

A new species of *Josephiella* (Hymenoptera: Agaonidae) forming leaf galls on *Ficus microcarpa* L. (Moraceae)

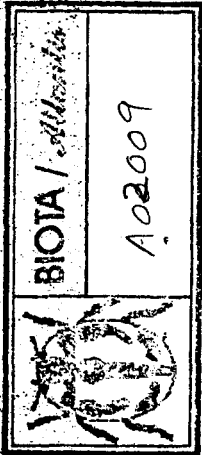
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A second species of *Josephiella* Narendran, *J. microcarpa*, is described and figured, based on specimens reared in Hawaii, California and the Canary Islands. This wasp develops in galls on the leaves of *Ficus microcarpa* L., a widely cultivated ornamental banyan tree that is native to South-East Asia and adjacent islands. It has not been found on any other hosts. Both sexes are described, and males, which are apparently all fully winged, are relatively rare. We postulate that this wasp is a recent introduction into Hawaii, California and the Canary Islands, from an unknown location in South-East Asia, where *Ficus microcarpa* is native.

KEYWORDS: Agaonidae, Epichrysomallinae, *Josephiella*, new species, pest, *Ficus*, Moraceae.



Introduction

In May 1989, the first author noticed for the first time the presence of small, pustule-like galls on the leaves of a common ornamental *Ficw* tree, *F. microcarpa* L. (figure 1) on the campus of the University of Hawaii in Honolulu. Specimens of an Epichrysomallinae agaonid wasp that emerged from galled leaves held in the laboratory were identified as possibly a species of *Camarothorax* by E. Grissell at the US National Museum in Washington, DC (Beardsley, 1992). Specimens were sent also to Z. Bouček at the Natural History Museum in London. Bouček (1997: 119) referred briefly to the species stating '...one species of *Acophila* Ishii (Epichrysomallinae), found recently in Hawaii, is believed to produce galls on the leaves of a *Ficw*'. In September 1997, the same wasp was discovered forming leaf galls on *F. microcarpa* at Santa Ana, California by J. N. Nisson (Anon., 1998). In October 1997, the species had spread as far as the Canary Islands (Spain), where it was found causing heavy infestation on foliage of cultivated *F. microcnrpa* in Tenerife

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line. Antennal formula 11(1)53 (the annellus hardly visible in *J. microcarpae*). Scape short not reaching the median ocellus. Occipital carina absent (in dried specimens of *J. microcarpae*, the occiput may be partly collapsed and a consequent crease misinterpreted as a carina). Axillar grooves shallow or obliterated. Tarsi four-segmented. Stigmal vein longer than marginal vein. Stigmal vein at an angle of about 90°. Marginal fringe present.

Josephiella clearly differs from *Acophila* in having four-segmented tarsi (vs five-segmented), bilobed clypeus (vs truncate). Antennae inserted above the ocular line (vs inserted below the ocular line). Occipital carina absent (vs clearly visible). Scutellum without distinct punctures (vs with punctures). Marginal vein about as long as the stigmal (vs marginal clearly longer than the stigmal). Stigmal vein at an angle of about 90° (vs stigmal vein at an angle less than 90°). Marginal fringe present (vs absent).

The closest genus to *Josephiella* is *Odontofroggattia* Ishii. In the key to genera of Nearctic Agaonidae (Bouček, 1997), couplet 10(8) should be altered as follows to allow identification of these genera:

- 10(8) Stigmal vein at a right angle to wing margin and about as long as marginal vein, the postmarginal vein very short and stub-like; body brown to yellow, shiny; tarsi 4-segmented EPICHRYSOMALLINAE, 10'
 - Stigmal vein more or less at an acute angle to wing margin and shorter, etc. . 11
- 10'(10) *Female*: head transverse. Antennal formula 1163, scape long, reaching the median ocellus. Supraclypeal area not delimited. Scutellum bearing 2 x 2 setae. Axillar grooves well marked. *Male*: mandible long and falcate. Petiole apparent, sometimes with a ventral hook or lateral teeth *Odontofroggattia* Ishii
 - *Female*: head subglobose (figure 3C). Antennal area formula 11(1)53 (figure 2A), the annellus hardly visible in *J. microcarpae*; scape short, not reaching the median ocellus. Supraclypeal area well delimited, subquadrate (figure 2B). Scutellum bearing at least 2 x 3 setae. Axillar grooves shallow or obliterated (figure 2D). *Male*: mandible normal. Petiole short *Josephiella* Narendran

In the key to the Oriental genera of Epichrysomallinae (Narendran and Sheela, 1996), the new species described here will run to the genus *Josephiella* only with difficulty. In the first couplet of their key these authors refer to the relative widths of the anterior margin of the scutellum and posterior margin of the midlobe of the mesoscutum. In the new species described below, the sutures that define these sclerites are weakly developed, and not easily seen; they are well defined in the type species. However, in specimens of the new species in which the axillary sutures are discernible, they intersect the transscutal articulation close together near the midline, as in the type species of *Josephiella*. The species described here shares another important, apparently apomorphic character with the type species of *Josephiella*: the unusual habit of developing within leaf galls.

Josephiella microcarpae, sp. n.
 (figures 2-4)

Female (figure 4B). Length of holotype 2.2 mm. Body uniformly dark brown; antennae and legs, including coxae, mostly pale yellow, femora slightly darkened, pretarsi dark; wings hyaline, veins pale yellow-brown, semi-transparent; mouthparts pale. Body weakly sclerotized, gaster and mesosoma tending to collapse and shivel

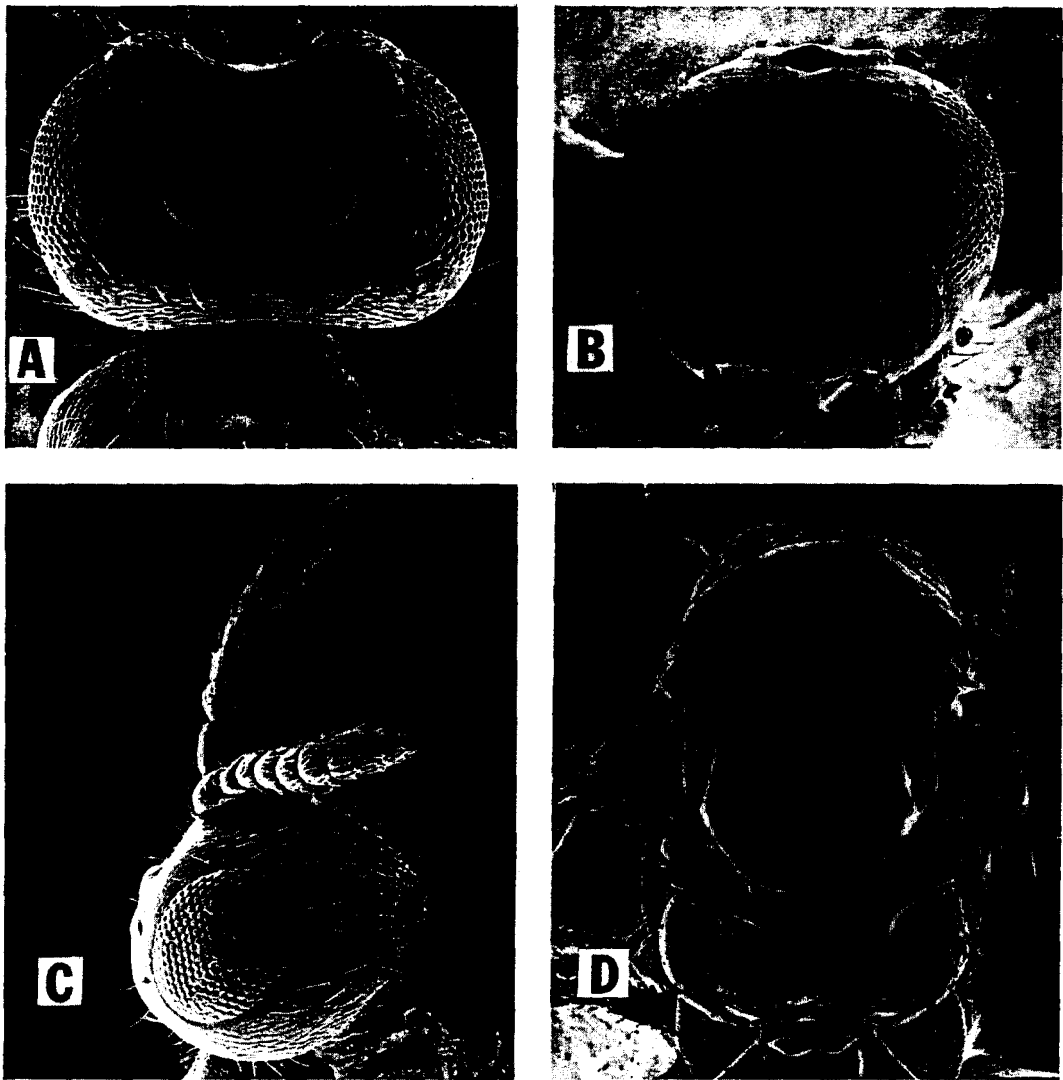


FIG. 3. *Josephiella microcarpae* sp. n. female. (A-C) Head. (A) Dorsal; (B) frontal (antennae removed); (C) lateral; (D) dorsum of mesosoma and base of gaster.

of anteriorly directed spiracular foveae. Hind coxae (figure 3D) with dorsal surfaces reticulate. Gaster smooth and shining.

Setae of head and mesosoma sparse, distributed as in *J. malabarensis*, but apparently more elongate, those of face averaging about $45-55\ \mu\text{m}$ long (figure 3A-C). Longer setae of mesosoma mostly $60-75\ \mu\text{m}$ long; sparsely scattered, and in a continuous row (*ca* 10) on posterior margin, on pronotum; less numerous on mesonotum. Mesonotum with one conspicuous pair of forward directed setae near posterior margin and three or four laterally on each side; axillae each with one such seta; scutellum with two pairs of elongate setae sublaterally, one near posterior margin and one near midlength; a few short inconspicuous short setae ($12-15\ \mu\text{m}$) present on scutellum and axillae, particularly laterally. Gaster largely bare, with a few fine setae in transverse line on each tergite.

Head globular, in dorsal view (figure 3A) wider than long (*ca* 7:4), ocelli in broadly obtuse triangle, area between them slightly raised and flattened, distance

Fore wing (figure 4A, B) hyaline, with venation very similar to *J. malabarensis*, marginal vein shorter than stigmal, postmarginal *ca* one-half as long as marginal; with *ca* six large setae on submarginal vein, two on marginal and one at apex of postmarginal; marginal and postmarginal with several smaller setae; discal setae of wing sparse, as in *J. malabarensis*, mostly small (*ca* 6 μm , long) and somewhat spiniform; apical fringe setae short (*ca* 15–18 μm long), moderately dense.

Legs similar to *J. malabarensis*; hind tibia (figure 2D) with a comb of five slightly curved spines on inner face near apex, a series of *ca* eight spines and several long setae on outer margin.

Gaster globular, dorsally humped and nearly as long as head plus mesosoma combined when distended with ova, rarily sessile, the petiolar segment much broader than long (figure 3D), hypopygium not reaching apex.

Male. Fully winged, similar to female in colour and form, except for slightly smaller average size (length of allotype 1.1mm), and details as follows: Antenna (figure 2B) shorter (*ca* 480 μm long) with three funicle segments plus very narrow anellus (as in female); club distinctly two-segmented, basic three-segmented condition indicated by marginal constriction and sensory plates. Gaster less strongly developed, relatively flat, elongate-oval in dorsal outline, about as long as mesosoma; genitalia (figure 2E) well developed, with conspicuous digiti and digital spines.

Holotype female and male allotype. **Hawaiian Is.: Oahu I.**: Honolulu, University of Hawaii, nanoa, July 1994 (J. W. Beardsley) ex leaf galls on *Ficus microcarpa*. Paratype: **Hawaiian Is.: Kauai I.**: Alexander Dam, 2 February 1992 (A. Asquith), galls on *Ficus* leaves. **Molokai I.**: Kualapuu in coffee field, 30 September to 14 October 1994, W. D. Perreira coll., blue sticky board trap (1 female); napulehu nr. Iliiopae Heiau, el. 60 ft, J. W. Beardsley and W. D. Perreira colls., sweeping (1 male); 22 July 1994, W. D. Perreira coll., reared ex leaves of *Ficus microcarpa* (3 females, 2 males); naunaloa, el. *ca* 1200 ft, 24 June to 8 July 1994, W. D. Perreira and M. Fukuda colls., yellow sticky board trap (2 females). **Oahu I.**: Honolulu, U. H. Manoa Campus, el *ca* 60 ft, 30 May 1989, J. W. Beardsley coll., reared ex leaf galls on *Ficus microcarpa* (30 females); same place as holotype and allotype (1 female, 2 males); Honolulu, U. H. Manoa, 28 June 1989, W. Nagamine coll., ex *Fictis retusa* (= *F. microcarpa*) (4 females, USNM); Honolulu, McCully St. overpass, el. *ca* 60 ft, 8 October 1994, J. W. Beardsley coll., reared ex leaf galls on *Ficus microcarpa* (15 females); Konahuanui, el. 3100 ft, 14 February 1993, W. D. Perreira coll. (2 females).

California: Orange County: Santa Ana, 3 October 1997, J. N. Nisson coll., reared from leaf galls on *Fictis microcarpa* (5 females); Orange, 12 November 1997, J. N. Nisson and B. Sanford colls., reared ex leaf galls on *Fictis microcarpa* (3 females, 2 males).

Canary Islands: Tenerife: 1997, IIE 23716, in galls on *Ficus nitida* (= *F. microcarpa*) (3 females).

Holotype and allotype deposited in B. P. Bishop Museum, Honolulu, Hawaii. Paratypes in Bishop Museum and Hawaii Department of Agriculture, Honolulu, in California Department of Food and Agriculture, Sacramento; USNM Washington; National History Museum in London; INRA collection Montpellier.

The new species can be easily separated from *J. malabarensis* Narendran by the very small annellus, hardly visible (vs well developed); the notauli obliterated (vs visible) and the gaster globular, not laterally compressed.

All rearings of these wasps in Hawaii yielded predominantly females, and in