

Taxonomic notes on *Polynema eutettexi* Girault (Hymenoptera: Mymaridae) and a similar species reared as an egg parasitoid of *Graphocephala atropunctata* (Signoret) (Hemiptera: Cicadellidae) in California

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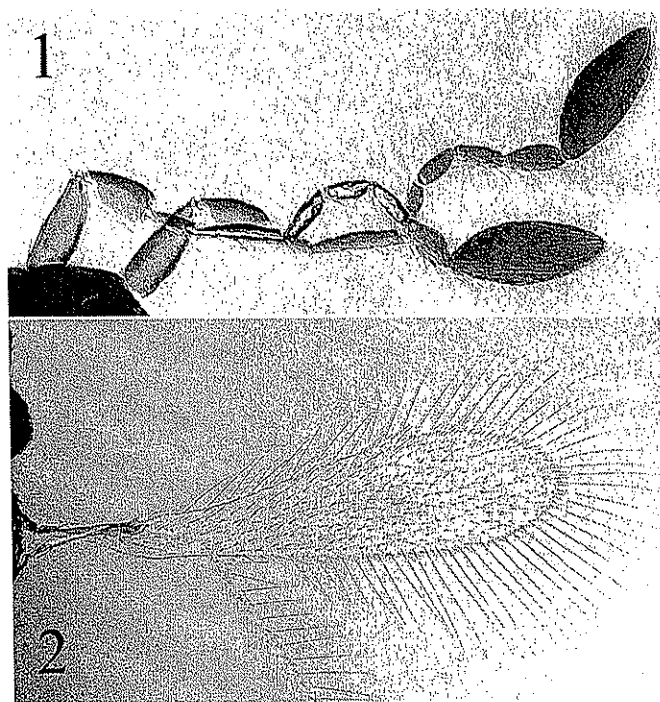
Abstract. The mymarid *Polynema* sp. near *eutettexi* Girault was found to be the primary egg parasitoid of the blue-green sharpshooter, *Graphocephala atropunctata* (Signoret), in California. Indicated and illustrated are its morphological differences from *P. eutettexi* Girault, an egg parasitoid of the beet leafhopper, *Neoliturus tenellus* (Baker). Host specificity studies revealed that female *P.* sp. near *eutettexi* would not parasitize eggs of the beet leafhopper under laboratory conditions, thus indicating an important biological difference that separates these two species of *Polynema*.

Key Words. Insecta, Cicadellidae, Mymaridae, *Neoliturus tenellus*, *Polynema eutettexi*, *Graphocephala atropunctata*, *Polynema* sp. near *eutettexi*, egg parasitoid, California.

The blue-green sharpshooter, *Graphocephala atropunctata* (Signoret), (Hemiptera: Cicadellidae) has been recognized for nearly a century as the principal vector of *Xylella fastidiosa*, the causative agent of Pierce's disease, in coastal wine- and table-grape growing regions of California (Hewitt et al. 1942, Winkler 1949, Freitag & Frazier 1954). Indigenous to the Pacific Coastal fog belt (Hewitt et al. 1942), *G. atropunctata* is highly polyphagous; capable of feeding and reproducing on native annuals, perennials, and exotic ornamental plants (Severin 1949, Winkler 1949). Oviposition preference of *G. atropunctata* on wild grape, *Vitis girdiana* Munson, was recently described by Boyd & Hoddle (2006) whereby eggs were deposited singly into new growth, specifically succulent canes, tendrils, and leaf petioles.

Until recently, egg parasitoids of *G. atropunctata* have been unknown except for the unpublished record of a *Polynema* sp. (initial determination by R. L. Doutt) reared in 1973 in Berkeley, California, from *G. atropunctata* eggs (A. Purcell, personal communication). Several slide-mounted specimens from that rearing were found by the second author in the collection of the Essig Museum of Entomology, University of California at Berkeley (EMEC) and compared with the numerous specimens collected in the course of the recent surveys conducted by the senior author in southern California during 2004 and 2005 (Boyd & Hoddle 2006). Specimens from these two collection sites in northern and southern California are conspecific. Because taxonomy of the North American species of *Polynema* Haliday is in flux, positive identification of this species had been impossible until it was compared with the types of all the described Nearctic species of this genus in the National Museum of Natural History in Washington, D.C. (USNM). Specimens reared from *G. atropunctata* eggs were found to be morphologically similar, but nevertheless different, to *P. eutettexi* Girault, described from California where it

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Figures 1, 2. *Polynema eutettixi* Girault, female (holotype). 1. Antennae. 2. Forewing.

was reared from eggs of the beet leafhopper, *Neoliturus tenellus* (Baker) (Girault 1917). Here we provide brief, illustrated diagnoses of both species and indicate the morphological differences between them. Both *P. eutettixi* and *P. sp. near eutettixi* belong to the nominate subgenus of *Polynema*, as defined by Triapitsyn & Fidalgo (2006).

Host specificity trials were conducted to determine whether *P. sp. near eutettixi*, reared from eggs of *G. atropunctata* would parasitize eggs of *N. tenellus*. In addition to morphological differences these biological differences in host preference and usage may also be important in helping distinguish if the parasitoid reared from *G. atropunctata* eggs is a separate species from *P. eutettixi*. All voucher specimens from new collections and host specificity experiments were deposited in the Entomology Research Museum, Department of Entomology, University of California at Riverside (UCRC).

POLYNEMA EUTETTEXI GIRAULT
(Figs. 1 and 2)

Polynema eutettixi Girault, 1917:18.

Polynema eutettixi [sic, invalid emendation] Girault: Stahl, 1920: 250; De Santis, 1979:376.

Type Locality. Spreckels, Salinas, Monterey Co., California, USA.

Types. Holotype female on slide (USNM), labeled: 1. "*Polynema eutettixi* Girault. [female symbol] type. [*eutettixi*, added in a different ink and handwriting later]"; 2. [red, USNM catalog number] "19799". The holotype is in fair condition, mounted more or less dorsoventrally, with left foreleg missing. Allotype male on slide

(USNM), labeled: 1. "*Polynema eutettixi* Gir. Allotype. VI-28-15 Spreckels Cal."; 2. "Chitt. # 1648 Reared from egg of *E. tenella*. C. F. Stahl"; 3. [red, USNM catalog number] "19799".

Diagnosis. Female (holotype).—Length 0.726 mm. Body brown to dark brown, except petiole light brown and apical half of gaster (except for tip) contrastingly darker; appendages light brown to brown. Antenna (Fig. 1) with scape smooth, much longer than F2 (the longest funicle segment), all funicle segments without longitudinal sensilla, clava longer than combined length of F4–F6, with 6 longitudinal sensilla. Axillar seta about 1/2 length of scutellum. Propodeum with short medial carina (at posterior margin only). Forewing (Fig. 2) 4.2 × as long as wide; blade hyaline, densely setose; longest marginal seta 1.1–1.2 × greatest forewing width. Ovipositor occupying almost the entire length of gaster, slightly exerted beyond its apex; ovipositor length: metatibia length ratio 1.2:1.

Male (allotype).—Length about 0.7 mm. Similar to female except for normal sexually dimorphic features, such as antenna and genitalia (poorly visible). Forewing slightly narrower than in female, 4.4 × as long as wide.

Distribution. USA (California, Idaho, Utah) and Mexico (De Santis 1979).

Host. *Neoliturus tenellus* (Baker) (Hemiptera: Cicadellidae) (Girault 1917; Stahl 1920).

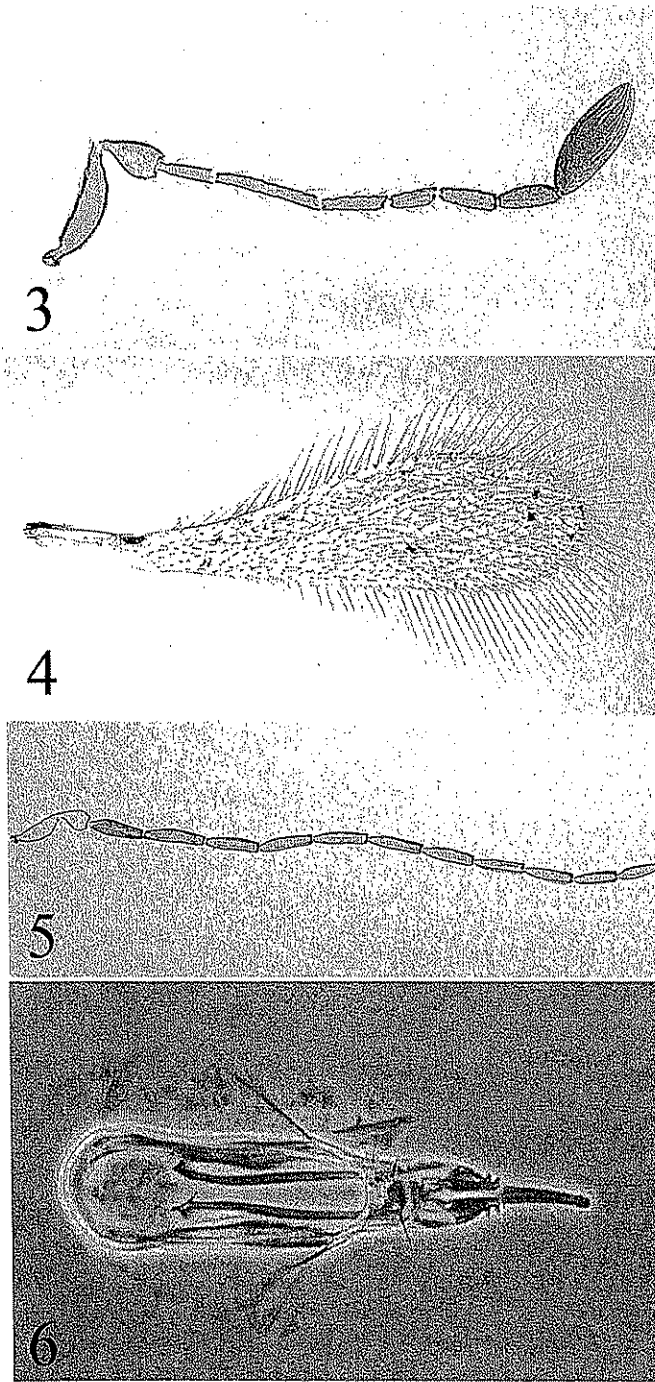
POLYNEMA SP. NEAR EUTETTEXI GIRAULT

(Figs. 3–6)

Polynema sp.: Boyd & Hoddle, 2006:1158.

Material examined. USA, CALIFORNIA: Alameda Co., Berkeley, collected 26.vi.1973, emerged 30.vi.1973, A. Purcell, from *G. atropunctata* eggs in midrib of *Hydrangea quercifolia* (4 females, 8 males, EMEC). Orange Co., Laguna Beach, main beach and Brown Park, 25.iv-10.vi.2005, E. A. Boyd, from *G. atropunctata* eggs on stems and petioles of *Metrosideros excelsus* and *Rhaphiolepis indica* 'Pink Lady' (numerous females and males, UCRC). Riverside Co., ca. 16 km. W of Temecula, 33°29.468'N, 117°14.897'W, 299 m and 33°28.234'N, 117°16.111'W, 161 m, 5.viii-10.ix.2003, 28.v-10.x.2004, and 27.vi-14.x.2005, E. A. Boyd, from *G. atropunctata* eggs on stems, tendrils, and petioles of *Vitis girdiana* and stems and petioles of *Ocimum basilicum* (numerous females and males, UCRC). Sonoma Co., Glen Ellen, at roadside of Arnold Dr., 4.v.1996, S. V. Triapitsyn, from blackberry leaves near creek (4 females, 1 male, UCRC). Ventura Co., Oxnard, at Portrero Rd., 18.iii.1999, E. J. Dietrick, from *G. atropunctata* eggs on commercial raspberries (1 female, 1 male, UCRC).

Diagnosis.—Female.—Length 1.150–1.230 mm. Body brown to dark brown, except petiole light brown and two subapical gastral terga contrastingly darker; appendages light brown to brown. Antenna (Fig. 3) with scape smooth, about as long as or only slightly longer than F2 (the longest funicle segment), all funicle segments without longitudinal sensilla, clava shorter than combined length of F4–F6, with 6 longitudinal sensilla. Axillar seta about 1/2 length of scutellum. Propodeum with very short medial carina (at posterior margin only). Forewing (Fig. 4) about 3.9 × as long as wide; blade hyaline, densely setose; longest marginal seta 0.75–0.80 × greatest forewing width. Ovipositor occupying 4/5–9/10 length of gaster, slightly exerted beyond its apex; ovipositor length: metatibia length ratio 1.0–1.1:1.



Figures 3–6. *Polynema* sp. near *eutettexi* Girault (Temecula, California). 3. Antenna, female. 4. Forewing, female. 5. Antenna, male. 6. Genitalia, male.

Male.—Length 0.900–1.100 mm. Similar to female except for normal sexually dimorphic features, such as antenna (Fig. 5) and genitalia (Fig. 6). Forewing about $4.0 \times$ as long as wide; longest marginal seta $0.8\text{--}0.9 \times$ greatest forewing width.

Specimens of *P. sp. near eutettexi* are approximately 40% larger than the type specimens of *P. eutettexi*. Additionally, *P. sp. near eutettexi* differs from *P. eutettexi* in having relatively longer funicle segments of the female antenna (the clava is shorter than combined length of F4–F6 in the former but longer in the latter) and especially in the length of the marginal setae relative to the greatest forewing width. In *P. sp. near eutettexi*, the longest marginal setae are shorter than the greatest forewing width (the ratio is 0.75–0.80:1 in females) whereas they are longer than greatest forewing width in *P. eutettexi* (the ratio is 1.1–1.2:1 in the female holotype).

Distribution. USA (California).

Host. *Graphocephala atropunctata* (Signoret) (Hemiptera: Cicadellidae).

Host Testing and Discussion. To help determine whether the displayed size and other above-mentioned morphological differences between *P. sp. near eutettexi*, reared from *G. atropunctata* eggs, and the types of *P. eutettexi*, reared from *C. tenellus* eggs, were not host-induced (the eggs of the blue-green sharpshooter are much larger than those of the beet leafhopper), a simple host specificity test was conducted in June 2006. A single, 1-day-old, mated, and honey-water-fed *P. sp. near eutettexi* female was introduced into a cage containing 25 (± 5) *C. tenellus* eggs on *Beta vulgaris* var. *saccharifera* L. (Chenopodiaceae). All plants were seedlings ~15 cm tall, and comprised of 8 (± 2) rosette leaves. All eggs were ≤ 48 -h-old, deposited into the petioles and leaf midribs, and each were marked and counted prior to exposure to the parasitoid female, who was provided honey-water throughout the course of its exposure to the eggs and remained within the cage until it perished. This procedure was replicated five times. The experiment was concluded when the majority of the eggs had eclosed. In each of the five replicates, all previously marked eggs were examined closely under a dissecting microscope. If a marked egg did not develop, it was dissected.

In all five replicates, no *P. sp. near eutettexi* emerged from any of the eggs, nor was any evidence of parasitism found within dissected eggs. All eggs were determined to be non-parasitized. It was extrapolated from this study that the species of *Polynema* reared from eggs of *G. atropunctata* is not conspecific with *P. eutettexi* and thus is likely a new, undescribed species. However, to avoid adding any further taxonomic problems in the already unmanageable genus *Polynema*, we refrain from describing *P. sp. near eutettexi* as a new taxon. Descriptions of any new species in North American *Polynema* should be done in a revisionary context only.

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