

## New species of oak gallwasp from Costa Rica (Hymenoptera: Cynipidae: Cynipini)

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### Abstract

A new species of oak gallwasp, *Andricus costaricensis* Pujade-Villar & Melika is described from Costa Rica. Only asexual females are known to induce galls on *Quercus costaricensis*. Data on the diagnosis, distribution and biology of the new species is given.

**Key words:** Cynipidae, oak gallwasp, *Andricus*, taxonomy, morphology, distribution, biology.

The cynipid gallwasp fauna (Hymenoptera: Cynipidae) of Costa Rica is poorly known. Fergusson (1995) mentioned the presence of different cynipid genera; Díaz *et al.* (2002) listed 6 species of Cynipidae. Recently one species, *Odontocynips hansonii* Pujade-Villar was described (Pujade-Villar, 2009).

The species diversity of the Mexican gallwasps, especially that of oak gallwasps, is extraordinarily high, around 154 species are known, which trophically associate with more than 30 oak species (Pujade-Villar *et al.*, 2009), while approximately 150 *Quercus* species are known from Mexico (Govaerts & Frodin, 1998). Nineteen species of oaks are listed for Costa Rica (Govaerts & Frodin, 1998), which definitely should support a larger species richness of oak gallwasps. Pujade-Villar & Hanson (2006) estimated that the oak gallwasps (Cynipini) might be represented by more than 30 species. Herein described new species is the first record of an *Andricus* oak gallwasp species from Costa Rica.

### MATERIALS AND METHODS

Adult gallwasps were reared from galls collected on *Q. costaricensis* Liebm. We follow the current terminology of morphological structures (Liljebald & Ronquist, 1989; Melika, 2006). Abbreviations for fore wing venation follow Ronquist & Nordlander (1989); cuticular surface terminology follows that of 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.

Images of wasp anatomy were produced with a digital Nikon Coolpix 4500 camera attached to a Leica DMLB compound microscope, followed by processing in CombineZP

(Alan Hadley) and Adobe Photoshop 6.0. Gall images were taken by N. Pérez-Hidalgo.

The type material is deposited in the next institutions: UB, University of Barcelona, Spain (curator J. Pujade-Villar); PDL, Pest Diagnostic Laboratory (the former Systematic Parasitoid Laboratory, SPL), Tanakajd, Hungary (G. Melika); USNM, U.S. National Museum of Natural History, Smithsonian Institution, Washington, DC, U.S.A. (Matthew Buffington).

### *Andricus costaricensis* Pujade-Villar & Melika, new species (Figs 1-16)

**Etymology.** The species is named after the country in which it was collected, Costa Rica.

**Type material.** Holotype female: COSTA RICA, San Jose, Cerro de la Muerte, Villa Mills 3000m; II.1993. P. Hanson; *Quercus costaricensis*, large stem swelling (deposited in UCR). PARATYPES (41 females): 19 females with the same labels as the holotype (4 paratypes in PDL; 7 in UB; 3 in USNM; 5 in UCR); 6 females: COSTA RICA, Cartago-San Jose, Cerro de la Muerte, 3000m, I.1988, col. P. Hanson; *Quercus costaricensis*, large stem swelling (2 in PDL; 2 in UB; 2 in UCR); 4 females: COSTA RICA, Cartago-San Jose, Cerro de la Muerte, 3000m, 2.X.1988, col. P. Hanson; *Quercus costaricensis*, large stem swelling (1 in PDL; 1 in UB; 2 in UCR); 1 female: COSTA RICA, Cartago-San Jose, Cerro de la Muerte, 3000m, Villa Mills, 2.X.1988, col. P. Hanson; *Quercus costaricensis*, large stem swelling (in UCR); 11 females: COSTA RICA, Cerro de la Muerte, ex *Quercus costaricensis*. (15.XII.2008) XII.2008, leg. Nicolás Pérez (4 in PDL; 7 in UB).

**Diagnosis.** *Andricus costaricensis* belongs to the group of *Andricus* species without a basal lobe on tarsal claws. Numerous species, placed by Weld (1952) into the *Callirhytis* Förster were transferred to the *Andricus* Hartig genus by Melika & Abrahamson (2002). *Andricus costaricensis* closely resembles *Andricus* (*Callirhytis*) *quercussuttoni* (Bassett, 1881) known to induce large rounded abrupt stem swelling-like galls on black oaks, *Q. agrifolia* Nee, *Q. kelloggi* Newb. and *Q. wislizenii* A. DC. in California. In *A. costaricensis* the prominent part of the ventral spine of the hypopygium at least 5.0 times as long as broad; the clypeus widely emarginate, only the central, very small area elevated; lateral propodeal carinae are strong, high, curved outwards in the posterior 1/3, some structures of mesosoma are black, while in *A. quercussuttoni* the prominent part of the ventral spine of the hypopygium at most 3.0 times as long as broad; the clypeus narrowly emarginate, its largest portion elevated; lateral propodeal carinae are subparallel, not curved outwards in the posterior half; some structures of the mesosoma are darker than the rest of the body, but never black. *Andricus costaricensis* somehow also resembles *Andricus* (*Callirhytis*) *quercusbatatoides* (Ashmead, 1881), known from the south-eastern USA (SC, GA, FL, AL, MI, LA) to induce stem swelling-like galls on *Q. virginiana* Mill. and *Q. geminata* Small (*Quercus* s.s. section (white oaks)). In *A. costaricensis* the prominent part of the ventral spine of the hypopygium at least 5.0 times as long as broad; the head and the mesosoma with sparse white setae; the fore tibiae with few scattered setae, while in *A. quercusbatatoides* the prominent part of the ventral spine of the hypopygium at most 3.0 times as long as broad; the head and the mesosoma with dense white setae; the fore tibiae with numerous rows of dense white setae. More about the position of *A. costaricensis* is given below in Comments.

**Description.** Asexual female.

**Colour.** Head, except black clypeus, brown anteriorly and laterally, dark brown to black posteriorly; antenna uniformly dark brown to black; propleuron black; anterior rim of pronotum black; pronotum and mesopleuron partially brown, with black edges; anterior rim of pronotum black; propleuron black; mesopleuron brown, speculum black; mesoscutum brown, with black stripes along anterior parallel and parapsidal lines; axillula brown; subaxillular bar dark brown; mesoscutellum uniformly brown; metascutellum dark brown; metanotum, metanotal trough, propodeum and nucha black; all legs uniformly dark brown, except light brown femura; metasoma brown, 2nd metasomal tergite much darker dorso-laterally.

**Head.** Delicately coriaceous, with few white setae, 2.0 times as broad as long from above, 1.4 times as broad as high and as broad as or very slightly broader than mesosoma in front view. Gena very delicately coriaceous, broadened behind eye, 1.5 times as broad as cross diameter of eye; malar space very delicately coriaceous, without striae, 0.5 times as long as height of eye. POL nearly 1.2 times as broad as OOL; OOL 2.8 times as long as length of lateral ocellus and 1.8 times as long as LOL. Transfacial distance 1.4 times as broad as height of eye; diameter of antennal torulus 1.6 times as large

as distance between them, distance between torulus and inner margin of eye equal to the diameter of torulus; lower face delicately coriaceous, with dense white setae, median elevated area black. Clypeus rectangular, delicately coriaceous, with very small elevated central area, ventrally widely emarginate, without median incision; anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line distinct, deep. Frons delicately coriaceous, with few white setae. Vertex, interocellar area and occiput delicately coriaceous. Postocciput reticulate, impressed around occipital foramen; posterior tentorial pits large, deep, area around them strongly impressed; height of occipital foramen larger than height of gula; hypostomal carina emarginate, not going around oral foramen, continuing into gular sulcus. Labial palpus 3-segmented, terminal peg distinct, all three segments densely setose; maxillary palpus 5-segmented, terminal peg distinct, three terminal segments densely setose. Antenna with 13 flagellomeres; slightly longer than mesosoma; scape compressed and short, 1.4 times as long as pedicel; pedicel compressed, 1.3 times as long as broad; F1 1.1 times as long as F2, 2.4 times as long as pedicel; F2=F3; F4–F6 subsequently shorter, F7–F11 shorter than F4–F6, all equal in length; F12 only slightly longer than F13; placodeal sensilla on F3–F13, absent on F1–F2, obscured by setae.

**Mesosoma** 1.2 times as long as high; with uniform white setae. Pronotum coriaceous, with numerous striae laterally, along the ventrolateral edge emarginate, with dense white setae; anterior rim of pronotum narrow; propleuron coriaceous, shiny, with smooth area in centre, concave in mediocentral part. Mesoscutum delicately microreticulate, especially in between notauli; subequal, only slightly longer than broad in dorsal view (largest width measured across mesoscutum on the level of the base of tegulae). Notauli complete, deep and narrow, distinctly impressed, slightly converging and broadened posteriorly; anterior parallel lines extending to 1/2 length of mesoscutum; parapsidal lines distinct and broad, start from posterior margin and extending to 2/3 length of mesoscutum; median mesoscutal line absent. Mesoscutellum 0.7 times as long as mesoscutum, uniformly rugose, with parallel sides and short white setae, elongated in dorsal view, longer than broad, overhanging metanotum; scutellar foveae absent, only smooth, shining, slightly impressed subquadrangular area indicates them at the base of mesoscutellum, with distinct elevated coriaceous median carina dividing the base of mesoscutellum into two halves. Mesopleuron uniformly delicately coriaceous, with few white setae, smooth, shining; dorsal axillar area coriaceous, lateral axillar area alutaceous, both with few setae; axillula coriaceous, with few white setae; subaxillular bar smooth, shiny, as broad as height of metanotal trough; postalar process long, with parallel striae; metapleural sulcus reaching mesopleuron in the upper half. Metascutellum uniformly coriaceous, metanotal trough with some irregular rugae, with few short white setae; ventral impressed area at least twice narrower than height of metascutellum, smooth, with distinct longitudinal striae; central propodeal area smooth, shiny, with many irregular wrinkles and rugae, lateral propodeal carinae

strong, high, curved outwards in posterior 1/3; lateral propodeal area with few long white setae. Nucha with irregular wrinkles and rugae.

**Legs.** Fore tibiae with very few short scattered white setae; tarsal claws simple, without basal lobe.

**Wings.** Forewing longer than body, hyaline, with short dense cilia on margin, radial cell 4.3 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 its half height.

**Metasoma** shorter than head+mesosoma, higher than long in lateral view; only 2nd and 7th metasomal tergites with few short white setae only laterally, all other tergites without setae, smooth, shiny; 2nd metasomal tergite occupying half of metasoma length in dorsal view. Ventral spine of hypopygium slender, prominent part 5.0–5.2 times as long as broad, with sparse, long white setae, not extending beyond apex of spine. Body length 3.1–4.2 mm (n=8).

**Gall** (Figs 14-16). Usually elongated, sometime potato-like, abrupt, irregular swellings of twigs and branches, 3-16 cm long and 3-5 cm in diameter. The gall surface rough, of the same colour as the bark; lignified. Multichambered, larval cells long tubular-like, radiating from the centre of the gall. Tubular larval cells are isolated; up to 78 larval chambers in one gall.

**Biology.** Only asexual females are known, inducing galls on *Quercus costaricensis* Liebm. (Section Lobatae of *Quercus*, red oaks), distributed only in Costa Rica (Govaerts & Frodin, 1998). Mature galls were collected in December-February, adults emerged immediately after the galls were collected. Probably galls mature in late autumn, adults overwintering in the gall and emerging in late winter next year.

**Distribution.** Currently known from Costa Rica, Cerro de la Muerte only.

**Comments.** The presence or absence of a basal lobe on the tarsal claws was showed of no generic diagnostic value (Melika & Abrahamson, 2002). Two big oak gallwasp genera, *Callirhytis* and *Andricus* included species without and with basal lobe on the tarsal claws respectively (Weld, 1952). Thus, many species positioned by Weld (1952) into *Callirhytis* (as a genus without a basal lobe on tarsal claws), in fact, belong to *Andricus* and vice versa. A number of nearctic *Andricus* and *Callirhytis* species are known to induce stem swelling-like galls on *Quercus* L. subgenus *Quercus* and within the latter, on all three known sections: Lobatae (Erythrobalanus), Protobalanus and *Quercus* (Dalla Torre & Kieffer, 1910; Weld, 1952; Burks, 1979). Here we discuss only those species of nearctic *Callirhytis* (*sensu* Weld, 1952) -- *Andricus* (*sensu* Melika & Abrahamson, 2002) which have tarsal claws simple, without basal lobe and induce stem swelling-like galls. A large number of such

nearctic species is known, associated with Lobatae section of *Quercus*: *Callirhytis quercusclavigera* (Ashmead, 1881), *C. quercuscornigera* (Osten Sacken, 1865), *C. quercusmedullae* (Ashmead, 1885), *C. quercuspunctata* (Bassett, 1863), others, which, however, form a group of species, positioned well-away from *Andricus costaricensis*. Not very many species known to induce stem swelling-like galls across the nearctic, that somehow resembles *Andricus costaricensis*. The most similar species are *Andricus* (*Callirhytis*) *quercussuttoni* and *A. (C.) quercusbatatoides* discussed in the Diagnosis above. The two biggest world reviews of oak gallwasp fauna do not mentioned any *Andricus* (= *Callirhytis*) species (species group without basal lobe on claws), which induces stem swelling-like galls on oaks, south of USA (Dalla Torre & Kieffer, 1910; Weld, 1952). Thus, *Andricus costaricensis* is the first such a species reported from Central America and south of the United States since Kinsey (1937), however, seems to be common according to the studies made in Mexico (Pujade-Villar *et al.*, in press).

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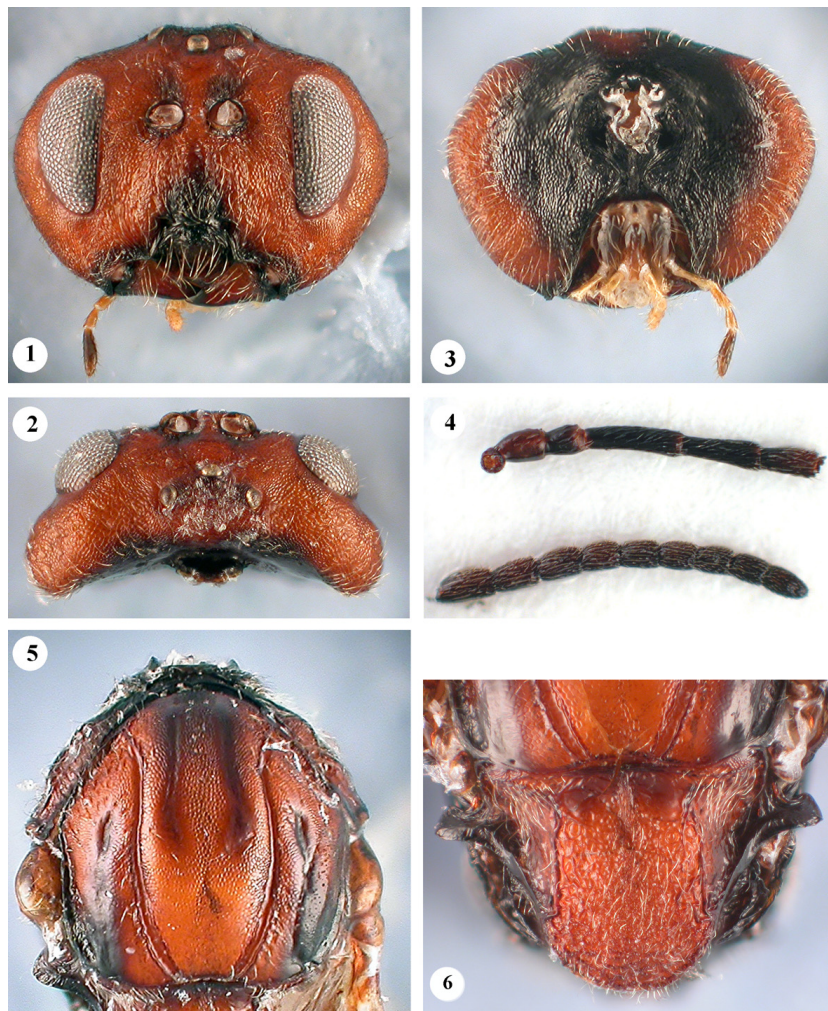
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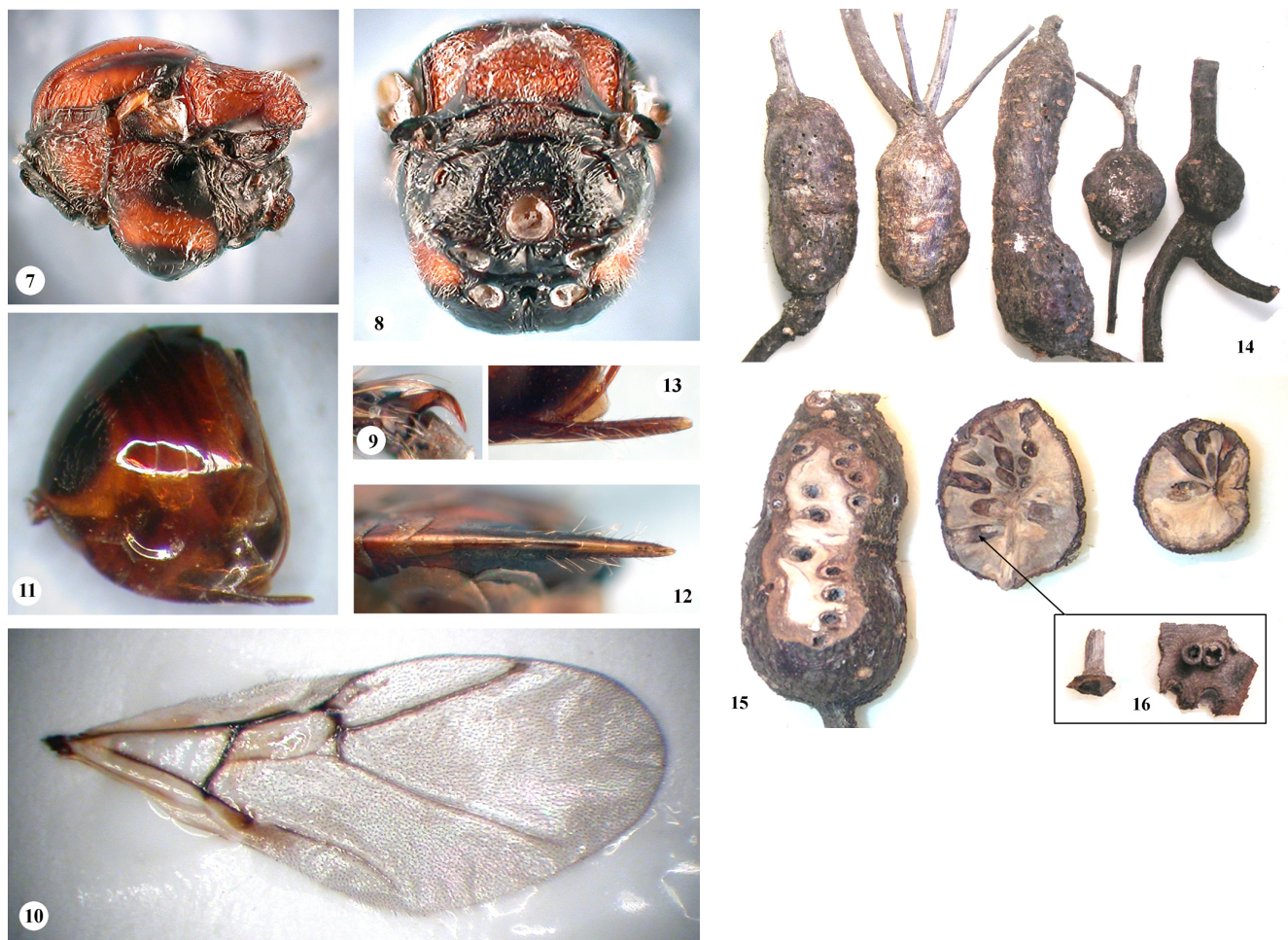
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Figures 1-6. *Andricus costaricensis*, **new species**, asexual female: 1, head (anterior view); 2, head (dorsal view); 3, head (posterior view); 4, antenna; 5, mesoscutum (dorsal view); 6, mesoscutellum (dorsal view).



Figures 7-13. *Andricus costaricensis*, **new species**, asexual female: 7, mesosoma (lateral view); 8, metanotum and propodeum (postero-dorsal view); 9, hind tarsal claw; 10, forewing; 11, metasoma (lateral view); 12-13, prominent part of the ventral spine of hypopygium: 12, ventral view, 13, lateral view. Figures 14-16. *Andricus costaricensis*, **new species**, galls: 14, general view; 15, dissected galls; 16, emerging hole and tubular larval chamber (photos by N. Pérez-Hidalgo).