

A New *Tetrastichus* Parasitizing Tephritid Gall-formers on *Chrysothamnus* in Idaho¹

(Hymenoptera: Eulophidae)

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Research on the biology of the Tephritidae causing galls on rabbit-brush, *Chrysothamnus* spp., in Idaho (Wangberg, 1976) revealed a unique habit for a eulophid wasp commonly parasitizing some of the gall-formers. The wasp was sent to Dr. C. M. Yoshimoto (Biosystematics Research Institute, Ottawa, Canada) for determination and the author was informed that it was a new species of *Tetrastichus*, Walker. It is here described so that biological observations can be reported.

For purposes of comparison and continuity the following description is consistent with the format of Burks (1943).

Tetrastichus cecidophagus, new species

(Figs. 1-3)

Female.—Dark, corvinus; ventral surface of antennae, apices of femora, tibia and tarsi testaceous. Antennae inserted slightly ventrad of level of ventral margins of compound eyes; apex of scape not reaching level of ventral margin of anterior ocellus; funicle segments subequal in length, club slightly shorter than funicle; length of malar space two-thirds as great as ocellocular line. Pronotum with prominent femoral groove; median longitudinal groove of mesoprescutum evident posteriorly, mesoprescutum as long as wide and bearing a row of three bristles at each lateral margin; submarginal vein of forewing with two dorsal bristles, marginal vein two and two-thirds times as long as stigmal vein; hindwing slightly pointed at apex, width of fringe at posterior margin slightly more than one-fourth as great as width of wing at hamuli. Surface of propodeum finely punctate with median carina; mesal length of propodeum about two-fifths as long as mesoscutellum; propodeal spiracle separated from anterior margin by a space slightly greater than one-half diameter of a spiracle; gaster slightly longer than thorax. Length 1.5 mm.

Male.—Unknown.

Types.—Holotype female: reared from galls of *Aciurina bigeloviae* (Cockerell) on *Chrysothamnus nauseosus* (Pallas) Britton collected at Twin Falls, Twin Falls County, Idaho, May 23, 1975, G. Carpenter, collector. Holotype is deposited at the U.S. National Museum, Washington, D.C.

Paratypes: three females reared from separate galls of *A. bigeloviae* on *C. nauseosus* collected at Twin Falls, Twin Falls County, Idaho, July 7, 1974; two females reared from separate *A. bigeloviae* galls on *C. nauseosus* collected at Lewiston, Nez Perce County, Idaho, May 11 and May 19, 1975 and one female reared from an *A. bigeloviae* gall collected at the Bruneau Sand Dunes, Owyhee County, Idaho, July 21, 1974, J. Wangberg, collector. Paratypes are deposited in the collections of the California Academy of Sciences, San Francisco and the University of Idaho, Moscow.

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This species is near *Tetrastichus chlamytis* Ashmead (Yoshimoto, 1976 personal communication). Specimens of *T. cecidophagus* were compared with Burks' (1943) description of *T. chlamytis* and the following differences noted. The gaster of *T. chlamytis* is from one and two-thirds to twice as long as the thorax. The gaster of *T. cecidophagus* is only slightly longer than the thorax. Furthermore, the marginal vein of *T. chlamytis* is two and one-quarter times as long as the stigmal vein compared to that of *T. cecidophagus* which is two and two-thirds as long.

Biology

During the spring and summer of 1974 and 1975, *T. cecidophagus* adults were observed at eight Idaho localities in six counties. Study sites at each locality were characteristically dominated by *C. nauseosus* or *Chrysothamnus viscidiflorus* (Hooker) Nuttall. Both species of *Chrysothamnus* serve as host plants for a variety of tephritid gall-forming species (Wangberg, 1976). Among these species, *T. cecidophagus* attacked the following in an endoparasitic fashion: *Aciurina bigeloviae* (Cockerell), *A. ferruginea* (Doane), *A. maculata* (Cole), and two undescribed species of *Procecidochares*.

Certain aspects concerning the biology of these gall-formers must be presented before it is possible to discuss the parasite. Each tephritid causes the formation of monothalamous galls at the axillary buds of the host plant. Some of these gall-formers are larval overwintering species. Their galls are typically comprised of thickened tissues and tend to persist on the plant. Others overwinter as eggs. Their galls are primarily leafy structures which lack much thickened tissue and are ephemeral. At maturity, larvae inhabiting galls with thick tissues prepare an exit for adult emergence by tunneling outward to a point just beneath the gall's outer tissue layer. The result is a small "window" of thin tissue. Similar habits have been described for other tephritid gall-formers (Uhler, 1951). Exit preparation is unnecessary for those larvae occupying galls with relatively thin tissues because there is no substantial barrier to emerging adults. The thin tissue layer of galls, whether it be extensive as in galls of egg overwintering species or merely a "window" in the thickened galls of larval overwintering species, makes the gall-formers vulnerable to parasitization by *T. cecidophagus*.

The manner in which *T. cecidophagus* adults locate and parasitize their hosts is unlike that recorded for any other gall-insect parasite. The female parasite does not insert her ovipositor to reach the host, but rather gains entrance by chewing a small hole through the thin tissue layer that separates her from the gall cavity. Thus, the mature larva and pupa of larval overwintering species are the only life stages vulnerable to *T. cecidophagus* attack, as earlier life stages lie pro-

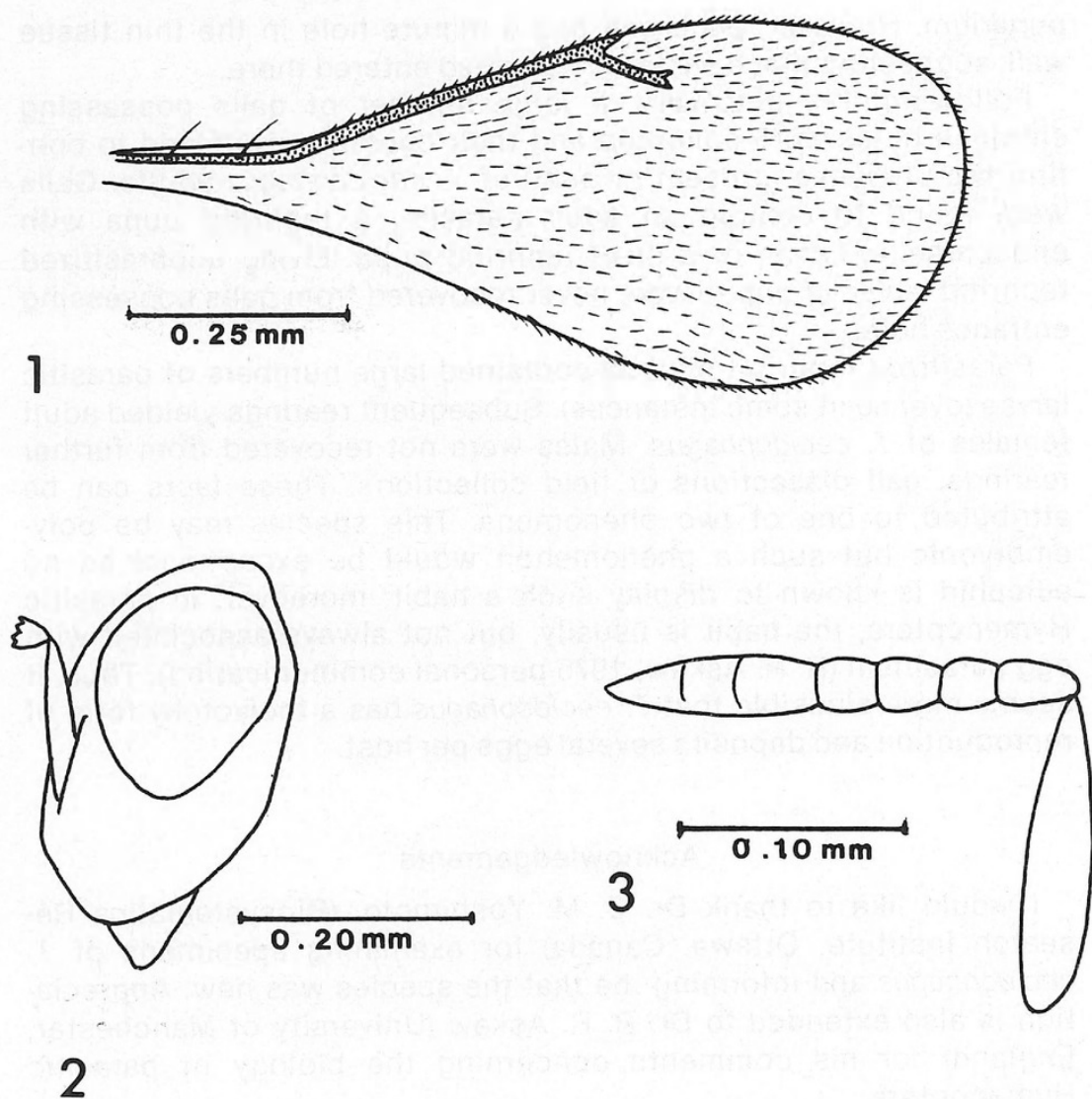


Fig. 1. Forewing of *Tetrastichus cecidophagus*. Fig. 2. Head (lateral view) of *T. cecidophagus*. Fig. 3. Antenna of *T. cecidophagus*.

tected inside thickened gall tissue. All larval instars and the pupae of egg overwintering species appear to be vulnerable. Such a habit is similar to *Xiphydriophagus meyerinckii* (Ratz.), a pteromalid parasite of the alder woodwasp larva, which reaches its host by chewing its way through wood into the host larval chamber (R. R. Askew, 1975 personal communication).

Evidence of this habit was obtained by dissecting several galls and observing a single female adult parasite moving freely inside the gall cavity. Adults were observed from June 21 to July 8, 1974 and from May 19 to July 15, 1975. In each of 20 observations adult parasites were located inside nonemerged tephritid galls. The tephritid was in the pupal stage and there were no signs of emergence from the

puparium. However, each gall had a minute hole in the thin tissue wall, suggesting that a parasitic wasp had entered there.

Following this discovery, a large number of galls possessing entrance holes were collected and their contents examined to confirm the presence (present or past) of *T. cecidophagus* adults. Galls were found to contain an adult parasite, a tephritid pupa with endoparasitic larvae or a dead tephritid pupa. Living unparasitized tephritid larvae or pupae were never recovered from galls possessing entrance holes.

Parasitized tephritid puparia contained large numbers of parasitic larvae (over 50 in some instances). Subsequent rearings yielded adult females of *T. cecidophagus*. Males were not recovered from further rearings, gall dissections or field collections. These facts can be attributed to one of two phenomena. This species may be polyembryonic but such a phenomenon would be exceptional as no eulophid is known to display such a habit; moreover, in parasitic Hymenoptera, the habit is usually, but not always associated with egg parasitism (R. R. Askew, 1975 personal communication). Thus, it seems more plausible that *T. cecidophagus* has a thelytoky form of reproduction and deposits several eggs per host.

Acknowledgements

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The authorities for insect host and plant host names are Dr. G. C. Steyskal, Systematics Entomology Laboratory, U.S.D.A., and Dr. L. C. Anderson, Florida State University, respectively.

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