

NOTA / NOTE

First record of *Zapatella grahami* Pujade-Villar & Melika, 2012
(Hymenoptera: Cynipidae) in Colombia (South America).Sara Fernández-Garzón¹, Pedro A. Rodríguez², Marcos Roca-Cusachs¹ &
Juli Pujade-Villar¹

¹ Universitat de Barcelona, Facultat de Biologia, Departament de Biologia Animal. Av. Diagonal, 645. E-08028 Barcelona, SPAIN.
e-mails: sarafegar8@gmail.com, marcosrocaacusachs@gmail.com, jpujade@ub.edu.

² ICA-Instituto Colombiano Agropecuario, Tibaitatá, Kilómetro 14 vía Bogotá, Mosquera, COLOMBIA.
e-mail: pedro.rodriguez@ica.gov.co

Abstract: *Zapatella grahami* Pujade-Villar & Melika 2012 (Hymenoptera: Cynipidae) is known as an endemic species from Costa Rica (Cerro de la Muerte) galling on *Quercus costaricensis*, but recent samplings in the region of Cundinamarca in Colombia have revealed a new population forming galls on *Q. humboldtii*. With this paper, the first record of *Z. grahami* in South America is given, widening the distribution range southwards and reporting a new host plant for this species.

Key words: Hymenoptera, Cynipidae, Cynipini, *Zapatella grahami*, *Quercus humboldtii*, Neotropics, Colombia, distribution.

Resumen: Primera cita de *Zapatella grahami* Pujade-Villar & Melika, 2012 (Hymenoptera: Cynipidae) en Colombia (Suramérica). *Zapatella grahami* Pujade-Villar & Melika 2012 (Hymenoptera: Cynipidae) es una especie conocida por ser endémica de Costa Rica (Cerro de la Muerte) produciendo agallas en *Quercus costaricensis*; sin embargo, recientes muestreos en la región de Cundinamarca en Colombia han revelado una nueva población formando agallas en *Q. humboldtii*. Con este trabajo, se da el primer registro de *Z. grahami* en Suramérica, ampliando su rango de distribución hacia el sur y reportando una nueva planta huésped para esta especie.

Palabras clave: Hymenoptera, Cynipidae, Cynipini, *Zapatella grahami*, *Quercus humboldtii*, Neotrópico, Colombia, distribución.

Recibido: 11 de agosto de 2017
Aceptado: 26 de agosto de 2017

Publicado on-line: 24 de septiembre de 2017

Introduction

Zapatella Pujade-Villar & Melika, 2012 (Hymenoptera: Cynipidae) is characterized by wasps galling in red oaks (*Quercus* of the Section Lobatae). This genus comprises eleven species (Pujade-Villar et al., 2012, 2015, 2017; Buffington et al., 2016): six of them (*Z. quercusmedullae* Ashmead, 1885; *Z. cryptica* Weld, 1922; *Z. herberti* Weld, 1926; *Z. oblata* Weld, 1952; *Z. quercusphellos* Osten Sacken, 1961; *Z. davisae* Buffington & Melika, 2016) inhabit North America, one species (*Z. grahami* Pujade-Villar & Melika 2012) is present in Central America (Costa Rica), and four species (*Z. nievesaldreyi* Melika & Pujade-Villar, 2012; *Z. inflata* Pujade-Villar & Rodríguez, 2015; *Z. tuberosa* Pujade-Villar & Caicedo, 2015; *Z. petiolata* Pujade-Villar & Caicedo, 2017) in Colombia.

Zapatella grahami was recently described from Costa Rica (Pujade-Villar et al., 2012) with its type locality in Cerro de la Muerte (3000 m.a.s.l.) between the provinces of Cartago and San Jose (in the Talamanca mountain range). This species is, so far, the only representative of this genus in Central America, despite the fact that this region is known for its oak forests with a high number of oak species (Muller, 1942). On the other hand, *Q. humboldtii*, as the only member of red oaks in Colombia, has a wide distribution, making the interaction with different environments possible, and also, it is the

host of all the *Zapatella* species described for this region (Pujade-Villar et al., 2012, 2015, 2017; Rodríguez-Correa et al., 2015).

Material and methods

Adults collected in Colombia were compared with adult specimens of the type series of *Z. grahami* housed in the collection of Universitat de Barcelona (UB) in order to observe any possible morphological differences.

Optical images of *Z. grahami* were taken at Universitat de Barcelona, using an Olympus SC30 digital microscope camera coupled with an Olympus U-CMAD3 adapted to a binocular microscope Olympus SZX10, combining 23 photographs from dorsal head and 38 photographs from habitus with the software «Helicon Focus 6.7.1». The photos of the galls were taken by Pedro A. Rodríguez in the Fruit flies' Laboratory of Instituto Colombiano Agropecuario (ICA- Tibaitatá).

The material is deposited in:

UB: Universitat de Barcelona, Catalonia, Spain (col. Juli Pujade-Villar): 2 ♀

ICA-Tibaitatá: Instituto Colombiano Agropecuario, Mosquera, Colombia (Pedro A. Rodríguez): 1 ♀

IAvH: Instituto Alexander von Humboldt, Villa de Leyva, Colombia (Claudia Medina): 2 ♀

Material studied: On July 21st 2013, at Guyabal de Siquima, finca Rafael, department of Cundinamarca, in Colombia (4°50'30"N, 74°28'34"W) and about 1920 m.a.s.l., five adult females were obtained from collected galls of *Q. humboldtii* (Lobatae section). The material was collected by the second author. Insects emerged on July 29 2013 from the galls kept in breeding boxes under laboratory conditions.

Results

The specimens studied correspond to *Z. grahami* according to Pujade-Villar et al. (2012).

The main diagnosis characters of *Z. grahami* are (Fig. 1a-b): (i) females much darker than males, (ii) POL (post-ocellar distance) 1.4 times as broad as OOL (ocellar-ocular distance), (iii) bottom of scutellar foveae with rugae, (iv) median mesoscutal line absent or present in a form of a very short triangle, (v) ventral spine of the hypopygium 7.5–8.5 times as long as broad.

Zapatella grahami is morphologically similar to *Z. oblata* (Weld, 1952), *Z. nievessaldreyi* Melika & Pujade-Villar 2012, *Z. davisae* Buffington & Melika 2016, and *Z. petiolata* Pujade-Villar & Caicedo 2017, by having dark reddish brown to dark brown body, without or with darker spots. *Zapatella oblata* differs from *Z. grahami* in the length of the median mesoscutal line extending to 2/3 of the mesoscutum length; the females of *Z. nievessaldreyi* are lighter, POL equal OOL, bottom of scutellar foveae smooth and without rugae, and the ventral spine of the hypopygium 6.0–7.0 times as long as broad in front of *Z. grahami*; *Z. davisae* and *Z. petiolata* have the first flagellomere (F1) subequal or longer than second (F2), while in *Z. grahami* F1 is shorter than F2.

Discussion and conclusions

The localities of Cundinamarca (Colombia) and Cerro de la Muerte (Costa Rica) are separated for more than 1100 km, therefore, the distribution of the species is extended southwards to South America with this new finding, with at least one independent population located in the center of Colombia. In addition, there could be a high probability that *Z. grahami* has populations in Panama, taking in consideration that part of the Talamanca range lies on the border between Costa Rica and Panama, which have *Quercus* oak species like *Q. costaricensis*, *Q. rapuruensis* and *Q. copeyensis*, also

distributed in Costa Rica (Muller, 1942), *Q. insignis* var. *oocarpa*, also distributed in Mexico, Costa Rica, and Guatemala (Valencia, 2004), and *Q. humboldtii*, also distributed in Colombia (González-Orozco *et al.*, 2011).

The Colombian specimens have some intraspecific variations in: (i) color: the Colombian specimens are darker, and (ii) in bottom of scutellar foveae: the Colombian specimens have the rugae less impressed. In addition, according to the original description, the individual larval chambers are located in the cupule, but in Colombian specimens the larval chambers are clearly located in the basis of the acorn nut (Fig. 1c), with more than one larval cell on it; cupule surface with pin-like exit holes (Fig. 1d).

Taking in consideration that the material in Colombia was unmistakably located in the nut of the acorns, and the evident host-specificity and tissue-specificity of this gall-wasps (Hardy & Cook, 2010), it would not be unusual to think about the possibility that the Costa Rican individuals found in the cupule of the acorn are a different species than the ones found in the nut. With our current material, we don't have enough information to make this distinction, remarking again the need of more samplings and a detailed revision of the Costa Rican material. Another possibility is that the galls in Costa Rica and in Colombia for this species are different but according to our knowledge of *Zapatella* species from Colombia this possibility is very unlikely.

Consequently, there is an evident need to increase the sampling effort in future studies to more areas where the oaks are distributed, in order to know the cynipid-associated fauna in each region and also the geographic distribution of the genus. Especially in order to evaluate the presence of the species in the adjacent areas as there is a probability that their geographic distribution may be broader than expected.

Bibliography

- Buffington, M.L.; Melika, G.; Davis, M. & Elkinton, J.S. 2016. The description of *Zapatella davisae*, new species, (Hymenoptera: Cynipidae) a pest gallwasp of black oak (*Quercus velutina*) in New England, USA. *Proceedings of the Entomological Society of Washington*, **118**(1): 14-26.
- González-Orozco, C.E.; Jarvis, A.J. & Palacios, J.D. 2011. Predicting the climatic distribution of the Colombian oak *Quercus humboldtii* Bonpl (Fagaceae). *Novedades Colombianas*, **11**(1): 1-17.
- Hardy, N.B. & Cook, L.G. 2010. Gall-induction in insects: evolutionary dead-end or speciation driver? *BMC Evolutionary Biology*, **10**: 257.
- Muller, C.H. 1942. *The Central American species of Quercus*. United States Department of Agriculture. Bureau of Plant Industry. Miscellaneous Publication, **477**: 1-216.
- Pujade-Villar, J.; Hanson, P.; Medina, C.A.; Torres, M. & Melika, G. 2012. A new genus of oak gallwasps, *Zapatella* Pujade-Villar & Melika, gen. n., with a description of two new species from the Neotropics (Hymenoptera, Cynipidae, Cynipini). *ZooKeys*, **210**: 75-104.
- Pujade-Villar, J.; Caicedo-Ramirez, G.; Rodríguez, P.A.; Fernández-Garzón, S. & Roca-Cusachs, M. 2017. Primer reporte de una especie de cinípido dañina para *Q. humboldtii* en Colombia: *Zapatella petiolata* n. sp. (Hym., Cynipidae). *Butlletí de la Institució Catalana d'Història Natural*, **81**: 37-46.
- Rodríguez-Correa, H.; Oyama, K.; MacGregor-Fors, I. & González-Rodríguez, A. 2015. How are oaks distributed in the Neotropics? A perspective from species turnover, areas of endemism and climatic niches. *International Journal of Plant Sciences*, **176**(3): 222-231.
- Valencia, A.S. 2004. Diversidad del género *Quercus* (Fagaceae) en México. *Boletín de la Sociedad Botánica de México*, **75**: 33-53.

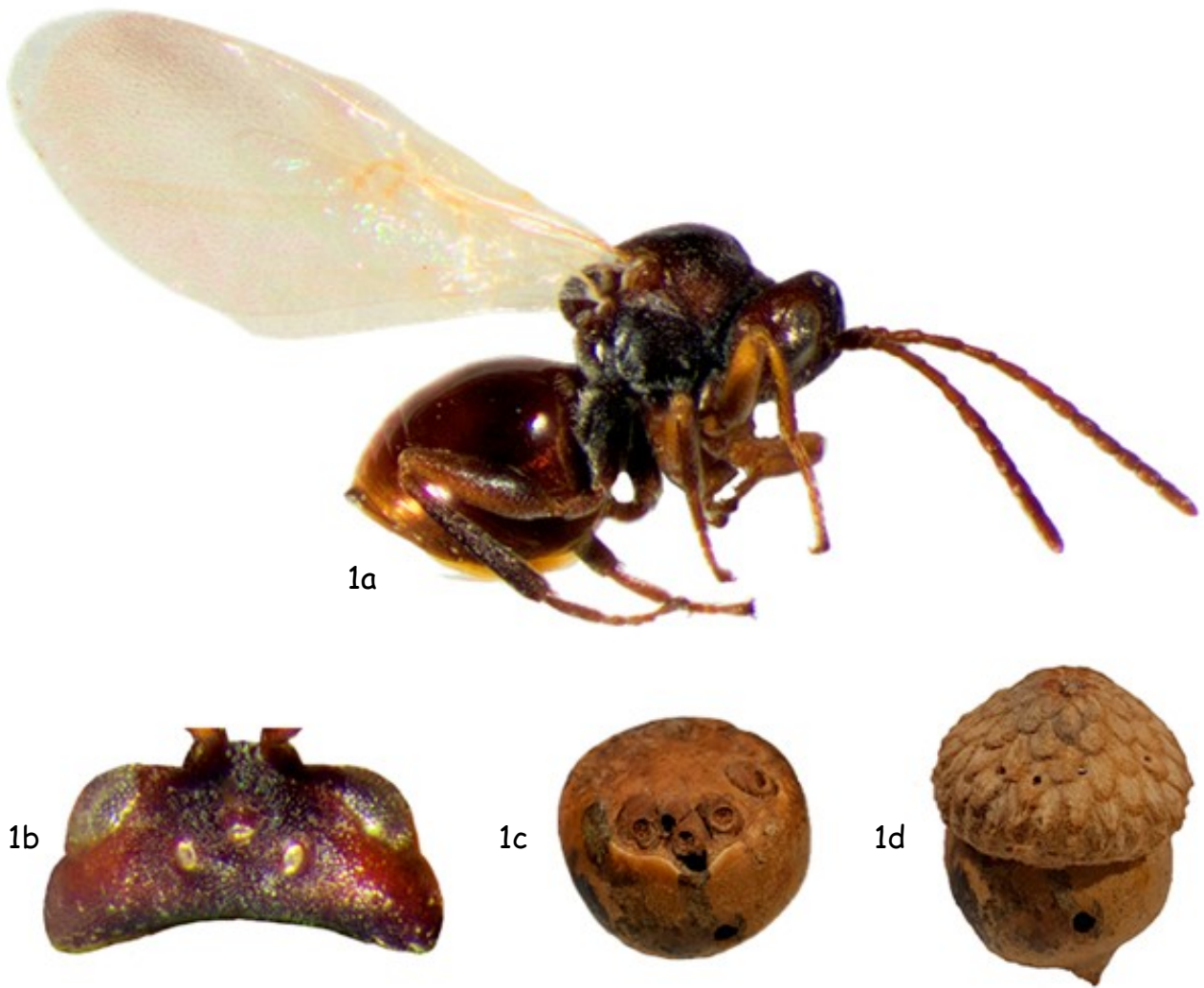


Fig. 1. - *Zapatella grahami*, female. **a.** - Habitus in lateral view. **b.** - Head in dorsal view. **c.** - Larval cells in acorn nut. **d.** - Acorn gall.