



First record of the genus *Disholcaspis* Dalla Torre & Kieffer (Hymenoptera: Cynipidae: Cynipini) in the Neotropics, with description of two new species from Panama

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Abstract

Two new species of *Disholcaspis* Dalla Torre & Kieffer 1910, *Disholcaspis bettyannae* and *D. bisethiae* (Hymenoptera: Cynipidae: Cynipini) are described from Panama. The two new species induce galls on *Quercus bumelioides* Liebm. and *Q. lancifolia* Schledl & Cham. (Fagaceae, sect. *Quercus*, White Oaks). Diagnostic characters, gall descriptions, distribution, biological data, as well as inquiline and parasitoid associated community data of the new species are given. The new species represent the first records of the genus *Disholcaspis* from the Neotropical region.

Key words: Cynipidae, oak gall wasps, *Quercus*, Chiriqui, Panama

Introduction

Disholcaspis Dalla Torre & Kieffer 1910 (= *Holcaspis* Mayr 1881) is a genus of oak gall wasps (Cynipidae: Cynipini) recorded as being confined to the Nearctic (Dalla Torre & Kieffer 1910; Weld 1952). To date, 52 species are known (Liljeblad *et al.* 2008): 41 from the United States and Canada, and 11 from Mexico (Burks 1979; Kinsey 1937, 1938; Melika & Abrahamson 2002). Although the genus was also mentioned as present in Costa Rica (Central America) by Pujade-Villar & Hanson (2006), no species have been described or recorded to date from the Neotropical region.

The nomenclature and classification within this genus has been unstable; Burks (1979) cited 38 species and one variety from the United States & Canada. Dailey & Menke (1980) transferred *D. truckeensis* Ashmead to *Andricus* Hartig. Melika & Abrahamson (2002) transferred three *Andricus* species to *Disholcaspis*: *A. lasius* Ashmead; *A. reniformis* McCracken & Egbert; and *A. spectabilis* Kinsey, but this taxonomic act was later considered erroneous (Pujade-Villar *et al.* 2010). Additionally *Disholcaspis. chrysolepidis* Beutenmüller; *D. canescens* Bassett; *D. conalis* Weld; *D. corallina* Bassett; *D. plumbella* Kinsey; *D. sulcata* Ashmead and *D. washingtonensis* Gillette differ in some aspects of the diagnosis typical of the genus (Weld 1952), and according to Burnett (1977), Melika & Abrahamson (2002), eventually could be transferred to other genera. More recently, one species described from Mexico, *D. lapiei* Kieffer, has been transferred to the new genus *Kinseyella* Pujade-Villar & Melika (Pujade-Villar *et al.* 2010).

All the known species of *Disholcaspis* induce galls on white oaks (Fagaceae, section *Quercus*) (Weld 1952; Liljeblad *et al.* 2008). Whereas the adults of *Disholcaspis* are quite uniform and difficult to differentiate morphologically (Weld 1952) (many species are based in differences of coloration), the galls of each species are usually quite distinctive (Weld 1952, 1957). The asexual generation of *Disholcaspis* species induce detachable galls, single or clustering in groups, on the twigs, roots and buds of various species of white oaks, whereas the sexual generation emerges from small, thin-walled bud galls (Weld 1952; Evans 1972; Melika & Abrahamson 2002).

The adults of the asexual generation of *Disholcaspis* are recognized as follows (see also Beutenmüller 1909; Melika & Abrahamson 2002): robust individuals, antenna 13–14 segmented, with scape stout, and very short and stout pedicel, flagellomeres F1–F6 long and slender, gradually decreasing in length, last flagellomeres short and somewhat thickened; without a malar sulcus, mesonotum with notauli incomplete, faintly anteriorly; scutellum rounded, convex; scutellar foveae not well differentiated, indistinctly separated medially, usually forming a shallow transverse depression, sometimes virtually absent; in profile, the scutellum is prolonged posteriorly far beyond propodeum; lateral propodeal carinae bowed or angulated, median propodeal area with some carinae or strong rugae; second metasomal tergum conspicuously pubescent at its base; metatarsal claws with a secondary basal tooth; projecting part of hypopygial spine short to moderately long, maximally 2.0 – 3.5 x as long as broad, hypopygial setae not forming an apical tuff. The adults of the sexual generation can be distinguished by the head lunate from above, scarcely broadened behind eyes, antenna of 14 segments, thorax smooth and shining, with conspicuous microreticulation anteriorly and laterally, notauli faint anteriorly, scutellum elongate, gradually and very slightly depressed towards the transscutal articulation, scutellar foveae indistinctly defined, mesopleuron bare and shiny; abdomen slightly longer than thorax, second metasomal tergite finely punctuate and pubescent, ventral spine short, seldom twice as long as wide (Evans 1972; Melika & Abrahamson 2002).

Morphologically and biologically, *Disholcaspis* share some similarities with *Aphelonyx* Mayr, a Palearctic genus, represented by only three species (Melika *et al.* 2010). The type species of both genera, *A. cerricola* and *D. quercusglobulus*, were recovered in a strongly supported clade in the recent phylogenetic analysis by Liljeblad *et al.* (2008).

In the framework of a field study of the oak gall wasps (Cynipidae) of Panama (see also Medianero & Nieves-Aldrey 2010; Nieves-Aldrey & Medianero 2010; Nieves-Aldrey & Medianero 2011), this paper contains the first accurate report of the genus *Disholcaspis* in the Neotropical region and includes the description of two new species from Panama.

Material and methods

Study material. The adults studied were reared from galls collected on *Quercus bumelioides* Liebm. and *Q. lancifolia* Schledl & Cham. Samplings were made and material was collected from December 2007 to May 2009 at Volcan Baru and Renacimiento, Chiriquí Province, Panama. The adult insects emerged from the galls in rearing cages under laboratory conditions. Voucher adult specimens and their galls were deposited in the entomology collections of the Museo Nacional de Ciencias Naturales, Madrid (Spain) and Maestria en Entomología, Universidad de Panama (MEUP). The identification of the *Quercus* species was based on several key references (Burger 1977; D'Arcy 1987; Breedlove 2001), as well as on comparison with materials from the collection of the University of Panama and the Smithsonian Tropical Research Institute.

Specimen preparation. For observation under a scanning electron microscope (SEM), adult cynipids were dissected in 70% ethanol, air dried, mounted on a stub and coated with gold. Micrographs were taken with an EVO 40 Zeiss and FEI QUANTA 200 microscope (high vacuum technique) for several standardized views. Forewings were mounted in Euparal on slides and later examined under a Wild MZ8 stereo microscope. Images of adult habitus and gall dissections were taken with a NIKON Coolpix 4500 digital camera attached to a Wild MZ8 stereo microscope. Measurements were made with a calibrated micrometer scale attached to an ocular of the light microscope. Terminology of morphological structures and abbreviations follow Ronquist & Nordlander (1989), Ronquist (1995), Nieves-Aldrey (2001) and Liljeblad *et al.* (2008).

Description of species

Disholcaspis bettyannae Medianero & Nieves-Aldrey sp. nov.

(Figs. 1, 2, 5A–B & 6A–C)

Type material. Holotype ♀ (Fig. 5A) (in Museo Nacional de Ciencias Naturales, Madrid, Spain (MNCN), card-mounted. Cat. n° 2108). PANAMA, Chiriquí, Volcan Baru 8° 47' 50 08" N, 82° 29' 35 9" W, 1800 m; ex gall on

stems of *Quercus bumelioides* Liebm. (Fagaceae), gall collected 30.i.2008, insect emerged ii.08, E. Medianero leg. Paratypes: 3♀ same data as holotype, but collected 22.xii.2008, insect emerged i.09. Two paratypes in MNCN, one paratype in Maestría en Entomología, Universidad de Panamá (MEUP).

Additionally, 1♀ paratype of the type series was dissected for SEM observation (in MNCN).

Etymology. Named after Dra. Betty Ann Rowe Catsambanis Vice-Rector Research/Graduate Programs, University of Panama.

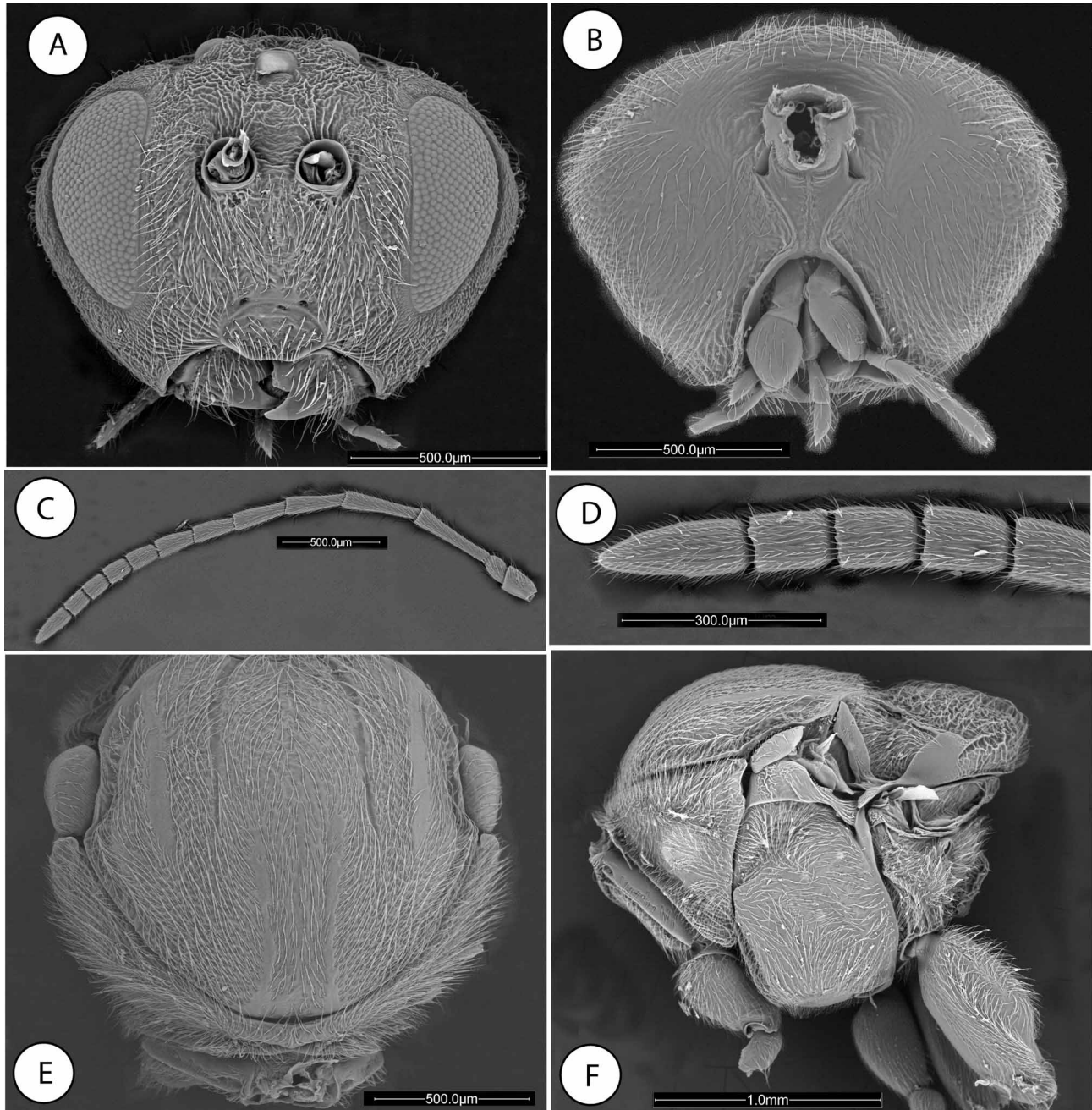


FIGURE 1. *Disholcaspis bettyannae*: (A) Head anterior view. (B) Head posterior view. (C) Female antenna. (D) Detail of last flagellomeres. (E) Pronotum antero-dorsal view. (D) Mesosoma lateral view.

Diagnosis and comments. The species is closely allied to *D. quercusvirens* Ashmead from Florida, being similar in color and a majority of morphological characteristics. The species differ in the length of the notauli, the scutellar foveae, leg coloration and, mainly, in the gall that is induced. *Disholcaspis bettyannae* has the notauli distinct posteriorly and medially, indistinct anteriorly, smooth, broad and convergent posteriorly, whereas *D. quercusvirens* has notauli weakly impressed also posteriorly. The new species has scutellar foveae ellipsoidal, shallow but

distinct, whereas the scutellar foveae are indistinct in *D. quercusvirens*. *Disholcaspis bettyannae* has legs yellowish brown, whereas *D. quercusvirens* has legs light reddish-brown. The new species induces a small globular gall (6–11 mm diameter) that does not secrete nectar. Internally, it is of a compact, rather hard, corky texture and contains a free, oval yellowish larval cell (Fig. 6C), whereas *D. quercusvirens* induces similar small, globular galls, internally spongy, which exude a sticky substance that attracts ants. In coloration, *Disholcaspis bettyannae* also resembles *D. unicolor* Kinsey from Mexico and *D. mamillana* Weld from California (USA) but differs from them mainly in the type of gall that it induces and host plant. The galls of *D. unicolor* and *D. mamillana* are large globular bullets (21 mm in diameter) with a nipple at the apex. Additionally, the anteroadmedian signa are not visible in *D. unicolor*, whereas they are discernible in *D. bettyannae*. A few more *Disholcaspis* species described from Mexico by Kinsey (Kinsey 1937) namely, *Disholcaspis laetae* Kinsey, *D. purlans* Kinsey, *D. purpurea* Kinsey and *D. regina* Kinsey 1937 seems also closely similar to the Panamanian species here described. However the Mexican species differ from them in the general brightly cherry rufous coloration and the smaller size of adults, as well as for the smooth and shining gall surface and the different oak hosts, being associated mainly to dwarf oaks as *Q. laeta*, *Q. reticulata* and *Q. repanda*.

Description. Body length 3.94 mm (range 3.64–4.19; N = 4) for females. Body uniformly amber and shiny with distal segment of antenna, anteroadmedian signa area, parapsidal signa, propodeal area (except by spiracular area), posteromedial area of metasoma, sternum, stipes, last segment of maxillary palp, labial palp and claws dark brown to black. Legs yellowish brown. Forewing hyaline with some very light infumation, veins dark brown to black.

Female. Head rugose, moderately pubescent with piliferous punctures, in dorsal view about 3.4 x wider than long. POL 1.5 x longer than OOL, posterior ocellus separated from inner orbit of eye by 2.2 x its longest diameter. Head in anterior view (Fig. 1A) transversely ovate, 1.3 x wider than high, gena moderately broadened behind eyes, 0.26 x diameter of compound eye. Vertex, frons and occiput more rugose; face, gena with piliferous punctures, short delicate irradiating carinae from clypeus present, not reaching ventral margin of compound eye, absent medially above clypeus; head moderately pubescent, with relatively long golden setae, except vertex, frons with sparse, shorter setae. Clypeus more or less trapezoidal, 1.8 x wider than high, mostly smooth and moderately pubescent, ventral margin sinuate, slightly projecting over mandibles. Anterior tentorial pits visible; epistomal sulcus not indicated, clypeo-pleurostomal lines visible. Malar space 0.4 x height of compound eye, without malar sulcus. Toruli situated slightly above mid-height of compound eye; distance between antennal rim and compound eye 1.1 x width of antennal socket including rim. Ocellar plate not raised. Head, posterior view (Fig. 1B) without occipital carina. Gula short; distance between occipital and oral foramina 1.5 x height of occipital foramen (Fig. 1B). Hypostomal sulci well separate at oral fossa.

Mouthparts (Figs. 1A, 1B): mandibles strong, exposed, with dense setae in base, right mandible with three teeth, left with two teeth. Cardo of maxilla not visible, maxillary stipes relatively short, broad, about 2.2 x longer than wide. Maxillary palp five-segmented. Labial palp three-segmented.

Antenna (Fig. 1C) of moderate length, as long as 1/2 body length, with 13 flagellomeres; flagellum not broadening towards apex; with relatively long, erect setae, and elongate placodeal sensilla not well visible (Fig. 1D). Relative lengths of antennal segments: 18:11:40:37:28:26:21:19:14:12:12:11:22. Pedicel sub-globose, small, 0.6 x as long as scape; F1-F6 long, slender, gradually decreasing in length. F1 1.08 x as long as F2. F7-F10 short and wide, F11 2.7 x longer than wide, 2.0 x as long as F10 (Fig. 1D). Placodeal sensillae on F3-F11 disposed in one row of 8–10 sensillae in half dorsal area of each flagellomere.

Mesosoma. Smooth to finely rugose, very densely pubescent with piliferous punctures, in lateral view 1.3 x as long as high, slightly convex dorsally. Pronotum, densely pubescent; lateral surface of pronotum with some longitudinal wrinkles dorsally; with long and dense setae (Fig. 1F). Pronotum short medially, ratio of length of pronotum medially/laterally = 0.18. Pronotal plate indistinct dorsally (Fig. 1E).

Mesonotum (Fig. 2A). Mesoscutum finely rugose, densely pubescent with piliferous punctures, slightly broader than long in dorsal view. Notauli distinct posteriorly, medially, faint anteriorly, smooth and convergent posteriorly, with an indistinct median mesoscutal impression. Anteroadmedian signa clearly visible. Parapsidal signa broad, smooth. Transscutal fissure narrow, clearly visible, deeply impressed, slightly sinuate. Scutellar foveae ellipsoidal, shallow, almost smooth, indistinctly separated medially, anterior and posterior margins relatively well marked, about 1/8 x as long as scutellum. Scutellum (Fig. 2A) rounded from above, about 0.8 x length of mesoscutum, strongly reticulate-rugose, in lateral view extended posteriorly over dorsellum. Axillula densely pubescent, anterior, posterior margins marked. Mesopleuron smooth, densely pubescent with piliferous punctures (Fig. 1F).

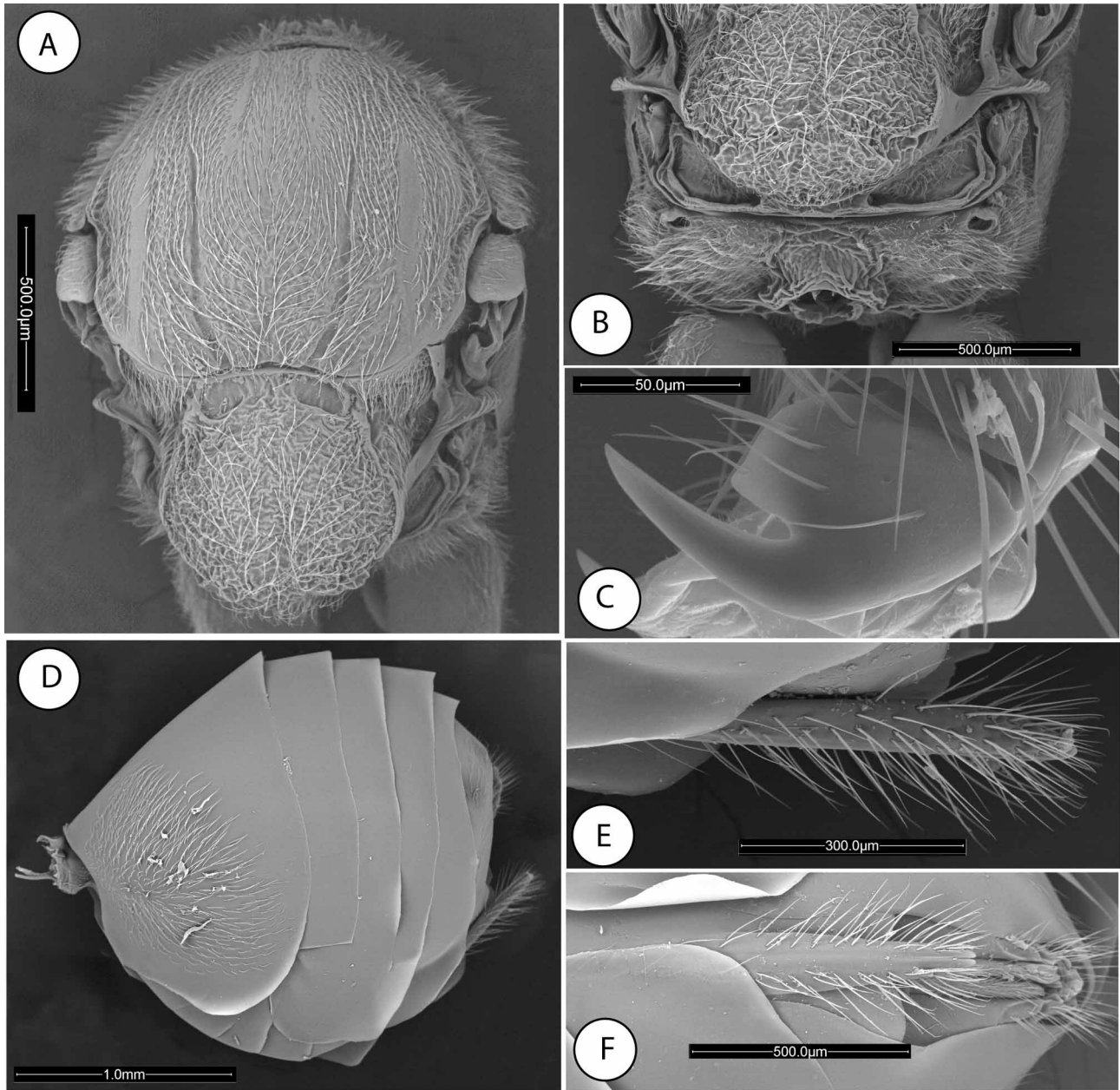


FIGURE 2. *Disholcaspis bettyannae*: (A) Mesosoma dorsal view. (B) Propodeum. (C) Metatarsal claw. (D) Metasoma lateral view. (E) Detail of ventral spine of hypopygium, lateral view. (F) Detail of ventral spine of hypopygium.

Metanotum (Fig. 2B). Metapectal-propodeal complex. Metapleural sulcus reaching posterior margin of mesoplectus at about mid-height of metapectal-propodeal complex (Fig. 1F). Lateral propodeal carinae arched, poorly defined, with some secondary strong rugae laterally and dorsally on bare median propodeal area (Fig. 2B), lateral propodeal area densely pubescent; nucha rugose.

Legs. Densely pubescent; metatarsal claws with strong triangular basal lobe or teeth (Fig. 2C).

Forewing (Fig. 5B) as long as body, radial cell 3.2 x longer than wide; open along anterior margin; areolet small, triangular, closed, distinct. R1 and M nearly straight, not reaching wing margin. R1 and Rs weakly pigmented. Rs slightly bowed. Rs+M not reaching basalis. 2r well pigmented, slightly projected medially. Apical margin of wing with short hair fringe.

Metasoma (Fig. 2D) large, as long as head and mesosoma combined, in lateral view as wide as high. Second metasomal tergite covering about 2/3 of metasoma, with patch of dense setae in its anteromedial area. Projecting part of hypopygial spine (Fig. 2E) about 2.5 x as long as wide in ventral view (Fig. 2F); laterally with long setae, longer than spine width, but not forming an apical patch.

Gall (Fig. 6A–C). Globose or bud-shaped, with broad base, monothalamic, densely pubescent with velvet or felt-like surface, growing singly or in clusters of two to six galls. Pale yellowish, sometimes tinged with pink or red when fresh (Fig. 6A) and light brown when mature (Fig. 6B). Internally with compact, rather hard, corky texture, containing free oval yellowish larval cell, (Fig. 6C). Diameter of gall 6 to 11 mm, formed in stems of *Quercus bumelioides* Liebm., closely resembling that of *D. simulata* Kinsey, 1922, *D. canescens* Bassett, 1890 and *D. quercussuccinipes* Ashmead, 1881 known from USA, but, these galls are induced in different oak species.

Distribution. *Disholcaspis bettyannae* was found between 1431–2400 m a.s.l. at Chiriquí, Panama.

Biology. Only the asexual generation is known, inducing galls on *Quercus bumelioides* Liebm. (section *Quercus*). The galls are found between October and May during the dry season in Panama. The insects studied emerged in December and February.

***Disholcaspis bisethiae* Medianero & Nieves-Aldrey sp. nov.**

(Figs. 3, 4, 5C–D & 6D–F)

Type material. Holotype ♀ (Fig. 5C) (in Museo Nacional de Ciencias Naturales, Madrid, Spain, card mounted. Cat n° 2109). PANAMA, Chiriquí, Renacimiento, 8° 49' 58 7" N, 82° 44' 44 5" W, 1270 m; ex gall on stems of *Quercus lancifolia* Schledl & Cham. (Fagaceae), gall collected 22.i.2009, insect emerged 23.i.2009, E. Medianero leg. Paratypes: 4♀, same data as holotype; 1♀ same data as holotype, but collected 18.vi.2008, insect emerged vii.2008, E. Medianero leg. Four paratypes in MNCN, one paratype in Maestría en Entomología, Universidad de Panamá (MEUP).

Additionally, 2♀ paratype of the type series were dissected for SEM observation (in MNCN).

Etymology. Named after Biseth Araúz, wife of the first author.

Diagnosis and comments. Closely similar to *D. bettyannae* described above in color and a majority of morphological characteristics. The two species can be readily distinguished using the key for the identification of *Disholcaspis* of Panama provided in this article. Like *D. bettyannae*, *D. bisethiae* resembles in coloration *D. quercusvirens* Ashmead, *D. unicolor* Kinsey and *D. mamillana* Weld, but differs from them in the characteristics described in the diagnosis of the first described species.

Description. Female body length 3.58 mm (range 3.17–3.72; N = 6). Head, mesosoma, metasoma shining amber to brown, with two last segments of antenna, anterodorsal signa area, parapsidal signa, median propodeal area, posteromedial metasoma area, sternum, last segment of maxillary palp, labial palp and claws dark brown to black. Legs yellowish brown. Forewing slightly yellowish brown, veins dark brown.

Female. Head rudely alutaceous, strongly pubescent, with piliferous punctures, in dorsal view about 3.0 x wider than long. POL 1.75 x longer than OOL, posterior ocellus separated from inner orbit of eye by 1.6 x its longest diameter. Head in anterior view 1.27 x wider than high (Fig. 3A). Genae slightly expanded behind eyes. Vertex, frons, genae pubescent with sparse, shorter setae; face, occiput more heavily pubescent, with relatively long setae. Clypeus trapezoidal, 1.6 x wider than high, shining alutaceous, with long setae ventrally, ventral margin slightly sinuate, projected over mandibles. Anterior tentorial pits conspicuous; epistomal sulcus indistinct, clypeopleurostomal lines distinct. Malar space 0.38 x height of compound eye, without malar sulcus and radiating striae from clypeus virtually absent. Distance between antennal rim of torulus and compound eye 1.07 x its width including rim. Ocellar plate slightly raised. Head, posterior view (Fig. 3B). Distance between occipital and oral foramina 1.27 x height of occipital foramen. Occiput without occipital carina, with some transversal rugae dorso-lateral to occipital foramen. Hypostomal sulci separated at hypostoma.

Mouthparts (Fig. 3B) as in diagnosis preceding species, but cardo of maxillae visible.

Antenna 0.6 x as long as body (Fig. 3C); with 12 flagellomeres, flagellum not broadening towards apex; with relatively long, erect setae and elongate placodeal sensilla visible only on F4–F12. F1–F6 long and slender, gradually decreasing in length. F7–F12 short, wide. Relative lengths of antennal segments: 19:13:39:39:30:29:24:20:15:18:12:12:10:17. Pedicel, globose, small, 0.7 as long as scape; F1 as long as F2 (Fig. 3D). F12 1.9 x longer than wide, 1.7 x as long as F11 (Fig. 3E).

Mesosoma. Smooth to finely alutaceous, densely pubescent with piliferous punctures, 1.23 x broader than long in dorsal view, 1.2 x as long as high in lateral view. Pronotum as *D. bettyannae*.

Mesonotum. Mesoscutum (Fig. 4A), smooth to alutaceous, densely, uniformly pubescent, with piliferous punctures. Notauli distinct posteriorly, medially, faint anteriorly, crossed by transversal rugae, convergent posteriorly. Anteroadmedian signa and parapsidal signa visible. Median mesoscutal impression absent. Scutellum (Fig. 4A), rounded, about 0.4 x as long as mesoscutum, strongly reticulate-rugose and moderately pubescent. Scutellar foveae ellipsoidal, confluent medially, with some longitudinal rugae, indistinctly margined posteriorly. Scutellum, in lateral view extended posteriorly over dorsellum. Mesopleuron (Fig. 3G) as in preceding species.

Metanotum (Fig. 4B). Metapectal-propodeal complex. Metapleural sulcus reaching posterior margin of mesoplectus at about mid-height of metapectal-propodeal complex (Fig. 3G). Lateral propodeal carinae arched, poorly defined, with some secondary strong rugae laterally and dorsally on bare median propodeal area (Fig. 4B), lateral propodeal area densely pubescent; nucha rugose.

Legs. Metatarsal claw bearing a strong basal tooth (Fig. 4C).

Forewing (Fig. 5D). As long as body, radial cell 3.6 x longer than wide; open along anterior margin; areolet small, triangular. Rs well pigmented, slightly bowed, vein 2r slightly angulated but not prolonged by stump into radial cell. Hair fringe on apical margin moderately long.

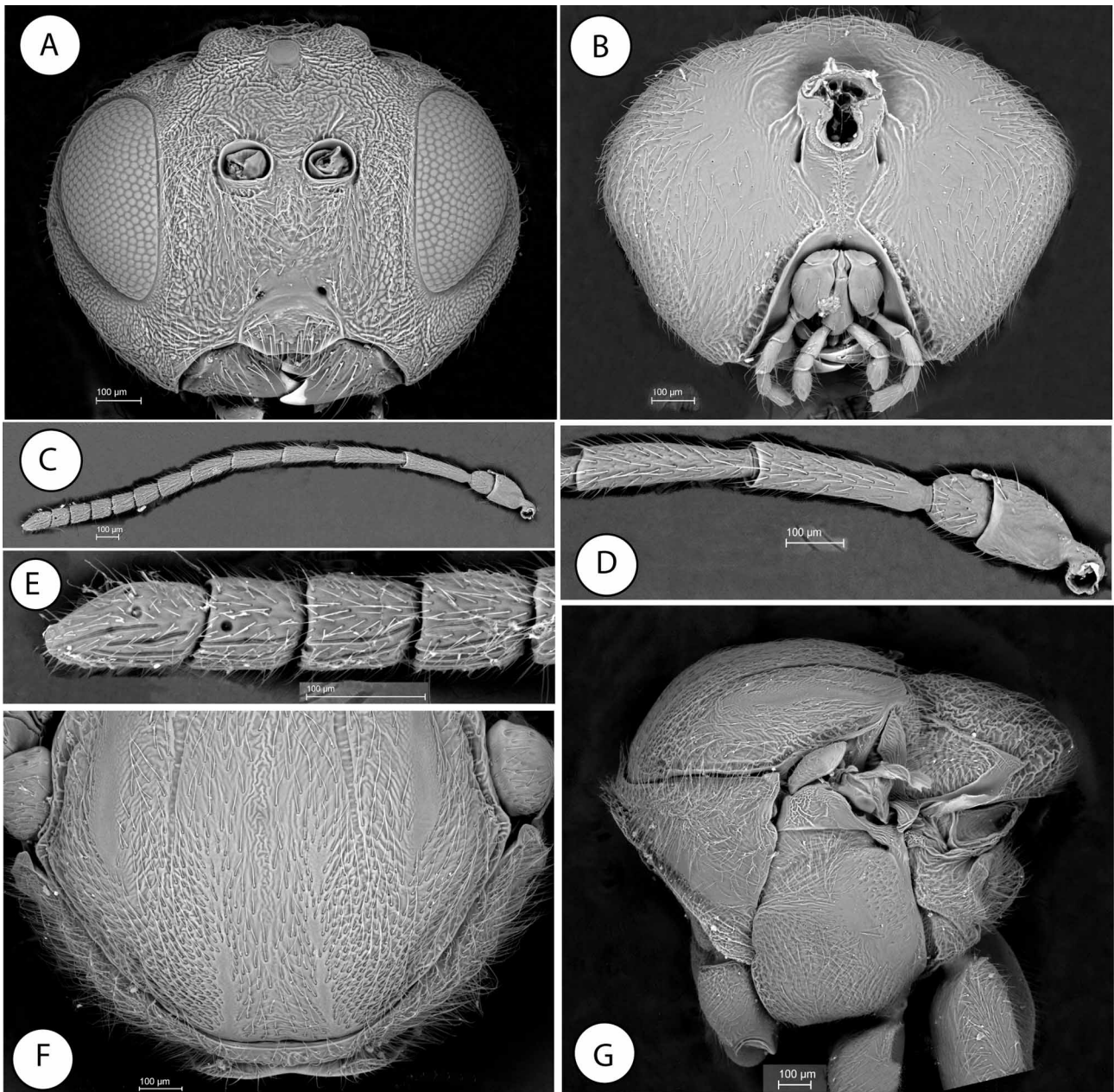


FIGURE 3. *Disholcaspis bisethiae*: (A) Head anterior view. (B) Head posterior view. (C) Female antenna. (D) Detail of basal flagellomeres. (E) Detail of last flagellomeres. (F) Pronotum antero-dorsal view. (G) Mesosoma lateral view.

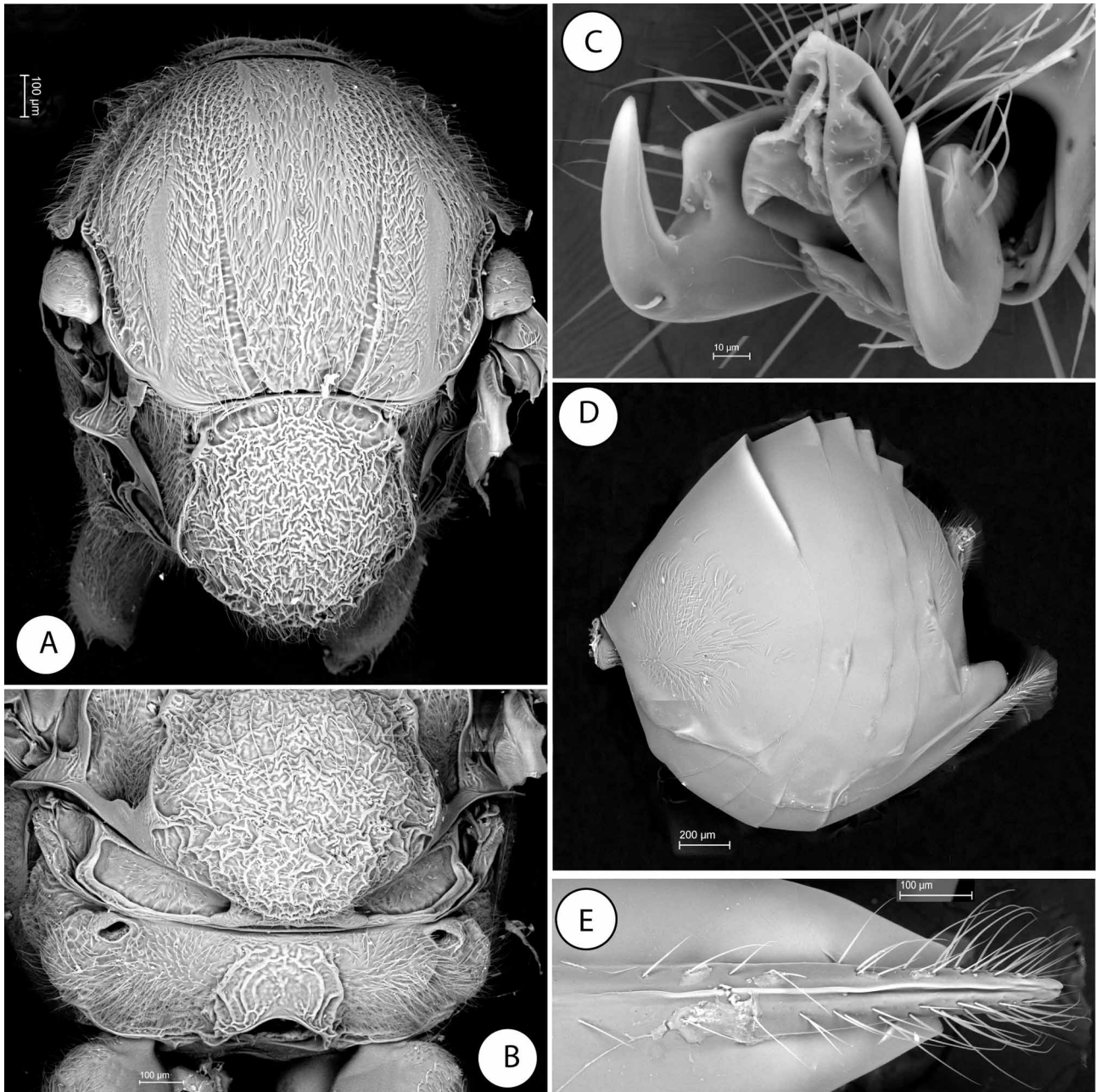


FIGURE 4. *Disholcaspis bisethiae*: (A) Mesosoma dorsal view. (B) Propodeum. (C) Metatarsal claw. (D) Metasoma lateral view. (E) Detail of ventral spine of hypopygium.

Metasoma (Fig. 4D). Smooth and shiny; large, as long as head and mesosoma combined; in lateral view 1.1 x as high as long. T3 covering about 2/3 of metasoma; without micropunctures; with a patch of dense setae in its anteromedial area. Projecting part of hypopygial spine, (Fig. 4E); about 2.75 x as long as wide; lateral margins of hypopygial spine with long setae projecting over apical end of the spine, but not forming a terminal tuft.

Gall (Fig. 6 D–F) Globular, monothalamic, with more or less distinct nipple at apex of some galls; hard, with felt-like covering, growing in clusters of two to ten galls (Fig. 6E). Brown when fresh and dark brown to black when old (Fig. 6D). Internally similar to gall of *D. bettyannae* (Fig. 6F). Diameter 8 to 14 mm. Formed in twigs of *Quercus lancifolia*. The gall most closely resembles that of *D. mamma* Walsh, known from USA.

Distribution. *Disholcaspis bisethiae* was found to 1270 m a.s.l. at Cotito, Finca Hill and Piedra de Candela, Renacimiento district, in western Panama, Chiriquí Province, near the border with Costa Rica.

Biology. Only the asexual generation of *D. bisethiae* is known, inducing detachable galls on stems of *Q. lancifolia*. Galls are found between December–April, during the dry season, and the insects emerge in the same season.

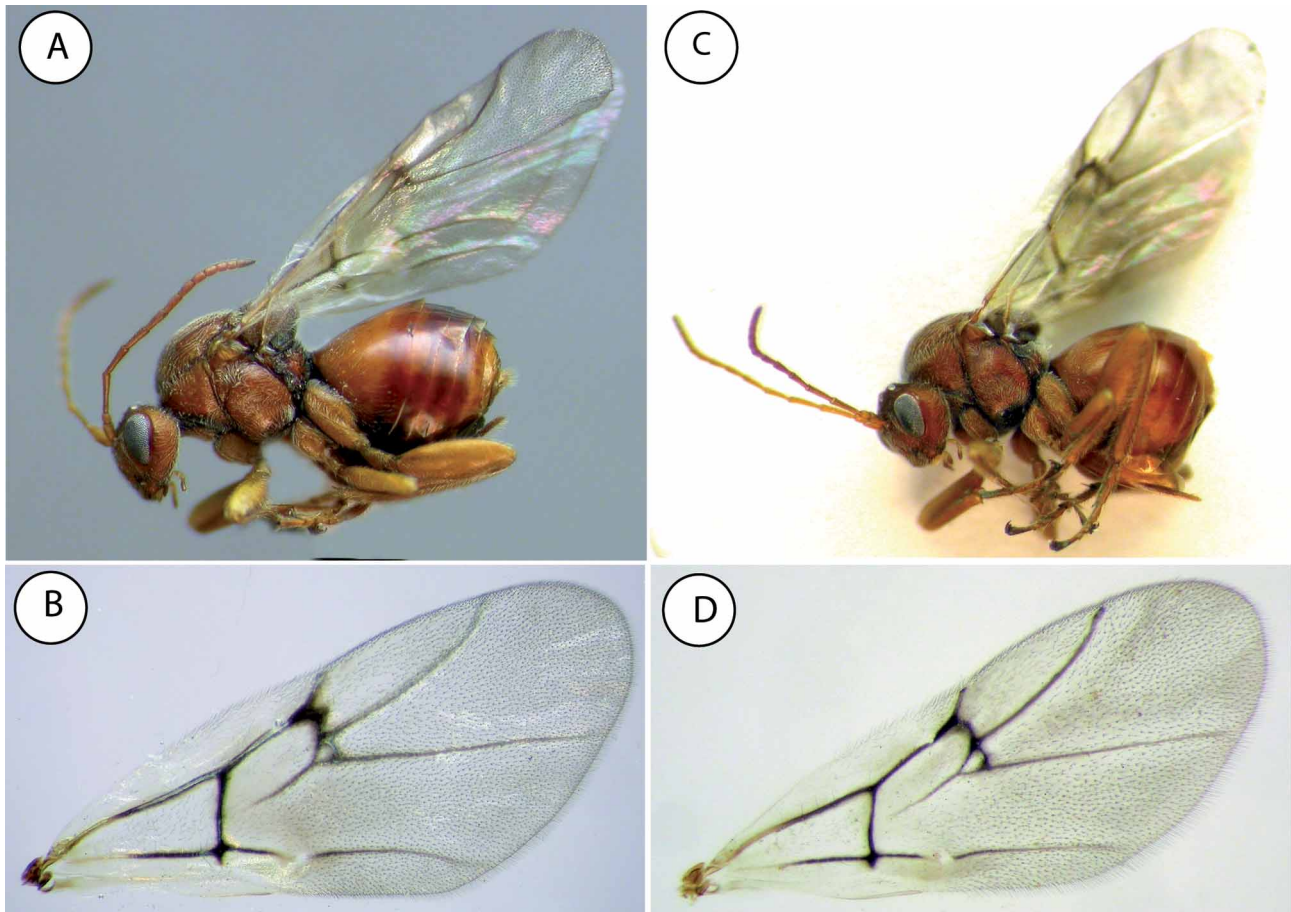


FIGURE 5. Habitus and forewings of *Disholcaspis* species: (A) *Disholcaspis bettyannae*, female (B) forewing of female. (C) *Disholcaspis bisethiae*, female. (D) forewing of female.

Key for the identification of *Disholcaspis* of Panama

1. Female antenna with 11 flagellomeres. Frons with strong rugae; facial striae radiating from clypeus visible. Ocellar plate not raised. Scutellar foveae smooth, confluent, with anterior and posterior margins visible. 2r vein of forewing with a stump medially prolonged into the radial cell. Projecting part of hypopigial spine less than 2.5 x as long as wide. Galls on stems of *Q. bumelioides* ***D. bettyannae***
- Female antenna with 12 flagellomeres. Frons with alutaceous sculpture and only some weak rugae, radiating striae from clypeus almost indistinct or very weak. Ocellar plate slightly raised. Scutellar foveae ellipsoidal, confluent, with some longitudinal rugae and posterior margins indistinct. 2r without a stump medially. Projecting part of hypopigial spine about three times as long as wide. Galls on stems of *Q. lancifolia*. ***D. bisethiae***

Final comments. Although the genus *Disholcaspis* had been cited on the Neotropical region (Pujade-Villar & Hanson 2006), no species had been formally described. Therefore, the two new species described herein are the first species of this genus reported for the Neotropics and represent a substantial advancement in the knowledge of their distribution and biology.

The complexity, diversity and nomenclatural instability of *Disholcaspis*, as have been demonstrated in recent studies (Melika & Abrahamson 2002; Liljeblad *et al.* 2008), together with the new information provided here, demonstrate the necessity of revising this genus. Furthermore, galls induced by species of *Disholcaspis* are among the most complex productions in the Cynipidae (Kinsey 1920), and the inclusion of this genus in ongoing phylogenetic studies is important in understanding the evolutionary history of oak gall wasps (Liljeblad *et al.* 2008; Stone *et al.* 2010).

Inquiline and parasitoid associated community. Unlike other galls induced by species of *Disholcaspis*, the two new species from Panama do not secrete nectar and consequently are not associated with ants. However, the

galls of the two new species described host a complex of parasitoids that include representatives of the genera *Torymus* Dalman (Torymidae), *Eurytoma* Illiger and *Sycophila* Walker (Eurytomidae), *Ormyrus* Westwood (Ormyridae), *Eupelmus* Dalman (Eupelmidae) and *Aprostocetus* Westwood (Eulophidae). Additionally, we reared two species of inquilines from the galls; *Synergus nicaraguensis* Díaz & Gallardo and *S. elegans* Nieves-Aldrey & Medianero (Nieves-Aldrey & Medianero in press.).

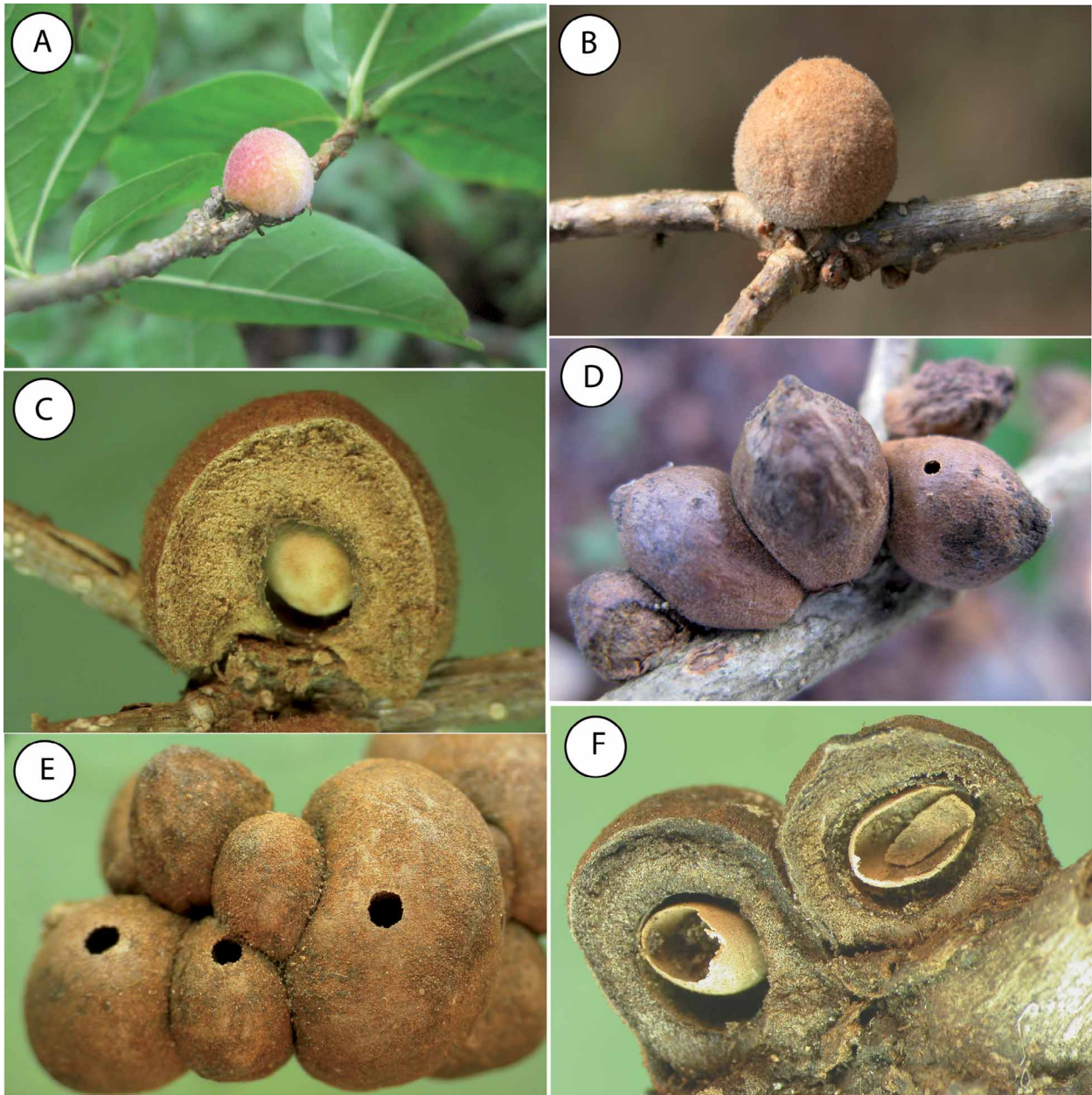


FIGURE 6. Galls of *Disholcaspis* species from Panama: (A) Immature gall of *Disholcaspis bettyannae*. (B) mature galls of *Disholcaspis bettyannae*. (C) Section of a gall showing the central cell. (D) Old gall of *Disholcaspis bisethiae* showing the exit holes of inducer. (E) Mature gall of *Disholcaspis bisethiae*. (F) Section of a gall showing the central cell.

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