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## ***Andricus partali* n. sp. from Costa Rica (Hymenoptera: Cynipidae: Cynipini)**

## ***Andricus partali* n. sp. de Costa Rica (Hymenoptera: Cynipidae: Cynipini)**

**Juli Pujade-Villar<sup>\*</sup>, Victor Cuesta-Porta<sup>\*</sup> and Paul Hanson<sup>\*\*</sup>**

<sup>\*</sup>Universitat de Barcelona, Facultat de Biologia, Departament de Biologia Animal, Avda. Diagonal 645, 08028-Barcelona (Spain). E-mail: [jpujade@ub.edu](mailto:jpujade@ub.edu); [victorcp93@gmail.com](mailto:victorcp93@gmail.com); <sup>\*\*</sup>Museo de Zoología, Universidad de Costa Rica, San Pedro, Costa Rica. e-mail: [paul.hanson@ucr.ac.cr](mailto:paul.hanson@ucr.ac.cr).  
Corresponding author: Victor Cuesta-Porta. A/e: [victorcp93@gmail.com](mailto:victorcp93@gmail.com)

### RESUMEN

Una nueva especie de avispa agalladora, *Andricus partali* n. sp. (Hym., Cynipidae, Cynipini), es descrita de Costa Rica induciendo agallas en hojas de *Quercus costaricensis* Liebm. (Sección Lobatae). Se proporciona la descripción, diagnosis e información sobre la distribución y biología de la nueva especie.

**Palabras clave:** avispas agalladoras, taxonomía, morfología, distribución, biología.

### ABSTRACT

A new species of oak gallwasp, *Andricus partali* n. sp. (Hym., Cynipidae: Cynipini), is described from Costa Rica inducing galls on the leaves of *Q. costaricensis* Liebm. (Section Lobatae). We provide a description, diagnosis, and information about the distribution and biology of the new species.

**Key words:** Oak gallwasp, taxonomy, morphology, distribution, biology.

The oak gall wasps (Hymenoptera: Cynipidae: Cynipini) predominantly occur in the Holarctic region, but also in the Oriental and Neotropical. Historically, the Nearctic and Western Palaearctic regions have accumulated the greatest number of described species of oak gall wasps (Stone *et al.* 2002), but recently new hotspots of cynipid diversity are being discovered in the Eastern Palaearctic and Oriental regions (Pénzes *et al.* 2018). The Neotropics has been the most overlooked region with respect to the study of cynipids (Medianero and Nieves-Aldrey 2011a), but this is starting to change. During the last few years, this region has undergone a significant increase in sampling effort, mostly in Panama and, to a lesser extent, Colombia and Costa Rica. As a result, several species of in Neotropical oak gall wasp have been newly described belonging to the genera: *Amphibolips* Reinhard, *Andricus* Hartig, *Bassetia* Ashmead, *Disholcaspis* Dalla Torre Kieffer, *Loxaulus* Mayr, *Melikaiella* Pujade-Villar, *Neuroterus* Hartig, *Odontocynips* Kieffer and *Striatoandricus* Pujade-Villar, (e.g. Cuesta-Porta *et al.* 2020; Fernández-Garzón *et al.* 2017; Medianero and Nieves-Aldrey 2010, 2011a, 2011b, 2014; Medianero *et al.* 2011a, 2011b; Melika *et al.* 2009, 2011; Nieves-Aldrey and Medianero 2010; Nieves-Aldrey *et al.* 2021; Pujade-Villar 2008; Pujade-Villar and Rodríguez 2015; Pujade-Villar *et al.* 2015, 2017). New endemic genera have also been described: *Barucynips* Medianero and Nieves-Aldrey,

*Coffeikokkos* Pujade-Villar and Melika, and *Zapatella* Pujade-Villar and Melika (Medianero and Nieves-Aldrey 2013; Pujade-Villar *et al.* 2012a, 2012b, respectively).

The first cynipid species that was described for Costa Rica, was *Odontocynips hansonii* Pujade-Villar (Pujade-Villar 2008). Later descriptions include *Andricus costaricensis*, Pujade-Villar and Melika, 2009; *Disholcaspis costaricensis* Melika and Pujade-Villar, 2011; *Coffeikokkos copeyensis* Pujade-Villar and Melika, 2012; *Neuroterus glandiphilus* Nieves-Aldrey and Medianero, 2017 and *N. titou* Pujade-Villar and Hanson, 2021 (Melika *et al.* 2009; Melika *et al.* 2011; Pujade-Villar *et al.* 2012a; Medianero and Nieves-Aldrey 2017; Pujade-Villar and Hanson 2021, respectively). Currently, six species have been described from Costa Rica, though Pujade-Villar and Hanson (2006) estimated that the diversity of oak gall wasps (Cynipini) might be of more than 30 species. In this study, we describe a new species of *Andricus*, which represents the second record of this genus for Costa Rica.

### MATERIALS AND METHODS

The examined material was collected in Costa Rica and sent to the University of Barcelona by the last author from galls collected on leaves of *Quercus costaricensis* Liebm.

Morphological terminology follows Liljeblad and Ronquist (1998), and Melika (2006), except for

abbreviations of forewing venation, which follow Ronquist and Nordlander (1989). Cuticular surface terminology follows Harris (1979). 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 ocelli. The width of the forewing radial cell is measured from the margin of the wing to the Rs vein.

The SEM images were obtained using a field-emission gun environmental scanning electron microscope (FEI Quanta 200 ESEM) for high-resolution imaging without gold-coating the specimens. Gall images were taken with a Canon A1 camera with a 50 mm macro lens followed by Adobe Photoshop CS3 software processing. Adult images were taken with an Olympus SC30 camera, coupled to an Olympus U–CMAD3, adapted to an Olympus SZX10 stereomicroscope. Image stacking and processing was performed with the Helicon Focus 6.2.2 software. Forewing pictures were taken with a Canon camera (Power Shot SX 210 IS) directly from the microscope.

The type specimens of the newly described species are deposited in UB, Universitat de Barcelona, Catalonia (Juli Pujade-Villar col.).

## RESULTS AND DISCUSSION

### *Andricus partali* n. sp.

(Figs, 1-5, 6a)

<http://zoobank.org/EAE62BA5-FB1C-49EF-AAD7-B326AE37CFDC>

**Etymology.** Named after the journalist Vicent Partal i Montesinos, for his magnificent speech gloss about the repressed Catalan people on September 9, 2021 (see acknowledgments).

**Type material.** HOLOTYPE female deposited in UB (col. JP-V) with the following labels: ‘Costa Rica, Cartago-San José, Cerro de la Muerte, 3000 m., Villa Mills., 8.iv.1989, col. Hanson’ (white label); ‘*Quercus costaricensis*, leaf gall with free-rolling cell’ (white label); ‘Holotype of *Andricus partali* n. sp. ♀, desig. JP-V 2021’ (red label). PARATYPES (1♂ and 3♀ deposited in UB): 1♀ with same data of holotype; 1♀ idem 26.iii.1995, P. Hanson; 1♂ and 1♀ idem vi.1997, P. Hanson (‘Villa Mills.’ is not mentioned).

**Diagnosis.** This species belongs to a sexual form (see comments below). The new species is characterized and differs from other *Andricus* species by having the following combination of characters: head not broadened behind eye, lower face shining with alutaceous sculpture, malar space without radiating striae, antenna with 12-flagellomeres, F1 long (around 1.4x as long as F2), mesoscutum weakly sculptured, notauli complete, mesopleuron sculptured (weakly on the speculum), tarsal claws simple, lateral propodeal carinae strong and curved outwards in posterior

1/3, and ventral spine of hypopygium 3.0x as long as broad. The only other *Andricus* species known from Costa Rica, *A. costaricensis*, also has a malar space without radiating striae, notauli complete, simple tarsal claws and similar propodeal carinae, but differs from the new species by: head broadened behind eye, lower face with coriaceous sculpture, antenna with 13-flagellomeres, F1 slightly longer than F2, mesoscutum coriaceous, speculum smooth and ventral spine of hypopygium 5.0x as long as broad. The position of *A. partali* n. sp. discussed also in Comments.

**Description:** Sexual female.

**Body length** 2.1–2.4 mm (n=4).

**Color.** Light brown to chestnut; head in frontal view and legs amber to yellowish, antenna brown, with first segments (scapus to F2) lighter; lateral scutellum lighter; forewings hyaline with brown veins.

**Head.** Alutaceous with few white setae on lower face, 2.1 times as broad as long from above, 1.4 times as broad as high and as broad as mesosoma in front view. Gena delicately coriaceous, not broadened behind eye; malar space delicately coriaceous, without striae or malar sulcus, 0.5 times as long as height of eye. POL nearly 1.2 times or slightly longer than OOL; OOL 3.0 times as long as length of lateral ocellus and 1.3 times as long as LOL. Transfacial distance 1.4 times as broad as height of eye; diameter of antennal torulus 1.5 times as large as distance between them, distance between torulus and inner margin of eye equal to the diameter of torulus; lower face shiny, with very delicate alutaceous sculpture, with sparse white setae. Clypeus rectangular, delicately coriaceous, with very small elevated central area, ventrally smooth, widely emarginated, with a short median incision; anterior tentorial pits distinct; epistomal sulcus and clypeo-pleurostomal line distinct but superficial. Frons alutaceous, without setae. Vertex, interocellar area and occiput delicately coriaceous.

**Antenna.** 14-segmented; slightly longer than mesosoma; scapus compressed and short, 1.6 times as long as pedicel; pedicel globular, 1.5 times as long as broad; F1 1.4 times as long as F2, 2.6 times as long as pedicel; F2 longer than F3; F3=F4; F5–F7 becoming shorter, F8–F11 shorter than F5–F7, all equal in length; F12 1.4x as long as F11; placodeal sensilla present on F2–F13, absent on F1, obscured by setae.

**Mesosoma.** Slightly longer than high in lateral view; with very sparse white setae. Pronotum alutaceous, with numerous strigae laterally, emarginated along the ventrolateral edge, with short white setae; anterior rim of pronotum narrow; propleuron alutaceous, shining, with smooth area basally. Mesoscutum delicately alutaceous, almost smooth in the center, more strongly impressed outside the notauli; only slightly longer than 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 and not broadened at the posterior end; anterior parallel lines, parapsidal lines and median mesoscutal line absent. Mesoscutellum 0.5 times as



long as mesoscutum, uniformly coriaceous-rugose laterally, weakly sculptured in central part of disk, with parallel sides and short white setae, elongated in dorsal view, slightly longer than broad, overhanging metanotum; mesoscutellar foveae present, shining, subquadrangular with distinctly elevated coriaceous median carina not delimited basally. Mesopleuron alutaceous, more delicately in the speculum which is sometimes almost smooth, sometimes with very weak transverse carinae, basally smooth, glabrous or with very few white setae; dorsal axillar area alutaceous; lateral axillar area coriaceous and glabrous; axillula short, triangular, alutaceous, with few white setae; subaxillular bar smooth, shining, slightly shorter than height of metanotal trough; postalar process short, inconspicuous; metapleural sulcus reaching mesopleuron in the upper half of its height. Metascutellum, uniformly coriaceous, metanotal trough smooth to weakly alutaceous, with few short white setae; ventral impressed area at least twice as narrow as height of metascutellum, smooth, with distinct longitudinal striae; central propodeal area smooth, shiny, lateral propodeal carinae strong, high, curved outwards in posterior 1/3, glabrous; lateral propodeal area with few long white setae next to propodeal carinae. Nucha with irregular wrinkles and rugae.

**Legs.** Tarsal claws simple, without basal lobe.

**Wings.** Forewing longer than body, hyaline, with short dense cilia on margin, radial cell 4.2 times as long as broad; R1 reaching wing margin, Rs nearly straight, nearly reaching wing margin and broadened distally; areolet large, triangular, closed and distinct. M reaching basalis at half its height.

**Metasoma.** Shorter than head+mesosoma, as high as long in lateral view; only 2nd and 7th metasomal tergites with a few short white setae, only laterally, all other tergites without setae, smooth, shining; 2nd metasomal tergite occupying half the metasomal length in dorsal view. Ventral spine of hypopygium slender, prominent part 3.0 times as long as broad, with sparse, long white setae, not extending beyond the apex of spine.

**Male.** Similar to female except: head as long as broad in frontal view; malar space shorter, around 0.3 times as long as height of eye; POL 2.0x OOL; OOL slightly shorter than length of lateral ocellus and subequal in length to LOL. Transfacial distance slightly shorter than height of eye; antenna 15-segmented; longer than body length; scapus shorter, 1.3 times as long as pedicel; F1 1.3 times as long as F2, very slightly curved but broadened distally; F2=F3 and slightly longer than F4; F5=F7 and slightly longer than F8; F8=F12; F13 slightly shorter than F12; placodeal sensilla present on all segments; sculpture of mesoscutum more impressed and mesopleura smooth. Length: 2.0 mm (n=1).

**Gall** (Fig. 6a). Globular swelling of the leaf blade projecting on both the upper and lower surface of the leaf, located adjacent to the main vein or a secondary vein. Usually there are only one or two galls on a single leaf, rarely more. The gall is up to 10 mm in diameter, green

in color, sometimes with a slightly reddish tinge on the surface. The external wall is coriaceous, quite hard, and with a shiny surface. Mature galls are hollow inside and within the internal air space is a single 2-3 mm diameter, brown sphere containing the larval chamber, which can become detached and capable of rolling around inside the hollow interior of the gall.

**Biology.** This new species was found inducing galls on *Quercus costaricensis* Liebm. (Section Lobatae of *Quercus*, red oaks), which occurs from 2300 m to 3600 m elevation in Costa Rica and western Panama (Morales 2010). The gall appears to belong to the sexual generation. Mature galls were collected in March-April, and adults emerged soon after the galls were collected. Other hymenopterans that emerged from these galls include parasitoids, *Quercastichus* sp. (Eulophidae) and *Torymus* sp. (Torymidae).

**Distribution.** Only known from high elevations in Costa Rica (Cordillera de Talamanca).

**Comments.** *Andricus* is a problematic genus that has been repeatedly recovered as non-monophyletic in previous phylogenetic studies (Liljeblad *et al.* 2008; Stone *et al.* 2009; Nicholls *et al.* 2017), and thus needs a thorough taxonomic revision. Some of the characters of the new species described here are not concordant with the morphology of most *Andricus* species: tarsal claws simple, malar space without radiating striae from clypeus and lower face almost smooth.

The presence or absence of a basal lobe on the tarsal claws is not considered a diagnostic generic character (Melika and Abrahamson 2002). Two large oak gall wasp genera, *Callirhytis* and *Andricus*, include species without and with a basal lobe on the tarsal claws, respectively (Weld 1952; Melika 2006). Many species placed by Weld (1952) in *Callirhytis* (as a genus without a basal lobe on the tarsal claws), in fact, belong to *Andricus* and vice versa (Melika *et al.* 2009). Also, some *Andricus* species in the Western Palearctic and Neotropical regions do not have radiating striae from clypeus (Melika 2006; Melika *et al.* 2009), and a few species of *Andricus* have a smooth lower face (Tang *et al.* 2012; for example). Thus, the new species fits into the current definition of the genus *Andricus*, despite the peculiarity of some morphological characters. Further studies and revisions of this genus are needed to clarify the diagnostic characters and true limits of *Andricus*.

Cameron (1883: 71) described *Cynips guatemalensis* based exclusively on gall samples, however the drawings of the galls in the same study (Cameron 1883: Table 4, Figs 7 & 7a) were morphologically discordant from his description in the text. Furthermore, *Synergus dorsalis* Cameron was described in the same study (Cameron, 1883: 72); the type material of which (adult) was examined by Richie & Shorthouse (1987: 240) who concluded that it corresponds to an *Andricus*. Cameron mentions that *S. dorsalis* was obtained from the gall of *Cynips guatemalensis*, therefore *S. dorsalis*, currently *Andricus dorsalis* (Cameron), would be the inducer of the gall of *C. guatemalensis* (currently

*Andricus guatemalensis*). The gall of *Andricus partali* **n. sp.** may be similar to the description of *Andricus guatemalensis* (Cameron). Ritchie & Shorthouse (1987: 240) also studied the type material of *A. guatemalensis* (gall), labelled by Cameron, and the authors compared it with “*Andricus? mexicana* Bassett”, a velvety leaf gall; then, they confirmed that *A. guatemalensis* (gall) corresponds to Cameron’s drawing (Fig. 6b), a velvety leaf gall. Thus, the description of *A. guatemalensis* (gall) is erroneous. According to the ZNC, a drawing cannot be a type (nor a description); a ‘Type’ should be a sample, or a synthetic series of samples (Brothers *pers. com.*). Thus, the type series of *A. guatemalensis* (gall) and of *Andricus dorsalis* (adult) deposited in the British Museum are the true syntypes of both species, and not the description by Cameron. Pujade-Villar *et al.* (2011) considered *Andricus mexicanus* Bassett and *Cynips guatemalensis* Cameron as *incertae sedis*, since they were described based only on the velvety leaf galls, which are impossible to differentiate from other velvety leaf galls on leaves that are known. Based on the conclusions of Ritchie & Shorhouse (1987) we know the inducer of the gall *Andricus dorsalis* (Cameron) and after having the opportunity to examine the type of this species we conclude that it belongs to the *tecturnarum* group (JP-V *unpublished data*). Therefore, *A. guatemalensis* is a species morphologically distinct (both the gall and the adult) from the new species described here, and *Andricus partali* **n. sp.** is a valid species distinct from *A. guatemalensis* (= *S. dorsalis*). As was mentioned, neither a description nor a drawing are “valid” for anything beyond providing information about which the author considered relevant, and either (or both) could be erroneous in several aspects. In summary, even though the description of the gall by Cameron is similar to that described here and given that the verbal descriptions do not correspond to the drawings, the only way to determine the correct application of names is to examine the type specimens. By this means it can be decided whether the descriptions or the drawings are more precise. For these reasons, *Cynips guatemalensis*, considered in this study as *dubida species*, corresponds to a multilocular velvety gall on the leaves (Fig. 6b-c) very distinct from the leaf gall described here (*A. partali*, Fig. 6a). The lectotype of *Cynips guatemalensis* is designed here (Fig. 6c). Cameron (1883: 70) described also another velvety gall, *Cynips imitator*, from Guatemala in the same place, nevertheless this species occurs in twigs (Cameron, 1883: Fig. 8).

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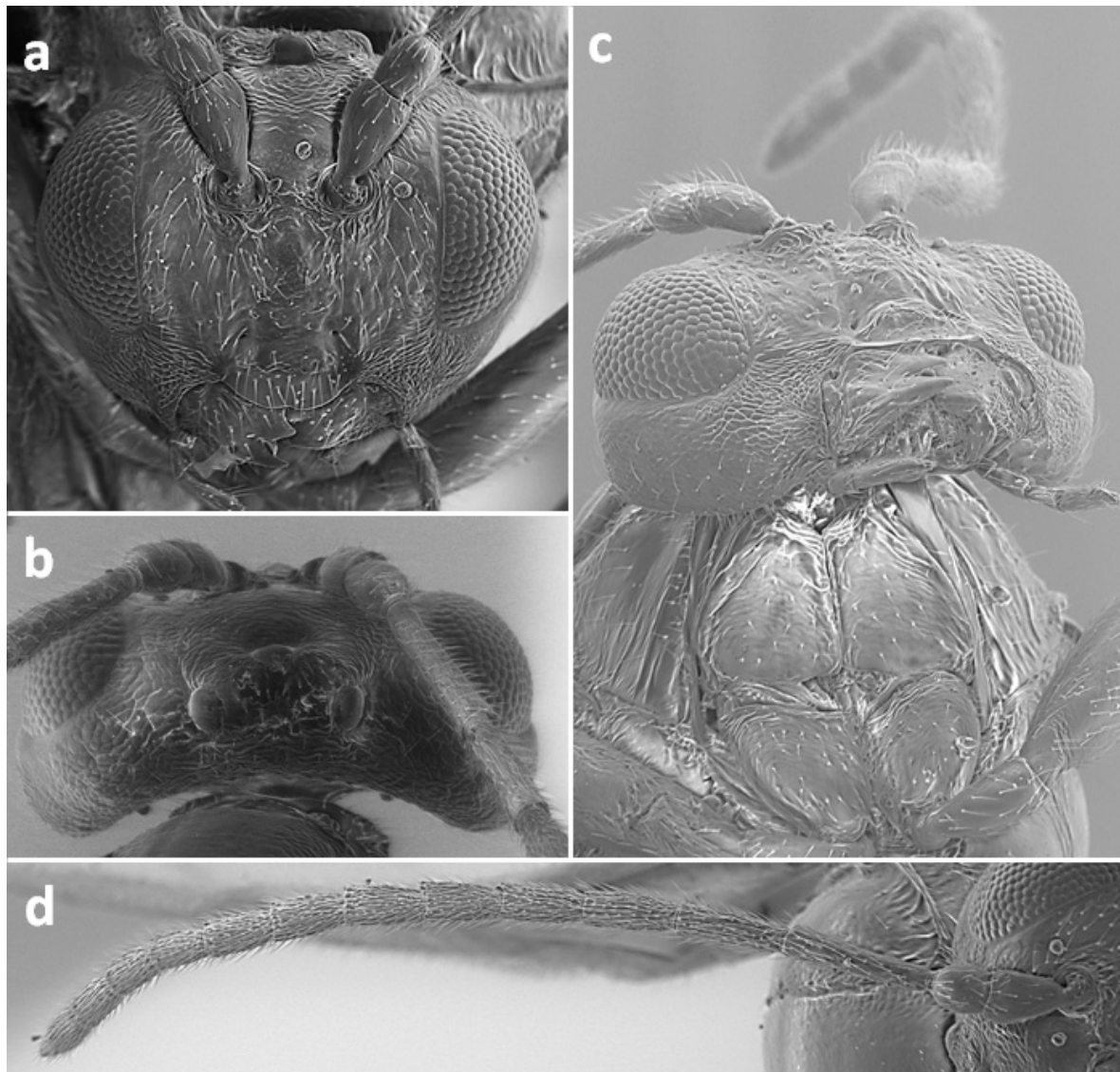
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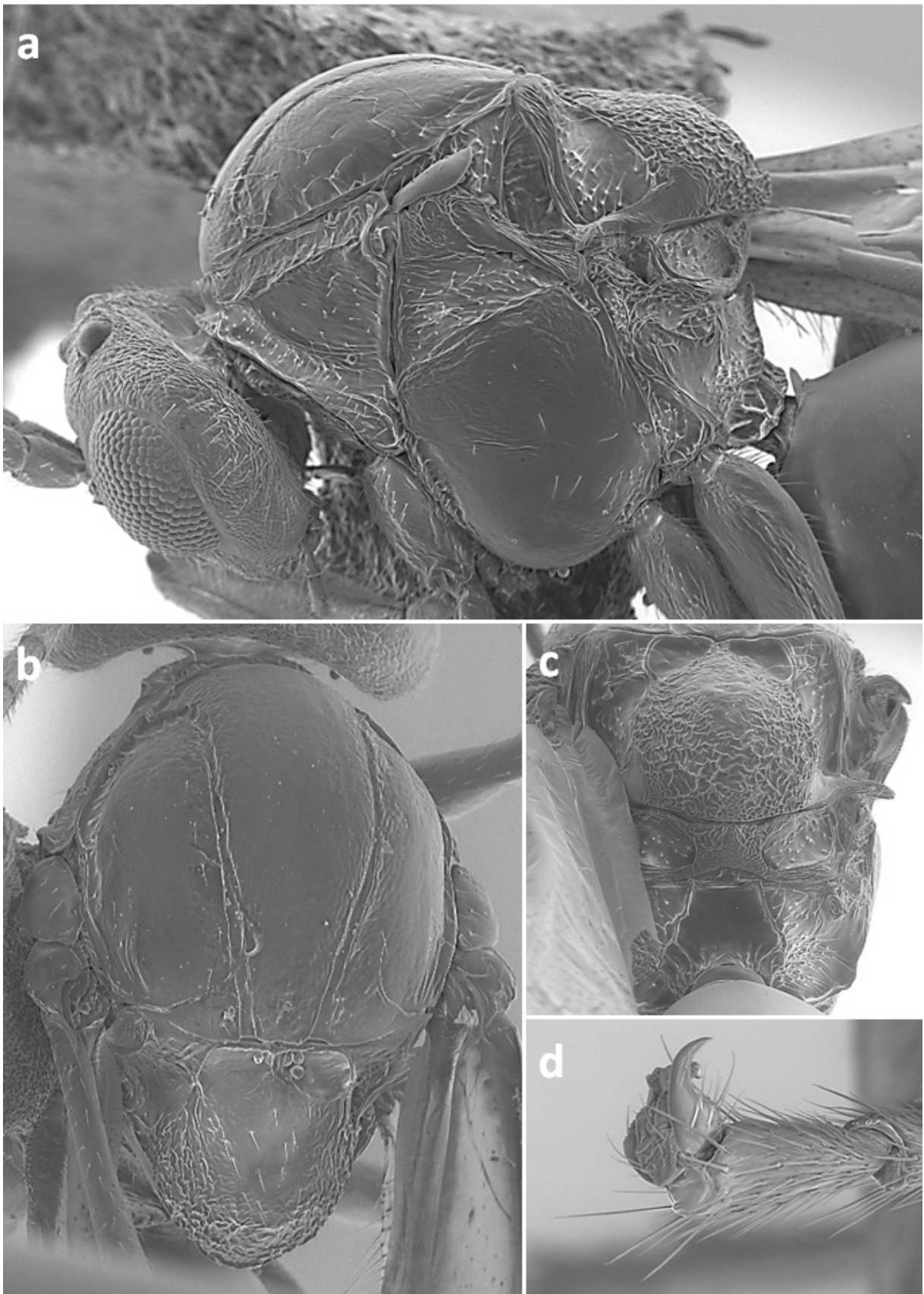
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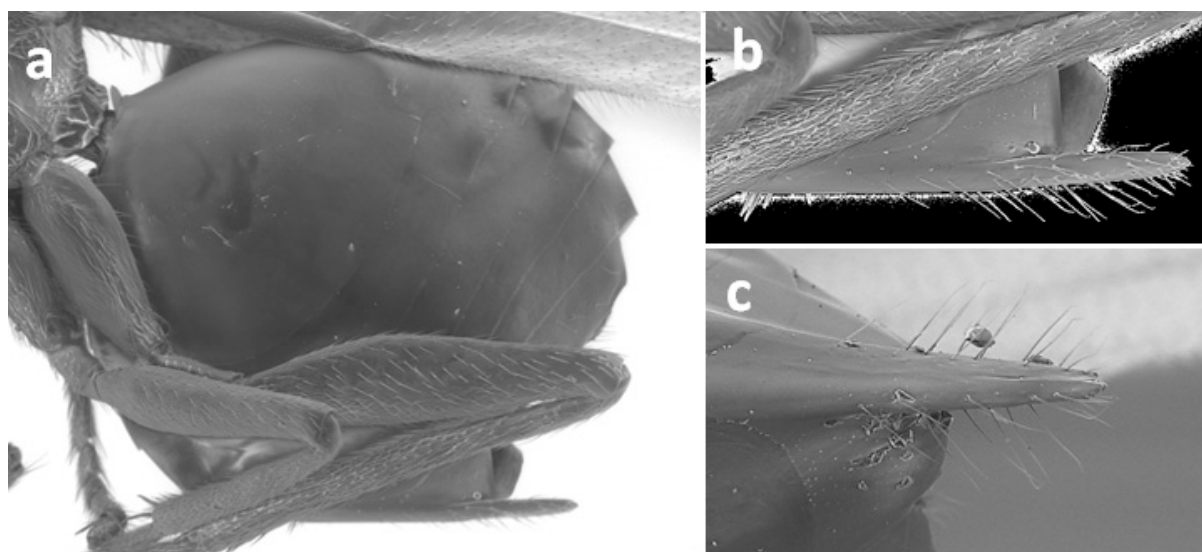


**Figure 1.** *Andricus partali* n. sp. ♀: (a) head in frontal view, (b) head in dorsal view, (c) head in ventral view and propleura, (d) antenna.

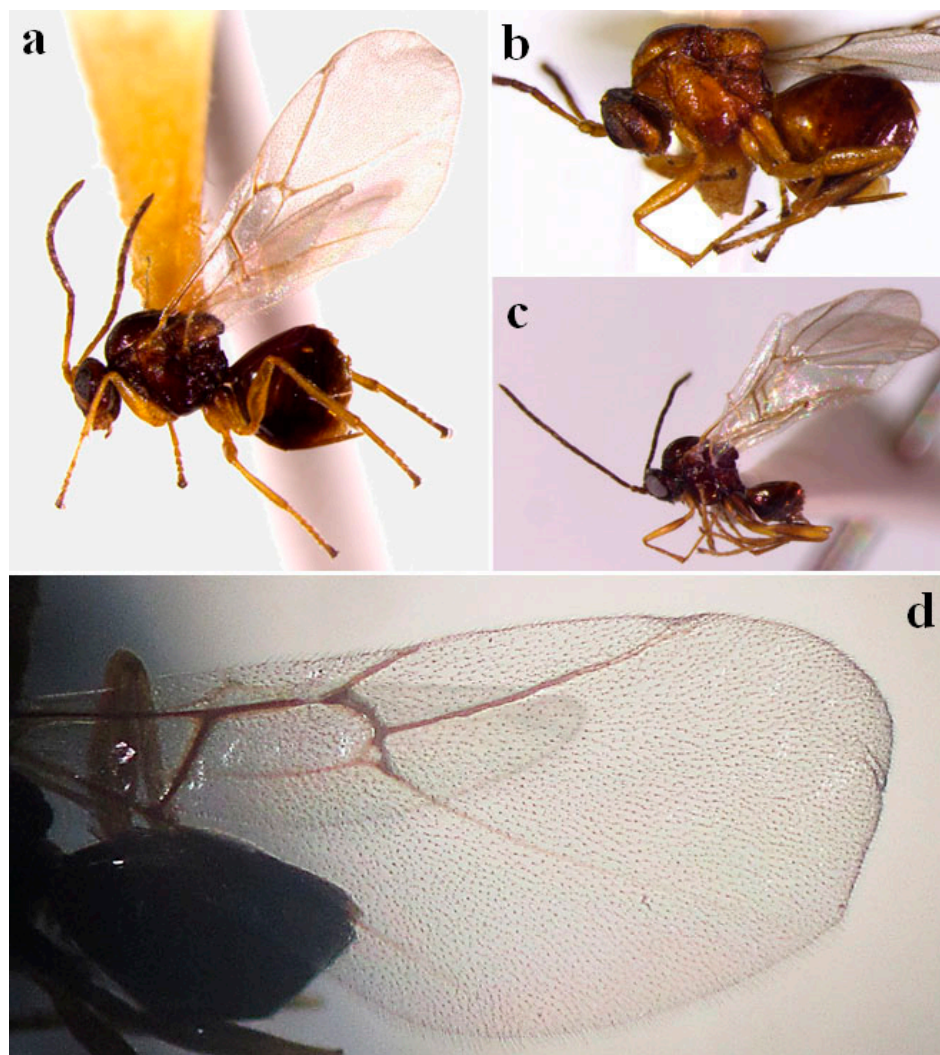


**Figure 2.** *Andricus partali* n. sp. ♀: (a) mesosoma in lateral view, (b) mesonotum in dorsal view, (c) mesosoma in posterior view, (d) tarsal claws.

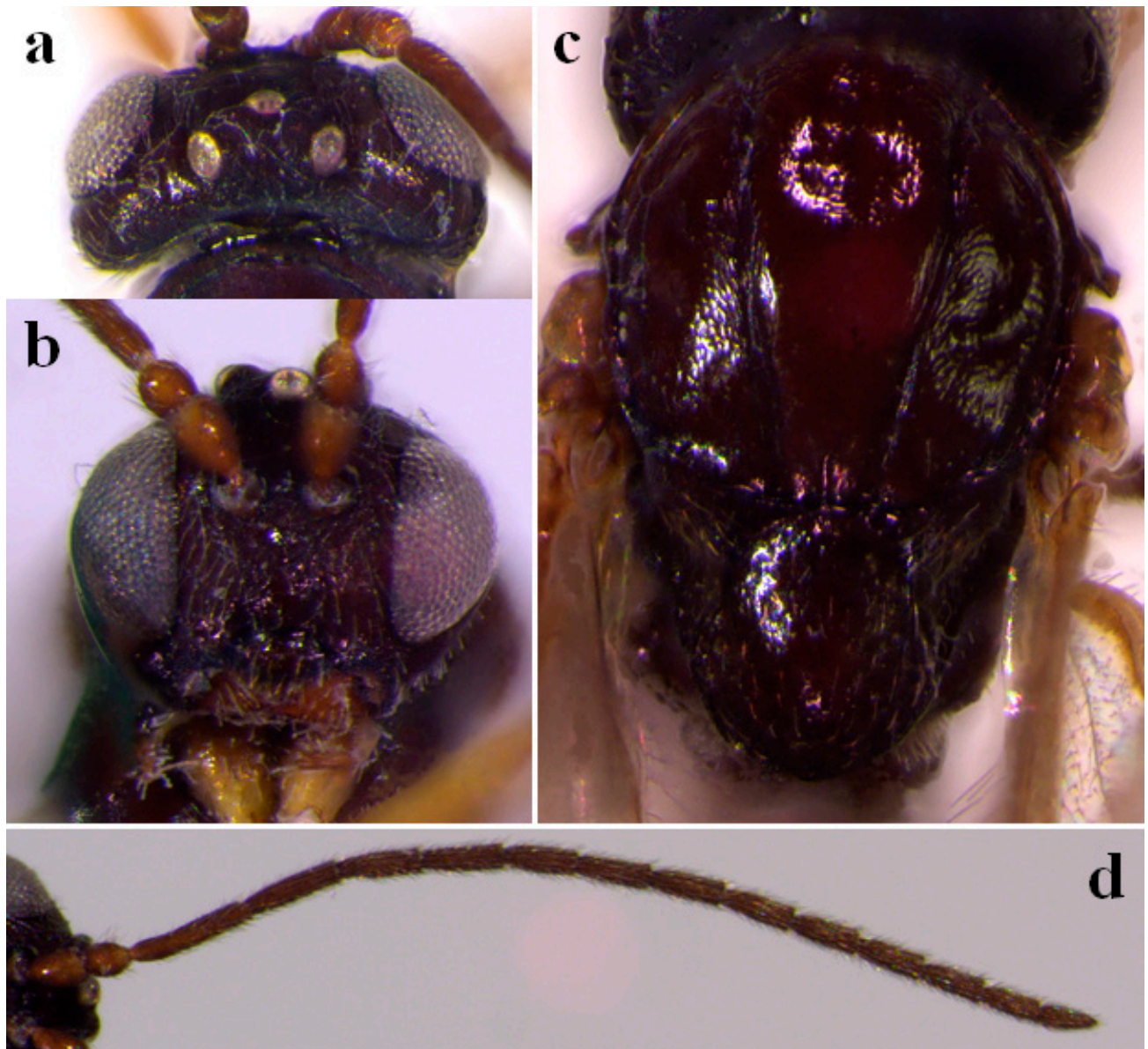




**Figure 3.** *Andricus partali* n. sp. ♀: (a) metasoma in lateral view, (b) ventral spine of hypopygium in lateral view, (c) ventral spine in ventral view.

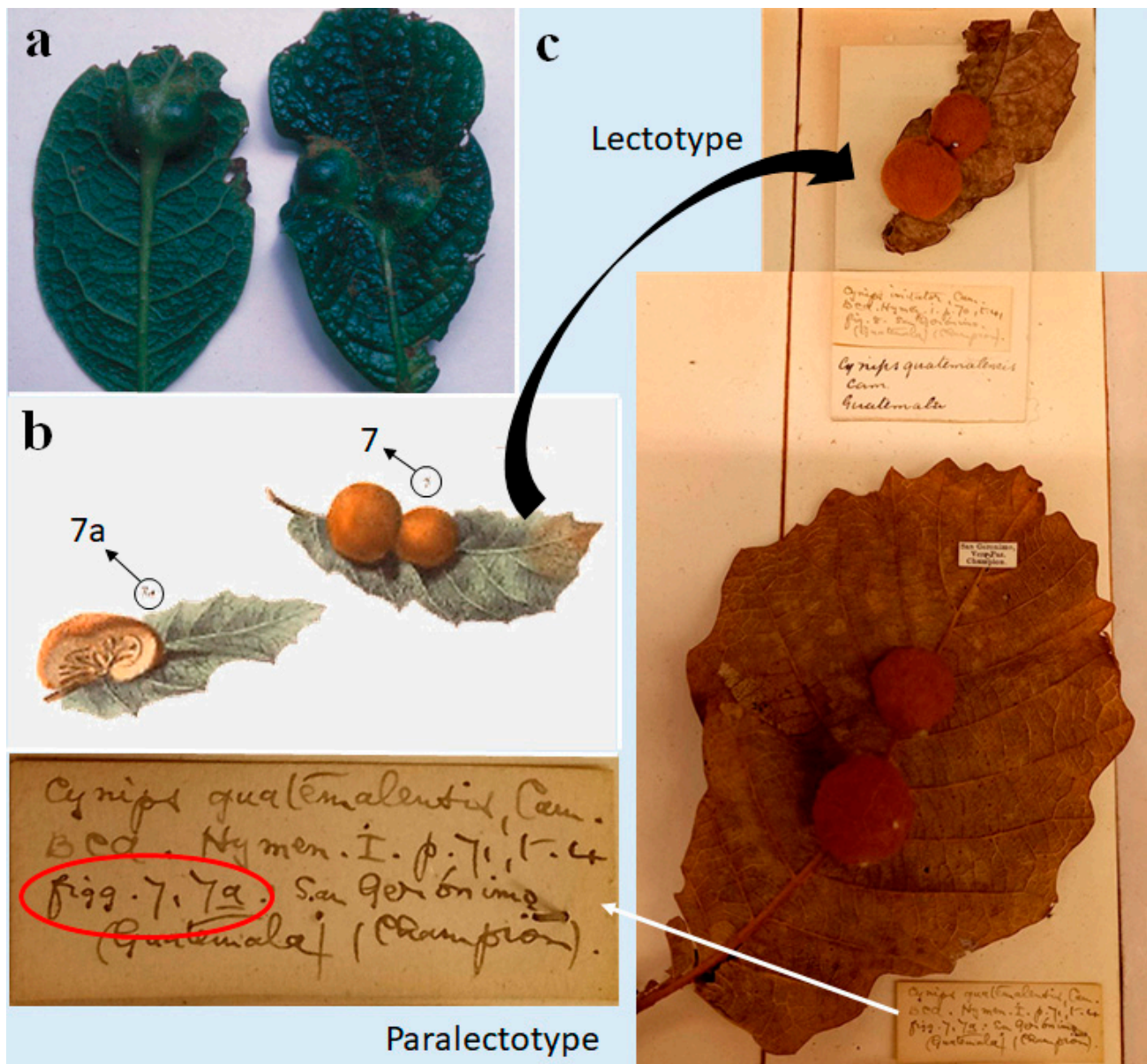


**Figure 4.** *Andricus partali* n. sp.: (a-b) habitus female, (c) habitus male, (d) forewing.



**Figure 5.** *Andricus partali* n. sp. ♂: (a) head in dorsal view, (b) head in frontal view, (c) mesosoma in dorsal view, (d) antenna.





**Figure 6.** (a) Gall of *Andricus partali* n. sp. on *Q. costaricensis*. (b) Drawing in Cameron (1883) illustrating *Cynips guatemalensis* gall. (c) Syntypes of *C. guatemalensis* including the designation of lectotype.