

Review of *Andricus* species (Hymenoptera, Cynipidae) producing woody tuberous oak galls in México and bordering areas of United States of America

Revisión de las especies de *Andricus* (Hymenoptera, Cynipidae) que producen agallas tuberosas en encinos de México y zonas limítrofes de los Estados Unidos de América

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ABSTRACT

A revision of tuberous oak galls induced by *Andricus* species from Mexico is given. *Andricus guanajuatensis* Pujade-Villar n. sp., *A. santafe* Pujade-Villar n. sp. and *A. carrilloi* Pujade-Villar n. sp. (Hymenoptera: Cynipidae: Cynipini) are described from Mexico. Diagnosis, biology and distribution data of all *Andricus* species are given. Some morphological characters are discussed, illustrated and compared between related species. A key for all Mexican species and two North American species collected next to Mexico (*Andricus wheeleri* and *A. lebaue* Pujade-Villar n. sp.) is included. The gall and host of *Andricus dugesi* Beutenmüller is described for the first time.

Key words: Cynipidae, tuberous galls, *Andricus*, taxonomy, morphology, distribution, biology.

RESUMEN

Se presenta una revisión de las especies de *Andricus* que producen agallas tuberosas en los encinos de México. Se describen de México tres nuevas especies de cinípidos, *Andricus guanajuatensis* Pujade-Villar n. sp., *A. santafe* Pujade-Villar n. sp. y *A. carrilloi* Pujade-Villar n. sp. (Hymenoptera: Cynipidae: Cynipini). Se exponen los caracteres diagnósticos, la biología y la distribución de todas las especies. Se discuten e ilustran algunos caracteres morfológicos y se comparan con los de las especies relacionadas morfológicamente. Se presenta una clave de identificación que incluye todas las especies mexicanas y dos especies de EE.UU recolectadas en áreas muy cercanas a México (*Andricus wheeleri* y *A. lebaue* Pujade-Villar n. sp.). Se describe por primera vez la agalla y el huésped de *Andricus dugesi* Beutenmüller.

Palabras clave: Cynipidae, agallas tuberosas, *Andricus*, taxonomía, morfología, distribución, biología.

INTRODUCTION

Tuberous galls present on the oak branches are induced by several species of oak wasps included in the tribe Cynipini (Cynipidae). These galls are usually irregularly shaped, polythalamous with rough delicate or coarse surface and a grayish color with green hues, similar to the color of the bark when fresh, woody brown at maturity. The induced wasps can remain inside the gall during several years, during which the tissues are hardened and lignified. For this reason, obtain the adults present inside the collected galls is a very difficult task, because sometimes it is not possible to chew the gall wall and they die before emergency.

According to Pujade-Villar & Paretas-Martínez (2012) the species which induce woody tuberous galls in Mexico are: *Andricus bonanseai* Mayr, 1905; *A. durangensis* Beutenmüller 1911; *A. dugesi* Beutenmüller 1917; *A. furnaceus* Kinsey, 1920; *Andricus montezumus* (Beutenmüller, 1913); *A. peredurus* Kinsey, 1920; *A. tumeralis* Pujade-Villar, 2009 (= *A. ashmeadi* Dalla Torre & Kieffer, 1910 no *A. ashmeadi* Bassett, 1900 = *A. championi* Ashmead, 1899 no *A. championi* Cameron, 1833); and *Andricus tumefaciens* Pujade-Villar, 2012. Two *Odontocynips* Kieffer species which induce woody tuberous

galls have been registered from the Neotropical region: *Odontocynips hansonii* Pujade-Villar, 2008 from Costa Rica and Panama, and *O. championi* (Cameron, 1883) from Panama (Medianero et al, 2011).

In America, north of Mexico, there are some species which cause similar tumoral galls in branches, roots and/or trunks close to the ground (they are called subterranean galls) (Weld, 1921). Many species of *Andricus* Hartig, *Bassettia* Ashmead, *Callirhytis* Förster, and *Loxaulus* Mayr are capable to produce swellings on branches, trunks and roots (Weld, 1957, 1959, 1960; Burks, 1979).

Kinsey (1920) made, at the same time that he described two new species, a preliminary key for the *Andricus* species which produce tuberous galls in the Mexican oaks on which understandably he does not include *A. bonanseai* described by Mayr (1905). This key is not satisfactory in several points. A reanalysis of these species was necessary. After revising the type material of the *Andricus* species from Mexico which produce tuberous galls we conclude that two adult's morphological groups are present (Fig. 1): the adults with the metasoma scarcely pubescent on the tergite II (only *Andricus durangensis* and *Andricus tumefaciens*), and the adults with

the metasoma completely pubescent (the rest of the species previously mentioned), sometimes with a loose arrangement. On the other hand, *Andricus wheeleri* (Beutenmüller, 1907) collected from Arizona may be also present in Mexico, thus it was included on a previous study (Pujade-Villar & Paretas-Martínez, 2012). Finally, material from Arizona and New Mexico determined by Kinsey as *A. ruginosus* Bassett, 1890 have been examined. It corresponds to a new species: *Andricus lebeaue* n. sp. This species has been also included in this study due to the proximity with Mexico.

MATERIAL AND METHODS

The type material revised is deposited in the following institutions:

AMNH, American Museum of Natural History, New York, USA (curator J.M. Carpenter).

NMW, Naturhistorisches Museum Wien (curator M. Vizek).

PDD, Pest Diagnostic Department, Plant Protection & Soil Conservation Directorate of County Vas, Tanakajd, Hungary (curator G. Melika).

UACH, Universidad Autónoma Chapingo, México (curator D. Cibrián-Tovar)

UB, Universitat de Barcelona, España (curator J. Pujade-Villar).

USNM, U.S. National Museum of Natural History, Smithsonian Institution, Washington, DC, U.S.A. (curator M. Buffington).

Type material of the following species have been examined: *Andricus bonanseai* (deposited on NMW), *A. dugesi* (USNM), *A. durangensis* (USNM), *A. furnaceus* (AMNH), *A. montezumus* (USNM), *A. peredurus* (AMNH), *A. tumefaciens* (UB, USNM, PDD), *A. tumeralis* (USNM), *A. wheeleri* Beutenmüller (AMNH) and material determined by Kinsey as *A. ruginosus* Bassett, 1890 (AMHM).

Morphological terms used follow Liljebblad & Ronquist, 1998 and Melika, 2006; Ronquist & Nordlander (1989) was used for the abbreviations of the fore wing venation; and Harris (1979) for the terminology of the cuticular surface. Measurements and abbreviations include: F1–F12, first and subsequent flagellomeres; POL (post-ocellar distance) is the distance between the inner margins of the posterior ocelli; OOL (distance ocellar-ocular) is the distance from the outer edge of the 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 was measured from the margin of the wing to the Rs vein.

SEM pictures were made using field-emission gun environmental scanning electron microscope (FEI Quanta 200 ESEM); it was used for high-resolution imaging without gold-coating the specimens. The optical images included in the figure 12 were photographed by Zeiss Discovery. V8 compound microscope with an attached INFINITYX-21C digital camera that fed image data to a notebook or desktop computer; the program DeltaPix View-Pro AZ was then used to merge an image series (typically representing 20 focal planes) into a single in-focus image. Finally, the images of the galls of *A. peredurus*, *A. furnaceus* and *A. ruginosus* determined by

Kinsey, now *A. lebeaue* n. sp., were made by C. Le Beau with a Nikon D40 and the rest of galls with a Canon Sx210 by the authors (Pujade-Villar, Pérez-García and Cibrián-Tovar).

Species are alphabetically sorted. The figures which show the most important morphological features of each species (Figs 1-11) are also alphabetically sorted. Figures 12 and 13 show special features of some adults and the galls are represented in figures 14-15 except for *A. montezumus* and *A. championi* which are not represented.

RESULTS

As it has been already mentioned, the Mexican tuberous galls have been recently studied by Pujade-Villar & Paretas-Martínez (2012) in regard to those having almost no pubescence on the metasoma. The key below can be used for separation of all the Mexican species and from adjacent areas, including those mentioned by Pujade-Villar & Paretas-Martínez (2012).

Determination Key

1. Metasoma scarcely pubescent on tergite II, only few setae on the anterior lateral margin (Fig. 1a-b) 2
- Metasoma with terga completely pubescent (Figs 1e-f, 3f, 6g, 10e), sometimes with lax disposal (Figs 1c-d). 4
- 2- Small specimens (2.5-3.5 mm). Antennae with 13 flagellomeres; F1 equal in length to F2. Fore wing margin without pubescence (Fig. 12h). Metascutellum subrectangular. Mesoscutum with separately strongly rugose interspaces almost smooth; medial scutum line inconspicuous. ***A. wheeleri* (Beutenmüller)**
- Robust specimens (4.5-4.7 mm). Antennae with 12 flagellomeres; F1 longer than F2. Fore wing margin with very short pubescence (Fig. 12i). Metascutellum constricted medially. Mesoscutum with densely rugae interspaces coriaceous; medial scutum line present. 3
- 3- Head, mesosoma and legs black. Irradiating facial carinae present close to the clypeus. Lateral ocellum very prominent in frontal view. Notauli thin, inside lacking sculpture. Propodeal area with straight carinae and pubescent anteriorly. ***A. tumefaciens* Pujade-Villar & Paretas-Martínez**
- Head, mesosoma and legs reddish brown. Irradiating facial carinae absent, face rugous. Lateral ocellum not or shortly prominent in frontal view. Notauli broad in posterior half and with carinae inside. Propodeal area with curved carinae and glabrous inside. ***A. durangensis* Beutenmüller**
4. Forewing ciliated in margin (Fig. 12j). 5
- Forewings not ciliated in margin (Fig. 12k). 9
- 5- Metasoma with sparse setae in second metasomal tergite and with few setae in the followings (Fig. 1c). Antennae (Fig. 5d) as long as body. Scutellar foveae alutaceous with some few weak rugae inside. Vein Rs+M not reaching basal vein. Femur III narrow (around 4.5 times as long as wide) and not incised distally (Fig. 12g). ***A. furnaceus* Kinsey**
- Metasoma with dense setae laterally in all terga (Fig. 1e). Antennae shorter, if they are equal to body then it is black and robust. Scutellar foveae with linear elements very

- conspicuous, alutaceous or very small. Vein Rs+M reaching basal vein, if not then the femur III is Femur III wider (less than 3.0 times as long as wide) and strongly narrowed distally (Figs 12e-f) 6
- 6- Mesoscutum with fine transverse and parallel carinae (Fig. 6e). Ventral spine of hypopygium very long, 7.0-8.0 times as long as wide (Figs 6g-h). Metasoma black. Propodeum with a basal plate in 2/3 inferior part with parallel elements (Figs. 6f) ***A. guanajuatensis* Pujade-Villar n. sp.**
- Mesoscutum rugose or with some strong transversal carinae. Ventral spine shorter, 3.5- 5.0 times as long as wide. Metasoma reddish to brown. Propodeum without plate inside 7
- 7- Head and mesosoma black. Mesoscutum rugose (Fig. 11d). Scutellar foveae with longitudinal and parallel carinae (Fig. 11d). Ventral bar of metanotal trough strongly sculptured (Fig. 11f); metascutellum constricted medially (Fig. 11f); radial cell with 2r vein strongly angled with a projecting stump vein in the middle and distal part of Rs vein strongly dilated (Fig. 12a). ***A. tumeralis* Pujade-Villar**
- Head and mesosoma chestnut. Mesoscutum with several transversal carinae (Figs 4d, 8d). Scutellar foveae rugous, never with longitudinal and parallel carinae (Figs 4d, 8d). Ventral bar of metanotal trough smooth or almost smooth (Figs 4e, 8f); metascutellum subrectangular (Figs 4e, 8f); radial cell with 2r vein angled or curved and distal part of Rs vein weakly dilated or not dilated (Fig. 12b-c). 8
8. Head weakly expanded in dorsal view (Figs 8a-b). Antennae with 12 flagellomeres, F1=F2, F11=F12 (Fig. 8c). Mesoscutum dull, weakly sculptured with interspaces coriaceous (Fig. 8c); medial scutum line absent (Fig. 8c). Scutellar foveae short, oval and delimited basally (Fig. 8c). Radial cell with R1 short until the margin of the forewing or despigmented and Rs not dilated distally (Fig. 12c). Femur III strongly incised apically (Fig. 12f). ***A. montezumus* Beutenmüller**
- Head strongly expanded in dorsal view (Fig. 4a-b). Antennae with 13 flagellomeres, F1>F2, F11=F12<F13. Mesoscutum shiny, strongly rugose-carinated with interspaces smooth (Fig. 4e); medial scutum line long (Fig. 4e). Scutellar foveae big, not delimited basally (Fig. 4e). Radial cell with R1 long arriving near the margin of forewing and Rs dilated distally (Fig. 12b). Femur III not incised apically (Fig. 12e). ***A. dugesi* Beutenmüller**
- 9- Notauli strongly convergent basally (Fig. 9c). Pronotum uniformly sculptured coriaceous with some weak parallel carinae. Scutum dull, transversally carinated (Fig. 9c); medial scutum line absent (Fig. 9c). Antennae with 12 flagellomeres (Fig. 9f), F12 shortly longer than F11; scapus and pedicellus lighter, flagellum almost black. ***A. peredurus* Kinsey**
- Notauli weakly convergent basally. Pronotum strongly carinated-rugose, with a smooth and shiny area in the anterior part next to the lateral corner (Fig. 13), sometimes small. Scutum shiny, winkled or strongly rugose or rugose-carinated; medial scutum line present. Antennae with 13 flagellomeres, F12 equal to F13 if 12 then F12 two times as long as F11; all antennomeres with the same color, yellowish to brown. 10
- 10- Body and legs testaceous. Forewing veins light, yellowish sometimes very transparent. Propodeal carinae parallel (Figs 2f, 7e). 11
- Body and legs brown to black. Forewing veins brown. Propodeal carinae curved (Figs 3d, 10d). 12
- 11- Head expanded dorsally (Fig. 2a). Antennae shorter than body, around 0.7 times. Radial cell of forewings around 3.3 times as long as broad. Metascutellum constricted medially (Fig. 2f). Metasoma with dense setae laterally in all terga (Fig. 1f). Interspace between propodeal carinae alutaceous (Fig. 2f) ***A. bonanseai* Mayr**
- Head shortly expanded dorsally (Fig. 7b). Antennae slightly shorter than body, around 0.9 times. Metascutellum subrectangular (Fig. 7e). Radial cell 4.0 times as long as broad. Metasoma usually with sparse setae in the second metasomal tergite and with few setae in the followings (Fig. 1d). Interspace between propodeal carinae rugous (Fig. 7e). ***A. lebeau* Pujade-Villar n. sp.**
- 12- Smooth area in the corner longer, not delimited by a carina with few carinae (Fig. 13a), shortly pilose. Notauli strongly convergent basally (Fig. 10b). Forewings brown smoked; radial cell 4 times as long as broad; Rs vein curved. ***A. santafe* Pujade-Villar n. sp.**
- Smooth area in the corner more or less triangular, delimited by a carina, rest of surface carinated-rugose (Fig. 13b) and densely pilose. Notauli less convergent, separated from medial sulcus (Fig. 3c). Forewings hyaline; radial cell around 3 times as long as broad; Rs vein straight or slightly curved. ***A. carrilloi* Pujade-Villar n. sp.**

Species description

The species with the metasoma pubescent appears here described in alphabetical order. For those with reduced pubescence consult Pujade-Villar & Paretas-Martínez (2012).

***Andricus bonanseai* Mayr**

(Figs 1f, 2, 14a)

Andricus bonanseai Mayr, 1905: 571 (female and gall)

Type material. Lectotype ♀ designated here, deposited in NMW with the following labels: “Bonanseai Frühling 05” (handwritten, black label), “Mex Col. GMayr”, “*A. bonanseai* det GMayr”, “MHNW”, “Lectotype ♀ *Andricus bonanseai* Mayr, 1905 desig. JP-V 2013” (red label). Paratypes (3♀): “*Bonanseai* m Mex OR 05” (handwritten, black label), “Collect GMayr”, “*A. bonanseai* det GMayr”, “MHNW”, “Paralectotype ♀ *Andricus bonanseai* Mayr, 1905” (red label); 2♀: “Mex Bonans. I.03 X.04” (handwritten, black label), “Collect GMayr”, “*A. bonanseai* det GMayr”, “MHNW”, “Paralectotype ♀ *Andricus bonanseai* Mayr, 1905” (red label).

Diagnosis. Asexual form: Female length 3.5-3.8 mm. Body testaceous; all antennomeres with the same colour, yellowish to brown. Head strongly expanded in dorsal view, lower face rugose with striate radiating from clypeus extending near to the eye margin; frons and vertex rugous with some longitudinal

strong carinae, medial frontal line visible. Antennae shorter than body length (80:110), with 13 flagellomeres, F12 equal to F13; pronotum rugous with a short, smooth and shiny area in the anterior part next to the lateral corner. Mesoscutum shiny, strongly rugose; notauli percurrent, weakly convergent basally; medial scutum line long, almost percurrent, both well impressed with bottoms, without rugae inside or with very few linear elements. Scutellum with rugous sculpture, foveae poorly defined, superficial, not delimited posteriorly, bottom shiny, with some rugae; medially separated by a carina. Metascutellum constricted medially. Propodeal carinae straight to slightly curved, interspace between propodeal carinae alutaceous. Femur III not incised apically. Forewings not ciliated in margin with a similar body length; radial cell around 3.2 times as long as broad; 2r angled; R1 not reaching wing margin; Rs conspicuous, curved; areolet present; Rs+M visible, reaching basalis at half length. Metasoma with dense setae laterally in all tergites; ventral spine of hypopygium needle-like, 5 times as long as wide.

Gall (Fig. 14a). Galls are chestnut red, large regular, woody enlargements partially surrounding small twigs and composed of small, distinct, thoroughly fused globular masses. Polythalamous, 2.0–4.0 x 1.0–3.0 cm, with very hard tissue. The grey to woody coloured gall surface is delicately rough and wrinkled; the net-like anastomose are slightly darker than the depressed areas and often weakly cracked. This structure is visible under stereomicroscope magnification. The larval chambers (3.0 x 4.5 mm) are nested in the basal part of the gall; walls of chambers are yellowish, hard. Galls remain on oak branches several years and turn darker over time.

Host. *Quercus* sp.

Distribution. Mexico, without locality according to the original description.

Biology. Only the asexual generation is known. Galls collected in March include fully developed adults which emerge in August. Gall tissues are very hard and dry shortly after they were detached from branches and it makes extremely difficult to obtain adults. The developing gall is not so hard.

Comments. Mayr (1905) mentions that the gall was sent by Silvio Bonansea and six specimens of *Andricus bonansea* were obtained (four of them are deposited in the NMW), in addition to some inquilines (*Synergus*) and parasitoids (*Ormyrus* and *Sycophila*) in the fourth year of the formation of the gall after subjecting it to humidification processes in spring and autumn during 1903-1904. Mayr (1905) did not mention the host neither a precise location in Mexico.

Andricus carrilloi Pujade-Villar n. sp.

(Figs 3, 13b, 14b)

Type material. Holotype deposited in UB (JP-V col) with the following labels: “ MEX (059), Zacatecas, Monte Escobedo, San Isidro, 22.349605° N 103.376640° W, 2050 m., Ex *Q. rugosa* (27.vii.2011) 1-5.viii.2011” (white label); “Holotype *Andricus carrilloi* n. sp. Pujade-Villar, design. JP-V 2013” (red label). Paratypes (1♀): same data of holotype; deposited UB (JP-V col).

Additional material. Miguel Hidalgo (Xochitepec, Morelos),

n° 145, Ex. *Quercus obtusata* (9.ii.2013) 1-5.iii.13: 8♀.

Diagnosis. This species resembles morphologically to *A. santafe* n. sp. having forewings not ciliated in margin, antennae with 13 flagellomeres, scutum strongly rugose, medial scutum line present, body dark, veins brown and propodeal carinae curved. However, they differ having a vertical carina in the lateral of the smooth area in the pronotum corner in *A. carrilloi* (without this carina in *A. santafe*), notauli not strongly convergent basally (strongly convergent in *A. santafe*), forewings transparent in *A. carrilloi* (brown smoked in *A. santafe*) and radial cell shorter, around 3 times as long as broad *A. carrilloi* (longer in *A. santafe*, around 4 times). Also resembles to *A. bonansea* and *A. lebeaue* but differs to having the body and legs brown to black (testaceous in *A. bonansea* *A. lebeaue*), forewings with veins brown (veins light, yellowish in *A. bonansea* and *A. lebeaue*), metascutellum subrectangular (strongly incised in and propodeal *A. bonansea*) and carinae curved (straight in *A. bonansea* and *A. lebeaue*).

Description. Asexual female.

Length. Female: 3.9-4.0 mm (n=2).

Colour. Body, antennae and legs brown to black. Metasoma reddish to brown; hypopygium with ventral spine yellowish. Forewing veins brown. Pubescence silvery.

Head (Figs. 3a, b). Lower face granulose-reticulate-rugose, with striate radiating from clypeus and extending near to eye margin, with carinae-rugae from ocelli to toruli without frontal carinae and some weak rugae from ocelli to eyes; sparse pubescent, 2,2-2.3 times as wide as long from above, 1.2 times as wide as high in frontal view and slightly shorter width than mesosoma. Gena broadened behind eye, around 0.4 as wide as transverse diameter of eye; malar space 0.3 times as long as eye height, malar sulcus absent. Ocellar area elevate, interocellar area rugose, shiny; POL:OOL:LOL is 7:3:3, lateral ocellus is 3.0. Transfacial distance subequal than eye height; diameter of torulus (including rims) 1.5 times as large as distance between toruli, distance between torulus and inner margin of eye equal as diameter of torulus; inner margins of eyes subparallel. Clypeus small, trapezoid, alutaceous, smooth, curved ventrally, not incised; anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line distinct. Frons, vertex, interocellar area and occiput strongly rugae with interspaces from granulate to strongly coriaceous; median frontal carina absent.

Antenna (Fig. 3g). 13 flagellomeres. Longer than head+mesosoma (90:53) and shorter than body length (90:95); pedicel nearly around 2.0 times as long as wide; F1–F5 broader distally; all flagellomeres straight; F1 longer than scape+pedicel and slightly longer than F2; F2 slightly longer than F3; F3 slightly longer than F4; the followings decreasing gradually; F12 slightly shorter than F13; placodeal sensilla on F6–F13 but only slightly impressed on F6.

Mesosoma (Figs. 3c-e, 13b). Around 1.2 times as long as high in lateral view, with sparse white setae. Mesoscutum 1.2 times as long as wide in dorsal view; strongly rugous with interspaces coriaceous and shiny. Notauli complete, deep, strongly convergent basally; sculptured with some internal rugae, interspaces alutaceous to smooth and shiny.

Anterior parallel lines extending to 1/2 length of mesoscutum, divergent, coriaceous. Parapsidal lines distinct and broad, weakly alutaceous and shiny, starting from posterior margin and extending to 1/2 length of mesoscutum. Parascutal carina anteriorly ending just at notauli level, but slightly differently due to the sculpture. Median mesoscutal line present, long starting from posterior margin and extending beyond to 4/5 length of mesoscutum, with rugose sculpture at bottom. Mesoscutellum around 0.5 times as long as mesoscutum, as long as broad, overhanging metanotum, uniformly rugous; scutellar foveae oval, big, superficial, not delimited posteriorly, bottom shiny, with some rugae; medially separated by a weak carina. Mesopleuron setose, carinated, punctuated posteriorly, microscutule coriaceous without a small smooth area in the upper part; mesopleural triangle conspicuously setose; axillula dull, alutaceous and shiny, with white setae; subaxillular bar smooth, shiny, as height as metanotal trough; postalar process short, as a carina; metapleural sulcus reaching mesopleuron in 1/2 of its height. Metascutellum strongly microreticulate, subrectangular slightly curved basally. Metanotal trough alutaceous with short white setae; ventral impressed area as 1/3 narrow as metascutellum height, strongly coriaceous. Propodeum alutaceous, shiny, setose laterally, glabrous centrally with some setae in the 1/3 anterior; posterolateral process shortly projected; central propodeal area alutaceous, shiny, with a very few irregular rugae impressed, propodeal carinae thin and curved, with an alutaceous sculpture. Nucha with irregular wrinkles and rugae.

Legs. Tarsal claws with basal tooth; femur III not incised apically.

Forewing. Longer than body length, transparent with brown venae, lacking cilia on anterior margin, radial cell around 3.0 times as long as wide; 2r angled; R1 not reaching wing margin; Rs conspicuous, slightly curved, distal part parallel to margin of forewings; areolet present; Rs+M visible, reaching basal length at half length.

Metasoma (Fig. 3f). Shorter than head+mesosoma, longer than high in lateral view, with setae laterally in all tergites, more densely present in the posterior margin of terga; second metasomal tergum without micropunctures. Prominent part of ventral spine of hypopygium needle-like, tapering to apex, around 5.0 times as long as wide, with two parallel rows of short white scattered setae that do not extend beyond the spine apex.

Gall (Fig. 14b). Galls are chestnut red, large regular, woody enlargements partially surrounding small twigs and composed of small, distinct, thoroughly fused globular masses. Polythalamous, 2.0–4.0 x 1.0–3.0 cm, with very hard tissue. The grey to woody coloured gall surface is delicately rough and wrinkled; the net-like anastomose are slightly darker than the depressed areas and often weakly cracked. This structure is visible under stereomicroscope magnification. The larval chambers (3.0 x 4.5 mm) are nested in the basal part of the gall; walls of chambers are yellowish, hard. Galls remain on oak branches several years and turn darker over time.

Host. *Quercus rugosa* Née and *Q. obtusata* Humb. & Bolpl. (section *Quercus*).

Distribution. Mexico: Monte Escobedo (Zacatecas) and Xochitepec (Morelos).

Biology. Only the asexual generation is known. Galls collected in March include fully developed adults which emerge in August. Gall tissues are very hard and dry shortly after they were detached from branches and it is extremely difficult to obtain adults. The developing gall is not so hard.

Etymology. Species dedicated to Carlos Carrillo (Ecologist of Monte Escobedo, Zacatecas) for his effort collecting wasp galls.

***Andricus dugesi* Beutenmüller**

(Figs 1e, 4, 12b, 12e, 15b)

Andricus dugesi Beutenmüller, 1917 (female)

Type material. Lectotype ♀ designated here, deposited in USNM with the following labels: “Guanajuato Mex, Duges oct 4. 1900”, “Type” (red label), “*Andricus dugesi* type Beutm.” (handwritten, black label), “Type n° 20974 USNM” (red label), “Lectotype ♀ *Andricus dugesi* Beutenmüller, 1917 desig. JP-V 2013” (red label).

Additional material. Tetela de Ocampo, Benito Juárez (PUEBLA, México), 1688 m., 19°49'23.8" N 97°48'25.3" W, n° 160 & 162, ex *Q. castanea*, col. Alondra-Gabriela Pérez-García, (8.ix.2013) 1-15.vi.2013: 17♀.

Diagnosis. Asexual form: Big specimens (4-5 mm.). Body reddish-brown with some black areas. Head strongly expanded in dorsal view with striate radiating from clypeus extending to eye margin basally and laterally without rugae in lower face; frons and vertex rugous with some longitudinal weak carinae. Antennae shorter than body length with 13 flagellomeres. Mesosoma strongly jumped anteriorly in lateral view. Mesoscutum shiny, strongly rugose-carinated with interspaces smooth; notauli percurrent; medial scutum line long, almost percurrent. Scutellum rugous; scutellar foveae deep, bottom big and rugous, not delimited basally. Ventral bar of metanotal trough smooth or almost smooth; metascutellum subrectangular. Propodeal carinae angled, divergent superiorly and convergent in the 1/3 inferior. Femur III not incised apically. Forewing uniformly yellowish brown, ciliated in margin, radial cell 3.0 times as long as wide, with R1 long arriving near to the margin of the forewing, Rs dilated distally, vein Rs+M reaching basal vein; areolet big. Metasoma with dense setae laterally in all tergites; ventral spine of hypopygium needle-like, 3.75 times as long as wide.

Gall (Fig. 15b). Galls are very big (maximum size 9x12x8 cm), polythalamous, with rough texture, large irregular, woody enlargements partially surrounding by twigs of 0.5-1.0 cm and composed by big, usually distinct, thoroughly fused globular masses. Coloration from dark green (young galls) to reddish brown (mature galls) of brown woody consistency, which as time goes by it becomes more and more rigid while the epidermis is gradually cracking. This gall is usually confused with the “cherimoya fruit” (*Annona cherimola*) due to its similarity in the size, texture and coloration. The tissues are very hard at the end of its development. The larval chambers (3.0 x 4.5 mm) usually are nested in the basal part of the gall, sometimes also in outermost areas. They are asymmetrically

distributed; walls of chambers are yellowish, delicate. The number of chambers are not abundant compared to the size of the gall; in a medium size gall seven larvae chambers were counted. Galls remain on oak branches several years and turn darker over time.

Host. *Q. castanea* Née (section *Lobatae*).

Distribution. Mexico (Guanajuato, Puebla).

Comments. In the original description, Beutenmüller (1917) mentioned that the types are deposited in the USNM and the cotypes in his collection. Only a single specimen has been found; the rest of the material is not deposited in the AMNH (C. Le Beau and M. Doering *pers. com.*) neither in the USNM (M. Buffington *per. com.*). The gall is described here for the first time.

Andricus furnaceus Kinsey

(Figs 1c, 5, 12j, 14d)

Andricus furnaceus Kinsey, 1920: 304-305 (female and gall)

Type material. Lectotype ♀ designated here, deposited in AMNH with the following labels: “San Luis Potosí MEX, Kinsey cut ex gall 4.29.19” (handwritten, black label), “*Andricus furnaceus* cotype” (handwritten, red label), “Lectotype ♀ *Andricus furnaceus* Kinsey, 1920 desig. JP-V 2013” (red label). Paratypes: “S.L.P. Mex, Schaffner 1880, Kinsey cut ex gall 4.29.19” (handwritten, black label), “*Andricus furnaceus* cotype” (handwritten, red label), “Paralectotype ♀ *Andricus furnaceus* Kinsey, 1920” (red label); “S.L.P. Mex, Schaffner 1880, Kinsey cut ex gall 4.29.19” (handwritten, black label), “*Andricus furnaceus* paratype” (handwritten, red label), “Paralectotype ♀ *A. furnaceus* Kinsey, 1920” (red label).

Diagnosis. Asexual form: Female length 2.0-3.3 mm. Head, mesosoma, antennae and legs reddish-brown; metasoma yellowish. Head weakly expanded in dorsal view, lower face weakly rugose-punctuated with few sparse striate radiating from clypeus and extending near to eye margin; frons and vertex strongly coriaceous, without linear elements. Antennae as long as body length, with 13 flagellomeres, F12 equal to F13; pronotum alutaceous and shiny, with some sparse longitudinal carinae. Mesoscutum shiny, weakly rugose with interspaces alutaceous; notauli percurrent weak impressed in the 1/3 anterior; medial scutum line almost absent. Scutellum with rugous sculpture interspaces alutaceous; foveae alutaceous, superficial, poorly delimited posteriorly, bottom shiny, with some carinae; medially separated by a carina. Metascutellum subrectangular. Propodeal carinae curved interspace between propodeal carinae alutaceous. Femur III narrow (around 4.5 times as long as wide) and not incised distally. Forewings ciliated in margin, longer than body length; radial cell around 4.0 times as long as wide; 2r weakly angled; R1 stopped near the wing margin; Rs almost straight; areolet present; Rs+M not reaching the basal vein. Metasoma with sparse setae on second metasomal tergite and with few setae in the followings; ventral spine of hypopygium needle-like, 4.0 times as long as wide.

Galls (Fig. 14d). Polythalamous, regular, swelling around small twigs, usually forming a single regular mass (4.5-6.0 cm. of diameter), resembling a baked potato. Matted, light brownish grey colour. The whole interior is hard, compact granular, with

very little solid woody fibre. The larval chamber (2.5-4.0mm.) is dispersing inside the tissue but more abundantly near the centre; a single gall contains fifty or more larval cells.

Host. *Quercus* sp. according to the original description.

Distribution. Mexico (San Luis Potosí).

Comments. According to the original description (Kinsey, 1920), the antennae has 12 flagellomeres. Nevertheless, after examining the only specimen with a complete antenna it has 13 flagellomeres. Also, Kinsey mentions that the type material is composed by 37 specimens but only three of them were found in the AMNH (C. Le Beau and M. Doering *pers. com.*). Adults were obtained after cutting galls (Kinsey, 1920). However, from similar galls collected by Palmer the adults appeared in summer.

Andricus guanajuatensis Pujade-Villar n. sp.

(Fig. 6, 14f)

Type material. Holotype deposited in Col. JP-V (UB) with the following labels: “Sta. Rosa (Guanajuato, MEX)”, “Ex. *Q. castanea*, (31.v.2012) ix-2012”, “Holotype *Andricus guanajuatensis* ♀ n. sp. Pujade-Villar, design. JP-V 2013” (red label). Paratypes (3 ♀): with same data as Holotype (deposited in the same collection).

Additional material. Sta. Rosa (Guanajuato, MEX), Ex. *Q. castanea*, (31.v.2012) extrac. v.2013: 3♀. Cerca de Amealco, Amealco de Bonfil (Querétaro), n° 142, Ex. *Q. obtusata*, (19.ii.2013) v.2013: 2♀.

Diagnosis. *Andricus guanajuatensis* n. sp. differs from all the *Andricus* species in the length of the hypopygium ventral spine (which is very long) and in the sculpture of the mesoscutum. The new species is characterized by: body completely black; antennae with 12 flagellomeres, shorter than body length; mesoscutum with fine transverse and parallel carinae; forewing ciliated in margin; femur III strongly narrowed distally; veins Rs+M reaching the basal vein; metasoma with terga completely pubescent; ventral spine of hypopygium very long, 7.0-8.0 times as long as wide.

Description. Asexual female.

Length. Female: 4.0-4.2 mm (n=4).

Colour. Body, antennae and legs black, distal flagellomeres brown to black and ventral metasoma brown. Forewing smoked brown, veins brown. Silvery pubescence.

Head (Figs. 6a, b). Sculpture granulate to strongly coriaceous. Lower face with short striate radiating from clypeus and extending near to the eye margin, without carinae-rugae from ocelli to toruli, without frontal carinae and without rugae from ocelli to eyes; sparse pubescent, 2.4-2.5 times as wide as long from above, 1.4-1.5 times as wide as high in frontal view and equal width than mesosoma. Gena broadened behind eye, 0.4 as wide as transverse diameter of the eye; malar space 0.5 times as long as eye height, malar sulcus absent. Ocellar area non elevate; POL:OOL:LOL is 6:5:2.5, lateral ocellus is 3.0. Transfacial distance longer than eye height (19:14); diameter of torulus (including rims) around 2.0 times as large as distance between toruli, distance between torulus and inner margin of eye equal than diameter of torulus; inner margins of eyes parallel. Clypeus small, squared, alutaceous, almost

straight, very slightly incised; anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line distinct. Frons, vertex, interocellar area and occiput granulate to strongly coriaceous; median frontal carina absent.

Antenna (Fig. 6c). 12 flagellomeres. Longer than head+mesosoma (70:33) and shorter than body (70:60); pedicel around 2.0 times as long as wide; F1–F5 broader distally; all flagellomeres straight; F1 equal in length to scape+pedicel and as long as F2; F2 1.2 times as F3; antennal formula: 8: 5: 13: 13: 11: 11: 8: 7: 6: 5: 5: 4: 3: 6; placodeal sensilla on F4–F13 but only slightly impressed on F4–F5.

Mesosoma (Figs. 6d-f). Around 1.3 times as long as high in lateral view, with sparse white setae. Mesoscutum as long as wide, or only slightly longer than wide in dorsal view; shiny, with weak and numerous parallel carinae, interspaces coriaceous. Notauli complete; sculptured with some parallel carinae, shiny. Anterior parallel lines extending to 1/3 length of mesoscutum, slightly convergent distally, coriaceous. Parapsidal lines distinct and broad, weakly alutaceous and shiny, starting from posterior margin and extending to 1/2 length of the mesoscutum. Parascutal carina anteriorly ending just at notauli level. Median mesoscutal line absent. Mesoscutellum around 0.6–0.7 times as long as mesoscutum, slightly longer than wide, overhanging metanotum, uniformly rugous; scutellar foveae oval, superficial, not delimited posteriorly, bottom shiny, with some rugae; medially separated by a point. Mesopleuron setose, carinated, punctuated posteriorly, microsculpture alutaceous; mesopleural triangle conspicuously setose; axillula dull, alutaceous with some rugae and white setae; subaxillular bar smooth, shiny, as height as the metanotal trough; postalar process short almost absent; metapleural sulcus reaching mesopleuron in 2/3 of its height. Metascutellum strongly microreticulate, rectangular, straight basally. Metanotal trough alutaceous with short white setae; ventral impressed area twice as narrow as metascutellum height, smooth and shiny. Propodeum alutaceous, shiny, setose laterally, glabrous centrally with some setae on anterior 1/3; posterolateral process shortly projected; central propodeal area alutaceous, with many irregular rugae impressed superiorly and parallel carinae basally in a plate, propodeal carinae thin, diverging but converging basally, with an alutaceous sculpture. Nucha with irregular wrinkles and rugae.

Legs. Tarsal claws with basal tooth; Femur III incised apically (Fig. 6i).

Forewing. Longer than body length, smoked brown, with cilia on anterior margin, radial cell around 3–3.5 times as long as broad; 2r angled; R1 not reaching wing margin; Rs conspicuous, slightly curved; areolet present; Rs+M visible, reaching basalis at half length.

Metasoma (Figs 6g-h). Shorter than head+mesosoma (around 0.75 times), shortly longer than high in lateral view, with dense setae laterally in all terga, more densely present in the posterior margin of terga; third and following metasomal tergums with mictopunctures. Prominent part of ventral spine of hypopygium needle-like, tapering to apex, around 8.0 times as long as wide, with two parallel rows of white scattered setae that do not extend beyond the spine apex.

Gall (Fig. 14f). Galls are chestnut red, large regular, woody

enlargements partially surrounding small twigs and composed by small, distinct, thoroughly fused globular masses surrounding twigs. Polythalamous, 2.0–6.0 x 1.0–5.0 cm, with hard tissue. The grey to woody coloured gall surface is delicately rough and wrinkled; the net-like anastomose are similar coloured than the depressed areas and often weakly cracked. This structure is visible under stereomicroscope magnification. The larval chambers (3.0 x 4.5 mm) are separately situated inside the gall, not very numerous. Walls of chambers are yellowish, big and very hard (2–3 mm thick). Galls remain on oak branches several years and turn darker over time.

Host. *Quercus castanea* Née and *Q. obtusata* Humb. & Bonpl. (section *Quercus*).

Distribution. Guanajuato and Michoacán (Mexico).

Biology. Only the asexual generation is known. Adults emerge in September and May. Gall tissues are very hard.

Etymology. Related to the State where these galls were collected.

Andricus lebeaue Pujade-Villar n. sp.

(Figs 1d, 7, 12k, 14e)

Type material. Holotype deposited in AMNH with the following labels: “Sta. Rita Mts., Ariz., Gall 1.16.20”, “*Q. arizonica*, Kinsey coll.”, “*Andricus ruginosus*, Kinsey det 37”, “Holotype *Andricus lebeaue* ♀ n. sp. Pujade-Villar, design. JP-V 2013” (red label). Paratypes (44 ♀): 30 ♀ with same data as Holotype; 4 ♀: “Highrolls NM, gall 12.22.19”, “*Q. undulate* var, Kinsey coll.”, “*A. ruginosus*, Kinsey det”; 6 ♀: “S. Catalina Mts., Sabino Trail, 1.1.10, Ariz.”, “*Q. arizonica*, Kinsey col.”, “*A. ruginosus*, Kinsey det 38”; 7 ♀: “Besbee, Ariz, gall 1.15.20”, “*Q. arizonica*, Kinsey coll.”, “*A. ruginosus*, Kinsey det 38”; 3 ♀: “Globe, Arizona?, gall 1.20.20”, “*Q. grisea*, Kinsey col.”, “*Q. ruginosus*, Kinsey det 38”.

Additional material. 37 specimens with same data of Holotype; 1 ♀ with labels of Highrolls type material; 12 ♀ with labels of S. Catalina type material; 5 ♀ with labels of Bisbee type material; 7 ♀: with labels of Globe type material.

Diagnosis. This species resembles morphologically to *A. bonanseai* having forewings not ciliated in margin, antennae with 13 flagellomeres, scutum strongly rugose, medial scutum line present body testaceous. However, they differ having the pronotum uniformly sculptured in *A. lebeaue* (with a short smooth and shiny area in the anterior part next to the lateral corner in *A. bonanseai*), metasoma with sparse setae in the second metasomal tergite and with few setae in the followings in *A. lebeaue* (with dense setae laterally in all terga in *A. bonanseai*), metascutellum subrectangular in *A. lebeaue* (constricted medially in *A. bonanseai*) and interspace between propodeal carinae rugous in *A. lebeaue* (alutaceous in *A. bonanseai*). Also resembles *A. santafe* n. sp. and *A. carrilloi* n. sp. but differs in body and legs testaceous, forewings veins light, yellowish sometimes very transparent and propodeal carinae parallel (color brown to black, forewings veins brown and propodeal carinae curved in *A. santafe* n. sp. and *A. carrilloi* n. sp.).

Description. Asexual female.

Length. Female: 3.0-3.7 mm (n=20).

Colour. Body, antennae and legs testaceous. Metasoma darker posteriorly, sometimes almost black; hypopygium with ventral spine yellowish. Forewing veins yellow to light brown. Pubescence silvery.

Head (Figs. 7b, c). Lower face granulose-reticulate-rugose, with striae radiating from clypeus and extending near to eye margin, with carinae-rugae from ocelli to toruli with the unobvious frontal carinae and some weak rugae from ocelli to eyes; sparse pubescent, 2.0-2.1 times as wide as long from above, 1.2-1.3 times as wide as high in frontal view and equal width than mesosoma. Gena broadened behind eye, 0.3 as wide as transverse diameter of eye; malar space 0.35–0.38 times as long as eye height, malar sulcus absent. Ocellar area elevate, interocellar area rugose, shiny; POL:OOL:LOL is 6:4:3, lateral ocellus is 3.0. Transfacial distance subequal to eye height; diameter of torulus (including rims) around 3.0 times as large as distance between toruli, distance between torulus and inner margin of eye equal as diameter of torulus; inner margins of eyes parallel. Clypeus small, trapezoid, alutaceous, smooth, curved ventrally, not incised; anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line distinct. Frons, vertex, interocellar area and occiput strongly rugae with interspaces from granulate to strongly coriaceous; median frontal carina weakly impressed.

Antenna (Fig. 7a). 13 flagellomeres. Longer than head+mesosoma (83:52) and shorter than body length (83:97); pedicel nearly 1.6 times as long as wide; F1–F6 broader distally; all flagellomeres straight; F1 longer than scape+pedicel; F1 1.1 times as long than F2; F2 shortly longer than F3, F3=F4; F4–F8 shorter and progressively shortening in length; F9 longer than F10 and F10 equal F11; F12 shorter F11 and equal or slightly longer than F13; placodeal sensilla on F6–F13 but only slightly impressed on F6.

Mesosoma (Figs. 7d-f). Around 1.3 times as long as high in lateral view, with sparse white setae. Mesoscutum as long as wide or only slightly wider than long in dorsal view; strongly rugous with interspaces coriaceous and shiny. Notauli complete, deep; sculptured with some internal rugae, interspaces alutaceous to smooth and shiny. Anterior parallel lines extending to 1/2 length of mesoscutum, divergent, coriaceous. Parapsidal lines distinct and broad, weakly alutaceous and shiny, starting from posterior margin and extending to 1/2 length of mesoscutum. Parascutal carina anteriorly ending just at notauli level, but slightly differently due to the sculpture. Median mesoscutal line present, usually long starting from posterior margin and extending beyond to 3/4 length of mesoscutum, with rugose sculpture at bottom, for this reason it is sometimes inconspicuous. Mesoscutellum around 0.5 times as long as mesoscutum, as long as broad, overhanging metanotum, uniformly rugous; scutellar foveae oval, big, superficial, not delimited posteriorly, bottom shiny, with some rugae; medially separated by a point. Mesopleuron setose, carinated, punctuated posteriorly, microsculpture coriaceous with a small smooth area in the upper part; mesopleural triangle conspicuously setose; axillula dull, alutaceous and shiny, with white setae; subaxillular bar smooth, shiny, as height as metanotal trough;

postalar process short, as a carina; metapleural sulcus reaching mesopleuron in 2/3 of its height. Metascutellum strongly microreticulate, rectangular straight basally. Metanotal trough alutaceous with short white setae; ventral impressed area twice as narrow as metascutellum height, strongly coriaceous. Propodeum alutaceous, shiny, setose laterally, glabrous centrally with some setae in the 1/3 anterior; posterolateral process shortly projected; central propodeal area alutaceous, shiny, with many irregular rugae impressed, propodeal carinae thin and parallel, with an alutaceous sculpture. Nucha with irregular wrinkles and rugae.

Legs. Tarsal claws with basal tooth; Femur III not incised apically.

Forewing (Fig. 11k). Longer than body length, hyaline and smoked brown between venae, lacking cilia on anterior margin (Fig. 10k), radial cell around 4.0 times as long as wide; 2r angled; R1 not reaching wing margin; Rs conspicuous, curved, distal part parallel to margin of forewings; areolet present; Rs+M visible, reaching basalis at half length.

Metasoma (Fig. 1d). Shorter than head+mesosoma (around 0.8 times), shortly longer than high in lateral view, with dense setae laterally in all tergites, more densely present in the posterior margin of terga; second metasomal tergum with an inconspicuous band of micropunctures. Prominent part of ventral spine of hypopygium needle-like, tapering to apex, around 5.0-6.0 times as long as wide, with two parallel rows of short white scattered setae that do not extend beyond the spine apex.

Gall (Fig. 14e). Galls are chestnut black, large irregular, woody enlargements partially surrounding small twigs and composed of small, distinct, thoroughly fused globular masses. Polythalamous, 2.0–7.0 x 1.0–5.0 cm, with very hard tissue. The grey to woody coloured gall surface is delicately smooth. The larval chambers (3.0 x 4.5 mm) are scattered throughout the gall tissue; walls of chambers are yellowish, hard. Galls remain on oak branches several years and turn darker over time.

Host. *Quercus arizonica* Sargent, *Q. grisea* Liebmann and *Q. undulata* Torr., all of them belonging to *Quercus* section.

Distribution. USA (Arizona and New Mexico), these localities are located near to the Mexican border.

Biology. Only the asexual generation. Adults emerge in winter (December and January, according to the labels). Gall tissues are very hard.

Etymology. Species dedicated to Christine Le Beau (Scientific Assistant of the American Museum of Natural History) for her kindness over the years in all my queries regarding to the Kinsey's collection.

Comments. The type material of *Andricus ruginosus* Bassett is lost (C. La Beau *pers. com.*). In the American Museum of Natural History there are long series of *A. ruginosus* determined by Kinsey. Nevertheless, Bassett's original description is not consistent with the characters present in the specimens deposited in Kinsey's collection (Pujade-Villar, 2013). In this work *A. ruginosus* is considered as '*incertae sedis*' and the material from Kinsey belongs to the new species described here.

***Andricus montezumus* Beutenmüller**

(Figs 8, 12c, 12f)

Andricus montezumus Beutenmüller, 1913 (female and gall)

Type material. Lectotype ♀ (metasoma lost) designated here, deposited in USNM with the following labels: “Mts. Mexico” (handwritten), “*Andricus montezumus* Beutm.” (handwritten), Type (red label), “Type 52979 USNM” (red label), “Beut Coll red’d 1935”, “*Andricus montezumus* Beut.” (handwritten); “Lectotype ♀ *Andricus montezumus* Beutenmüller, 1913, desig. JP-V 2013” (red label).

Diagnosis. Asexual form: Small specimens (2-3 mm.). Body reddish-brown with some black areas. Head weakly expanded in dorsal view with weak striae radiating from clypeus and extending to eye margin basally and laterally without rugae in lower face; frons and vertex strongly coriaceous without some longitudinal weak carinae. Antennae shorter than body length with 12 flagellomeres. Mesosoma strongly jumped anteriorly in lateral view. Mesoscutum dull, weakly sculptured with interspaces coriaceous; notauli percurrent; medial scutum line absent. Scutellum rugous; scutellar foveae short, oval and delimited basally. Ventral bar of metanotal trough smooth or almost smooth; metascutellum subrectangular. Propodeal almost straight. Femur III strongly incised apically. Forewing translucent, ciliated in margin, radial cell 3.0 times as long as wide, with R1 short until the margin of the forewing or despigmented and Rs not dilated distally, vein Rs+M not reaching basal vein; areolet big and veins pale brown. Metasoma with setae present laterally in all tergites (according to the original description, metasomal absent in the lectotype examined).

Host. *Quercus* sp. according to original description.

Gall. According to the original description, it is a polythalamous gall, on the twig of an indeterminate oak species. Composed by a number of irregularly rounded structures, tightly grown together and forming a solid mass. The outer surface is leather-brown, rugose with a number of fissures and cracks indicating the individual galls. Inside it is light wood-brown and exceedingly hard, almost like solid oak wood, making it difficult to cut with a knife.

Distribution. Mexico, without locality according to the original description. Also, Beutenmüller (1913) mentions that similar galls were sent by Weld from the Lake Chapala (Jalisco, Mexico).

Biology. Adults sent by Weld to Beutenmüller were obtained in summer.

***Andricus peredurus* Kinsey**

(Fig. 9, 14c)

Andricus peredurus Kinsey, 1920 (female and gall)

Type material. Lectotype ♀ designated here, deposited in AMNH with the following labels: “San Luis Potosí Mex Alive in galls 8.18.19” (handwritten), “*Andricus peredurus* Cotype” (handwritten, red label), “lectotype *Andricus peredurus* Kinsey, 1920, design. JP-V 2013” (red label). Paratypes (3♀):

“San Luis Potosí Mex, Alive in galls 12.24.29” (handwritten), “*Andricus peredurus* Paratype” (red label), 1♀; “San Luis Potosí Mex, Kinsey cut gall 4.29.19” (handwritten), “*Andricus peredurus* Paratype”, (red label), 2♀.

Diagnosis. Asexual form: Female length 3.5-4.2 mm. Body reddish-brown with some black areas, metasomal lighter antennae, femora and tarsi darker. Head expanded in dorsal view, lower face rugose with striae radiating from clypeus and extending near to eye margin; frons and vertex rugous without longitudinal carinae, medial frontal line inconspicuous. Antennae with similar length than body, with 12 flagellomeres, F12 shortly longer than F11; pronotum carinated, interspace alutaceous without a short smooth and shiny area in the anterior part next to the lateral corner. Mesoscutum dull, transversally carinated, interspaces alutaceous; notauli strongly convergent basally; medial scutum line absent. Scutellum with rugous sculpture, foveae poorly defined, not delimited posteriorly, bottom shiny, with some rugae; medially separated by a weak carina. Metascutellum strongly constricted medially. Propodeal carinae curved, interspace between propodeal carinae alutaceous with some rugae. Femur III not incised apically. Forewings not ciliated in margin, longer than body length; radial cell around 3.0 times as long as wide; 2r angled; R1 not reaching wing margin; Rs conspicuous, curved; areolet present; Rs+M visible, reaching basalis at half length. Metasoma with dense setae laterally in all tergites; ventral spine of hypopygium needle-like, around 3.3 times as long as wide.

Gall (Fig. 14c). According to the original description, it is a polythalamous gall, forming a large, dark brown, irregular and woody mass surrounding young twigs, often containing fifty or more larval cells. The whole is formed by many distinct but thoroughly fused masses, forming a rather spherical gall being 8.0 cm more or less in diameter; the surface is very rough, completely cracked as though it were burnt leather, the raised portions polygonal, averaging 2.0 mm. in diameter, and dark, blackish brown, the separating lines being much lighter or yellowish. Internally the gall is composed by a dense, somewhat granular tissue which becomes more compact-woody close to the margin and immediately around the larval cells. The larval cells are about 3.0 mm in diameter, but elongate, and are closely surrounded by the woody tissue which is scattered quite irregularly throughout the gall. The gall is quite too hard to cut though with a knife.

Host. *Quercus* sp. according to the original description.

Distribution. San Luis Potosí (Mexico), according to the original description.

Biology. Only the asexual generation is known. According to the original description, it is likely that the adults are mature two or three years after ovipositing and the adults were alive inside galls in October and also December.

Comments. In the original description Kinsey (1920) mentions that the typical series is compound by 10 specimens but only 4 of them have been located in AMNH (C. Lebeau and M. Doering *pers. com.*). Only the lectotype is well preserved despite the metasoma is deformed; paralectotypes are in very bad condition.

***Andricus santafe* Pujade-Villar n. sp.**

(Figs 10, 13a, 15a)

Type material. Holotype deposited in UB (JP-V col) with the following labels: "MEX, Santa Fe-Ciudad de México (DF), 1571 m., 19° 21'00.59" N 99°16'25.38 W, Ex. *Q. laeta*, (26.iii.2013) 25.iv.2013, DCT col (ref. 2779)" (white label), "Holotype *Andricus santafe* n. sp. Pujade-Villar, design. JP-V 2013" (red label). Paratypes (10♀): same data than holotype, 3♀; idem (ref. 2776), (1.ii.2013) 18.ii.2013: 7♀ (3♀ deposited JP-V col and 4♀ in UACH).

Diagnosis. This species resembles morphologically to *A. carrilloi* having forewings not ciliated in margin, antennae with 13 flagellomeres, scutum strongly rugose, medial scutum line present, body dark, veins brown and propodeal carinae curved. However, they differ having the smooth area in the pronotum corner not delimited by a carina (delimited by a vertical carina in *A. carrilloi*), notauli strongly convergent basally in *A. santafe* (less convergent in *A. carrilloi*), forewings brown smoked in *A. santafe* (transparent in *A. carrilloi*) and radial cell longer, around 4 times as long as wide in *A. santafe* (shorter in *A. carrilloi*, around 3 times). Also resembles to *A. bonanseai* and *A. lebeaue* but differs to having the body and legs brown to black (testaceous in *A. bonanseai* and *A. lebeaue*), forewings smoked with veins brown (veins light, yellowish in *A. bonanseai* and *A. lebeaue*), metascutellum subrectangular (strongly incised in *A. bonanseai*) and propodeal carinae curved (straight in *A. bonanseai* and *A. lebeaue*).

Description. Asexual female.

Length. Female: 3.8-4.1 mm (n=5).

Colour. Body, antennae and legs brown to black. Metasoma reddish to brown; hypopygium with ventral yellowish spine. Forewing smoked veins brown. Pubescence silvery.

Head (Figs. 10a). Lower face granulose-reticulate-rugose, with striae radiating from clypeus and extending near to eye margin, with carinae-rugae from ocelli to toruli without frontal carinae and some weak rugae from ocelli to eyes; sparse pubescent, 1.3-2.4 times as wide as long from above, 1.3-1.4 times as wide as high in frontal view and equal width than mesosoma. Gena broadened behind eye, around 0.4 as wide as transverse diameter of eye; malar space 0.3 times as long as eye height, malar sulcus absent. Ocellar area elevate, interocellar area rugose, shiny; POL:OOL:LOL is 7:4:4, lateral ocellus is 3.0. Transfacial distance slightly longer than eye height; diameter of torulus (including rims) 2.0 times as large as distance between toruli, distance between torulus and inner margin of eye equal as diameter of torulus; inner margins of eyes parallel. Clypeus small, trapezoid, alutaceous, smooth, curved ventrally, not incised; anterior tentorial pits, epistomal sulcus and clypeo-pleurostomal line distinct. Frons, vertex, interocellar area and occiput strongly rugae with interspaces from granulate to strongly coriaceous; median frontal carina absent.

Antenna (Figs. 10f, 13a). 13 flagellomeres. Longer than head+mesosoma (65:43) and shorter than body length (65:75); pedicel nearly 1.6 times as long as wide; F1-F5 broader distally; all flagellomeres straight; F1 longer than scape+pedicel; F2 1.1 times as long than F1; F2 shortly longer than F3, F3 shortly

longer than F4; F5-F6 equal shorter than F4; F7=F8 shortly shorter than F6; F9=F10 shortly shorter than F8; F12 shorter F11 and equal in length than F13; placodeal sensilla on F5-F13 but only slightly impressed on F5.

Mesosoma (Figs. 10b-d). Around 1.3 times as long as high in lateral view, with sparse white setae. Mesoscutum 1.3 times as long as wide in dorsal view; strongly rugous with interspaces coriaceous and shiny. Notauli complete, deep, strongly convergent basally; sculptured with some internal weak carinae, interspaces alutaceous to smooth and shiny. Anterior parallel lines extending to 1/2 length of mesoscutum, divergent, coriaceous. Parapsidal lines distinct and broad, weakly alutaceous and shiny, starting from posterior margin and extending to 1/2 length of mesoscutum. Parascutal carina anteriorly ending just at notauli level, but slightly differently due to the sculpture. Median mesoscutal line present, long starting from posterior margin and extending beyond to 3/4 length of mesoscutum, with rugose sculpture at bottom. Mesoscutellum around 0.5 times as long as mesoscutum, as long as broad, overhanging metanotum, uniformly rugous; scutellar foveae oval, big, superficial, not delimited posteriorly, bottom shiny, with some rugae; medially separated by a weak carina. Mesopleuron setose, carinated, punctuated posteriorly, microsculpture coriaceous with a small smooth area in the upper part; mesopleural triangle conspicuously setose; axillula dull, alutaceous and shiny, with white setae; subaxillular bar smooth, shiny, as height as metanotal trough; postalar process short, as a carina; metapleural sulcus reaching mesopleuron in 2/3 of its height. Metascutellum strongly microreticulate, rectangular, slightly curved basally. Metanotal trough alutaceous with short white setae; ventral impressed area twice as narrow as metascutellum height, strongly coriaceous. Propodeum alutaceous, shiny, setose laterally, glabrous centrally with some setae in the 1/3 anterior; posterolateral process shortly projected; central propodeal area alutaceous, shiny, with few irregular rugae impressed, propodeal carinae thin and curved, with an alutaceous sculpture. Nucha with irregular wrinkles and rugae.

Legs. Tarsal claws with basal tooth; Femur III not incised apically.

Forewing. Longer than body length, smoked with brown venae, lacking cilia on anterior margin, radial cell around 4.0 times as long as wide; 2r angled; R1 not reaching wing margin; Rs conspicuous, curved, distal part parallel to margin of forewings; areolet present; Rs+M visible, reaching basalis at half length.

Metasoma (Fig. 10e). as long as head+mesosoma, longer than high in lateral view, with setae laterally in all tergites, more densely present in the posterior margin of terga; second metasomal tergum without micropunctures and setae sparse. Prominent part of ventral spine of hypopygium needle-like, tapering to apex, around 5.0 times as long as wide, with two parallel rows of short white scattered setae that do not extend beyond the spine apex.

Gall (Fig. 15a). Galls are chestnut black, large irregular, woody enlargements partially surrounding small twigs and composed of small, distinct, thoroughly fused globular masses.

Polythalamous, 2.0–7.0 x 1.0–5.0 cm, with very hard tissue. The grey to woody coloured gall surface is delicately smooth. The larval chambers (3.0 x 4.5 mm) are scattered throughout the gall tissue, few chambers per gall (2–25, depending of the size of the gall); walls of chambers are yellowish, hard, and distributed irregularly inside. Galls remain on oak branches one to two several years and turn darker over time. When young the galls are olive green. The gall development start in June and becomes mature until February to March of the next year.

Host. *Quercus laeta* Liebm. (section *Quercus*).

Distribution. Mexico (Santa Fe, Delegación Cuajimalpa, D. F., Mexico City).

Biology. Only the asexual generation is known. Adults emerge in winter to early spring (February to April). Gall tissues are very hard.

Etymology. Named after the Mexican collecting place.

Andricus tumeralis Pujade-Villar

(Figs 11, 12a, 12d)

Andricus championi (Cameron, 1883) Ashmead, 1899: adults ♀ (not conespecific with Cameron galls)

Cynips ashmeadi Dalla Torre & Kieffer (1910) (*nomen novum*)

Andricus ashmeadi: Weld, 1952 (non *Andricus ashmeadi* Bassett, 1900)

Andricus tumeralis Pujade-Villar, 2009 (*nomen novum*)

Type material. Lectotype ♀ designated here, deposited in USNM with the following labels: “Guanajuato Mex”, “Collection ADuges”, Type N° 4304 USNM” (red label), “*Andricus championi* ♀ Cam (Ashm)” (handwritten, red label), “*Cynips ashmeadi* n.n. Dalla Torre & Kieffer, 1910; *Andricus tumeralis* n.n. Pujade-Villar, 2009”; “Lectotype ♀ *Andricus tumeralis* Pujade-Villar, 2009, desig. JP-V 2013” (red label).

Diagnosis. Asexual form: Female length 4.5 mm. Head and mesosoma black; antennae generally dark but the first antennomeres lighter, legs reddish-brown; metasoma light brown. Head strongly expanded in dorsal view, lower face weakly rugose-punctuated with striae radiating from clypeus and extending to eye margin basally and laterally; frons and vertex strongly rugous. Antennae as long as body length, with 12 flagellomeres, F12 almost a half of F13 (5:9); pronotum strongly coriaceous dorsally with some rugae, strongly winkled basally. Mesoscutum rugose with interspaces coriaceous; notauli percurrent; medial scutum line present but inconspicuous. Scutellum with rugous sculpture interspaces coriaceous; scutellar foveae confluent, with longitudinal carinae. Ventral bar of metanotal trough strongly sculptured; metascutellum constricted medially. Propodeal carinae curved, interspace between propodeal carinae smooth with some weak rugae. Femur III narrow (around 4.5 times as long as wide) and not incised distally. Forewings ciliated in margin, weakly shorter than body length; radial cell around 3.0 times as long as wide; 2r vein strongly angled with a projecting stump vein in the middle and distal part of Rs vein strongly dilated; R1 stopped near wing margin; Rs+M reaching basal vein; areolet

present. Metasoma with dense setae laterally in all tergites; ventral spine of hypopygium needle-like, 4.0 times as long as wide.

Galls. Polythalamous gall, on the twig of an indeterminate oak species, undescribed by Ashmead (see comments).

Host. *Quercus* sp. according to the original description.

Distribution. Guanajuato (Mexico).

Comments. *Cynips championi*, was described by Cameron (1883) from Panama, from which the adults were unknown. Ashmead (1899: 193–4) described the females of a Mexican gall and considered that they correspond to the species described by Cameron, which was transferred to the *Andricus* genus. Dalla Torre & Kieffer (1910: 440, 446) considered that the galls from Panamá and the Mexican adults were different species (maybe because they were collected from different countries), thus the specimens described by Ashmead were named as *Cynips ashmeadi*; this species was later transferred to the genus *Andricus* by Weld (1952). The designation of *Andricus ashmeadi* was preoccupied by Bassett (1900), for this reason Pujade-Villar et al. (2009) proposed to name *Andricus ashmeadi* (Dalla Torre & Kieffer) as *Andricus tumeralis* Pujade-Villar, 2009. Moreover, taking into account that in the Holarctic region species morphologically different can be obtained from very similar galls, Pujade-Villar et al. (2009) considered *Andricus championi* (Cameron) as “*incertae sedis*”, because neither the vegetal host where it was collected nor the adults which form it are known. This last species has been recently collected in Panama (Medianero et al., 2011) and the adults correspond to the genus *Odontocynips*.

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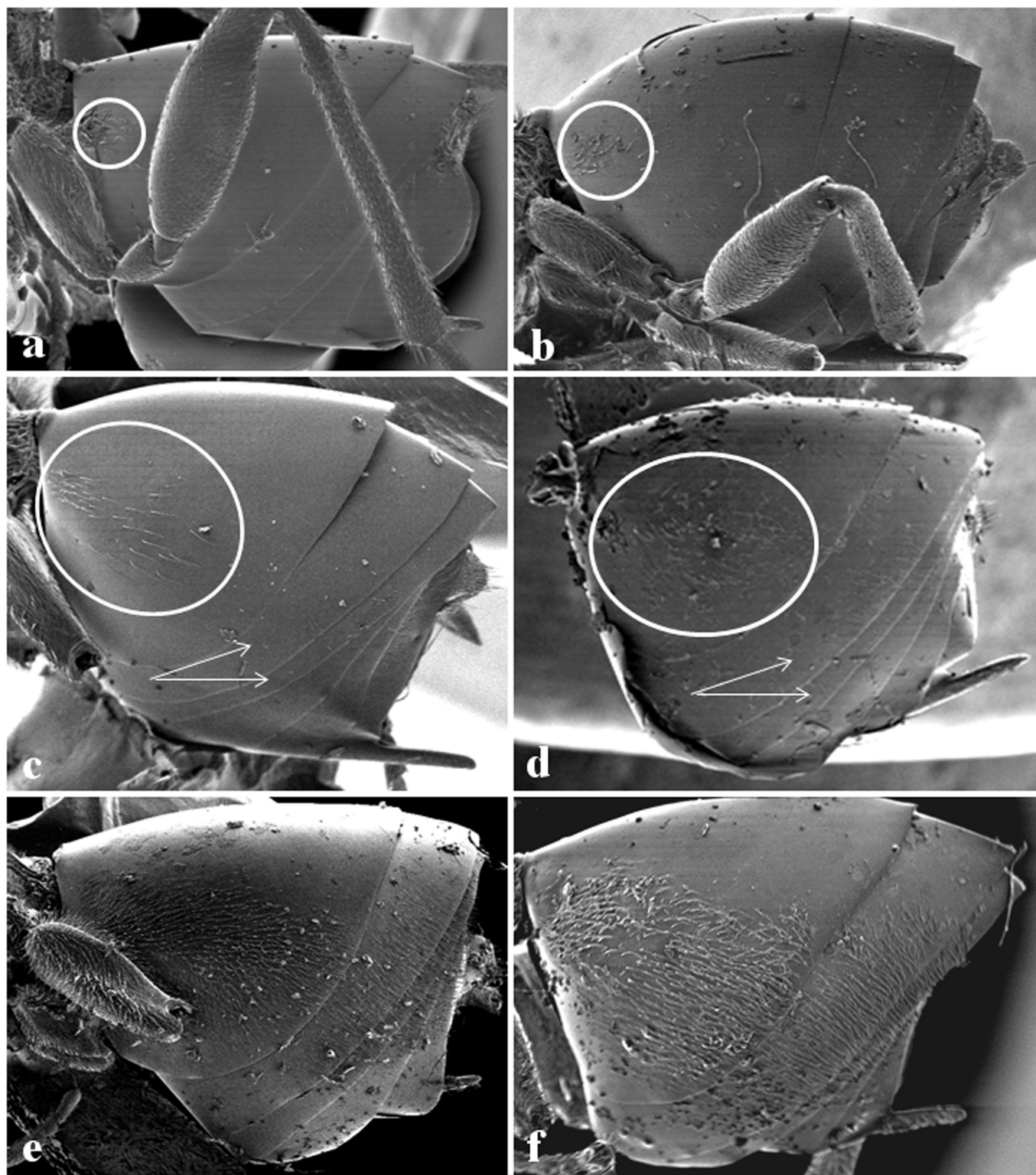


Figure 1. Metasoma in lateral view of: (a) *Andricus wheeleri*, (b) *A. durangensis*, (c) *A. furnaceus*, (d) *A. lebeaue*, (e) *A. dugesi* and (f) *A. bonanseai*.

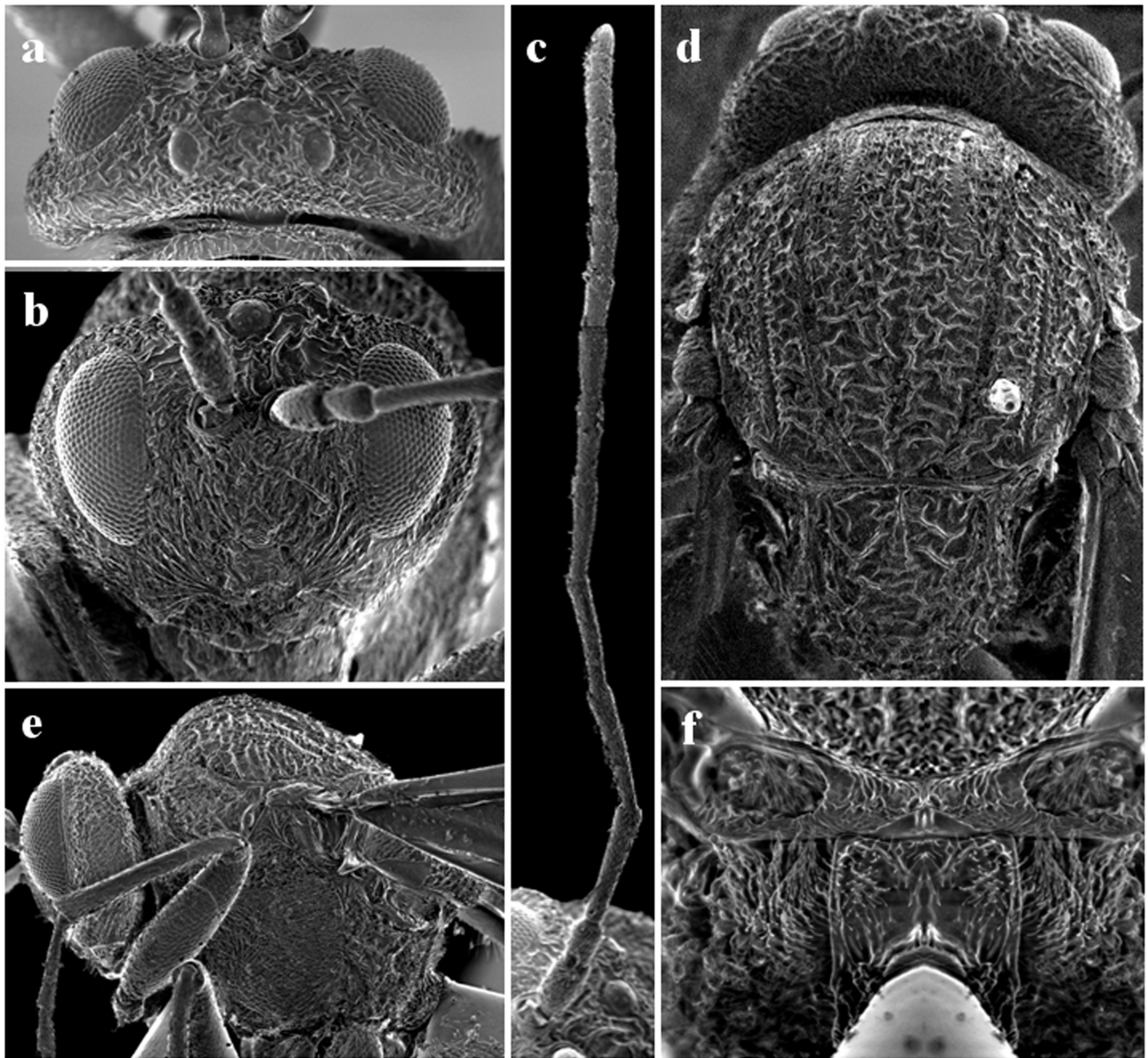


Figure 2. *Andricus bonanseai*. (a) Head in dorsal view, (b) head in frontal view, (c) antenna, (d) mesosoma in dorsal view, (e) head and mesosoma in lateral view, (f) propodeum.

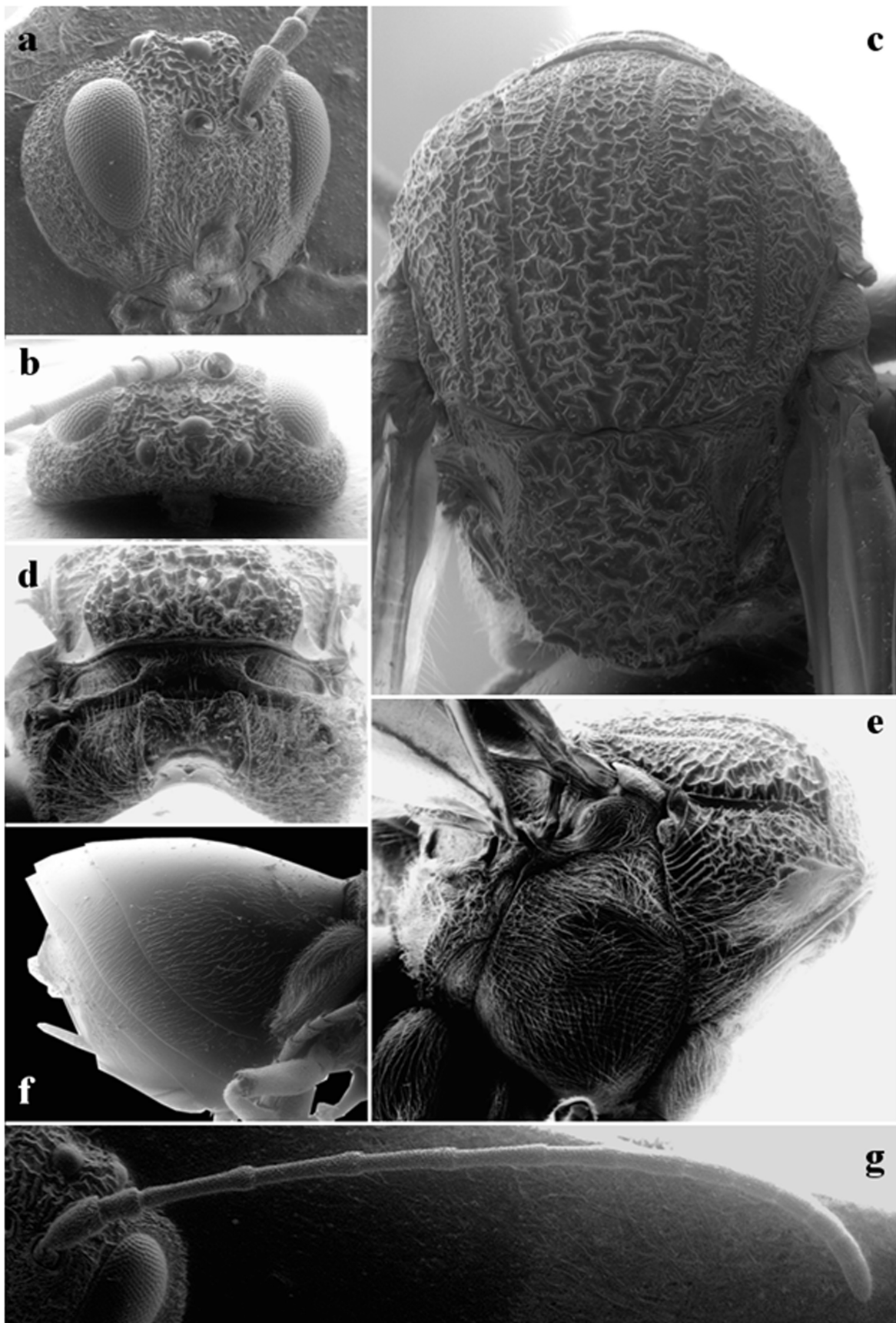


Figure 3. *Andricus carrilloi* n. sp. (a) Head in frontal view, (b) head in dorsal view, (c) mesosoma in dorsal view, (d) propodeum, (e) mesosoma in lateral view, (f) metasoma in lateral view, (g) antenna.

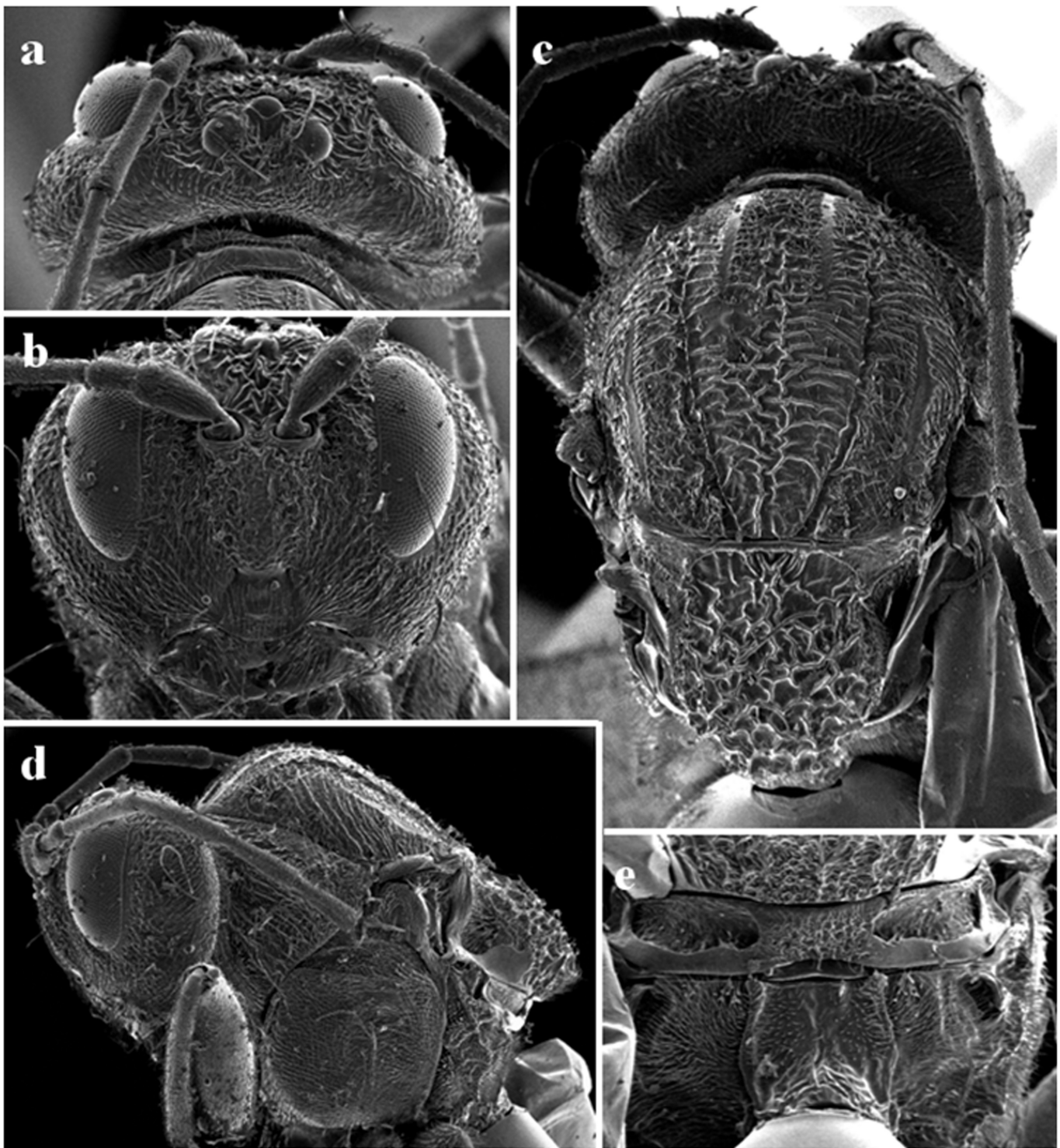


Figure 4. *Andricus dugesi*. (a) Head in dorsal view, (b) head in frontal view, (c) mesosoma in dorsal view, (d) head and mesosoma in lateral view, (e) propodeum.

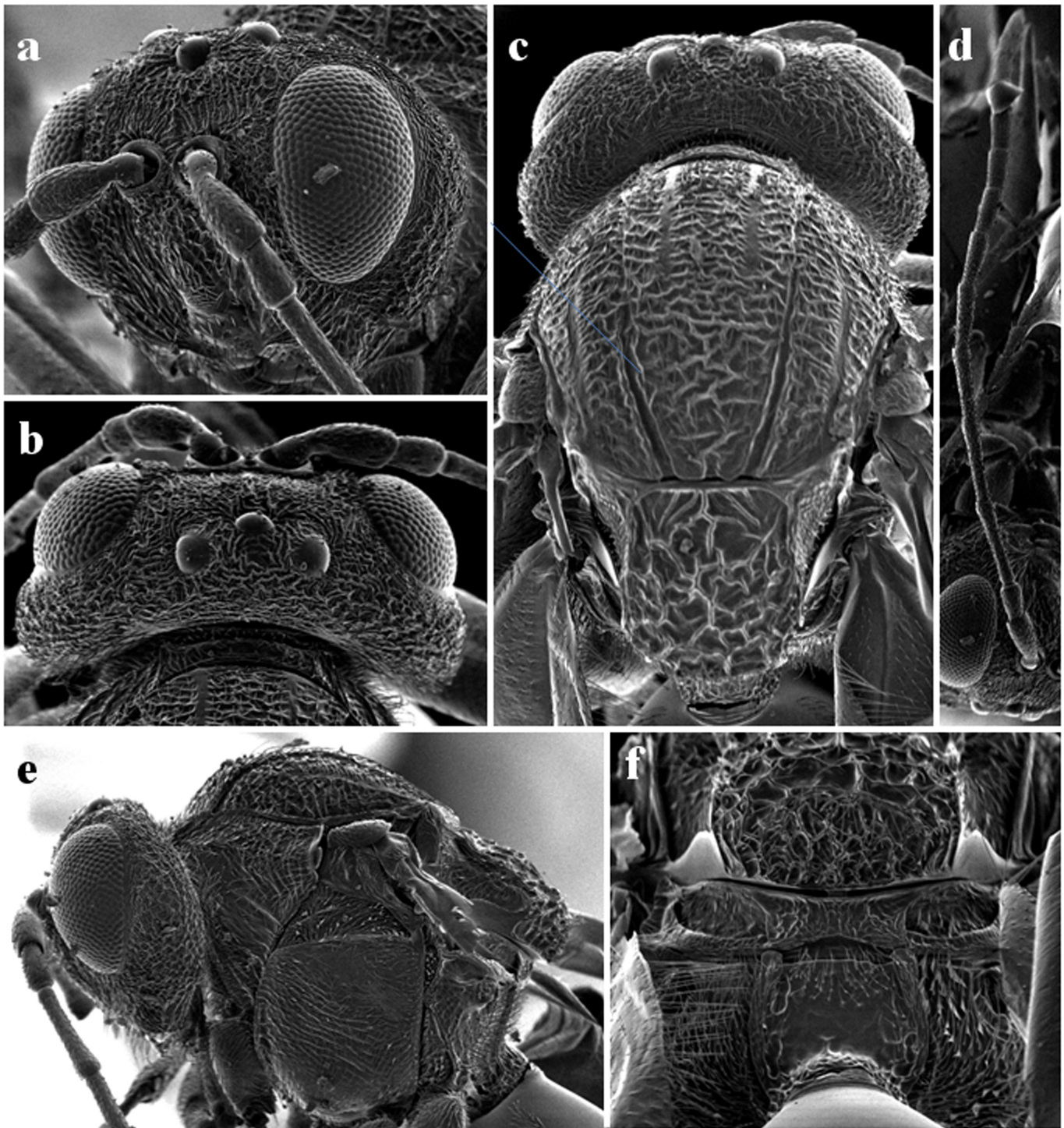


Figure 5. *Andricus furnaceus*. (a) Head in fronto-lateral view, (b) head in dorsal view, (c) head and mesosoma in dorsal view, (d) antenna, (e) head and mesosoma in lateral view, (f) propodeum.

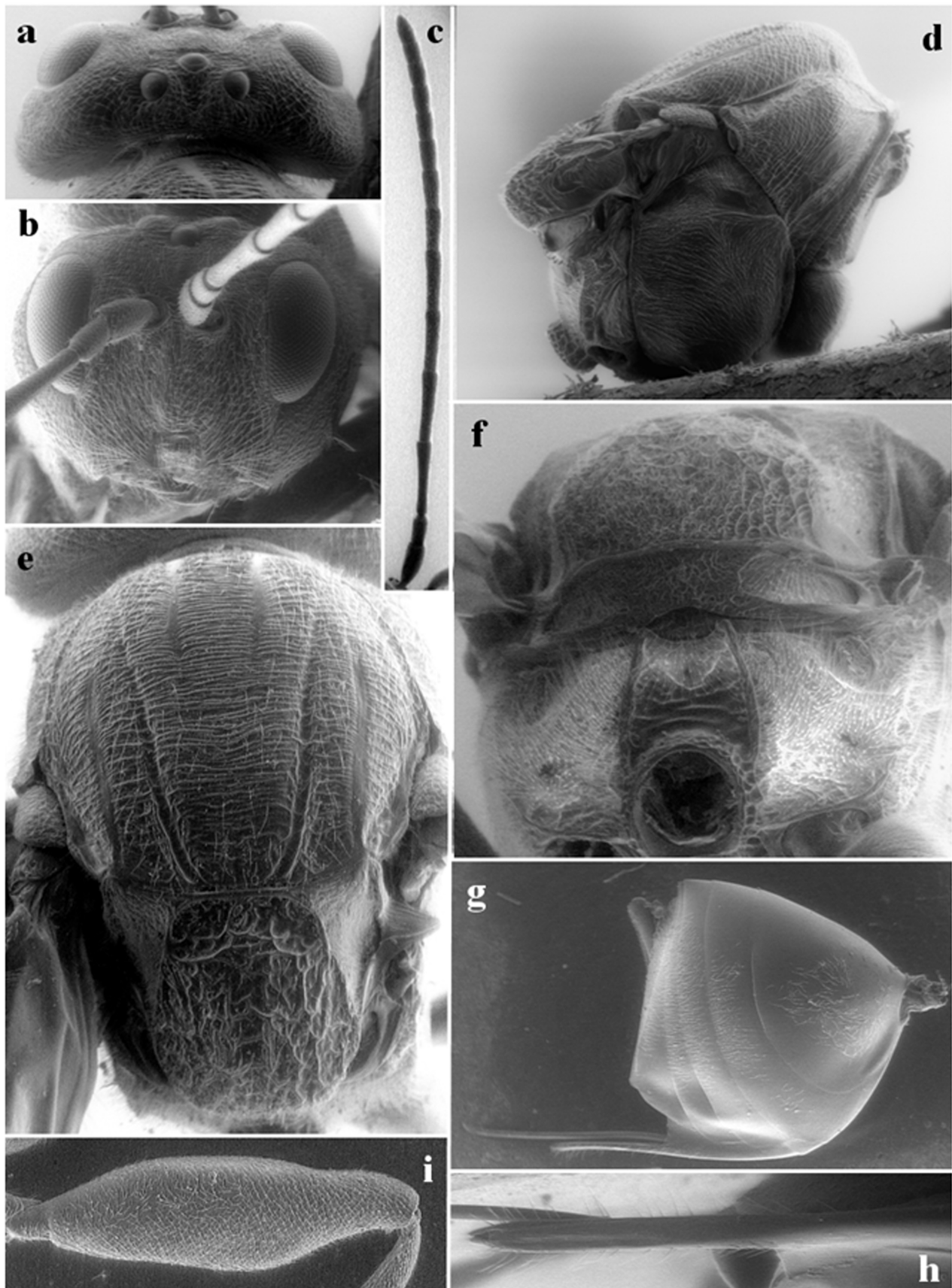


Figure 6. *Andricus guanajuatensis* n. sp. (a) Head in dorsal view, (b) head in frontal view, (c) antenna, (d) mesosoma in lateral view, (e) mesosoma in dorsal view, (f) propodeum., (g) metasomal in lateral view, (h) ventral spine of hypopygium in ventral view, (i) femur III.



Figure 7. *Andricus lebeaue* n. sp. (a) antenna, (b) head in dorsal view, (c) head in frontal view, (d) head and mesosoma in dorsal view, (e) propodeum, (f) head and mesosoma in lateral view.

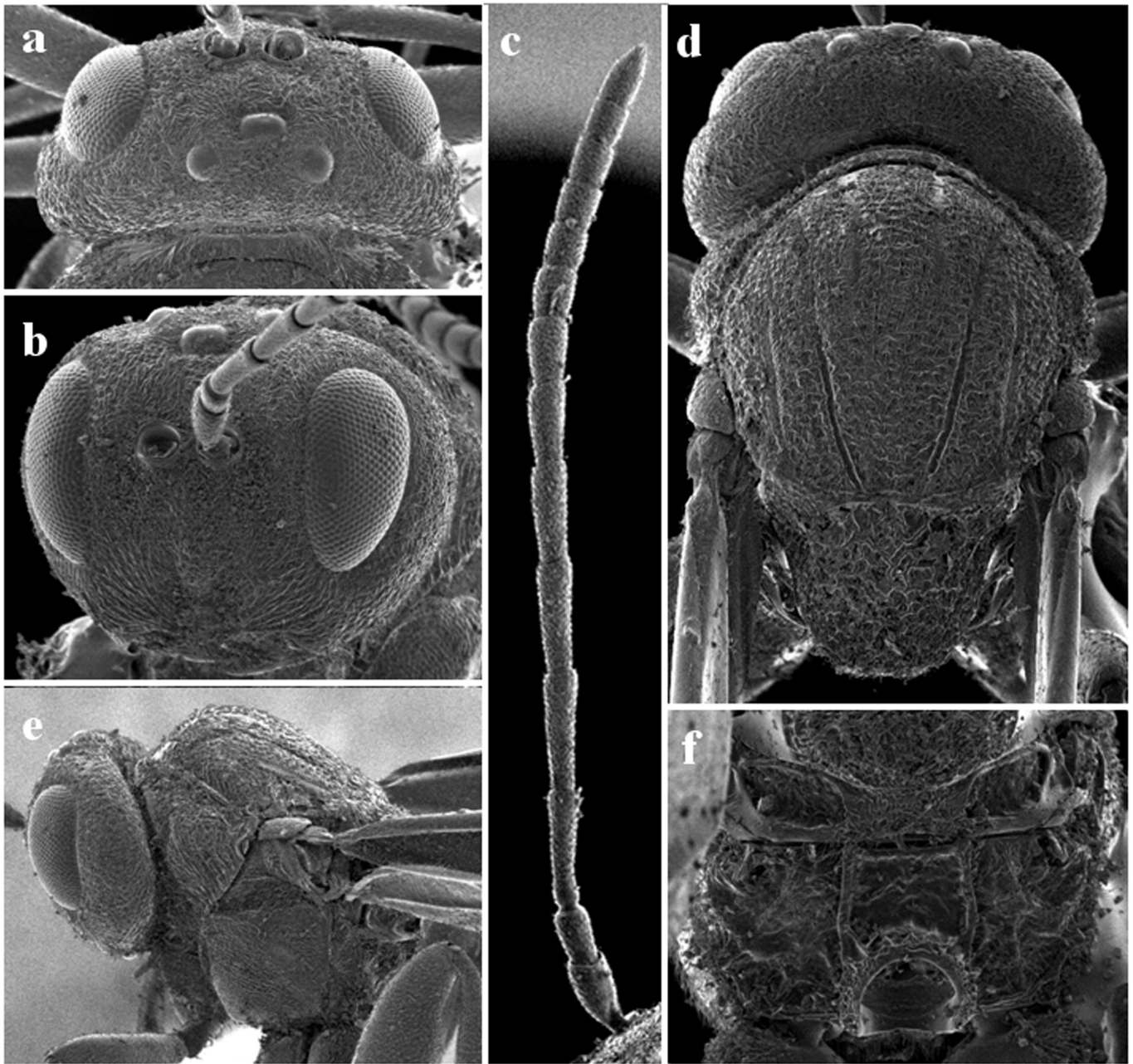


Figure 8. *Andricus montezumus*. (a) Head in dorsal view, (b) head in frontal view, (c) antenna, (d) head and mesosoma in dorsal view, (e) head and mesosoma in lateral view, (f) propodeum.

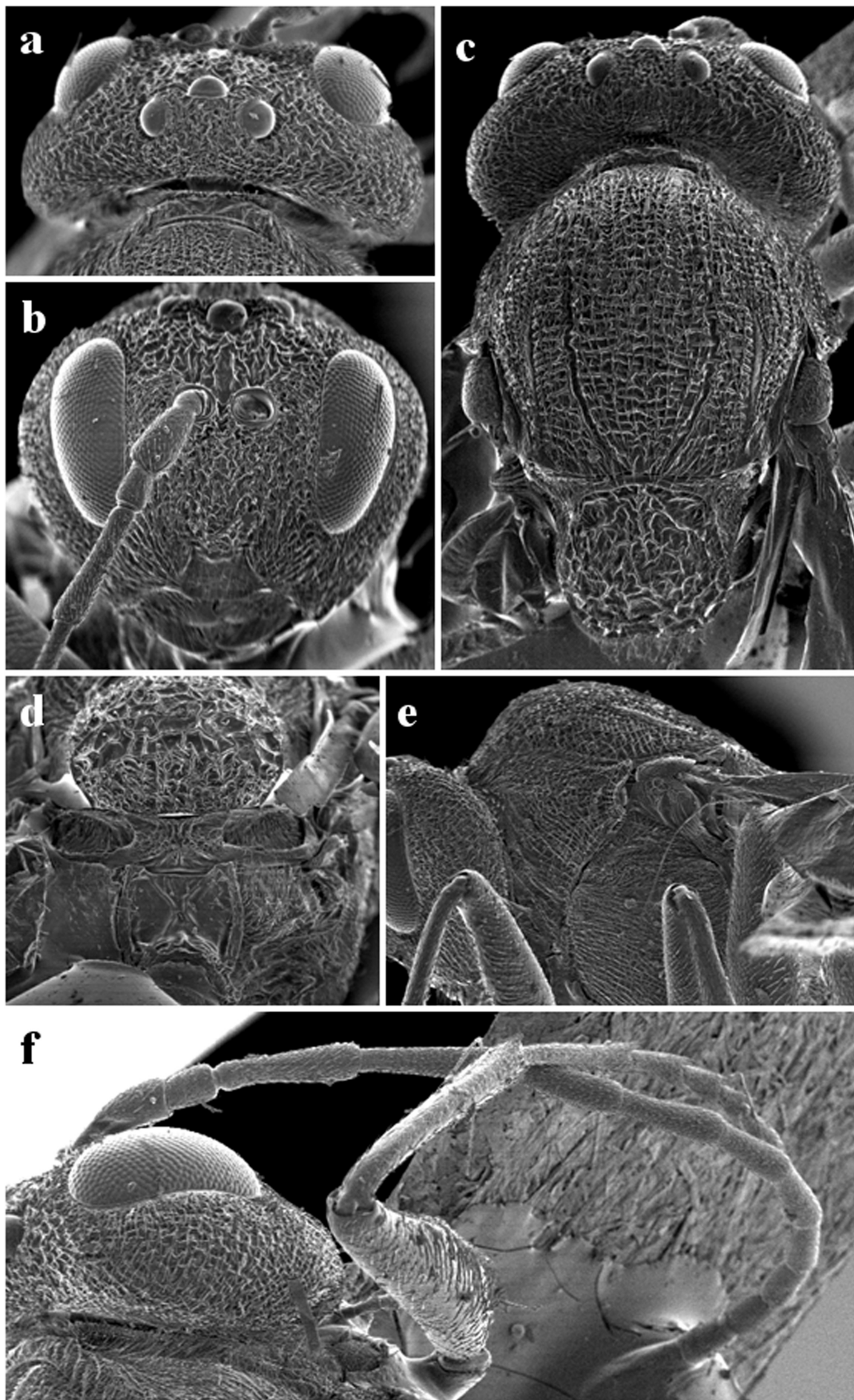


Figure 9. *Andricus peredurus*. (a) Head in dorsal view, (b) head in frontal view, (c) head and mesosoma in dorsal view, (d) propodeum, (e) head and mesosoma in lateral view, (f) antenna.

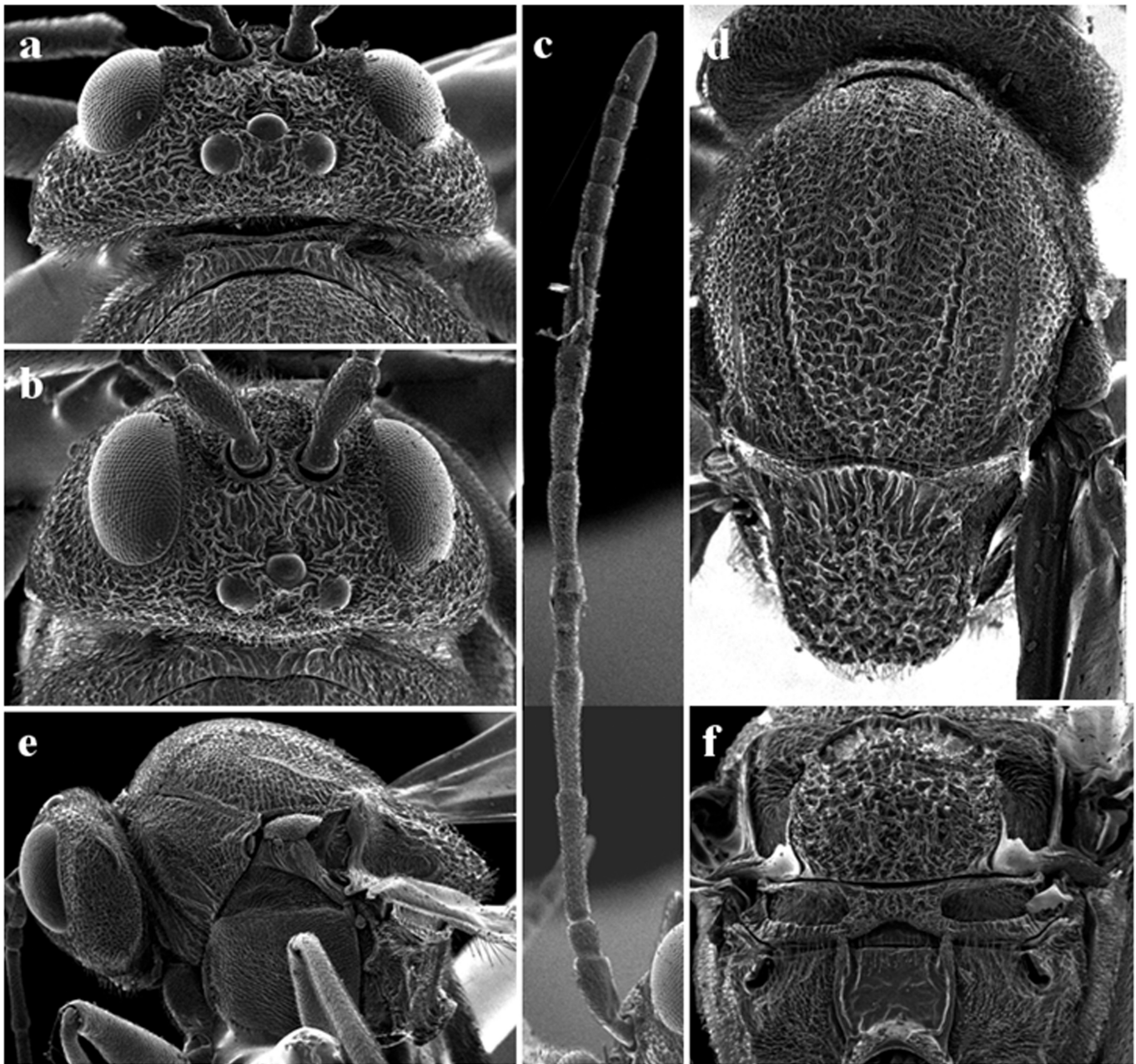


Figure 10. *Andricus santafe*. (a) Head in frontal view, (b) mesosoma in dorsal view (c) mesosoma in lateral view, (d) propodeum, (e) metasomal in lateral view, (f) antenna.

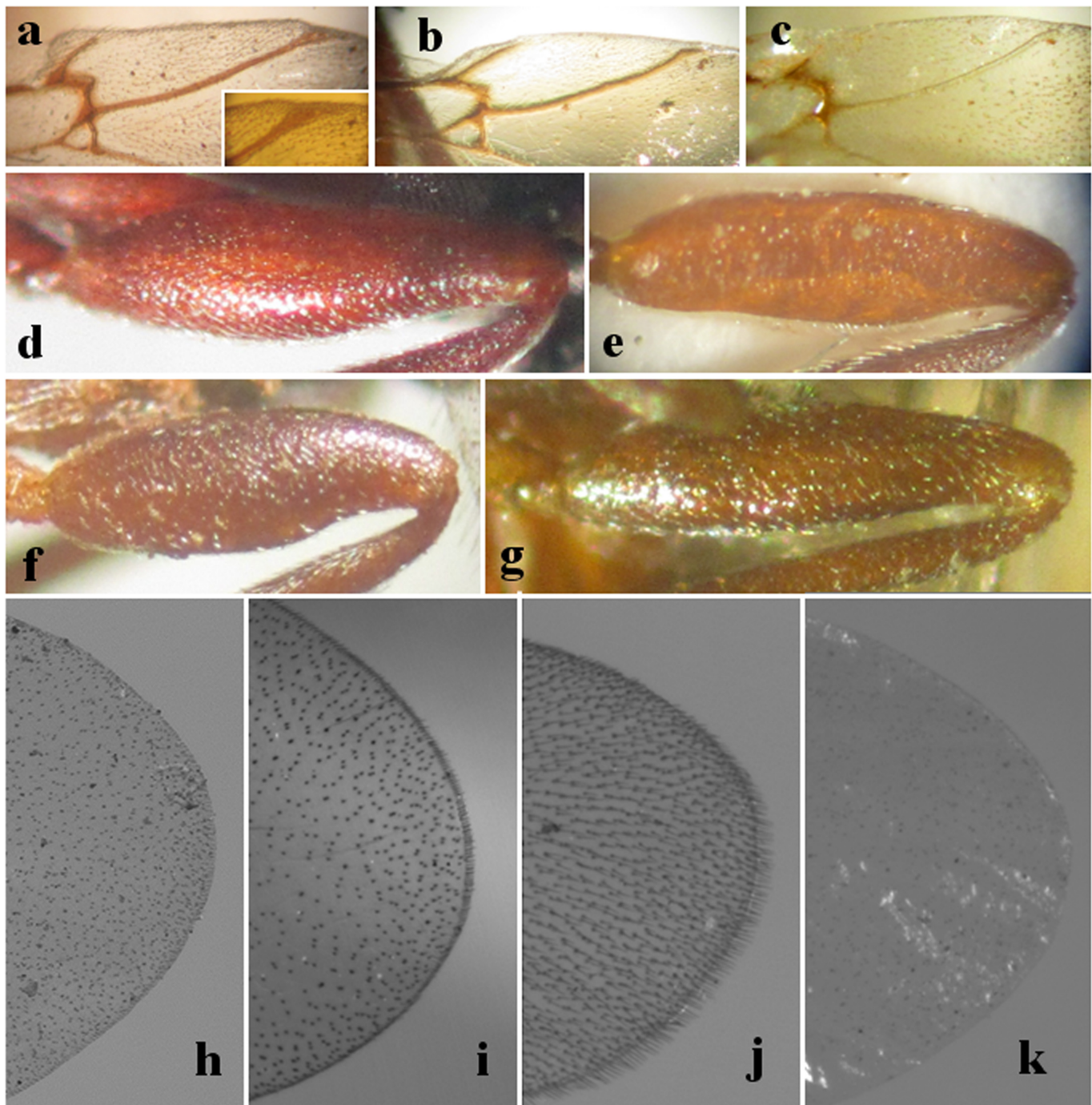


Figure 11. *Andricus tumeralis*. (a) Head in dorsal view, (b) head in frontal view, (c) antenna, (d) mesosoma in dorsal view, (e) head and mesosoma in lateral view, (f) propodeum.

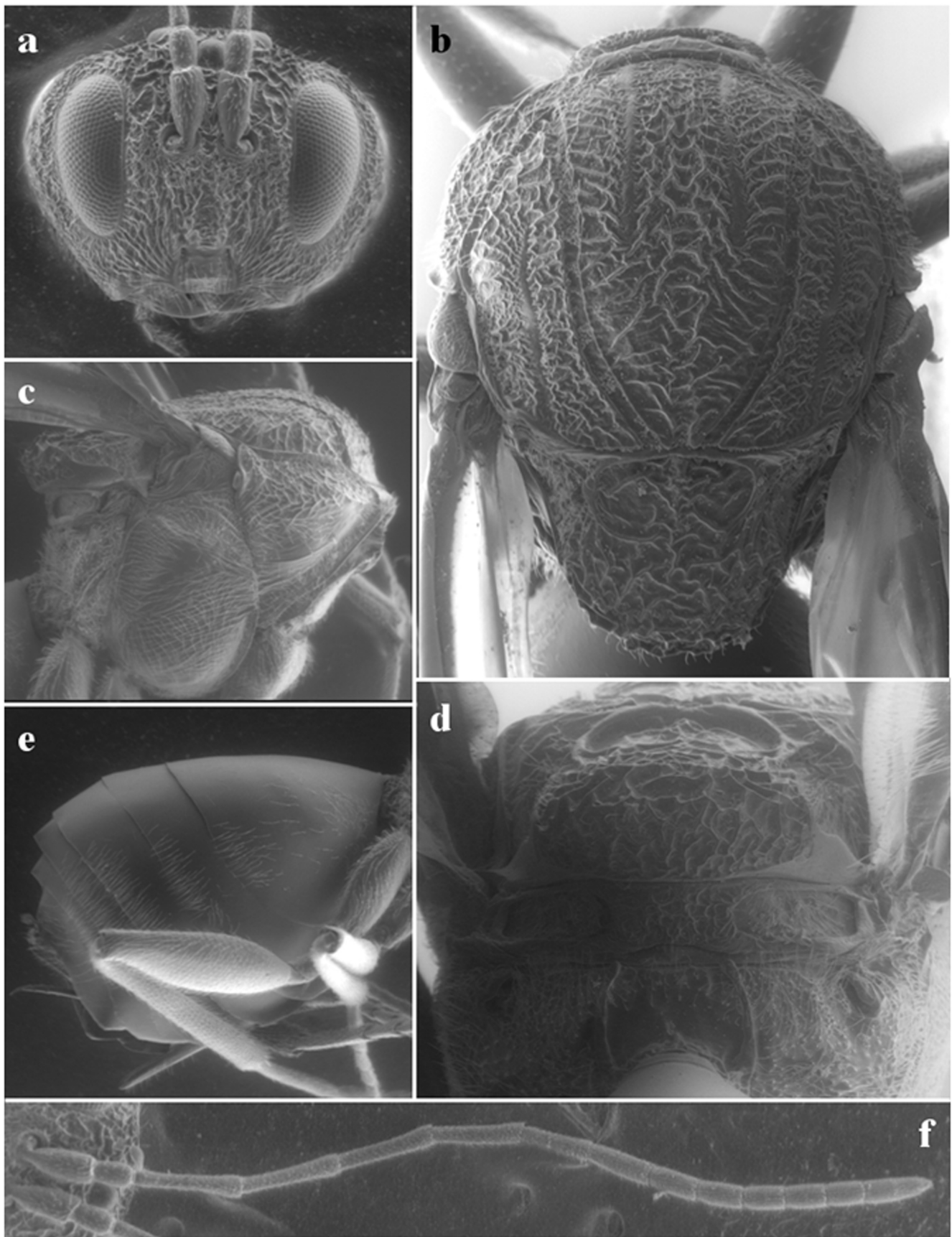


Figure 12. Radial cell of: (a) *A. tumeralis*, (b) *A. dugesi*, (c) *A. montezumus*; femur III of: (d) *A. tumeralis*, (e) *A. dugesi*, (f) *A. montezumus*, (g) *A. furnaceus*; anterior margin of forewing of: (h) *A. wheeleri*, (i) *A. tumefaciens*, (j) *A. furnaceus*, (k) *A. lebeaue* n. sp.

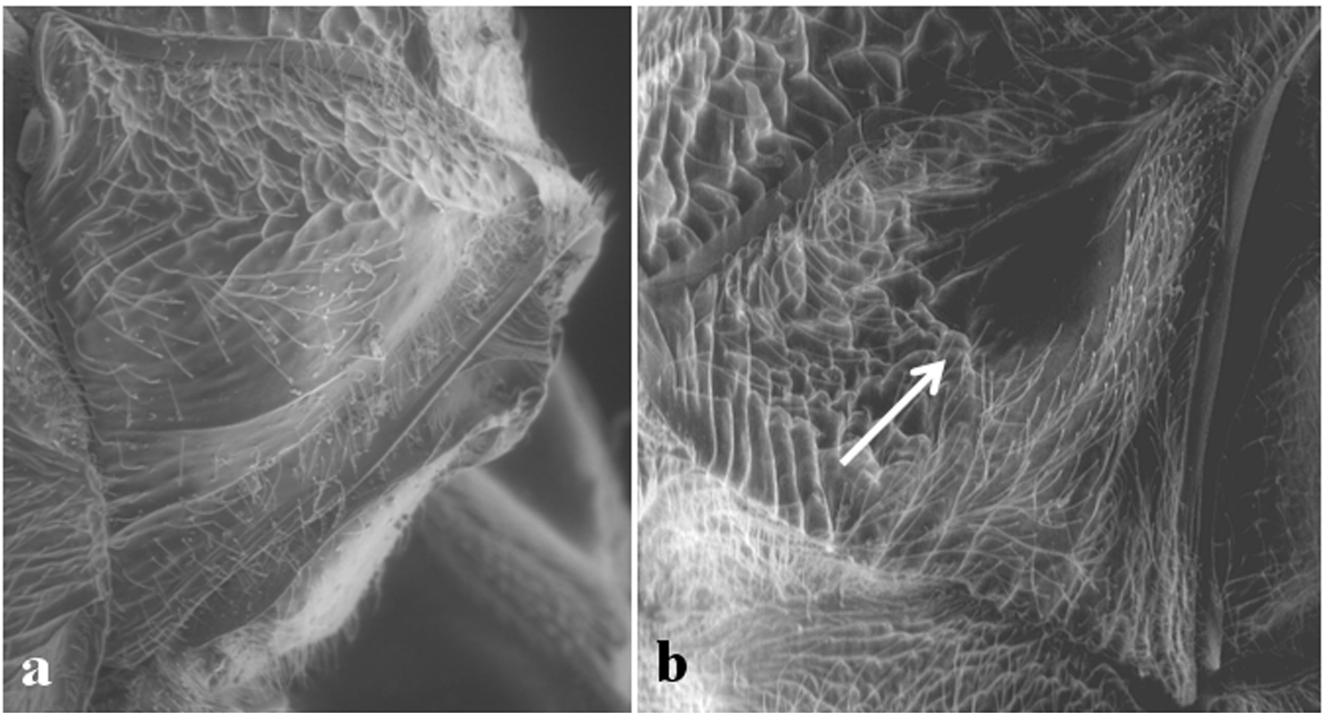


Figure 13. Pronotum in lateral view indicating the smooth area in the corner (a) *A. santafe* n. sp. and (b) *A. carrilloi* n. sp. (the arrow indicates the carina limiting this area)

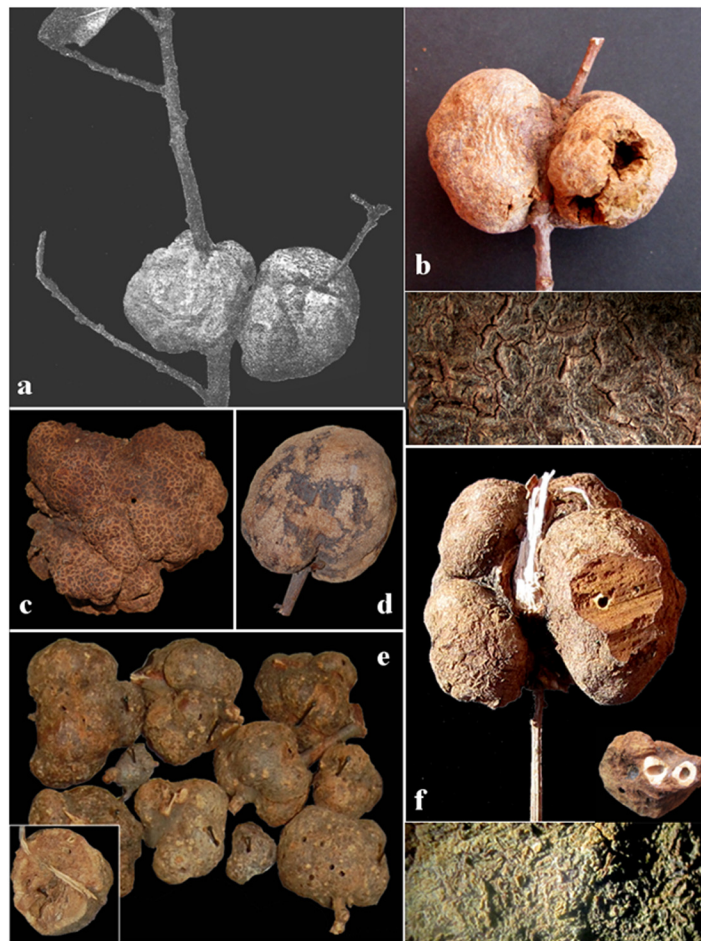


Figure 14. (a) Original gall of *A. bonanseai* from Mayr manuscript, (b) gall of *A. carrilloi* and surface wood, (c) *A. peredurus* gall, (d) *A. furnaceus* gall, (e) *A. lebeaue* n. sp. gall, (f) *A. guanajuatensis* gall, larval chambers and surface wood of *A. guanajuatensis* n. sp.



Figure 15. Gall and larval chambers of (a) *A. santafe* and (b) *A. dugesi*.