

THE FLORIDA FIG WASP, *SECUNDEISENIA MEXICANA*
(ASHM.), AND SOME OF ITS HYMENOPTEROUS
SYMBIONTS

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Two species of fig wasps of the chalcidoid family Agaonidae are known from North America. One of these, *Blastophaga psenes* (Linn.), is rather well known as the essential pollinator of the commercial Smyrna Fig in California, occurring there as an introduction from Smyrna in 1890 for this purpose (Condit 1922). The other species, *Secundeisenia mexicana* (Ashm.), is a non-economic form first described in 1904 from fruits of the native Florida *Ficus curea*. These two species are similar in appearance, but are distinct in the pattern of their wing venation and in other minor morphological characters.

The Florida Fig Wasp occurs abundantly in the fruits of our two native fig trees, *Ficus aurea* and *F. laevigata*. It has not been observed in the fruits of other common *Ficus* species, including *F. altissima*, *benjamina*, *glomerata*, *religiosa*, and *retusa* (= *nitida*). Wolcott (1951) reports this small wasp occurring in the fruits of *F. laevigata* in Puerto Rico, but notes that it has not been observed in the fruits of the "climbing fig (*Ficus pumilla*) or the smaller more numerous fruits of the 'laurel de la India' (*Ficus nitida*). . . ." I have observed these insects each year in Dade County fig trees since 1955.

The fruit of a fig tree is a type of multiple fruit, consisting of a round receptacle or synconium bearing numerous individual flowers on its internal concave surface (Condit 1932). The cluster of internal flowers or the achenes developing from them largely fill the cavity of the receptacle, which entirely encloses the inflorescence during the development period. Near the apex of the receptacle is a circular structure known as the ostiole or "eye," which is closed by a number of closely adhering small scales or bracts. The ostiole of the receptacle serves as the point of entrance for the adult female fig wasp. The receptacle is subject to infestation quite early in its development. The ostiole becomes exposed when growth has pushed the receptacle apex beyond the short pair of outer bracts originally enclosing the receptacle bud. Any time thereafter, the female wasp pushes her way through the scales of the ostiole into the receptacle, usually losing her wings during the process. Examination of the developing receptacles frequently will reveal the wing remnants of this wasp adhering to the ostiole scales. When such a receptacle is opened, one or more wingless adult wasps will normally be observed either actively in the process of oviposition or, if considerable time has elapsed since their entrance, there will be dead wasps within the receptacle. Several female wasps will enter a single receptacle, and several sets of wings may be found wedged beneath the outer scales of the receptacle ostiole.

¹The author is indebted to David P. B. McLean for several of the observations here reported. They were part of a student project in the spring of 1961.

When a recently infested receptacle is opened, the female wasps that have entered it may be readily observed searching for oviposition sites. The wasp's ovipositor is removed from its outer sheaths and directed at right angles to the venter of the wasp as it is forced into the ovary of the flowers. The developmental period of the larvae hatching from such eggs has not been determined, but it is completed before the receptacle matures and falls from the tree. As the receptacles approach maturity, large numbers of both male and female fig wasps emerge from the achenes. The males emerge earlier than the females, and are quite different in appearance and activity. They are entirely wingless and are light amber in color. They have a slender elongate abdomen which is closely recurved under the body with the abdominal tip projecting anteriorly between the forelegs. They are slow and sluggish in their movements, and typically never leave the receptacle into which they emerge. Shortly after his emergence from an individual achene in the receptacle, the male gnaws a hole into the side of an achene containing a female wasp, inserts the tip of his abdomen through the opening thus formed, and fertilizes the female before she emerges from her developmental site. Shortly thereafter, the female opens a hole near the apex of the achene and emerges into the cavity of the receptacle. Females are fully winged, black-colored, typical chalcidoid wasps. Soon after their emergence, the numerous females leave the receptacle through an exit hole cut in the side or through the ostiole of the receptacle. Presumably they immediately seek developing receptacles to enter in order to initiate another generation. In the laboratory, the female wasps sometimes entered new receptacles within a few hours after their emergence.

An infested receptacle opened during the period of wasp emergence from the achenes presents a sight of immense activity. Up to 150 individual wasps have been observed in a single receptacle. The females are quite active and will readily fly short distances from the opened receptacle, while the more sluggish males move around the achenes in the receptacle.

Five other hymenopterous insects have been encountered in fig fruits during the observations on this wasp. Dr. B. D. Burks of the U. S. National Museum has identified four of these forms as representatives of the chalcidoid family Torymidae and the fifth as apparently a representative of the Eurytomidae. The most abundant of these five species is *Idarnes carne* Walker (subfamily Idarninae), readily distinguished by the very long ovipositor of the female. The male of this species is a wingless form with a short abdomen articulating at a dorsal location as in an evaniid wasp. *Neosycophila bicolor* (Ashm.) and *Colyostichus brevicauda* Mayr are other representatives of the subfamily Idarninae. The subfamily Toryminae is represented by *Physothorax russelli* Crawford (1909), a slightly larger species.

These six species of small chalcidoids found in *Ficus* fruits may be differentiated by the following key to the adult forms:

1. Wingless forms; males of highly dimorphic species.....2
- 1'. Wings well developed; females, or males of species without marked sexual dimorphism.....3

2. Form elongate; head longer than broad; abdomen elongate, vermiform, flexed under thorax with the tip extending anteriorly between the fore-legs.....*Secundeisenia mexicana* (Ashm.)
- 2'. Form more robust, posterior legs conspicuously elongated; abdomen short, ovate, typically extending dorso-posteriorly in living specimens, flexed ventrally in death.....*Idarnes carme* Walker.
3. Ovipositor clearly longer than body, hair-like.....*Idarnes carme* Walker
- 3'. Ovipositor shorter, not longer than body.....4
4. Ovipositor distinctly longer than abdomen, carried at an upward projecting angle; posterior femora dentate; face metallic green, eyes red; robust forms, especially females.....*Physothorax russelli* Crawford.
- 4'. Ovipositor not distinctly longer than abdomen; posterior femora not dentate; smaller forms.....5
5. Head elongate, with deep median, longitudinal groove dorsally; ovipositor thin, hair-like, equal to or slightly exceeding length of abdomen.....*Secundeisenia mexicana* (Ashm.)
- 5'. Head not longer than broad, ovipositor not elongate, hair-like.....6
6. Ovipositor very short and inconspicuous; body, including head, brownish yellow in color, with a distinctive black stripe dorsally on median line of thorax and abdomen; ocelli conspicuous.....unidentified species (a eurytomid of uncertain generic assignment)
- 6'. Ovipositor stout, slightly shorter than abdomen, sheath bearing numerous short hairs; color not as above.....7
7. Stigmal vein with an obvious lip or extension toward apex of wing, containing 4 distinct postules; post-marginal vein $\frac{3}{4}$ length of marginal; ovipositor extending straight posteriorly from tip of abdomen.....*Colyostichus brevicauda* Mayr.
- 7'. Stigmal vein terminating in clavate swelling but without distinct lip, only 3 postules present; post-marginal extremely short or absent; ovipositor normally pointing downward from tip of abdomen.....*Neosycophila bicolor* (Ashm.).

These five species are apparently competitors of *S. mexicana* in the fig fruits, but their methods of infesting the fruits have not been accurately determined. However, we have observed females of *C. brevicauda* and *P. russelli* attempting to insert their ovipositors into the sides of *Ficus* receptacles, and remnants of the long hair-like ovipositor of *I. carme* females frequently have been found inserted into the sides and in the ostiole scales of receptacles. Hence it is presumed that external oviposition into the receptacle characterizes infestation by these species. *P. russelli* larvae develop in enlarged "gall-flowers" within the receptacle; it seems probable that their presence within the flower ovule stimulates the plant tissue to this enlargement of the achene.

The fig trees involved normally produce three crops of fruits yearly, with considerable overlapping by individual trees between the summer, winter, and spring fruiting. All of the chalcidoid wasps, except the recently encountered unidentified form, have been observed in each of these

fruiting seasons. In the summer period, a cecidomyiid fly was observed developing in enlarged gall-flowers in the receptacles, but they have not been observed in the winter and spring fruits. This midge keys to the genus *Ficiomyia*, and it is probable that it represents either *F. perarticulata* or *F. birdi*, both described by Felt (1922, 1934) from Florida *Ficus*.

It is of interest that seven species of chalcidoids from *Ficus* are listed from Florida in the Hymenoptera Catalog (Peck, 1951). They include the five species identified above, and another species in each of the genera *Neosycophila* and *Physothorax*. The unnamed eurytomid constitutes an eighth species of chalcidoid from *Ficus* in Florida. Baker (1913), working in the Philippines, recognized and described four species of Torymidae in fruits of *Ficus nota*, along with three species of Agaonidae. The descriptions of his species reveal that the forms herein reported are distinct from those he encountered.

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