ABSTRACT. We surveyed woody Asteraceae for root-boring lepidopteran larvae in California, Nevada, and Arizona. Data are reported for 21 species of the genera Phaneta, Eucosma, Pelochrista, Epiblema, and Sonia (Tortricidae: Eucosmini) reared from 23 species (14 genera) of Asteraceae. Among 80 rearing records, about half of the tortricids were recorded at multiple localities. One widespread species, Eucosma ridingsana, fed on several genera of Asteraceae at different localities, and Sonia vovana fed on species of two plant genera, whereas other species that we reared more than once were host specific to one or two plants of one genus. Larvae of seven other moth species were associated in these collections, probably as scavengers (Acrolophidae, Oecophoridae, Gelechiidae, macrothecine and phycitine Pyralidae, and Noctuidae). Literature reports of larval hosts for the tortricids are summarized. Additional key words: Lepidoptera, Phaneta, Eucosma, Pelochrista, Epiblema, Sonia, Arizona, Nevada, root-borer specificity, Acrolophidae, Oecophoridae, Gelechiidae, Pyralidae, Noctuidae.

INTRODUCTION

The Holarctic genera Phaneta and Eucosma, Pelochrista, and Epiblema, along with Sonia in the Nearctic, comprise an extremely species-rich group for which no phylogenetic classification has been proposed. Heinrich (1923) based the current classification of Nearctic species on presence/absence of a costal fold in the male, wing venation, and male genitalia. The Eucosmini, including this group of genera, warrants comprehensive study, including assessment of the female genital characters, which Heinrich omitted. There are more than 300 species of these five genera regarded as valid in America north of Mexico, about 60% of them in the western states, and many other species in collections remain unnamed.

Almost all species of the above named genera are endophagous, borers in stems, roots, or conifer cones, and those treated here comprise a guild feeding in roots of Asteraceae. Probably nearly all are specialists in larval host selection, but we lack host plant data for most and have only one record for many of those that have been reared. In 1966–68, as part of broader investigations on microlepidoptera biologies funded by the National Science Foundation, we conducted an extensive survey of tortricid borers in woody Asteraceae. Our study is the primary source of host data for western members of this guild. We present the data here, along with a few records from earlier and later years, in order to make them available for citing host plants in a book in progress on western moths and perhaps to lure researchers into further effort to rearing root-feeding caterpillars.

METHODS

We selected potential field sites for investigation based on past collections of adults, some of which were netted in association with particular composite shrubs, providing clues to their larval hosts. We visited identified localities about four weeks prior to recorded flight dates and searched for likely habitats, especially those dominated by Chrysothamnus, Gutierrezia, or “Haplopappus” (species of the last are now in Ericameria, Hazardia, Isocoma). Armed with narrow blade trenching spades, we dug up suspect shrubs and split open the root crowns to expose evidence of larval borers, exudations of sawdust-like frass. If a healthy colony of Eucosmini was present, we usually detected evidence within the first few plants; if not we spent an hour or more digging to locate a few potential larval galleries or become convinced none was present. When frass was detected, we clipped off lower roots and the above ground stems of the plant and placed the root crowns in plastic bags (45 × 20 cm) for transport in camp coolers. In the insectary, collections were housed in plastic bags lined with paper toweling, and each was reversed and aired out frequently in order to discourage fungal growth yet maintain sufficient moisture to avoid desiccation of larvae or pupae. Larvae were left in situ, and those that successfully transformed constructed emergence trackways leading to frass-encrusted silken turrets where the active pupae wedge enabling eclosion of the adults. When emergences began, the collections were checked daily to harvest newly emerged adult specimens. When moths failed to emerge from the pupal shell following metamorphosis,
identifications were made by genitalia dissections.

All collections were made by one or both of us, often accompanied by one or more student assistants (see acknowledgments). The rearing lot numbers were date-based, e.g. 68G23 = 1968, July, 23rd collection (except “I” was not used, so J-M = September to December). The number for each lot was assigned to notes on larval habits, moths and parasitoid specimens reared, and larvae preserved.

This information is summarized in an Access database. Voucher specimens are deposited in the E. S. G. Museum of Entomology, University of California, Berkeley.

Plant nomenclature and authorship has been updated from that used on our specimen labels and follows The Jepson Manual (Hickman 1993).

Abbreviations: I to XII = February to December; emgd. = dates adults emerged; n = number of individuals reared; AZ = Arizona. CA = California, NV = Nevada. Co. = County. Mts. = Mountains. Cr. = Creek; Vy. = Valley; campgr. = campground; mi. = miles; N, E, S, W, NE etc. = compass directions.

Results

Our efforts produced about 80 rearing records of root-boring Eucosma from approximately 135 Asteraceae collections processed, including one or more species from 66 collections, 2 or more from 11 collections. In total, we reared 21 species of Phaneta, Eucosma, Pelochrista, Epiblema, and Sonia from 23 species (14 genera) of Asteraceae, about half of the tortricids from multiple localities. We found one widespread species, Eucosma ridingsana, feeding on several genera of Asteraceae at different localities, and Sonia vovana fed on both Gutierrezia and Isocoma; whereas other species for which we had multiple records were host specific to one or two congeneric plants. A species of Eucosma and a Phaneta or Sonia sometimes occupied the same roots, but two congeneric species did so only once, when a single E. canariana was reared along with several E. crambitana.

Confined females of Eucosma sandiego laid large numbers of eggs in crevices and irregularities on the surface of bark and dirt clods, as well as on container sides. Evidence of oviposition normally occurs on bark near the base of the plant, and young larvae burrow downward in above ground stems and into the root crowns in later instars. Larvae usually do not penetrate the deeper roots of smaller diameter, but in smaller plants such as Gutierrezia, larvae feed on slender roots by scoring a groove and covering the open side with silk and debris. Late instar larvae were found oriented either head upward or downward but eventually form a pupal cell head upward. Emergence is via a track leading to a frass-covered turret at or above ground level. We did not detect a diapause in any of the species we reared.

The roots often are shared by larvae of beetles, especially Cerambycidae and Curculionidae, and by various other insects that invade secondarily. Along with the Eucosmini, we list associated species of Lepidoptera of several families that were reared, all of which probably are detritivores.

Species accounts

**Phaneta offectalis** (Hulst, 1886)

H. einrich (1923) recorded “Artemisia” as a food plant of offectalis, whereas Sites and Phillip (1989) reared it from Senecio riddelli. Mackay (1959) described the larva based on specimens labeled “loco-weed” [Astragalus or Oxytropis?, Fabaceae], a 1947 collection of larvae from College Station, Texas. This may have been a misidentification of the plant.

**Phaneta bucephaloides** (Walsingham, 1891)


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**Phaneta bucephaloides** (Walsingham, 1891)


Phaneta bucephaloides (Walsingham, 1891)


Engelhardt reared bucephaloides from Chrysothamnus linifolius in western Colorado (H einrich 1929) and Mackay (1959) described the larva from the same collection.

**Phaneta sp. near bucephaloides**

Associate species: 68G35 Alpheias sp. (Pyralidae),

**Eucosma crambitana** (Walsingham, 1879)


Eucosma sp. near crambitana

Eucosma canariensis Kearfott, 1907
Chrysothamnus viscidiflorus.—68G37: NV, Nye Co., Currant Creek campgr. VII.21.1968 (n = 1, emgd. IX.19).

Associated species: E. crambitana, Phaneta bucephaloides; Alpheias sp. (Pyralidae).

Eucosma aurilineana Ferris, 2005
Chrysothamnus viscidiflorus.—68G37: NV, Nye Co., Currant Creek campgr. VII.21.1968 (n = 1, emgd. VIII.5).

Associated species: E. crambitana, Phaneta bucephaloides; Alpheias sp. (Pyralidae).

Eucosma caniceps (Walsingham, 1884)

Eucosma avalona McDunnough, 1938
Artemisia californica. —67D42: CA, Santa Barbara Co., Cuyama River, 11 mi. ENE Santa Maria, IV.27.1967 (n = 2, emgd. by X).

Eucosma sandiego Kearfott, 1908


Eucosma optimana Dyar, 1893

Eucosma laticurva Heinrich, 1929
Ericameria ericoides. —68G69: CA, Plumas Co., SW edge Plumas-Eureka State Park, VII.27.1968 (n = 2,
Eucosma maculatana (Walsingham, 1879)

Eucosma williamsi Powell, 1963
The original series of this species was reared by F. X. Williams from larvae boring in roots of B. pilularis in February in the Oakland Hills, Alameda Co., CA, adults emerging in July (Powell 1963). De Benedictis et al. (1990) also reared this species at San Bruno Mt., San Mateo Co., from the same plant.

Pelochrista metariana (Heinrich, 1923), species complex

Pelochrista passerana (Walsingham, 1879)
Achillea millefolium.—04B38: CA, Santa Barbara Co., Santa Barbara Island, II.23. 2004 (n = 3, emgd. VI.1,2).

Epiblema strenuana (Walker, 1863) (beach form, differs phenotypicaly from typical strenuana)
The larvae bore in the woody stems, which act as rhizomes for the spreading plant, at or just beneath the sand surface. Presence of larvae is evidenced by accumulations of frass at nodes or breaks in the brittle stems. On A. psilostachya at Antioch dunes Natl. Wildlife Refuge, Contra Costa Co., growing on riverine sand dunes, larvae of strenuana burrowed into vegetative terminals and downward in the above ground stems.(82E92, 82F13, 91H23). Typical populations of E. strenuana have been reared from Asteraceae in the subtribe Ambrosiinae, including other Ambrosia species, Parthenium, and Xanthium, in widespread parts of North America, recorded by Heinrich (1923), MACKay (1959), Miller and Pogue (1984) and others.

Sonia vovana (Kearfott, 1907)
68D177: CA, San Benito Co., Limekiln Canyon, IV.24.1968 (n = 5, emgd. IX.13 to X.1).
91F17.1: same data except (SP, west parcel) (n = 1, emgd. IX.11).
Gutierrezia sarothrae.— all CA, San Diego Co.: 66J11: Buckman Spr., IX.2.1966 (n = 1, emgd. IX.21).
66J12: 1 mi E Boulevard, IX.2.1966 (n = 4, emgd. IX.7 to IX.26).
68F33: AZ, Yavapai Co., 7 mi NE Bridgeport, VI.4.1968 (n = 2, emgd. VIII.16 to X).
68F36: AZ, Gila Co., Pine campgr., V.5.1968 (n = 1, emgd. VII.17).
68F33: AZ, Yavapai Co., 7 mi NE Bridgeport, VI.4.1968 (n = 2, emgd. VIII.16 to X).
68F36: AZ, Gila Co., Pine campgr., V.5.1968 (n = 1, emgd. VII.17).

Sonia tenuisecta.—68F58: AZ, Pima Co., VI.6.1968 (n = 2, emgd. IX.16/18).
91F17.1: same data except (SP, west parcel) (n = 1, emgd. IX.11).

Sonia comstocki Clarke, 1952
67K33: same data except 6 mi. W Lancaster (n = 16, emgd. X.6/17).
Associated species: 67K33 Ephiastodes gilvescentella
Ragonot (Pyralidae).

**Sonia filiana** (Busck, 1907)


Associated species: 67K79 *Amydria obliquella* Dietz (Acrolophidae); 66J10 *Isophrictis* sp. (Gelechiidae); 66J10, 67K59 *Battaristis pasadenae* Keifer (Gelechiidae); 66J10, 67K59 *Eucosma sandiego*.

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**Literature Cited**


