The status of *Euaresta stelligera* (Coquillett) (Diptera: Tephritidae)

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Abstract. Based on examination of morphological characters of specimens from throughout their ranges, *Euaresta stelligera* (Coquillett) is confirmed to be a distinct species from *E. bellula* (Snow). The diagnostic characters, distributions, and host plants of both species are discussed. New distribution records for *E. aequalis* (Loew) and *E. tapetis* (Coquillett) are also provided, and an error concerning the range of *Valentibulla californica* is noted.

Key words: *Euaresta bellula, stelligera, aequalis, tapetis, Valentibulla californica, Ambrosia,* taxonomy, host plants, distributions.

Introduction

Species of the genus *Euaresta* breed in ragweeds, bursages, and cockleburs of the closely related composite genera *Ambrosia* L., *Xanthium* L., and *Dicoria* Torr. and Gray (Asteraceae: Heliantheae: Ambrosiinae) (Foote 1984, Goeden and Teerink 1993). Because some of their host plants cause health problems (hayfever and other allergic reactions) and/or are agricultural weeds, various *Euaresta* species have been investigated or introduced as biological control agents (Batra 1979).

Euaresta stelligera (Coquillett, 1894), originally described as *Trypeta* (*Euaresta*) *stelligera*, has been generally considered a synonym of *Euaresta bellula* Snow, 1894, since Quisenberry's (1950) revision of the U.S. species of this genus. On the other hand, Berlocher (1984) presented electrophoretic data, based on single populations of *E. stelligera* from Oregon and *E. bellula* from New Mexico, that suggest that there are two distinct species. He also listed several morphological differences between his two samples, but he did not investigate these characters in other populations. In the latest comprehensive treatment of North American *Euaresta*, Foote et al. (1993) continued to treat *E. stelligera* as a synonym of *E. bellula*. They noted Berlocher's work, but suggested further investigation was needed to resolve the status of this complex. In a world catalog of Tephritidae, Norrbom et al. (1999) recognized *E. stelligera* as a valid species, but without further explanation. This paper reports the results of a morphological investigation of additional specimens from throughout the ranges of these species. They support Berlocher's (1984) hypothesis that *E. stelligera* is a valid species, distinct from *E. bellula*. The diagnostic characters, distributions, and host plants of both species are discussed.

Diagnosis. Berlocher (1984: 356) stated that his Oregon specimens of *E. stelligera* had "a broader gena, darker markings on the femora, and a more elongate ovipositor tip than the New Mexico flies [*E. bellula*]." He also stated that he "observed that the Oregon flies have dark markings on the postorbital region, in addition to the markings of the occiput seen in the New Mexico flies." Based on examination of specimens from additional geographic areas (a list of examined specimens will be posted on the SEL/SI Diptera web site; see http://www.sel.barc.usda.gov/Diptera/tephriti/Euaresta/Euaresta.htm), gena size and the microtrichia pattern of the abdomen are consistent diagnostic characters for *E. bellula* and *stelligera*. Leg color and aculeus tip shape are also useful characters, but I see little difference in head color.

The following couplets are provided to replace couplet 6 of the key to U.S. and Canadian species of *Euaresta* of Foote et al. (1993).

6. Cell br with a large, subapical, nearly quadrate hyaline spot extending completely across cell and broadly touching vein R_{4+5} (fig. 188, a). Other hyaline areas relatively large and often partially connected. Coastal Washington and Oregon. ..... *jonesi* Curran

Table 1. Gena height (measured at narrowest point in slightly ventral, lateral view with gena at maximum size), first flagellomere width in lateral view, and their ratio. Measurements in mm. include range, average and standard deviation.

Species	Sex	Sample Size	Gena height	First flagellomere width	Ratio
bellula	male	13	0.04-0.06, 0.051 ±0.007	0.10-0.13, 0.115 ±0.009	0.308-0.500, 0.445
bellula	female	13	0.05-0.08, 0.064 ±0.009	0.11-0.14, 0.125 ±0.008	0.357-0.615, 0.513
stelligera	male	16	0.075-0.105, 0.091 ±0.009	0.105-0.15, 0.123 ±0.011	0.625-0.826, 0.741
stelligera	female	16	0.08-0.14, 0.107 ±0.016	0.11-0.14, 0.128 ±0.011	0.692-1.083, 0.833

— Cell br with a rounded subapical hyaline spot which is separated from vein R_{4+5} by infuscation of varying extent. Other hyaline areas smaller and usually discrete. 6A

6A. Gena very narrow, height 0.040-0.080 mm., usually less than 0.60 width of first flagellomere in lateral view. Abdominal syntergite 1+2 and tergites 3 and 4 entirely microtrichose, matte. Femora entirely yellow. Western USA, northwestern Mexico. ..... *bellula* Snow

— Gena slightly broader, height 0.075-0.140 mm., usually more than 0.67 width of first flagellomere. Usually at least abdominal tergite 4 and often tergite 3 and syntergite 1+2 with lateral shiny nonmicrotrichose areas. Femora often with brown markings. Coastal British Columbia to Baja California.... *stelligera* (Coquillett)

Based on the samples of specimens measured, there is very slight overlap in the actual height of the gena (see Table 1), but none in its relative height, expressed as the ratio of gena height to first flagellomere width. Males generally have a narrower gena in both species, and there is probably some relationship between this character and overall body size.

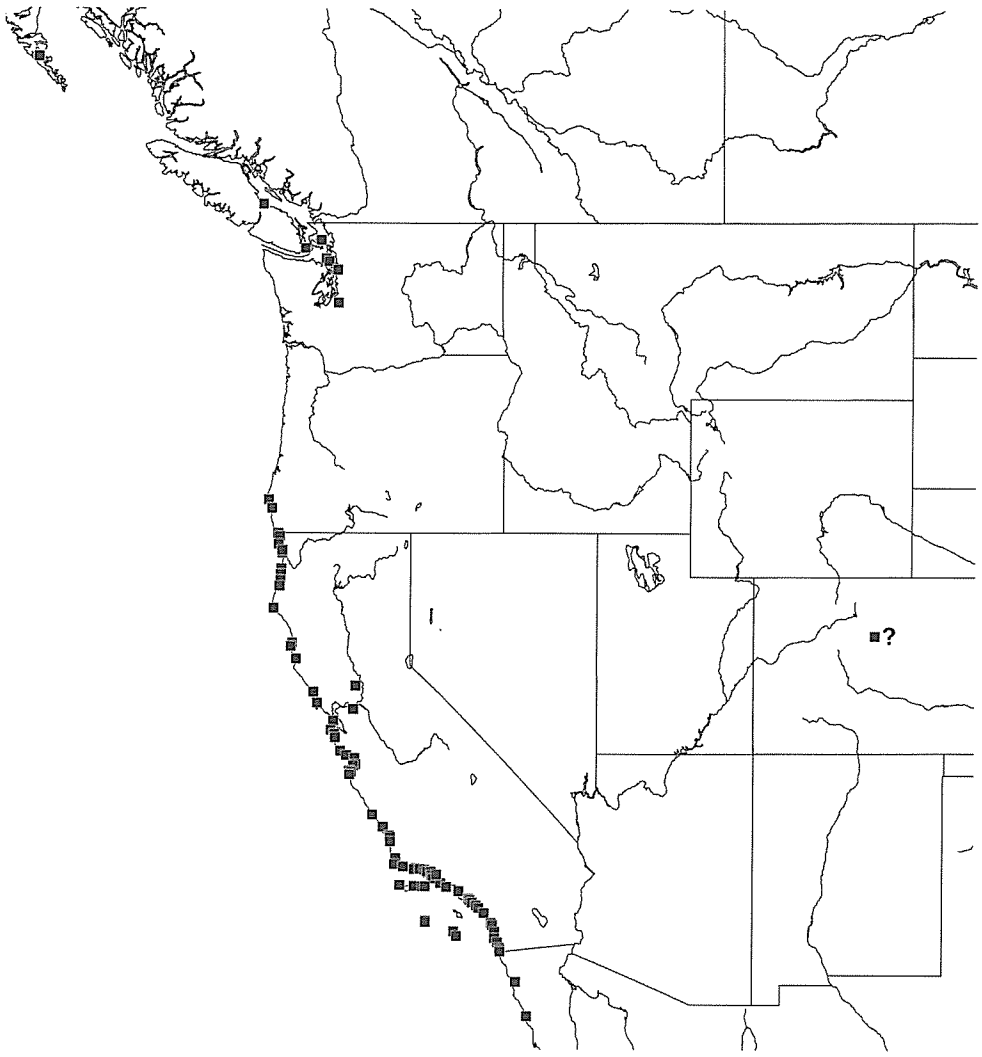
The preabdominal tergites are entirely microtrichose in *E. bellula* except for most of tergite 5 and in the female most of tergite 6. These tergites are microtrichose only on their basal margins. In *E. stelligera* there is more variation in the extent of the nonmicrotrichose abdominal areas. In addition to most of tergite 5 and female tergite 6, there is almost always at least a small lateral bare area on tergite 4. Most specimens also have lateral nonmicrotrichose areas on tergite 3 and many have another on syntergite 1+2; in some specimens the nonmicrotrichose lateral areas on tergites 3 and 4 may be as broad as the medial microtrichose area. This character varies in a few series of specimens of *E. stelligera* examined from southern California (Los Angeles and San Diego Counties), but the lateral bare area is predominantly present (e.g., tergite 4 entirely microtrichose in only 3 of 24 specimens from dunes W of Los Angeles airport (UCB) and in 2 of 8 specimens from Border Field State Beach (UCB)).

There is no significant difference in aculeus tip length between the two small samples I measured, but generally in *E. stelligera* the tip tapers slightly more rapidly and appears slightly more pointed than in most *E. bellula*.

The legs are consistently entirely yellow in *E. bellula*. Spots, streaks or occasionally larger areas of brown, often appearing blue-gray due to overlying dense microtrichia, are often present on the femora, especially the fore and hind femora, of *E. stelligera*, but are not consistently present. There may be a cline in this character, but the percentage of specimens with some markings differed considerably among localities within the same states. At least a spot on one femur was present in the following numbers of specimens examined for this character: 1 of 7 from British Columbia, 5 of 20 from Washington, 8 of 8 from Oregon, 7 of 10 from northern California, 14 of 30 from southern California, and 10 of 16 from Baja California.

I can see no consistent difference between *E. bellula* and *stelligera* in the markings on the back of the head. In both species there is a dark brown area on the middle of the occiput and a usually paler, diffuse brown to blue-gray area of variable size on the postgena.

Distribution. The distributions shown in Maps 1 and 2 are based mainly on specimens that I examined, but some unconfirmed records that were the basis for the distribution map of *E. bellula* of Foote

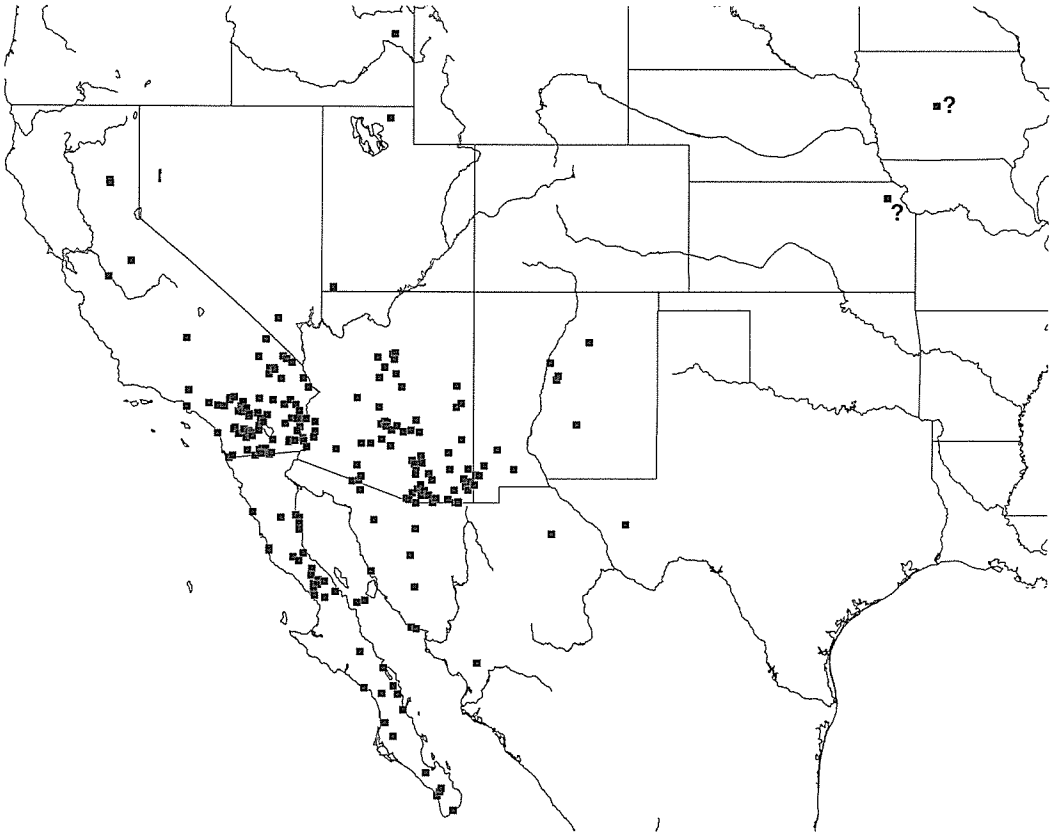


Map 1. Distribution of *Euaresta stelligera*. A "?" indicates uncertain records.

et al. (1993, map 15) were included. Any that are not within the ranges based on the specimens I examined are noted below. Full specimen data are available on the Systematic Entomology Laboratory web site (see http://www.sel.barc.usda.gov/Diptera/tephriti/Euaresta/Euaresta.htm).

Euaresta stelligera appears to be restricted to the coast of western North America (Map 1). I have examined specimens from British Columbia (Queen Charlotte Islands) to northern Baja California Norte. The only specimens I have seen that appear to be this species and that are from a locality significantly far from the coast are a male and two females from Colorado: Jefferson County, Red Rocks Park, near Morrison, 6 Mar 1985, J. A. Powell (UCB USNM00054989-91). Unless mislabeled, these specimens represent an interesting *Euaresta* population that should be further investigated.

Euaresta bellula occurs in the western USA (Idaho, Nevada, Utah, inland northern and widespread southern California, Arizona, New Mexico, western Texas) and northern Mexico (Baja California Norte, Baja California Sur, Sonora, Chihuahua) (Map 2). It has been collected much less commonly north of the Arizona and New Mexico borders than in southern California, Arizona and northwestern Mexico. I have not confirmed the identities of the specimens that were the basis of the data points in Utah and northern California (Merced, Plumas, Tuolumne Counties) from distribution map 15 of Foote et al. (1993), but they are probably valid. The record from Kansas and especially that from Iowa are suspicious, however, and should be rechecked. According to R. H. Foote's identification notebook, the Kansas record was based on 2 adults from Atchison



Map 2. Distribution of *Euaresta bellula*. A "?" indicates uncertain records.

County, Muscotah Marsh, 29 Aug 1961 (depository not stated), and the Iowa record was based on a single specimen from Boone County, 8 Jul 1955, R. Frye (Stoltzfus collection). The distribution point for south central Texas in Foote et al. (1993, map 15) was based on 2 misidentified males (USNM00053444) of *Dyseuaresta mexicana* from Hondo, but *E. bellula* does occur in western Texas (Davis Mountains, 10 Jul 1958, W. F. Barr, 1 female UIM USNM00056092)).

Host plants. Unfortunately, few voucher specimens have been preserved to document the host records that have been reported for *Euaresta bellula* (R. D. Goeden, B. A. Foote, pers. comm.), but the localities of these records for the most part indicate whether they pertain to *E. bellula* or *E. stelligera*. The record from male flowers of *Ambrosia chamissonis* (Lessing) Greene (Goeden and Ricker 1974), which has a coastal distribution very similar to *E. stelligera*, probably pertains to *E. stelligera*. I have examined numerous specimens of *E. stelligera* collected on *A. chamissonis*, including specimens collected by Goeden and Ricker from several localities, but no reared specimens. I have seen no specimens of *E. bellula* from this plant. Foote and Blanc (1963) reported specimens as *E. bellula* "ex" *A. acanthicarpa* Hooker based on a series of *E. stelligera* collected from Del Monte, California, by H. H. Severin. It is likely that these specimens were swept rather than reared, and the status of this species as a possible host plant needs further investigation.

The other host plant records reported for *E. bellula* appear to truly pertain to that species: *Ambrosia ambrosioides* (Cav.) Payne, female flowers or seeds (Foote 1984); *A. chenopodiifolia* (Bentham) Payne, male and female flowers (Foote and Blanc 1963, Goeden and Ricker 1976b); and *Dicoria canescens* Torrey and Gray, flowers (Goeden and Teerink 1993). *Ambrosia dumosa* (Gray) Payne and *A. confertiflora* DC., from which adults have been collected (Goeden and Ricker 1976a, Berlocher 1984), are other possible host plants. Except for that of *A. chenopodiifolia*, the localities of these records are all in the distribution of only *E. bellula*: Arizona (*A. ambrosioides*), New Mexico (sweep record from *A. confertiflora*), and inland California (*D. canescens*; adult record

from *A. dumosa*). I examined 2 males mounted along with puparia from Upper Sabino Canyon, Santa Catalina Mountains, Arizona, 24 May 1971, B. A. Foote, that were presumably reared from *A. ambrosioides*, although their labels lack host data.

Ambrosia chenopodiifolia occurs within the ranges of both fly species and could be a host plant of both, but the only specimen I examined that was reared from *A. chenopodiifolia* is a male of *E. bellula* from California: San Diego County, San Ysidro, reared 23 Jun 1970 by Goeden and Ricker, ACh-70-2K (USNM00056143). The host record reported by Foote and Blanc (1963) was based on a series (not located by me) also from San Ysidro.

Notes on distributions of other species. *Euaresta aequalis* (Loew): MEXICO: Baja California Norte: Cantamar, 4-6 Sep 1969, W. Apperson, 1 male 2 females (USU, USNM; USNM00053374-6). This is the first record of this species from Mexico.

Euaresta tapetis (Coquillett): UNITED STATES: Nebraska: Hooker County, Mullen, 1.5 mi. N, Middle Loup River, 2-4 Jul 1983, E. E. Grissell and A. S. Menke, 1 female (USNM00053445). Nevada: Humboldt County, Winnemucca, 10 mi. N of, 23 Jun 1971, G. C. Steyskal, 4 males 3 females (USNM00053476-82). These are the first records of this species from these states, and that from Nebraska is the first from east of Colorado and Wyoming.

Valentibulla californica: The distribution point for this species in Foote et al. (1993, map 104) for San Nicholas Island, California was based on a misidentified female (USNM00053443) of *Euaresta stelligera*, and *V. californica* appears not to occur on the coast.

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