinal stripes when mature. None of these species are fixed by the extreme of its small diameter, having a transverse disposition to the branch; also *A. trotteri* is the only species of this group with a grey gall.

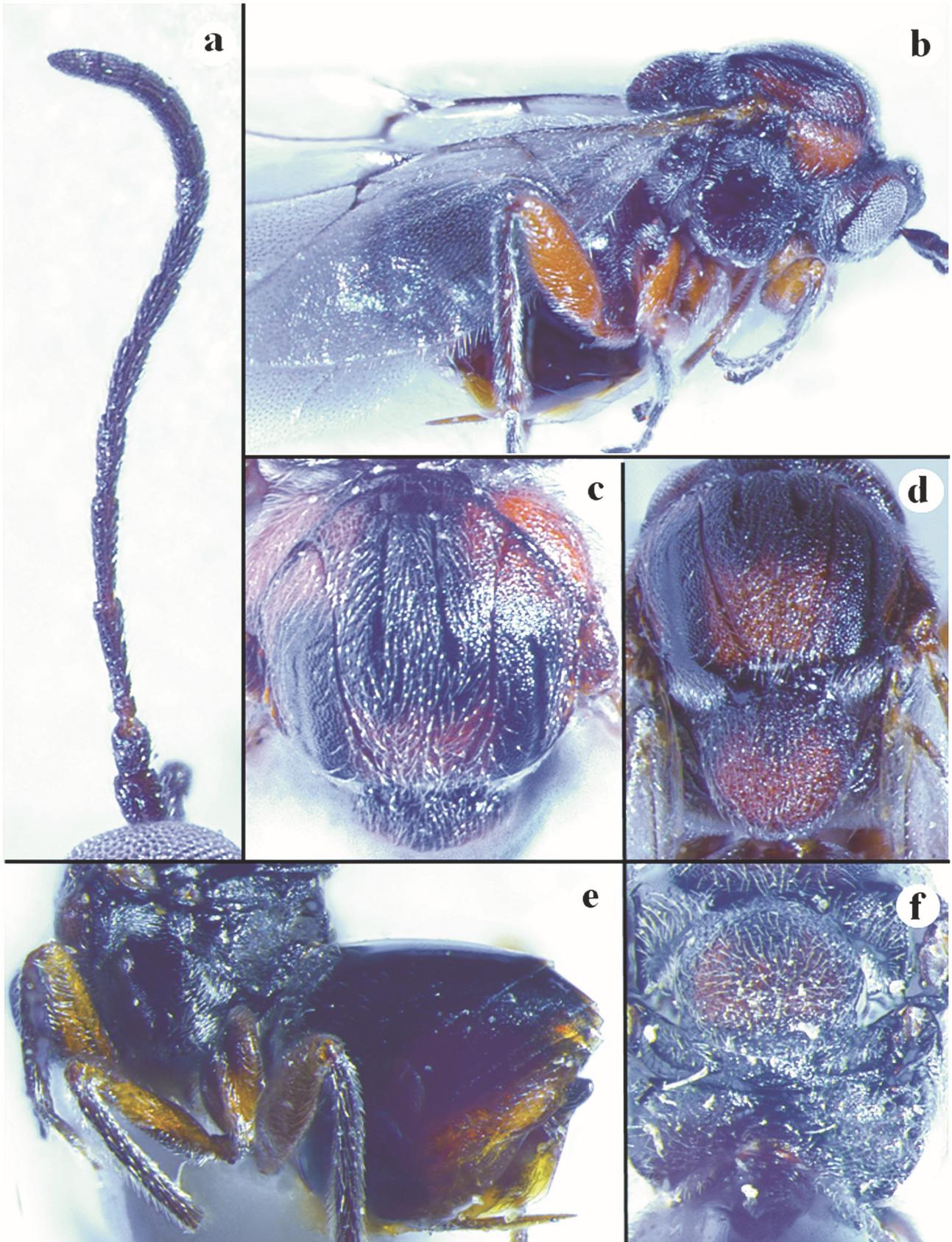


Fig. 2. *Andricus trotteri*: (a) antenna, (b) body in lateral view, (c-d) mesosoma in dorsal view, (e) body in latero-posterior view, (f) propodeum. /*Andricus trotteri*: (a) antena, (b) cuerpo en vista lateral. (c-d) mesosoma en vista dorsal, (e) cuerpo en vista lateroposterior, (f) propodeo.

References

- ADLER, H. 1881. Über den Generationswechsel der Eichen-Gallwespen. *Zeitschrift für Wissenschaftliche Zoologie Leipzig*, **35**: 151-246, plates X-XII.
- AMBRUS, B. 1974. *Cynipida-Gubacsok -- Cecidia Cynipidarum. Fauna Hungariae*, 116, XII, Hymenoptera II füz. 1/a, 120 pp.
- BAGNALL, R.S. & J.W.H. HARRISON 1918 On some cynipid oak-galls new to the British fauna. *Entomological Monthly Magazine*, **54**: 177-182.
- BENSON, R. B. 1953. Revision of Nomenclature. p. 220. In Marsden-Jones, E. M. A study of the life cycle of *Adleria kollari* Hartig, the marble or Devonshire gall. *Trans. R. ent. Soc. London*, **104**: 195-222.
- DALLA TORRE, K.W. & J.J. KIEFFER 1910. Cynipidae. Das Tierreich, 24. Berlin, Friedlander & Sohn. 891 pp.
- EADY, R. D. & J. QUINLAN 1963. *Handbooks for the identification of British insects. Hymenoptera*. London. VIII (1a). 81 pp.
- HARRIS, R. 1979. A glossary of surface sculpturing. State of California, department of food and agriculture. *Occasional Papers of Entomology*, **28**: 1-31.
- IONESCU, M.A. 1957. *Fauna Republicii Populare Romine. Insecta. Vol. IX, Cynipinae*. Editura Academiei Republicii Populare Romine (Bucarest), 249 pp.
- IONESCU, M.A. 1973. *Biologia Galelor. Monografie Cecidologica*. [Biology of Gall inducers. Monograph on Cecidology] Academiei Republicii Socialiste Romania Press, Bucuresti, 178 pp. [In Romanian].
- KIEFFER, J.J. 1898. Description de deux espèces nouvelles de Cynipidae (Hymén.). *Bulletin de la Société Entomologique de France*, **6**: 142-143.
- KWAST, E. 2012. A contribution to the fauna of Cynipidae (Insecta, Hymenoptera, Cynipidae) of Croatia with a description of an asexual female of *Andricus korlevici* (Kieffer, 1902) nov. comb., *Natura Croatica*, **(21):1**: 223-245.
- LILJEBLAD, J. & F. RONQUIST 1998. A phylogenetic analysis of higher-level gall wasp relationships (Hymenoptera: Cynipidae). *Systematic Entomology*, **23**: 229-252.
- MELIKA, G. 2006. *Gall Wasps of Ukraine. Cynipidae*. Vestnik zoologii, supplement 21(1-2), 1-300, 301-644.
- MELIKA, G., G. CSÓKA & J. PUJADE-VILLAR 2000. Check-list of oak gall wasps of Hungary, with some taxonomic notes (Hymenoptera: Cynipidae, Cynipinae, Cynipini). *Annls. hist.-nat. Mus. natn. hung.*, **92**: 265-296.
- MUTUN, S. & S. DINÇ 2015. Twelve oak gall wasp species (Hymenoptera, Cynipidae) new to the Turkish fauna. *Turkish Journal of Zoology*, **39**: 962-964.
- RONQUIST, F. & G. NORDLANDER 1989. Skeletal morphology of an archaic cynipoid, *Ibalia rufipes* (Hymenoptera: Ibalidae). *Entomologica Scandinavica*, **Supplement 33**: 1-60.