SCIENTIFIC NOTE

Andricus protuberans Pujade-Villar & Ferrer-Suay IS A SEXUAL FORM (HYM., CYNIPIDAE, CYNIPINI)

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Scientific Note

Andricus protuberans Pujade-Villar & Ferrer-Suay IS A SEXUAL FORM (HYM., CYNIPIDAE, CYNIPINI)

Andricus protuberans Pujade-Villar & Ferrer Suay es una forma sexual (Hym., Cynipidae, Cynipini)

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ABSTRACT. We describe and illustrate the morphological characters of the male of *Andricus protuberans* Pujade-Villar & Ferrer-Suay, 2015 (Hymenoptera, Cynipidae), an oak gall wasp species considered an asexual generation in the original description. The reasons for this mistake are discussed, and the variability of this species in the metasomal segments is mentioned.

Keywords: Cynipids, gall-inducing insect.

RESUMEN. Se describen e ilustran los caracteres del macho de *Andricus protuberans* Pujade-Villar & Ferrer-Suay, 2015 (Hymenoptera, Cynipidae), especie gallícola considerada en la discripción original como asexuada. Se discuten los motivos de este error y se menciona la variabilidad de la especie en lo que se refiere a la puntuacions de los segmentos metasomales.

Palabras clave: Cinípidos, insectos agalladores.

INTRODUCCIÓN

The genus *Andricus* Hartig, 1840 is a large polyphyletic genus with more than 300 species (Stone et al., 2002), which needs a detailed review. Currently, this genus includes many species that do not fit into any other genera, and thus they were put into *Andricus* (Pujade-Villar et al., 2022). Over the last decade, several genera have been re-established from *Andricus* and, most likely, further research will split the genus into more genera. Recent morphological and molecular studies have re-established several valid genera which were synonyms of *Andricus*: *Erythres* Kinsey (Pujade-Villar and Melika, 2014), *Femuros* Kinsey (Pujade-Villar and Ferrer-Suay, 2015a), and *Dros* Kinsey (Pujade-Villar et al., 2017). Other genera are also under re-establishment. The Palearctic *Andricus* sexual and asexual alternating generations strongly differ in the morphology of adults (Melika, 2006). In the asexual generations, genae are usually broadened behind the eyes in frontal view, while

in the sexual generation the genae are not broadened behind eye in frontal view and their galls are never lignified. However, in the Nearctic and Neotropics, this character might vary. Females of *Andricus* protuberans Pujade-Villar and Ferrer-Suay, have strongly broadened genae (Fig. 1a) and galls are highly lignified (Figs 1b-c). Given those characters, Pujade-Villar and Ferrer-Suay (2015b) described the species as an asexual generation.

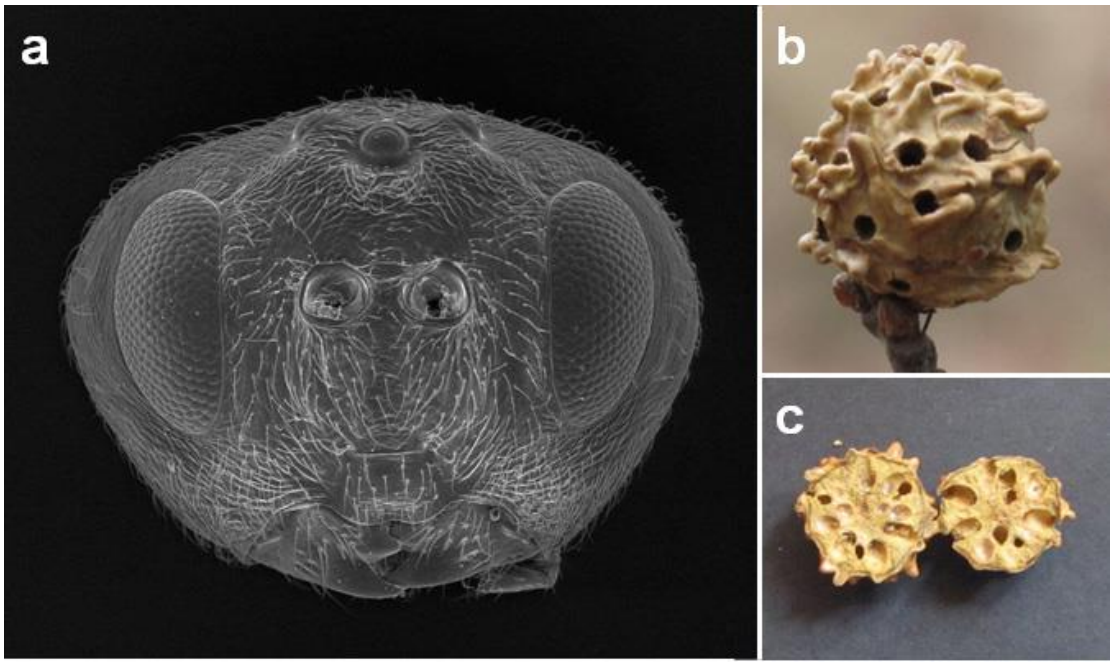

Figure 1. (a) Head in frontal view of *Andricus protuberans* female, (b) gall collected from *Quercus laeta* Santa Fe, Mexico City, (c) transversal section of a gall.

On 25 March, 2019 adult males and females emerged from the galls collected on *Quercus laeta* Liebm. in Bosques de Santa Fe (19° 21' 04.35" N, 99° 16' 35.10" W, 2,622 masl), Alcaldia Cuajimalpa, Mexico City, Mexico, which were morphologically identical to the galls from Los Romeros in the State of Hidalgo (Mexico) mentioned in Pujade-Villar and Ferrer-Suay (2015b: see Fig. 3c). From 14 collected galls, we obtained 472 specimens males and females of *Andricus*, and 51 parasitoids (523 specimens in total) (Table 1); parasitoids emerged belong to Eurytomidae (two morphotipes) and Ormyridae (a single morphotype). Males of *A. protuberans* predominantly emerged earlier than the females, the latter tended to emerge by the end of the emergence period. Probably, this is why only females were obtained from the Zacatecas's samples, from which the species was described (Pujade-Villar and Ferrer-Suay, 2015b).

The specimens were examined and photographed under an environmental scanning electron microscope (FEI Quanta 200® ESEM) at the University of Barcelona. The Santa Fe female adults had micropuncture on the third and subsequent metasomal terga (Fig. 2g), while the type specimens have a completely smooth metasoma. The gall protuberances were shorter than on the galls from Zacatecas (Pujade-Villar and Ferrer-Suay, 2015b). We have recently found Nearctic species of *Andricus* with a great intraspecific variation in the metasomal sculpture, e.g., *Andricus quercuslanigera* from Texas and Florida (USA) have the 2nd metasomal tergum smooth and micropunctured 3rd and subsequent terga, while

Table 1. Emerging periods and number of adults of *A. protuberans* from 14 galls of *Q. laeta* collected on 15 March 2019 in Santa Fe, Mexico City.

Date	Male adults	Female adults	Parasitoids
27–31 March	47	0	0
1–4 April	128	8	0
5–8 April	64	168	6
9–12 April	5	48	23
13–16 April	1	3	20
17–20 April	0	0	2
Total	245	227	51

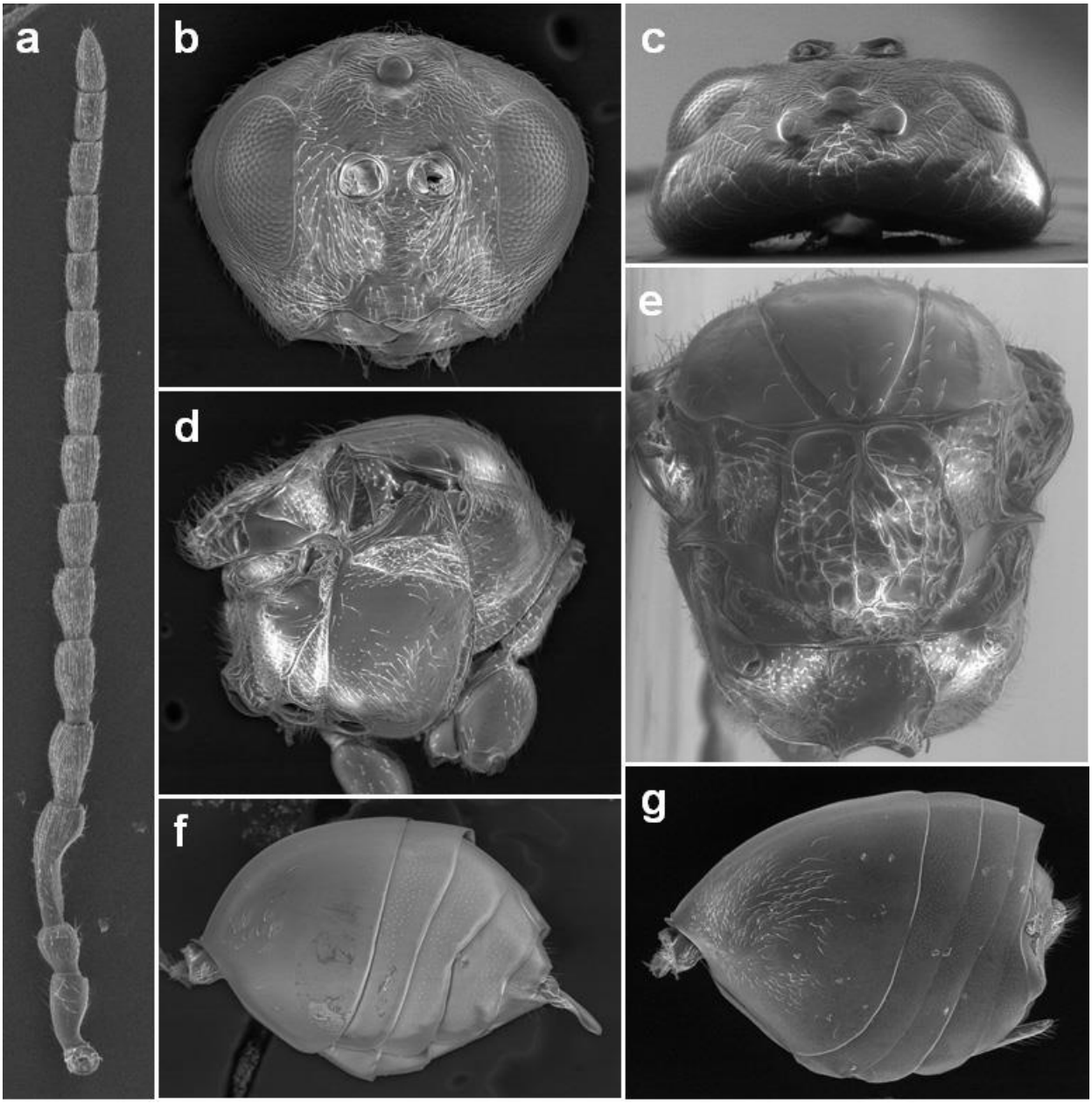

Figure 2. *Andricus protuberans* male (a–f), female (g) from Santa Fe (Mexico City), collecting site. (a) Antenna, (b) head in frontal view, (c) head in dorsal view, (d) mesosoma in lateral view, (e) mesoscutellum and propodeum in dorsal view, (f–g) metasoma in lateral view.

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the specimens of this species from Chihuahua (Mexico) have the 2nd metasomal tergum striated and 3rd and subsequent metasomal terga reticulated; phylogenetically (unpublished data) these morphological differences do not correspond to the existence of different species, they are simply intraspecific variations. Thus, we consider that both populations belong to *A. protuberans* and we propose to describe the male in this species instead of describing a new species. We do not consider that both populations correspond to each of the alternating generations of the same species, since no galls with long protuberances containing adults with smooth metasoma are found in Santa Fe.

The males of *A. protuberans* emerged from galls collected from Santa Fe differ from the female type by the following characters:

Antennae with 13 flagellomeres (Fig. 2a); F1 curved, strongly broadened distally; **head** (Fig. 2b) less transverse in frontal view, 1.3x as broad as high; transfacial distance short, 1.16x as long as the height of eye; malar space shorter, 0.35x as long as the height of eye; **ocelli** are relatively bigger (Fig. 2c see arrow); POL: OOL: LOL = 30: 25: 10 and the diameter of the lateral ocellus is 14. **Mesosoma** laterally (Fig. 2d) is less pubescent, with pronotum weakly sculptured laterally; with smooth mesopleuron; and more conspicuous mesopleural sulcus. **Mesoscutellum** (Fig. 2e) is less wrinkled. **Propodeal carinae** (Fig. 2e see arrow) weaker. **Metasoma** (Fig. 2f) with third and subsequent terga micropunctured, and 2nd metasomal tergum with sparse lateral pubescence.

Females from Santa Fe have the surface sculpture less impressed, although they are identical to the type specimens. Most of the mentioned male differences correspond to the intraspecific sexual dimorphism within Cynipini, which contributes to consider both populations as part of the same species with some intraspecific variation in the sculpture of the metasoma (Figs. 2f-g). Regarding the host plants, this species has been collected on *Quercus* from both the Section Lobatae (*Q. eduardii* Trel. in Zacatecas, sample code MEX–085 and *Q. castanea* Née in Hidalgo – Los Romeros, sample code P–051), and Section Quercus (*Q. laeta* Liebm. in Mexico City, new host in this study, sample code MEX–493). This kind of variation in the host plant has been previously reported in other Mexican *Andricus*, e.g., *Andricus bonanseai* Mayr; *A. fusiformis* Pujade-Villar; and *A. sphaericus* Pujade-Villar, among others. However, it is a rare condition, and we consider that the host records from Lobatae Sections should be confirmed by new samplings.

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