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Re-establishment of *Erythres* Kinsey, 1937 as a valid genus of gallwasps from Mexico (Hymenoptera: Cynipidae: Cynipini)

Reestablecimiento del género *Erythres* Kinsey, 1937 como género válido de avispas agalladoras de México (Hymenoptera: Cynipidae: Cynipini)

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ABSTRACT

The genus *Erythres*, from Mexico, is re-established as a valid genus after a detailed examination of the type material of two known species: *E. hastata* Kinsey, 1937 and *E. jaculi* Kinsey, 1937. The morphological characters to differentiate *Erythres* from other genera of oak gall inducers are given. The differences to recognize both species mentioned are commented. Data on the biology are also exposed.

Key words: Cynipidae, Cynipini, *Erythres*, Mexico, species, galls.

RESUMEN

Se reestablece el género *Erythres*, de México, como un género válido después de un examen detallado del material tipo de dos especies conocidas: *E. hastata* Kinsey, 1937 y *E. jaculi* Kinsey, 1937. Se exponen los caracteres morfológicos para diferenciar *Erythres* de los otros géneros de inductores de agallas de roble. Las diferencias para reconocer las dos especies mencionadas son comentadas. También se exponen datos sobre la biología.

Palabras clave: Cynipidae, Cynipini, *Erythres*, México, especies, agallas.

The genus *Erythres* was established by Kinsey (1937) for two species known from Mexico only, *E. hastata* Kinsey, 1937 and *E. jaculi* Kinsey, 1937. The type species of this genus, *E. hastata*, was established in the original description. Both species are known only from the asexual females. Later it was synonymized to the genus *Andricus* Hartig, 1840 (Melika & Abrahamson, 2002). The authors mentioned that “the only character separating it from *Andricus* is the presence of a simple tarsal claw” but it is not exactly so, some other important diagnostic characters, which *Andricus* genus is lacking, were omitted. In this study we discuss the morphological reasons to re-establish the validity of the *Erythres* genus.

MATERIAL AND METHODS

The type material of *E. hastata* and *E. jaculi* have been studied. The type material of *E. jaculi* is very scarce, according to the original description consists of three specimens, however, only the holotype and one paratype were located. By contrast, the type series of *E. hastata* is very large (more than 150 specimens according to the original description, 145 found). Some material collected from Zacatecas.

The material is deposited in the American Museum of Natural History (AMNH, New York City, USA; curator J. Carpenter), Plant Health and Molecular Biology Laboratory (PHMBL, Budapest, Hungary; curator G. Melika) and Barcelona University (UB, Barcelona, Catalonia; curator J. Pujade-Villar).

The 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. Optical images of wasp anatomy were produced with a Leica DFC450 Digital Microscope Camera

attached to a Leica DM2700 M compound microscope, followed by processing in LAS Montage MultiFocus System and Adobe Photoshop 6.0. Galls images were taken by J. Pujade-Villar with a Canon camera PowerShot SX210 15 followed by processing with Adobe Photoshop CS3 program.

RESULTS AND DISCUSSION

Andricus Hartig is a large genus with about 350 described species (Melika 2006). Melika & Abrahamson (2002) considered that *Dros* Kinsey, 1937; *Erythres* Kinsey, 1937; *Liodora* Förster, 1869, *Parandricus* Kieffer, 1906 and *Trichoteras* Ashmead, 1897 had to be included into the *Andricus* genus and synonymized all those genera to *Andricus*. All species in the *Andricus* genus are known to have tarsal claws toothed, except the two species of the synonymized *Erythres* genus. The tarsal claw is an important character to differentiate genera within Cynipini, however, according to several authors (Ronquist, 1999a, 1999b; Liljeblad & Ronquist, 1998) the presence of a basal lobe or tooth on a claw have evolved independently several times in different cynipid groups. Two cynipid genera, *Trigonaspis* Hartig, 1840 and *Callirhytis* Förster, 1869, include species with and without basal lobes on tarsal claws. All known *Andricus* species do possess a basal lobe on tarsal claws.

For this reason, exact differentiation of *Erythres* from *Andricus*, based only on the tarsal claw character states by far is not enough. Adults' morphology presents several peculiarities that allow us to affirm that *Erythres* is a valid genus, distinct from *Andricus*. *Erythres* species have the body with a very uniform finely punctato-rugose or rugose surface of the mesosoma and the head (Figs 1a-d; 2a-c, 2f-h), without any wrinkles and/or carinae (in

Andricus the sculpture of the mesosoma and different parts of the head always different, never the same on the head and mesosoma, usually with some wrinkles and carinae on the frons and in some part of the mesoscutum and/or mescutellum); the malar sulcus weak but present in a form of shallow impressed area right under the compound eye and nearly reaches the base of the mandible (Fig. 1a) (never present in *Andricus*); the forewing margins are not ciliate (only very few species possess this character in *Andricus*); notauli incomplete, distinct in the posterior 1/4-1/2 and obsolete in the anterior half, hidden by the sculpture; anterior parallel lines obsolete, hidden by the sculpture, however, well delimited by black stripes (Fig. 2a-c, 2f-h) (in *Andricus* notauli and anterior parallel lines distinctly delimited, never hidden by the sculpture of the mesoscutum); scutellar foveae are very narrow, with shiny bottom, fused, never delimited by carinae and not divided by a median carina (Fig. 2c, 2h) (in *Andricus* scutellar foveae usually are distinctly delimited by carinae and divided by a median carina). All of these characters allow us to affirm that *Erythres* is not a synonym of *Andricus*. The malar sulcus is a peculiar character which is present only in few genera, *Belonocnema* Mayr, 1881; *Biorhiza* Westwood, 1840; *Callirhytis* Förster, 1869; *Loxaulus* Mayr, 1881; *Neuroterus* Hartig, 1840 and *Trigonaspis* Hartig, 1840.

Erythres differs from all other Cynipini genera by the very uniform sculpture all over the mesosoma (pronotum, mesoscutum, mesoscutellum, mesopleuron, sides of propodeum), head (malar space, genae, lower face, frons and interocellar area) and even dorsal surface of legs (coxae, femora, tibiae). Only five genera of Cynipini, *Belonocnema*, *Callirhytis*, *Erythres*, *Loxaulus* and *Trigonaspis*, in the asexual generations have the next character combination: (i) the transscutal articulation present, (ii) tarsal claws are simple, (iii) the malar sulcus present, (iii) the prominent part of the ventral spine of the hypopygium needle-like, long, never broadened till the apex, and (iv) adults are fully winged. *Belonocnema* differs from *Erythres* by the apex of the fore tibia, which extends far behind the base of fore tarsomere I, and the 2nd abscissa of Rs is strongly curved. *Trigonaspis* differs from *Erythres* by the smooth mesoscutum and deep and complete notauli. *Callirhytis* 'sensu Förster' differs from *Erythres* by the presence of parallel transverse carinae on the mesoscutum. Finally, *Loxaulus* differs from *Erythres* also by the finely transversely coriaceous sculpture of the mesoscutum and the presence of the median longitudinal carina in the central part of the propodeum and the short prominent part of the ventral spine of the hypopygium which is always less than 3.5 times as long as broad while in *Erythres* is always longer.

The galls are monolocular and very peculiar in shape, represented by cone-like clusters, each gall of which enclosing a small larval cell (Fig. 3). They are some similar to the cone-like galls which are induced by some Cecidomyiidae (Diptera), *Andricus quercusfoliatus* (Ashmead, 1881), *A. stropus* Ashmead, 1887 and *A. cinnamomeus* Ashmead, 1887 from the Nearctic; *A. foecundatrix* (Hartig, 1840) from the Western Palaearctic and *A. mukaigawae* (Mukaigawa, 1913) from the Eastern Palaearctic, nevertheless, the adults of *Erythres* are quite distinct from all of mentioned species. The other very important difference between

Erythres and mentioned *Andricus* species are the host oaks. *Erythres* species are known only from red oaks (section Lobatae of *Quercus* L.), while all the listed *Andricus* species are associated with white oaks only (section Quercus of *Quercus*).

For all the above-mentioned characters we think that *Erythres* is a valid genus, and do not corresponds to any other Cynipini genus. The description of the genus given by Kinsey (1937: 461-462) is enough detail to recognize it. *Erythres* can be defined by the next characters: the body is robust, 2.5–3.5 mm in length; the lower face without striae radiating from clypeus, entire head uniformly rugose-punctate; the malar sulcus indistinct but present; genae are broadened behind the compound eyes (Figs 1a-d); antennae with 13 flagellomeres (sometimes F12 and F13 partially are fused) (Fig. 1e); the mesoscutum coarsely granular to rugose-punctate; notauli incomplete, well impressed in the posterior 1/4-1/2, less distinct or obsolete in the anterior half (Fig. 2a-b, 2f-g); the mesoscutellum is rounded with a uniform surface sculpture similar to that of the mesoscutum; scutellar foveae are very narrow, fused, not divided by a median carina, with shiny dark bottom (Fig. 2c, 2h); lateral propodeal carinae bended outwards, delimiting a transversal central coriaceous area (Fig. 2d, 2i); forewings smoky yellow, without cilia on margins, with distinct closed areolet; legs rugose-punctate on dorsal parts, tarsal claws are simple; all metasomal tergites with dense whitish setae laterally; the prominent part of the ventral spine of the hypopygium long, more than 8.0 times as long as broad (Fig. 1g).

Erythres includes two species: *E. hastata* and *E. jaculi*. Both species are very similar. They can be differentiated by the next characters: anterior parallel lines and parapsidal lines are superficial but visible in *E. hastata* (absent but indicated by black stripes in *E. jaculi*), notauli broad and distinct in the posterior 1/3-1/2 and obsolete in the anterior half in *E. hastata* (notauli narrow and distinct only in the posterior 1/4-1/3, absent in the anterior part of the mesoscutum in *E. jaculi*); areolet of a usual size in *E. hastata* (Fig. 2e) (much bigger in *E. jaculi*, Fig. 2j); metascutellum curved ventrally in *E. hastata* (Fig. 2d) (straight in *E. jaculi*, Fig. 2i); scutellar foveae are small and narrow but always distinctly impressed, with shiny bottom in *E. hastata* (very superficially impressed, with sculptured bottom in *E. jaculi*). Kinsey differentiated the two species by different colour patterns, however, both species are similar in this aspect (length of black stripes can strongly vary in *E. hastata* specimens). The galls are also different in shape but associated with the same oak host. *Erythres hastata* has an elongated gall and was collected by Kinsey on *Q. castanea* Née (= *Q. serrulata* Trel.) known from Michoacán and Zacatecas (Figs 3a, c) and *E. jaculi* has a thicker gall also on *Q. castanea* (= *Q. rossii* Trel.) known from Jalisco (Fig. 3b).

Erythres jaculi and *E. hastata* are morphologically very similar, as we have commented, and have the same host, then, it is possible that they could be the same species; nevertheless, we accept both species since they have different shape of galls (Fig. 3). More *E. jaculi* specimens must be studied in order to solve this problem. Since Kinsey descriptions, only *E. hastata* was collected from *Q. eduardii* Trel. (Fig. 3c) and *Q. viminea* Trel. (Pujade-Villar *et al.*, 2013: Fig 3a). These two new host records with the earlier known one, *Q. castanea*, all belong to the section Lobatae of *Quercus* L.,

and thus *Erythres* related only to the red oaks. *Quercus eduardii* and *Q. viminea* are known only from Mexico, while *Q. castanea* is known also from Guatemala and El Salvador (Govaerts & Frodin, 1998) and thus it is possible that *Erythres* species can be found south of Mexico also.

Material examined: Type material of *Erythres jaculi*: the HOLOTYPE is deposited at the AMNH, with the following labels: "13SW, Sayula, Jal., 1700', Mex, 12.21.31 3.20.32, 3♀" (handwritten, white label), "Q. rossii Kinsey col." (handwritten, white label), "Erythres jaculi Holotype" (handwritten in this form, red label); one PARATYPE designated by A. Kinsey with the same labels as the holotype, deposited at the PHMBL collection.

Distribution: Jalisco (Mexico).

Type material of *Erythres hastata*: the HOLOTYPE is deposited at the AMNH, with the following labels: "Zacapu IIE, Mich. 8000', Mex. Gall 12.20.31', 'Q. serrulata 136 fm. 2.10.32, Kinsey coll." (handwritten, white label) and a red label "Erythres hastata, Holotype (handwritten in this form, red label)"; 4 PARATYPES with the same labels as the holotype, deposited at the PHMBL collection; 141 female paratypes were designated by A. Kinsey which were studied by GM at the AMNH. **Additional examined material of *E. hastata*** (deposited UB): MEX (ref. 92), Las Cuevitas (Monte Escobedo, Zac.), *Q. viminea* Trel., (7.x.2011) 11.ii.2012: 5♀. MEX (ref. 92), Las Guacamayas (Monte Escobedo, Zac.), *Q. eduardii* Trel., (17.x.2011) 11.ii.2012: 1♀ [Carlos Carrillo Sánchez, coll. in both cases].

Distribution: Michoacán, Zacatecas (Mexico).

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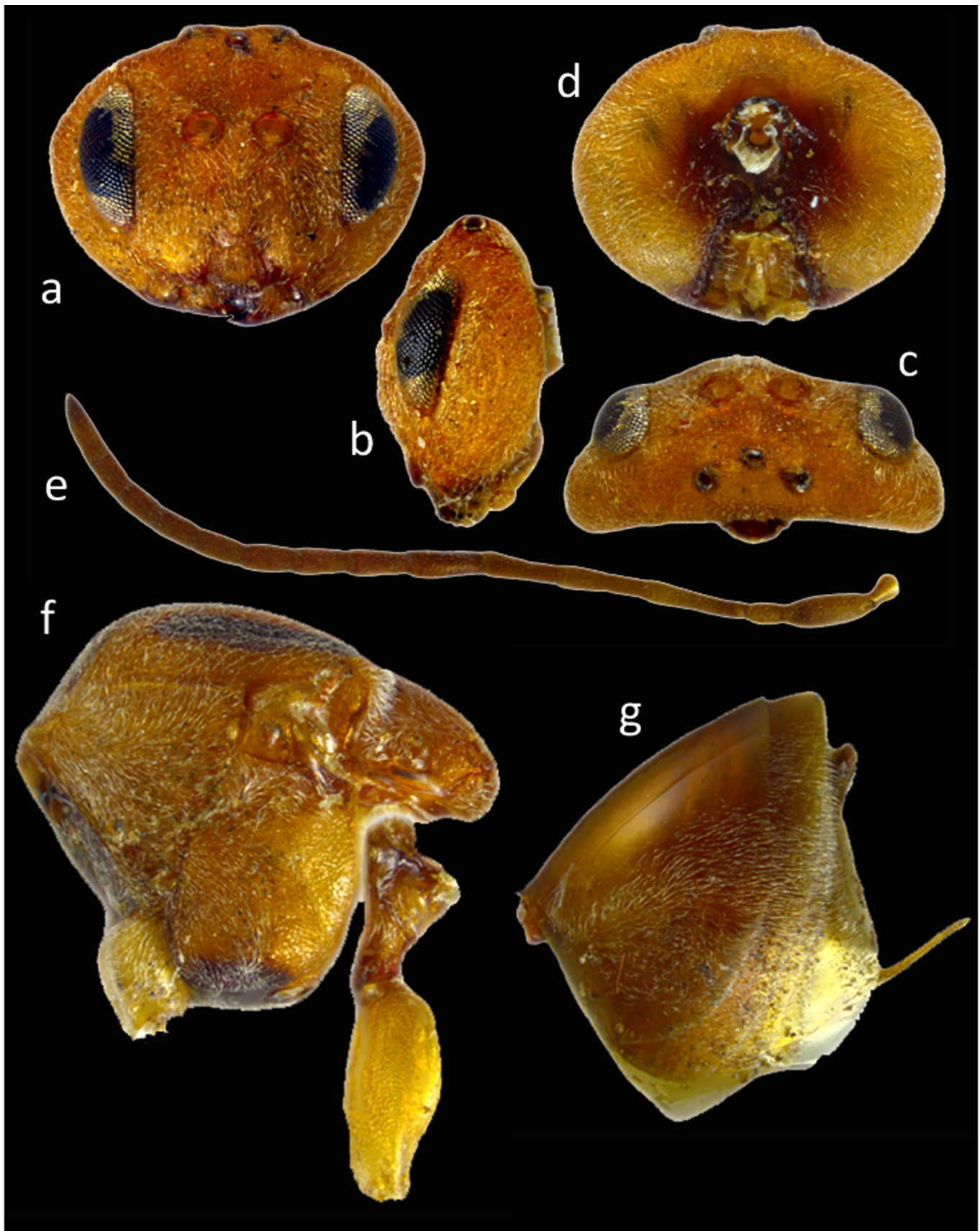


Figure 1. *Erythres hastata*, asexual female: (a) head front view, (b) head lateral view, (c) head dorsal view, (d) head posterior view; (e) antenna. (f) mesosoma, lateral view, (g) metasoma, lateral view.

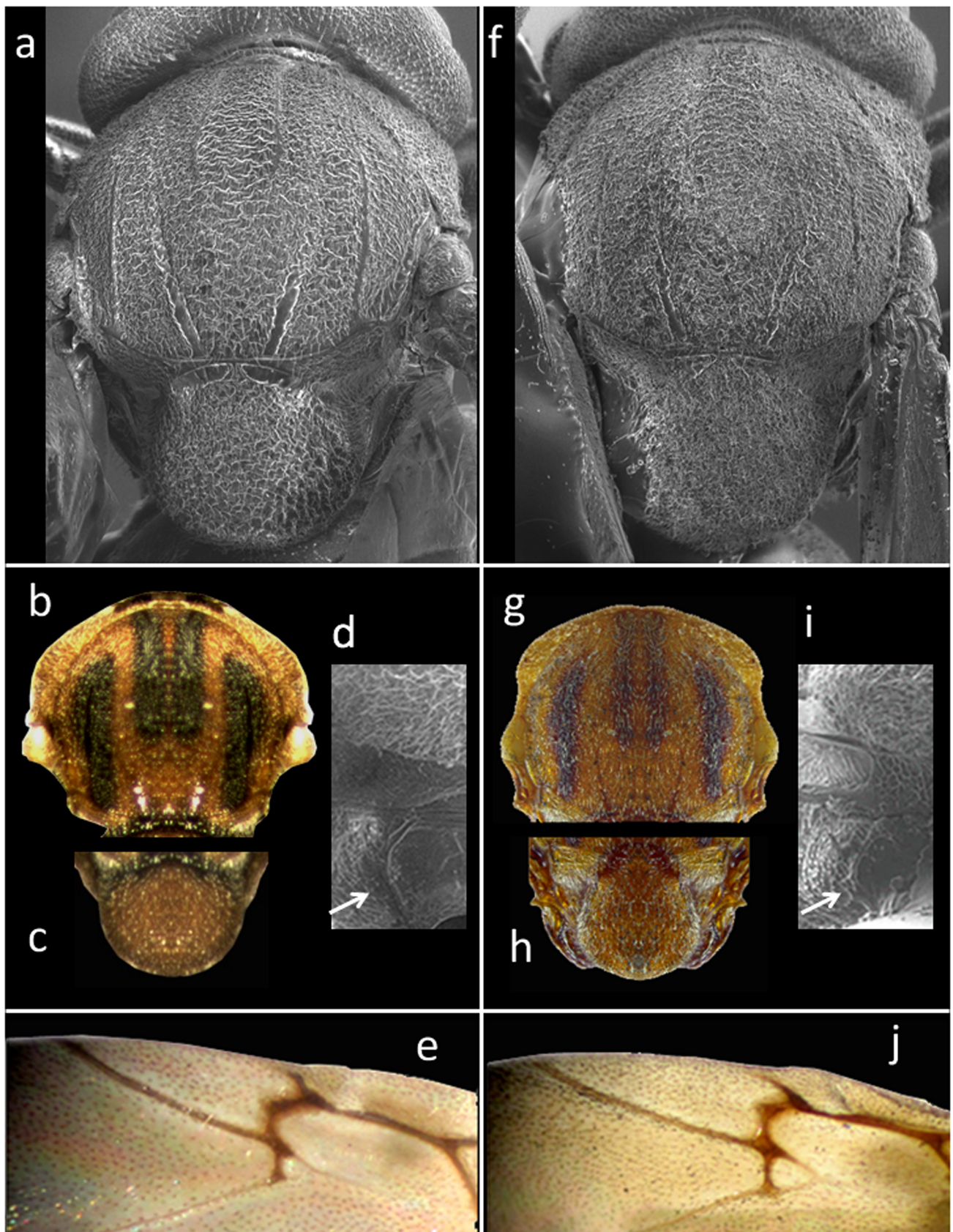


Figure 2. *Erythres hastata* (a-e) and *E. jaculi* (f-j) asexual females: (a, f) SEM mesoscutum in dorsal view (f: holotype material), (b, g) optical mesoscutum in dorsal view (paratype material), (c, h) optical mesoscutellum in dorsal view (paratype material), (d, i) propodeum (e, j) radial cell and areolet of the forewing.



Fig. 3. Galls of *Erythres*: (a) *E. hastata* from the Kinsey collection (AMNH, NYC), (b) *E. jaculi* from the Kinsey collection, and (c) galls of *E. hastata* collected from Zacatecas.