

PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

RECORDS AND DESCRIPTIONS OF SOME
INTERESTING SPECIES OF *EUCOSMA*
IN CALIFORNIA
(LEPIDOPTERA: TORTRICIDAE)

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During the past few years an increasing amount of field work in the southwestern states has resulted in the accumulation of numbers of olethreutine moths for which there has been incomplete distributional data, or which appear to be undescribed. Since there evidently are no revisionary studies in progress on this group, which might incorporate such knowledge, it seems reasonable to present this information while it is assembled.

Eucosma langstoni, new species

A moderately large moth with nearly unicolorous rust-orange forewings.

Holotype male: Length of forewing 12.2 mm. *Head*—Labial palpus moderately large, second segment about one-third longer than vertical eye diameter; scales elongate, thin dorsally and ventrally, forming a roughened dorsal crest on distal half and a long, more or less appressed, ventral brush which entirely obscures the short, thin, appressed-scaled third segment; pale rust-orange, paler at base, dorsally, and anteriorly. Antenna less than one-half costal length; banded dorsally and ventrally by pale scaling; scape pale rust-orange above, whitish below. Scale tufts spreading, of elongate, thin, very pale ochreous-orange scales. *Thorax*—Dorsal scaling unicolorous pale rust-orange; shining pale tan below. Prothoracic leg dark rust-brown exteriorly, whitish interiorly, meso- and metathoracic legs paler, rust-orange exteriorly. *Forewing*—Conspicuously broadened distally, length about 2.9 times width at end of cell; costal fold less than one-third costal length, tightly appressed, enclosing a brush of about 40 stiff, dark gray hairs; costa nearly straight on basal half, only slightly curved beyond, apex rather acute, termen rather strongly angled back, broadly curved to dorsum, latter straight except near base. Ground color pale rust-orange, costal fold, fold through

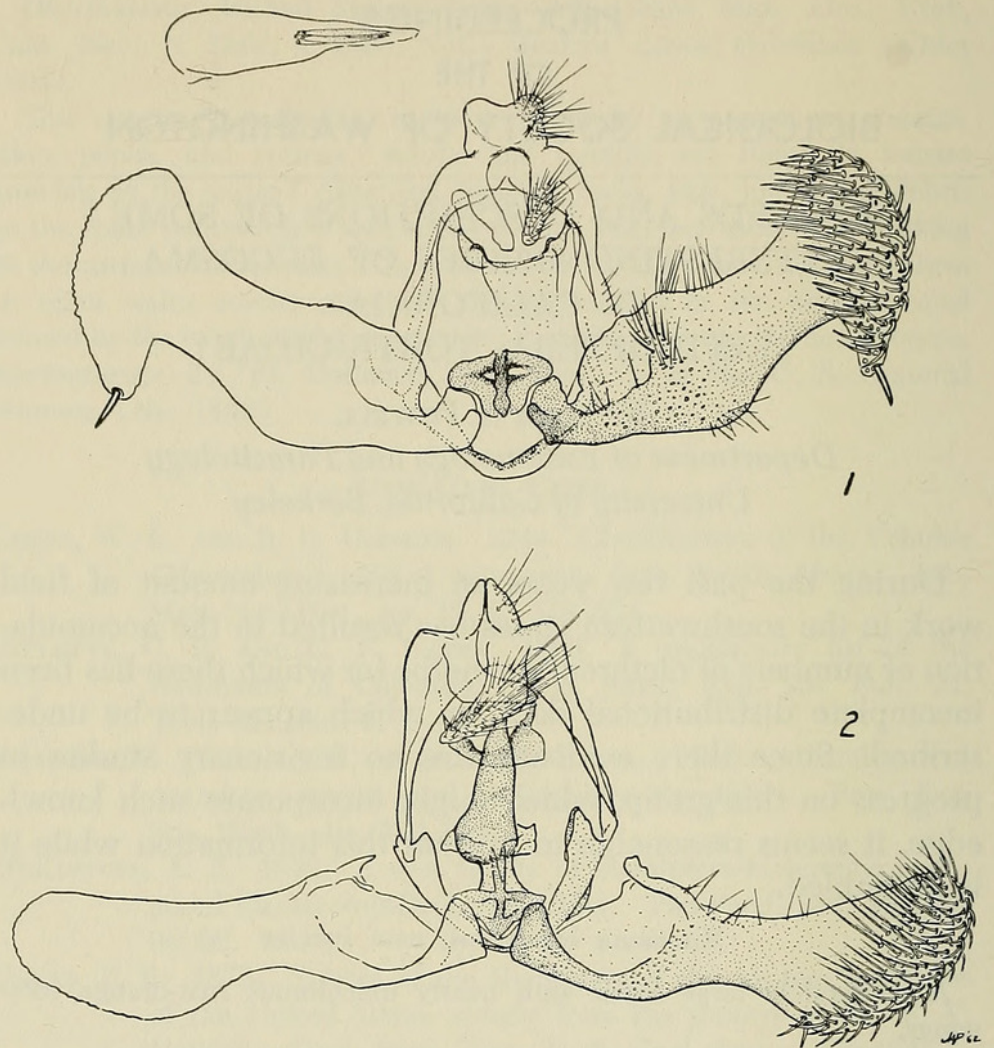


PLATE I

FIGS. 1-2. Male genitalia: 1, *Eucosma langstoni* Powell, ventral aspect, aedeagus removed and figured in lateral aspect. 2, *Eucosma williamsi* Powell, ventral aspect.

cell, and veins beyond cell slightly darker, scarcely discernible to naked eye; a few scattered blackish scales beyond cell in dorsal half, not forming a pattern. Fringe whitish at base, with a median brown band, becoming rust-orange towards dorsum, and a rust-orange marginal band. Underside pale gray except costa rust-orange, fringe as above. *Hind-wing*—About one-fourth broader than forewing; costa rather strongly excavate on distal half, apex rounded, termen and dorsum slightly convex. Pale gray above, the hair tufts whitish. Fringe broad, whitish, with subbasal and marginal grayish bands. Underside a little paler, faintly orangish towards apex. *Abdomen*—Shining pale tan dorsally, pale rust-orange ventrally including the relatively sparse genital tuft. Genitalia as in Fig. 1 (drawn from paratype, JAP prep. No. 1197; two preparations examined).

Allotype female: Length of forewing 11.0 mm. Essentially as de-

scribed for male, color throughout paler. Labial palpus with elongate, thin scales more diffuse, no distinct elongate, appressed, ventral brush, third segment not entirely obscured. Forewing broader basally, costa gently curved on basal third, nearly straight beyond, length about 3.0 times width. Ground color brighter rust-orange, veins scarcely darker, no scattered black scales. Underside very pale grayish, costal area in outer third and fringe pale rust-orange. Hindwing above very pale gray, below whitish, apical area, fringe and veins beneath faintly tinged with pale rose-orange. Abdomen pale, faintly tinged with orange above and below; a well-developed tuft of broad, dark ochreous, amber-appearing scales ventrally; genital tuft otherwise of normal scales. Genitalia as in Figs. 3, 4 (drawn from paratype JAP prep. No. 1442; two preparations examined); papillae anales with median anterior portion folded outwardly, posterior portion flap-like, densely clothed with elongate, curved setae; sterigma a simple plate, setate; seventh abdominal sternite with a dark, sclerotized region produced anteriorly into lateral lobes; ductus bursae with two weakly sclerotized patches; signa well developed, horn-like.¹

Holotype male and allotype female, Pozo, San Luis Obispo County, Calif., 3 May and 27 April 1962, respectively, collected at light (J. Powell), deposited in the California Academy of Sciences. Three male and four female paratypes, same data, 27 April to 5 May (R. L. Langston & J. Powell), deposited in the California Insect Survey collection and U. S. National Museum.

Taxonomic discussion: Length of forewing of paratypes, males 11.5 to 12.2, females 10.7 to 11.0 mm. Color variation similar to that of the holo- and allotypes. No males are darker than the holotype, but one female is, having a slight infusion of dark brownish scales beyond cell, a few blackish scales, the dark fringe bands, and the hindwing grayish. One female is paler than the allotype, with the forewings having the orange brighter, appearing almost as a diffuse reticulated pattern on a pale ground, and with the hindwings white.

According to the male genitalia, the species belongs to the *agricolana* group, members of which are superficially wholly unlike *langstoni*; and it seems closest to *E. heathiana* Kearfott (Manitoba to New Mexico) which has whitish forewings with a diffuse dark dorsal blotch. Other related species are generally smaller moths with pale tan to brownish forewings indistinctly marked with white lines or are silver marked.

***Eucosma williamsi*, new species**

A large moth having whitish forewings heavily mottled with shades of gray and brown.

¹ Unfortunately, female genitalia of only a few of the 150-odd species of North American *Eucosma* have been illustrated. Thus, at the present time there is little value in presentation of these characters with regard to comparison to related forms. Although obvious differences exist, it cannot be stated whether the female genitalia will offer diagnostic characters within closely related species groups.

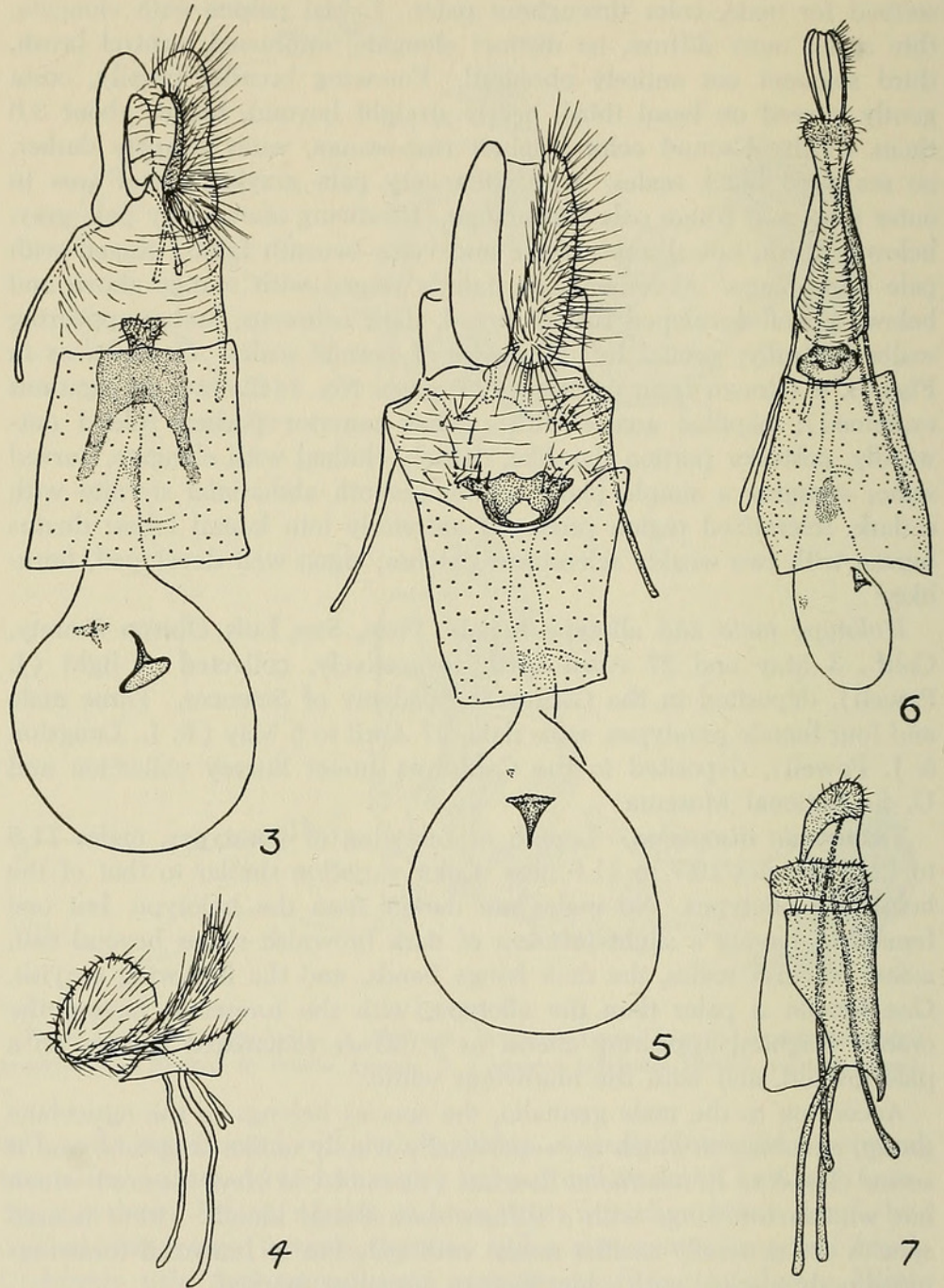


PLATE II

FIGS. 3-7. Female genitalia: 3, 4, *Eucosma langstoni* Powell: 3, ventral aspect; 4, lateral aspect of segments VIII-X. 5, *Eucosma williamsi* Powell, ventral aspect. 6, 7, *Eucosma hohana* Kearfott: 6, ventral aspect; 7, lateral aspect of segments VIII-X.

Holotype male: Length of forewing 11.3 mm. *Head*—Labial palpus broad, short, second segment length about equal to vertical eye diameter; scaling elongate, broadly spreading distally into a truncate tuft, pro-

duced below and almost entirely obscuring third segment; dark brownish-gray exteriorly, the scales paler at their bases and narrowly tipped with white; pale interiorly; third segment small, pointed, appressed-scaled, purplish. Antenna weakly scaled dorsally, pale brownish; scape and basal few segments scaled, purplish. Scaling of head dense, elongate, strongly directed mesad; the scales dark brownish gray, reflecting purplish apically, pale basally. *Thorax*—Collar and notum anteriorly brownish, remainder of notum white; tegulae white with intermixed gray scales; metanotum unscaled anteriorly, with broad white scales and lateral hair tufts posteriorly. Underside shining whitish; legs brownish exteriorly with pale tibial and tarsal bands; metathoracic leg paler. *Forewing*—Broad, length about 2.5 times width; costal fold appressed, narrow, short, extending along basal one-fourth, enclosing a brush of about 50 white, hairlike scales and an imbricate row of small, narrow, white scales along middle portion of fold, below vein Sc; costa straight beyond, termen concave, rather sharply angled at tornus. Whitish, heavily marked with indistinct brownish and grayish as follows: basal area to one-fourth grayish with a few short blackish strigulae; a broad median area of ground color heavily clouded with transverse gray strigulae, becoming a well-defined broad band in dorsal half; a large dark brownish dorsal spot follows just before tornus, the most contrasting marking of the wing; apical area indistinctly clouded with grayish and pinkish scales, in part forming shining, transverse strigulae and enclosing an ill-defined subapical blackish mark; fringe of intermixed pinkish and gray scales. Underside dark gray-brown, reflecting purplish; paler dorsally; costa with a series of whitish marks. *Hindwing*—Slightly broader than forewing, costa slightly emarginate before apex; termen concave, broadly curved with dorsum. Dark brown, slightly paler basally; fringe scales with a whitish median band and narrowly tipped with white. Underside similar with some whitish strigulae in apical area. *Abdomen*—Dorsum whitish basally, following segments successively darker grayish with posterior whitish bands; underside shining whitish; genital tuft moderately conspicuous and spreading, shining whitish. Genitalia as in Fig. 2 (drawn from paratype, Pleasant Hill, JAP prep. No. 809; three preparations examined).

Allotype female: Length of forewing 13.8 mm. Essentially as described for male; in general paler, the forewing markings more distinct and contrasting on a white ground. Costal fold lacking, costa gently curved on basal half, straight beyond. Hindwing paler than in male, underside strongly clouded with whitish. Genital tuft not spreading, purplish ventrally. Genitalia as in Fig. 5 (drawn from paratype, Pleasant Hill, JAP prep. No. 1444; two preparations examined); papillae anales simple, densely clothed with elongate setae; sterigma broad, funnel-like, setate laterally; ductus bursae with a lightly sclerotized patch near corpus bursae; dorsal signum minute.

Holotype male: Leona Heights, Oakland Hills, Alameda County,

California, 26 July 1909 (F. X. Williams) [reared from larvae collected February 1909 in stems of *Baccharis pilularis*]; and allotype female, Hastings Natural History Reservation, near Jamesburg, Monterey County, California, 23 July 1959 (D. D. Linsdale) deposited in the California Academy of Sciences, San Francisco; 70 paratypes, all California, as follows: *Napa Co.*: St. Helena, 1 ♀ 27 Aug. 1935 (E. C. Johnston). *Contra Costa Co.*: Orinda, 1 ♂ 16 Aug. 1952 (R. L. Langston); Pleasant Hill, 9 ♂, 1 ♀ 8–11 July 1959, 2 ♀ 1 Aug. 1959, 1 ♂, 2 ♀ 1, 4 Aug. 1960 (W. E. Ferguson). *Alameda Co.*: Berkeley, 1 ♂ 1 July 1931 (D. Meadows), 1 ♀ 29 Aug. 1954, 1 ♀ 29 June 1959, 1 ♀ 7 July 1959 (R. L. Langston); Leona Heights, Oakland Hills, 1 ♂ 10 July 1909, 1 ♀ 26 July 1909, 1 ♀ 31 July 1909, 1 ♂ 3 Aug. 1909 (F. X. Williams). *Santa Clara Co.*: Stanford, 1 ♀ 29 July 1947 (J. W. Tilden); Los Gatos, 8 ♂ 1–15 Aug. 1933 (J. A. Kusche), 1 ♂, 1 ♀ 25 July 1942, 2 ♀ 30 Aug. 1942, 2 ♂ 12 Sept. 1942 (G. E. Pollard); 12 mi S Los Gatos, 1 ♂ 29 Aug. 1959 (D. C. Rentz); Alma, 1 ♂ 5 Sept. 1944, 1 ♀ 2 July 1946 (G. E. Pollard). *Santa Cruz Co.*: Santa Cruz, 2 ♂, 1 ♀ 8 Aug. 1939 (J. W. Tilden); "Santa Cruz Co.," 1 ♀ 17 July 1935 (J. W. Tilden). *Monterey Co.*: Carmel, 1 ♀ 23 Aug. 1938 (L. S. Slevin); Bixby Canyon, 1 ♀ 7 Aug. 1947 (J. W. Tilden); Hasting's Reservation near Jamesburg, 2 ♂ 17–30 July 1949, 1 ♂ 23 July 1959 (D. D. Linsdale); 3 ♂ 23 July to 20 Aug. 1954 (B. S. Davis); Paradiso Hot Springs, 1 ♂, 1 ♀ 15 July 1954 (O. & L. Bryant); 10 mi S Big Sur, 1 ♀ 20 Aug. 1948 (C. I. Smith). *Ventura Co.*: Ventura, 1 ♂ 7 Aug. 1936, 1 ♀ 16 July 1944 (C. W. Kirkwood); Ventura River, 1 ♂ 4 June 1945, 1 ♂ 26 July 1945, 1 ♀ 9 Aug. 1946 (C. W. Kirkwood). *Riverside Co.*: Rancho La Sierra, Arlington, 1 ♀ 23 July 1941, 1 ♂ 30 July 1941 (F. H. Rindge), 1 ♂ 1 July 1949, 1 ♀ 6 Aug. 1949 (A. H. Rindge). *San Diego Co.*: San Diego, 1 ♂ 30 July 1931 (no further data); "San Diego Co.," 2 ♂ 9 Sept. 1921 (E. Piazza). Paratypes deposited in the collections of American Museum of Natural History, British Museum, California Academy of Sciences, California Insect Survey, California State Department of Agriculture, Canadian National Collection, R. L. Langston, Los Angeles County Museum, San Diego Museum of Natural History, J. W. Tilden, and U. S. National Museum.

The following additional material has been studied but not designated as paratype due to incomplete condition of data or specimens. *Santa Clara Co.*: "Santa Clara, Calif.," 1 ♀ (no further data); Alma, 1 ♂ 13 July 1944 (G. E. Pollard). *Monterey Co.*: Salinas River near King City, 3 ♂ 12 June 1937 (M. L. Walton). *Ventura Co.*: Ventura River, 1 ♀ 14 Aug. 1933, 1 ♀ 6 July 1944, 1 ♂ 2 July 1945 (C. W. Kirkwood). *Riverside Co.*: Palm Springs, 1 ♂ 20 Oct. 1940 (F. H. Rindge). *County unknown*: "California," 1 ♀ "7873," "No. 14 676, collection Hy. Edwards."

Taxonomic discussion: Forewing length range of paratypes—males, 9.8 (reared) to 12.4; females 11.2 to 14.0 mm. The wing color is vari-

able, but the pattern and general appearance are constant. The white is replaced by vertical gray strigulae to a greater or lesser degree, resulting in darker or paler specimens. At times the outer dorsal and apical spots are more heavily scaled with black. A male from Palm Springs has a very washed-out appearance, being pale and without dark markings. The genitalia are not distinguishable from typical *williamsi*, however.

The species appears to be most similar to *E. denverana* Kearfott in structure of the male genitalia. However, it seems most closely related to *E. eburata* Heinrich in general appearance, having a similar but darker color pattern. In addition to color, it differs from *eburata* by having the valva rather strongly constricted and by a more produced uncus. *E. williamsi* is superficially similar to *Epiblema carolinana* (Walsingham) and specimens have been confused with the latter in collections. Specimens were also found in the California Academy of Sciences and U. S. National Museum bearing a "TYPE" label and manuscript name of Kearfott.

Biology: The species was reared from *Baccharis pilularis* (Compositae) in 1909 by F. X. Williams. With the exception of a penciled label, "ex Baccharis," on one female, the specimens bear no biological data; but notes on the collection appear in Williams' 1909 notebook² and were correlated through the emergence dates. Collections of *Baccharis* stems were made on 14 and 22 February 1909, and the "rather small, very sluggish" larvae were in the base of the plants. Williams noted the affected plants were "not particularly healthy." In May he observed that a larva had lined its gallery (presumably with silk) and, along with several other larvae, it had prepared an emergence hole. The exit apertures were closed with wood dust and chips. Adults emerged from 7 to 26 July. Subsequent collection records, based on adults of both sexes taken at lights, indicate that a similar emergence period occurs throughout the range.

I take pleasure in naming the species for Dr. F. X. Williams, dean of American insect biologists, who wrote on 22 February 1909, "Went out especially to obtain this borer, was moderately successful."

Eucosma biplagata (Walsingham)

Paedisca biplagata Walsingham, 1895, Trans. Ent. Soc. London, 1895: 507.

This large species with straw yellow forewings was described from north central Colorado. Walsingham gave the type locality as "Loveland, 10,000 ft," but Loveland itself is located at only about 5,000 feet elevation; and subsequent records have not represented boreal regions. Heinrich (1923) recorded it from Pullman in eastern Washington, and the U. S. National Museum also has specimens from nearby Walla Walla.

² Deposited in the historical files of the Pacific Coast Entomological Society at the California Academy of Sciences and kindly made available by Hugh B. Leech.

Two other records, those of Braun (1925) "lower west slopes of the mountains" near Logan, Utah, and of McDunnough (1927) in the Seton Lake area of southern British Columbia, are in accordance. Specimens I have examined from Plumas County, California, extend the distribution to eastern California, and lend further evidence to the suggestion that the species occupies a broad range through the foothills adjacent to the Great Basin.

The California specimens are a little larger (expanse 26 to 29 mm) and show somewhat more variation in wing color than is given by Walsingham's description. The two oblique bands of the forewing tend to be a little more well developed and distinct, and either one may be somewhat sigmoid rather than straight. In addition, Walsingham reported the hindwing upperside as pale reddish brown; while the Plumas County examples have primarily gray hindwings tending towards reddish brown apically. The underside of the forewing is dark gray with a pale costa and fringe, of the hindwing white. In genitalia a California slide agrees with Heinrich's (1923) figure (Fig. 174) of a Washington specimen in nearly all respects but has a slightly less pointed uncus than his microphotograph shows.

California material examined: Plumas Co.: Nelson Creek, 6 ♂, 4-30 Aug. 1940 (W. R. Bauer).

Eucosma hasseanthi Clarke

Eucosma hasseanthi Clarke, 1952, Bull. So. Calif. Acad. Sci., 52: 60.

This species was described from a series of specimens reared at Orange, California, from *Hasseanthus* [= *Dudleya*] *variegatus* (Wats.) (Crasulaceae). It seems likely that this plant is *Dudleya blochmanae* (Eastwood) according to present concepts (see Munz & Keck, 1959). Clausen *et al.* (1945) treated as distinct *Hasseanthus blochmanae*, a form which had been considered a variety of *H. variegatum* by earlier authors. The latter species does not range northward as far as Orange County.

During the spring of 1962, while investigating Hydrophyllaceae for Ethmiidae, I found larvae of *E. hasseanthi* boring in the woody roots of *Phacelia ramosissima* Dougl.³ (var. *suffrutescens* Parry) at Riverside, California.

The collection was made 13 May on the dry hills back of the Citrus Experiment Station, where exceptionally heavy rains of the current season had resulted in a tremendous growth by annual and perennial herbs, including *P. ramosissima*. Although individual plants of this species had formed large, semiprostrate bushes 10 to 12 feet in diameter, the woody portions of their roots were comparatively small, the crown extending only a few inches downward before separation into individual roots which diminished in size abruptly. The larvae were all found within the crown area in tunnels about 2.5 mm in diameter, which extended at least 4 to 6

³ Determined by P. H. Timberlake, Citrus Experiment Station, University of California, Riverside.

inches through the roots. Every *P. ramosissima* examined showed evidences of feeding in the form of the characteristic tubes of tightly packed, pale, sawdust-like frass; and larvae were collected in several different plants, two of which had two larvae each.

One larva, exposed by splitting the root, spun a silken shelter enclosing itself in its tunnel within 24 hours. During the course of feeding or in preparation for emergence, two larvae formed elongate tubes of silk covered with frass which projected upward from the root pieces. These tunnels, which served as emergence exits, were about 12 and 25 mm in length; in the case of the second, it extended along and through layers of paper toweling. Other individuals emerged from burrows which opened directly at the root surface. Pupae were not observed *in situ*, but not all occupied tunnels collected were opened for examination. Apparently pupation began soon after the roots were excavated, since adults emerged from 28 May to 11 June. Under field conditions probably pupation does not begin until June or July. The type series was reared in August, but the collection date was not given.

Although most North American species of *Eucosma* are thought to be root borers, very few have been reared, and some of those from only a single locality. Thus, little information is available on host specificity of individual species or species groups, and the occurrence of *E. hasseanthi* in representatives of two plant families is noteworthy. Even though the distance between the cities of Orange and Riverside is only about 40 road miles, the two represent areas of differing ecological conditions, on the coastal and east sides of the Santa Ana Mountains. *Dudleya blochmanae* in southern California is limited to the seaward foothills (Munz & Keck, 1959) and would not be expected to occur in arid, inland parts of the range of *E. hasseanthi*, such as at Riverside. In addition, the growth form of *D. blochmanae* is described as stems from a globose or fusiform corm, which should provide a somewhat different habitat for borers from the dry, woody rootstocks of *P. ramosissima*.

Eucosma hohana Kearfott

Eucosma hohana Kearfott, 1907, Trans. Amer. Ent. Soc., 33: 28.

This curious, little known species was described from Mt. Piran, Alberta and subsequently was reported by Heinrich (1923) from Paradise Valley, Mt. Rainier, Washington. Colonies which recently have been turned up in California indicate that the species is a resident of true boreal zones above climatic timberline. In the Mono Pass area of the southern Sierra Nevada and in the White Mountains, it flies in association with such Lepidoptera as *Hesperia meriamae* MacNeill (Hesperiidae) and *Catastia bistriatella* (Hulst) (Pyrilidae), species which were not encountered during investigations of subtending Hudsonian Zone areas of 10,000–11,000 feet elevation.

California specimens average a little smaller than Kearfott's two types, which were given as 20–22 mm. I suspect that the latter were males, since

in my material males range about 17–20 mm in wing expanse, and females about 15–16 mm. Since the original description was based on only two specimens and was somewhat superficial, the species (based on California specimens) may be further characterized as follows:

Male: Length of forewing 9.1 to 10.5 mm. *Head*—Labial palpus moderately elongate, second segment length 1.5 times vertical eye diameter, clothed by spreading scales especially ventrally, which become more elongate distally to form a broad, apical tuft which completely obscures third segment; gray exteriorly, the tuft scales blackish distally, tipped with white. Antenna less than one-half forewing length; dark, the scale bands pale gray; minutely setate. Head scaling dense, bushy, shorter on front; pale grayish, tipped with white. *Thorax*—Dorsal scales dark gray tipped with white; metanotum scales posteriorly dark gray. Underside scaling shining gray; metathoracic leg whitish. *Forewing*—Elongate, narrow at base, expanding apically, length about 3.3 times width at end of cell. Costal fold narrow, short, less than one-third costa length; costa beyond almost straight, slightly concave at middle; apex acute, termen strongly angled back, broadly curved with dorsum. Ground color whitish, tinged with ocreous; more or less evenly and lightly to heavily speckled with slate gray; the gray tending to form a series of parallel, transverse lines; a series of outer costal dashes being the only constant marks. In pale forms the ochreous overscaling combined with the grayish gives an olivaceous appearance; the gray dusting often concentrated into two more or less well-defined dorsal spots, one at basal one-third, which tends to form the margin of a basal patch, and a triangulate one just before tornus; area between these at times evident as a broad, median, paler band. Fringe gray, tipped with white. Underside pale grayish, whitish areas of upperside evident.

In male genitalia California examples compare well with Heinrich's figure (Fig. 241) of a Washington specimen, although a White Mountains male has slightly narrower, less angulate valvae.

Female: Length of forewing 6.9 to 9.4 mm. Essentially as described for male, tending to be darker, ranging to a form which is almost entirely dark gray with the whitish restricted to narrow, ill-defined bands. Costal fold lacking, costa slightly convex in basal area. Genitalia as in Figs. 6, 7 (drawn from plesiotype, Mt. Barcroft, JAP prep. 1449; two preparations examined); papillae anales rotated outward 90°, apparently forming a blade-like ovipositor; sclerotized portion of abdominal segments IX–X bearing short hook-like setae; eighth abdominal tergite elongate, laterally compressed; sterigma a concave plate; ductus bursae gradually broadened distally, bearing a broad, lightly sclerotized patch distad of ductus seminalis; ventral signum small, dorsal signum reduced to a trace.

The general grayish, speckled appearance is similar to that of granite rocks which the moths frequent. Both sexes were taken during the day amongst rocky outcroppings around the small, dry alpine meadows at Mt. Barcroft.

California material examined: Mono Co.: Mt. Barcroft, 12,500 ft., White Mts., 2 ♀ 5 July 1961 (D. C. Rentz), 20 ♂, 14 ♀ 21 July 1961 (D. C. Rentz and J. Powell). Inyo Co.: near Mono Pass, 12,000 ft., 2 ♂ 13 August 1957 (J. Powell), 1 ♀ 8 August 1961 (MacNeill, Rentz, Lundgren).

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