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EIGHT NEW SPECIES OF *EUCOSMA* HÜBNER (TORTRICIDAE) FROM WESTERN NORTH AMERICA

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ABSTRACT. Eight new species of *Eucosma* Hübner (Tortricidae) are described from western North America: *E. angelana*, *E. blanchardi*, *E. candida*, *E. johnstoni*, *E. lafontainei*, *E. maculosa*, *E. mescalerana*, and *E. rufocostana*. *Eucosma conspiciendana* Heinrich and *Eucosma cataclystiana* (Walker) are reviewed due to similarity in forewing appearance to *E. rufocostana*. Illustrations of the adults and genitalia are provided.

Additional key words: Olethreutinae, Eucosmini, *conspiciendana*, *cataclystiana*.

In the Nearctic Region, the olethreutine lineage currently arranged under the genera *Phaneta* Stephens, *Eucosma* Hübner, and *Pelochrista* Lederer is represented by some 300 named species. The greatest diversity occurs in western North America, where there are numerous taxa yet to be recognized and described. This paper proposes names for eight new species, five from the desert southwest, two from the high plains east of the Rocky Mountains, and one from the Great Basin and central Rocky Mountain regions. Their placement in *Eucosma* is based on the presence of a costal fold on the male forewing and the lack of a large spine on the ventral margin of the male cucullus. Included are reviews of *Eucosma conspiciendana* Heinrich and *Eucosma cataclystiana* (Walker), which are similar in forewing appearance to one of the new species.

MATERIALS AND METHODS

This study is based on the examination of 366 specimens and 97 associated genitalia preparations from the following institutional and private collections: Charles D. Bird, Erskine, Alberta (CDB); The Natural History Museum, London (BMNH); Canadian National Collection, Ottawa (CNC); Laurence L. Crabtree, Bieber, California (LLC); Donald J. Wright (DJW); Essig Museum of Entomology, UC Berkeley (EME); George J. Balogh, Portage, Michigan (GJB); John S. Nordin, Laramie, Wyoming (JSN); and United States Museum of Natural History, Washington D.C. (USNM). Collections at Colorado State University, Fort Collins, Colorado (CSU) and Michigan State University, East Lansing, Michigan (MSU) are included amongst the paratype depositories for some of the new species. Morphological nomenclature follows Gilligan et al. (2008). Forewing length (FWL) is measured from base to apex including fringe, aspect ratio (AR) is defined as FWL divided by medial forewing width, saccular angle refers to the angle formed by the ventral margin of the sacculus and the adjacent margin of the neck (see Wright 2011), and "≈" stands for "approximately equal to".

SPECIES ACCOUNTS

Eucosma blanchardi, new species

(Figs. 1–3, 21, 31, 32, 47)

Diagnosis. *Eucosma blanchardi* resembles *Eucosma mescalerana* (described below) (Figs. 1–3 vs. Fig. 4), but the forewing has a less sharply defined median fascia, a paler apical region, and brown reticulations in the interfascial areas. The male genitalia of the two species are distinguished by subtle differences in valval shape (Figs. 21, 22), the number and size of the spines along the distal margin of the cucullus (fewer and stouter in *E. blanchardi*), and the presence/absence of a ridge on the medial surface of the valva at the proximal margin of the cucullus (present in *E. blanchardi*, absent in *E. mescalerana*). Females are easily separated by sterigma shape (Figs. 32, 34). Also, *E. blanchardi* lacks the sclerotized patch present on the ductus bursae in *E. mescalerana* (Figs. 31, 33).

Description. *Head*: Frons white; vertex with medial scales beige, lateral scales white with pale brown shading; labial palpus white, with some brownish-gray shading on lateral surface of second segment and with third segment concealed by long scales on ventral margin of second segment; antenna concolorous with vertex. *Thorax*: Dorsal surface white; tegula white with light brown basal and sub-apical spots; ventral surface white; legs brown, sometimes shading to tan, with white markings at mid-tibia, distal extremity of tibia, and distal extremity of each tarsomere. *Forewing* (Figs. 1–3): ♂ FWL 5.9–8.0 mm (mean = 6.5, n = 30), AR = 2.89; ♀ FWL 5.9–8.2 mm (mean = 7.1, n = 17), AR = 2.84; costal margin weakly convex; apical angle approximately 90°; distal margin weakly convex; dorsal markings brown to gray; interfascial areas white with extensive gray-brown reticulations; subbasal fascia well expressed from dorsum to cubitus, barely discernable from cubitus to costa; median fascia usually complete, often weakly expressed on radius and cubitus, and frequently with small cluster of black scales forming a dark dot at proximal margin of ocellus; ocellus with proximal and distal margins defined by white-edged lustrous beige bars; central field of ocellus white, frequently with fine brown reticulations, and crossed by up to

three longitudinal black dashes; costal strigulae well expressed from base to apex; scales along termen white with black to blackish-brown cross-bars; fringe scales whitish, those toward apex with dark cross-bars. *Hindwing*: Gray brown. *Male genitalia* (Fig. 21) (n = 9): Uncus semitriangular and well differentiated from dorsolateral shoulders of tegumen; socius long and narrow, with distal one-half tapering to narrowly rounded apex; vesica with 1–6 deciduous cornuti; valva with costal margin concavely curved at neck, apex evenly rounded, distal margin convex of nearly uniform curvature, anal angle moderately produced, neck long and tapering from saccular corner to cucullus, saccular angle obtuse; proximal margin of cucullus accentuated by weakly developed ridge on medial surface of valva; distal margin of cucullus with 5–9 spines spaced evenly from anal angle nearly to apex. *Female genitalia* (Fig. 31, 32) (n = 7): Papillae anales with ventrolaterally facing posterior lobes, laterally facing anterior lobes, long ventrally curving setae along lateral margins, and hook-tipped setae along margins of anal opening; lamella postvaginalis semirectangular, medial width ≈ 2 × length, with posterior margin somewhat wider than ostium, and with several hair-like setae flanking shallow central trough; lamella antevaginalis ring-like and weakly sclerotized; posterior margin of sternum 7 roundly emarginated to one-half length of sterigma; ductus bursae lacking sclerotization; corpus bursae with two signa of distinctly different size; corpus bursae finely wrinkled, with interior surface lacking microspinules.

Holotype. ♂, Arizona, [Pima Co.], Madera Canyon, Santa Rita Mtns., R. W. Hodges, 4400 ft., 12 October 1959, USNM.

Paratypes. ARIZONA: Cochise Co., S. W. Res. Sta., 5 mi. W. Portal, J. R. Powers, 1 September 1959 (1 ♂, genitalia slide DJW 2410); same location and collector as holotype, 6 October 1959 (2 ♂), 12 October 1959 (1 ♂); [Pima Co.], Madera Canyon, Santa Rita Mtns., R. W. Hodges, 4880 ft., 24 July 1959 (1 ♂), 28 August 1959 (1 ♂), 13 September 1959 (1 ♀), 14 September 1959 (1 ♂), 16 September 1959 (1 ♂), 26 September 1959 (1 ♀, genitalia slide DJW 2065), 27 September 1959 (1 ♂; 1 ♀, genitalia slide DJW 2406), 29 September 1959 (1 ♀, genitalia slide DJW 2067); Santa Cruz Co., Pena Blanca Canyon, R. W. Hodges, 26 August 1959 (1 ♂). NEW MEXICO: Otero Co., Dog Cyn. Rd., south of Alamogordo, G. J. Balogh, 14 September 2004 (11 ♂, genitalia slides DJW 1743, 2407; 1 ♀, genitalia slide DJW 2063); Sierra Co., Hwy 195 near I-25 exit 83, G. J. Balogh, 15 October 2001 (1 ♂, genitalia slide DJW 1119); White Sands National Monument, E. H. Metzler, 25 August 2009 (3 ♂, genitalia slide DJW 2534), 14 September 2009 (3 ♀). TEXAS: [Brewster Co.], Big Bend N. P., Chihuahuan Desert near Nugent Mtn., A. & M. E. Blanchard, 21 September 1971 (1 ♂, genitalia slide USNM 90418; 1 ♀), 8 October 1969 (1 ♀, genitalia slide USNM 90420); Presidio Co., Shafter, A. & M. E. Blanchard, 9 September 1969 (1 ♂, genitalia slide USNM 90419), 16 October 1973 (1 ♂, genitalia slide USNM 90421). Depositories: BMNH, DJW, EME, GJB, MSU, USNM.

Etymology. The specific epithet honors André Blanchard for his many contributions to our knowledge of the Tortricidae of Texas.

Distribution and biology. Figure 3 is representative of 6 specimens (1 ♂, 5 ♀) I collected approximately 12 miles south of Silver City in Grant County, New Mexico on 9 August 1999. I did not include them in the type series because they are a little larger than the designated paratypes (mean FWL ≈ 7.5 vs. 6.6 mm) and a little more strongly marked, but I am treating them as *E. blanchardi* based on similarity of genitalia and *forewing* pattern. The 49 specimens examined (32 ♂, 17 ♀) document a geographic range extending from southeastern Arizona to southwest Texas (Fig. 47). Adults fly from late July to mid-October.

Eucosma mescalerana, new species

(Figs. 4, 22, 33, 34, 47)

Diagnosis. *Eucosma mescalerana* is similar to *E. blanchardi*; differences are discussed in the diagnosis section for the latter species.

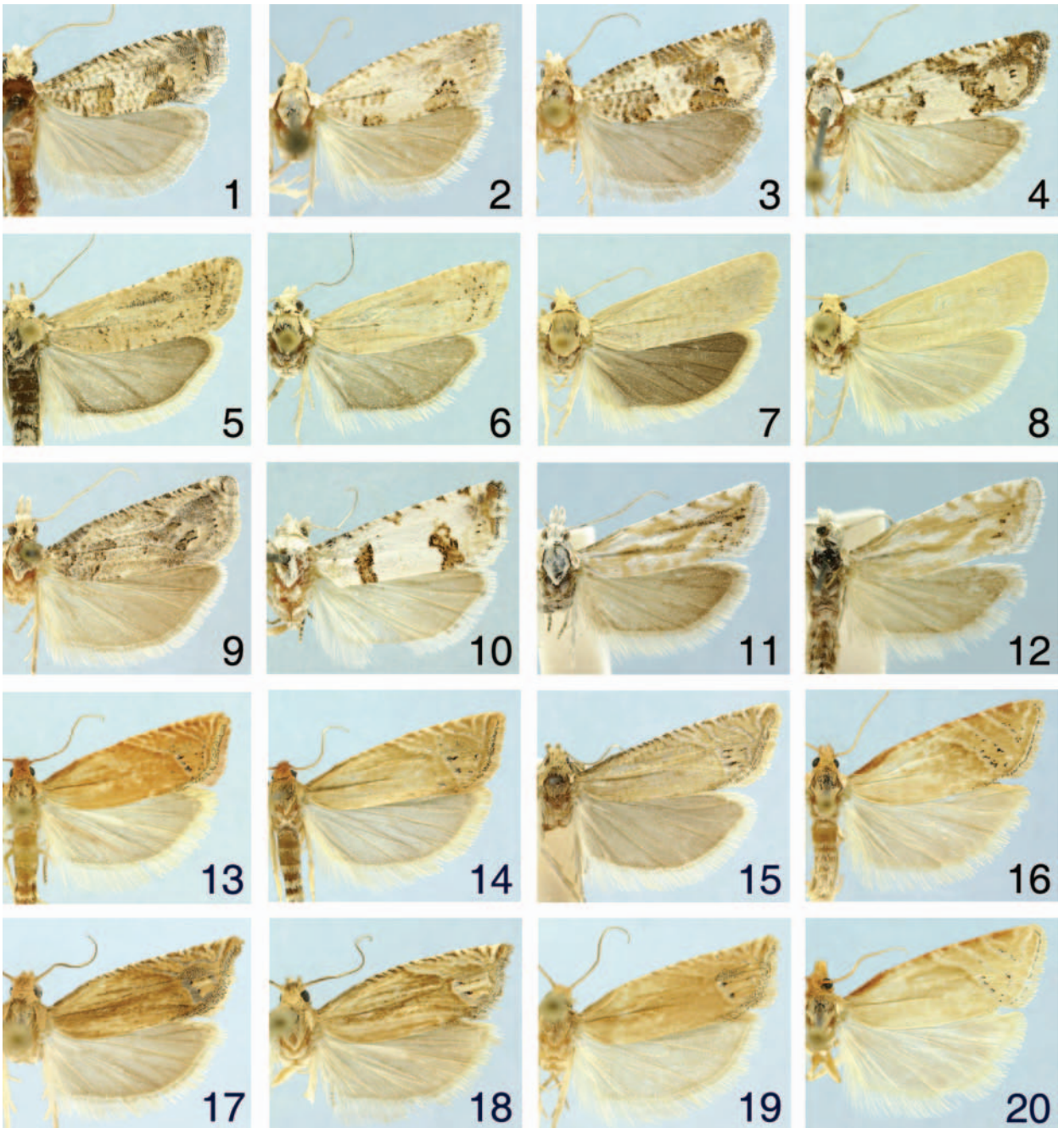
Description. *Head*: Frons and vertex white; labial palpus white, with gray-brown shading on lateral surface of second segment; antenna white. *Thorax*: Dorsal surface white; tegula white with brown basal spot; ventral surface white; fore- and mid-leg with anterior surfaces pale brown, posterior surfaces whitish; hind-leg whitish; mid-leg with white marks at mid-tibia and distal extremity of tibia; tarsi with whitish annular markings at distal end of each tarsomere. *Forewing* (Fig. 4): ♂ FWL 7.8–8.7 mm (mean = 8.2, n = 3), AR = 3.19; ♀ FWL 6.7–7.7 mm (mean = 7.4, n = 3), AR = 2.94; costal margin nearly straight; apex acute; distal margin straight; dorsal surface white with brown markings, the latter variably edged with black; male costal fold grayish brown; basal and subbasal fasciae represented by short mark on inner margin and by bar from inner margin to cell, respectively; median fascia complete, with cluster of black scales forming conspicuous dot at proximal margin of ocellus; postmedian band often interrupted by white sub-costal scaling; central field of ocellus white to pale tan, crossed by up to three black dashes, bordered on proximal and distal margins by white-edged lustrous beige bars, and capped anteriorly by patch of white-tipped gray scales; costal strigulae sharply defined from mid-costa to apex; scales along termen blackish gray with white apices; fringe scales whitish near tornus, shading to dark gray toward apex. *Hindwing*: Gray brown. *Male genitalia* (Fig. 22) (n = 3): Uncus a prominent lobe with rounded apex; dorsolateral shoulders of tegumen well developed; socius long and narrow, tapering gradually to narrowly rounded apex; vesica with 5–6 deciduous cornuti; valva with costal margin concave, apex rounded, distal margin weakly convex to nearly straight, anal angle moderately produced, ventral emargination of neck moderate, saccular angle obtuse; cucullus with medial surface covered with fine setae and with 12 or more spiniform setae along distal margin from anal angle nearly to apex. *Female genitalia* (Figs. 33, 34) (n = 3): Papillae anales with ventrally facing lobes extending posterior to anal opening, laterally facing surfaces flanking anal opening, long ventrally curving setae along lateral margins, and shorter often hook-tipped setae along anal opening; lamella postvaginalis nearly flat, with semitriangular posterolateral corners and shallow medial trough; anterior margin of ostium fused with sternum 7; membrane posterior to sterigma with irregular lines of hair-like setae extending to ventral extremities of tergum 8; sternum 7 with posterior edge emarginated to nearly full length of sterigma and with medial section weakly sclerotized compared to posterior and lateral margins; ductus bursae with small sclerotized patch near juncture with ductus seminalis; corpus bursae with large signum on ventral surface and small tack-like signum on dorsal surface.

Holotype. ♂: New Mexico, Chaves Co., Mescalero Dunes east of Roswell, G. J. Balogh, 22 September 2003, genitalia slide DJW 1122, USNM.

Paratypes. ARIZONA: Cochise Co., 5131 Bannock St., Pueblo Del Sol, Huachuca Mts., H. S. Wielgus, 22 June 1986 (1 ♀, genitalia slide DJW 1934); Cochise Co., Turkey Creek, Chiricahua Mts., 5600 ft., J. Brown, 1–2 August 1986 (1 ♂, genitalia slide DJW 1319; 1 ♀, genitalia slide DJW 1321); Santa Cruz Co., 2 mi. W. of Ft. Huachuca on Forest Serv. Rd. 827, D. J. Wright, 6 August 1999 (1 ♀, genitalia slide DJW 1153). NEW MEXICO: same data as holotype (1 ♂, genitalia slide DJW 1154). Depositories: DJW, EME, USNM.

Etymology. The specific epithet is derived from the name of the type locality, the Mescalero Dunes in southeastern New Mexico.

Distribution and biology. I examined 6 specimens (3 ♂, 3 ♀) from the southeast corner of Arizona and east



FIGS. 1-20. **1-3,** *E. blanchardi*. **1,** ♂ Otero Co., New Mexico. **2.** ♀ Santa Rita Mts., Arizona; **3,** ♀ Grant Co., New Mexico. **4,** *E. mescalerana*, ♂ holotype, Chaves Co., New Mexico. **5-6,** *E. maculosa*. **5,** ♂ holotype. **6,** ♂ Albany Co., Wyoming. **7-8,** *E.* lafontainei, ♂, ♂ Albany Co., Wyoming. **9,** *E. angelana*, ♂ Los Angeles Co., California. **10,** *E. candida*, ♂ holotype. **11-12,** *E. johnstoni*. **11,** ♂ holotype. **12,** ♂ Mojave Co., Arizona. **13-15,** *E. conspiciendana*. **13,** ♂ Sanpete Co., Utah. **14,** ♂ Albany Co., Wyoming. **15,** ♂ Monterey Co., California. **16,** *E. rufocostana*, ♂ holotype. **17-19,** *E. cataclystiana*, ♂, ♂, ♂, Adams Co., Ohio; Monona Co., Iowa; Larimer Co., Colorado. **20,** *E. rufocostana*, ♂ Oneida Co., Idaho.

central New Mexico (Fig. 47). One record is from late June, the others from August and September.

Eucosma maculosa, new species
(Figs. 5, 6, 23, 35, 36, 48)

Diagnosis. *Eucosma maculosa* is similar to *Eucosma lafontainei* (described below). The pale forewing is variably speckled with dark brown, the costal strigulae are weakly delimited by brown marks, and a pale grayish-brown streak extends from mid-cell nearly to the apex (Figs. 5, 6). The forewing in *E. lafontainei* (Figs. 7, 8) is immaculate except for a pale grid of fine yellow-brown reticulations. The male genitalia of the two species are similar (Figs. 23, 24), but in *E. maculosa* the uncus is somewhat more bulbous, the cucullus slightly more elongate, and the setae on the uncus, socii, and sacculus are finer and less densely distributed. The phallobase, which is bulbous in both species, is spherical in *E. maculosa* but comprised of two semispherical sections in *E. lafontainei*. Females of *E. maculosa* have large patches of scales on the lamella postvaginalis vs. a few hair-like setae in *E. lafontainei* (Figs. 36, 38), and in *E. maculosa* the posterior margin of sternum 7 more strongly overlaps the ostium. The male genitalia of *E. maculosa* resemble those of *Eucosma biquadrana* (Walsingham) (Wright 2008, Fig. 33), but the two species are easily separated by forewing color and maculation (Figs. 5, 6 vs. Wright 2008, Figs. 21, 22).

Description. *Head*: Frons and vertex creamy white to pale tan; labial palpus concolorous with vertex, with long scales of second segment a shade darker; antenna pale tan. *Thorax*: Dorsal surface tan; ventral surface creamy white; legs tan to pale brown, with whitish ring at distal end of each tarsomere. *Forewing* (Figs. 5, 6): ♂ FWL 9.5–11.7 mm (mean = 10.7, n = 12), AR = 3.50; ♀ FWL 10.9–11.7 mm (mean = 11.3, n = 2), AR = 3.23; costal margin straight; apex acute; termen nearly straight; dorsal surface pale yellowish white to tan, lacking fasciate markings but liberally speckled with brown/black scales, often with pale grayish-brown streak arising at about mid-cell and gradually widening toward apex; ocellus barely discernable, concolorous with wing, with transverse line of black scales through central field; costal strigulae weakly expressed from mid-wing to apex, separated by brown to blackish-brown costal marks; fringe scales concolorous with wing. *Hindwing*: Gray brown, with fringe paler. *Male genitalia* (Fig. 23) (n = 4): Uncus strongly developed and somewhat bulbous, with height ≈ basal width; dorsolateral shoulders of tegumen well defined; socii long, finger-like, and moderately setose; phallus cylindrical, with bulbous spherical base; vesica with 8–9 deciduous cornuti; valva with costal margin concave, apex evenly rounded, distal margin convex, anal angle weakly developed, ventral emargination of neck broad and shallow, saccular corner broadly rounded; cucullus with 4–5 spiniform setae on ventral two-thirds of distal margin. *Female genitalia* (Figs. 35, 36) (n = 2): Papillae anales ventrally facing and tapering from evenly rounded posterior lobes to more narrowly rounded anterior lobes, with ventral surfaces covered with short to medium length setae, lateral margins lined with long ventrally curving setae, and with numerous hook-tipped setae on anterior lobes; lamella postvaginalis nearly flat, shaped like a whale tail, with shallow central trough and large patches of scales (ca. 50, represented by sockets in Figs. 35, 36) on lateral projections; posterior margin of sternum 7 with medial projection shielding ostium; ductus bursae without sclerotization; corpus bursae with two signa, one thimble-like, the other smaller and cone-like; membrane of corpus bursae finely wrinkled, with interior surface lacking microspinules.

Holotype (Fig. 5). ♂: Wyoming, Albany Co., T15N R75W S29, W. side Gelatt Lake, 7250 ft., J. S. Nordin, 41° 14.0' N, 105° 50.6' W, 18 July 2005, USNM.

Paratypes. WYOMING: Same locality and collector as holotype, 29 June 2006 (1 ♂), 15 July 2005 (1 ♂, genitalia slide DJW 1411), 16 July 2007 (1 ♂), 18 July 2005 (2 ♂), 20 July 2005 (1 ♂), 28 July 2005 (4 ♂, genitalia slides DJW 1410, 1927, 1928; 1 ♀, genitalia slide DJW 1666), 29 July 2005 (1 ♂); Albany Co., NW side Gelatt Lake, 7250 ft., J. S. Nordin, 9 July 2007 (1 ♀, genitalia slide DJW 1874). Depositories: BMNH, CNC, CSU, DJW, EME, USNM.

Etymology. The specific epithet comes from the Latin adjective maculosus, meaning spotted or speckled.

Distribution and biology. The type locality, located approximately 15 miles WSW of Laramie, Wyoming, is noted for its alkali soil, with sizable stands of *Atriplex gardneri* (Moq.) D. Dietr. (Gardner's saltbush) (Chenopodiaceae) along the lake shore. The larva of *E. maculosa* is probably a root borer in one or more species of Asteraceae, as is the case with most species of *Eucosma* with documented hosts (see e.g. Powell & Opler 2006). Species of Asteraceae identified at the type locality include: *Ericameria nauseosa* (Pall. ex Pursh) G. L. Nesom & G. Baird (rubber rabbitbrush), *Artemisia frigida* Willd. (prairie sagewort), and *Artemisia tridentata* Nutt. (big sagebrush). Adult capture dates range from 29 June to 29 July.

Eucosma lafontainei, new species
(Figs. 7, 8, 24, 37, 38, 48)

Diagnosis. This species is distinguished from other Nearctic *Eucosma* by the uniformly pale yellowish forewing (Figs. 7, 8) together with the form of the female genitalia (Fig. 37). It most closely resembles *E. maculosa*, the differences being noted in the diagnosis for that species.

Description. *Head*: Uniformly yellowish white. *Thorax*: Dorsal surface concolorous with head; ventral surface a shade lighter; legs pale yellowish white and lacking tarsal annulations. *Forewing* (Figs. 7, 8): ♂ FWL 11.5–12.9 mm (mean = 12.3, n = 6), AR = 3.33; ♀ FWL 11.2–13.5 mm (mean = 12.4, n = 3), AR = 3.24; costal margin straight; apex acute; termen convex; dorsal surface uniformly pale yellow to pale tan, with extensive pale yellowish-brown reticulations; fasciate markings, ocellus, and costal strigulae not expressed. *Hindwing*: Pale gray brown to dark gray brown; fringe contrastingly lighter in dark specimens. Male genitalia (Fig. 24) (n = 6): Uncus strongly developed, with apex rounded to weakly indented medially; dorsolateral shoulders of tegumen well differentiated; socii large, finger-like, and densely covered with moderately stout setae; phallus cylindrical, with bulbous base divided into two semispherical lobes; vesica with 6–13 deciduous cornuti; valva with costal margin weakly concave, apex rounded, distal margin convex, anal angle weakly produced, ventral emargination of neck broad and shallow, saccular corner broadly rounded; cucullus with medial surface densely covered with moderately stout setae and with ca. 5 spiniform setae along distal margin. *Female genitalia* (Figs. 37, 38) (n = 3): Papillae

anales ventrally facing and tapering from evenly rounded posterior lobes to more narrowly rounded anterior lobes, with medial margins flanking anal opening somewhat raised, ventral surfaces densely setose, lateral margins lined with long ventrally curving setae, and numerous hook-tipped setae on anterior lobes; lamella postvaginalis nearly flat, in the shape of a whale tail, with very shallow central trough and several setae (6–12) on each lateral projection; posterior margin of sternum 7 with convex medial projection weakly shielding ostium; ductus bursae without sclerotization; corpus bursae with two signa of unequal size, membrane finely wrinkled, and interior surface lacking microspinules.

Holotype. ♂: Wyoming, Albany Co., T15N R75W S29, W. side Gelatt Lake, 7250 ft., J. S. Nordin, 28 July 2005, genitalia slide DJW 2422, USNM.

Paratypes. CANADA: Alberta, Dry Island Buffalo Jump Provincial Park, 51.939° N, 112.965° W, 760 m., C. D. Bird, 12 July 2003 (1 ♀, genitalia slide DJW 1899). COLORADO: [Pueblo Co.], 5 mi N. Pueblo, 5100 ft., Lafontaine and Bowen, 22 August 1975 (1 ♂, genitalia slide DJW 1164). WYOMING: same location and collector as holotype, 18 July 2005 (1 ♂, genitalia slide DJW 1412), 28 July 2005 (2 ♂, genitalia slides DJW 1408, 2423; 2 ♀, genitalia slides DJW 1409, 1930), 29 July 2005 (1 ♂, genitalia slide DJW 1929); Albany Co., NW side Gelatt Lake, 7242 ft., J. S. Nordin, 22 July 2009 (1 ♂). Depositories: CDB, CNC, CSU, DJW, EME, USNM.

Etymology. This species is named after J. Donald LaFontaine, one of the collectors of the earliest dated specimen in the type series.

Distribution and biology. I examined 10 specimens (7 ♂; 3 ♀) from the plains of eastern Colorado, southeastern Wyoming, and southern Alberta (Fig. 48). Capture dates range from 12 July to 22 August.

Eucosma angelana, new species

(Figs. 9, 25, 39, 40, 47)

Diagnosis. The combination of forewing appearance (Fig. 9) (brownish-gray coloration with fragmented median fascia) and male cucullus shape (Fig. 25) (broadly rounded apex with narrowly rounded and strongly developed anal angle) distinguishes *E. angelana* from other Nearctic *Eucosma*. The male genitalia most closely resemble those of *Eucosma matutina* (Grote) and *Eucosma fiskeana* Kearfott (Gilligan et al. 2008: 217 and 220), but the latter two species are smaller (mean FWL ≈ 7.6 mm and 9.2 mm, respectively, vs. 11.9 mm in *E. angelana*) and quite different in forewing color and maculation (Fig. 9 vs. Gilligan et al. 2008: 108, 114). The female genitalia resemble those of *Eucosma totana* Kearfott (Figs. 39, 40 vs. Wright 2005, Figs. 28, 32), but the forewing of the latter species has whiter interfascial areas and a distinctive chevron-shaped mark at the end of the cell (Fig. 9 vs. Wright 2005, Figs. 7, 8).

Description. *Head*: Lower frons creamy white; scales of upper frons and vertex creamy white, with variably expressed tan to brown cross-markings; labial palpus with medial surface and dorsal edge creamy white, lateral surface pale brown, third segment creamy white and concealed by long scales of second segment; antenna concolorous with vertex. *Thorax*: Scales of dorsal surface creamy white with grayish-brown cross-markings; ventral surface creamy white; fore- and mid-leg with anterior surfaces brown, posterior surfaces creamy white; hind-leg paler; legs with whitish markings at mid-tibia, distal extremity of tibia, and distal end of each tarsomere. *Forewing* (Fig. 9): ♂ FWL 11.3–12.2 mm (mean = 11.7, n = 7), AR = 3.21; ♀ FWL 11.5–12.7 mm (mean = 12.2, n = 4), AR = 2.95; costa weakly arched at base, otherwise straight; apex acute; termen straight; dorsal surface brownish gray, heavily suffused with creamy white, with faint creamy-white streaks along radius, cubitus, and CuP; fasciate markings darker brown, often with some black edging; subbasal fascia an oblique bar from inner margin to radius, separated from costa by creamy-white sub-costal streak; median fascia weakly expressed and broken into three components: an outwardly oblique bar at mid-costa, a pretornal oblique bar arising on inner margin and bordering proximal margin of ocellus, and a bar at distal end of cell that aligns with dark scaling anterior to ocellus to form an apical streak; ocellus defined proximally and distally by lustrous beige bars; central field of ocellus concolorous with interfascial areas and marked by up to three black dashes, the latter often reduced to black dots; scales along termen white with dark brown cross-markings; fringe scales creamy white, sometimes with pale brownish cross-markings. *Hindwing*: Grayish brown. *Male genitalia* (Fig. 25) (n = 4): Uncus a well developed convex lobe; dorsolateral shoulders of tegumen well defined; socii finger-like, narrowing distally; vesica with 8–11 deciduous cornuti; valva with costal margin concave, apex broadly rounded, distal margin nearly straight toward anal angle, anal angle acute and strongly produced, ventral emargination of neck broad and U-shaped, saccular angle obtuse; cucullus with medial surface densely setose. *Female genitalia* (Figs. 39, 40) (n = 3): Papillae anales laterally facing and moderately setose; ostium circular; lamella postvaginalis widening posteriorly, with V-shaped emargination of posterior margin, acute posterolateral corners, and several hair-like setae flanking microspinulate medial section; lamella antevaginalis narrow and ring-like; posterior margin of sternum 7 weakly concave and separated from sterigma by thin band of membrane; ductus bursae lacking sclerotization but with microspinules on inner surface near juncture with ductus seminalis; corpus bursae with two signa of different size and with inner surface sparsely microspinulate.

Holotype. ♂: California, Los Angeles Co., Mint Canyon, Christopher Henne, 15 October 1941, genitalia slide JAP 4602, EME.

Paratypes. CALIFORNIA: same location and collector as holotype, 11 October 1941 (1 ♀, genitalia slide DJW 2415); Los Angeles Co., 6 mi. W. Lancaster, J. A. Powell, 2 October 1967 (8 ♂, genitalia slides JAP 2292, DJW 1312, 2416; 4 ♀, genitalia slide DJW 1313); 5 October 1964 (1 ♀, genitalia slide DJW 2056). Depositories: DJW, EME, USNM.

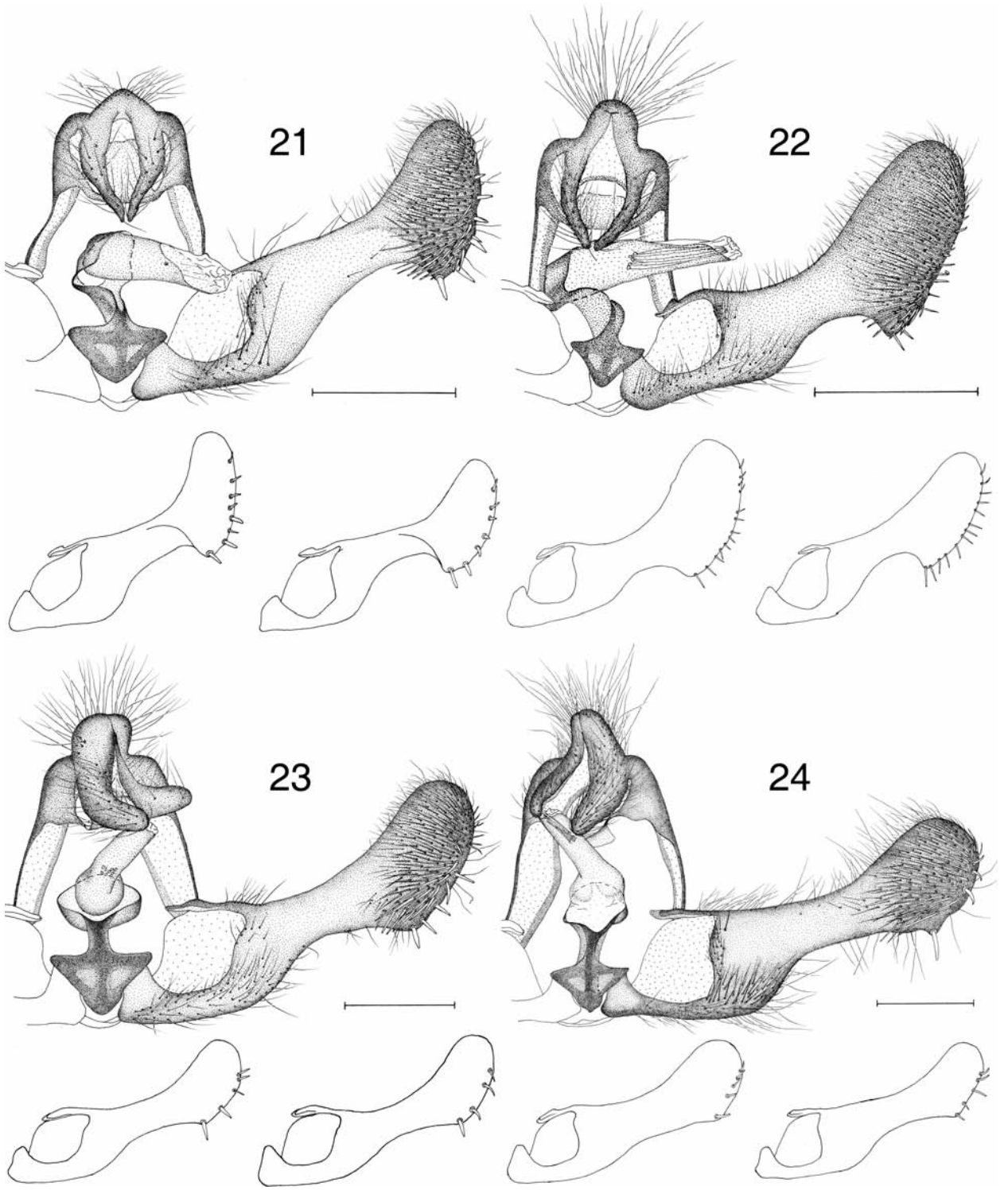
Etymology. The specific epithet refers to Los Angeles County, California, where the type series was collected.

Distribution and biology. I examined 15 specimens (9 ♂, 6 ♀) (Fig. 47), all captured during the first half of October. Those from the Lancaster site bear pin labels with the inscription "Artemisia".

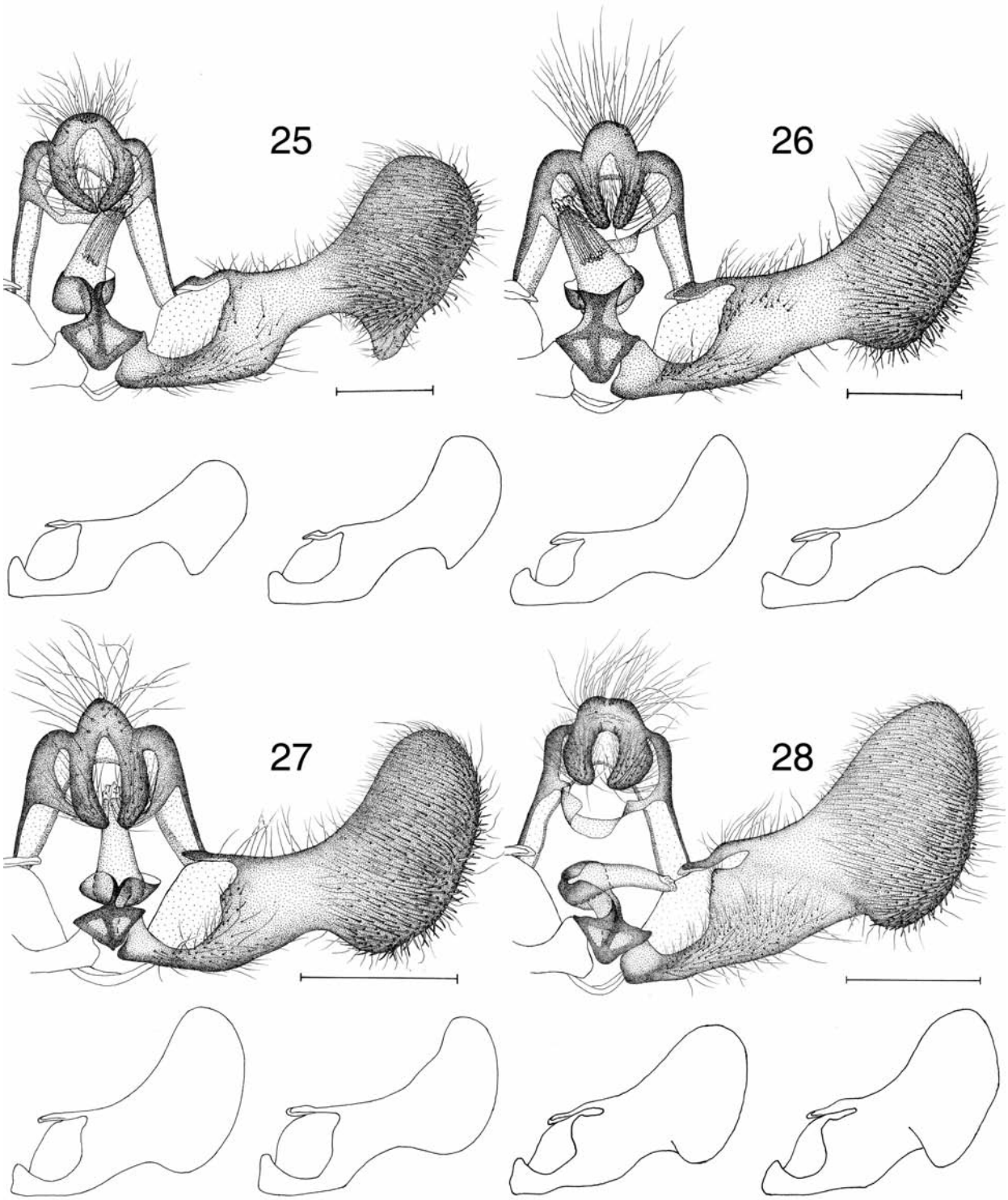
Eucosma candida, new species

(Figs. 10, 26, 47)

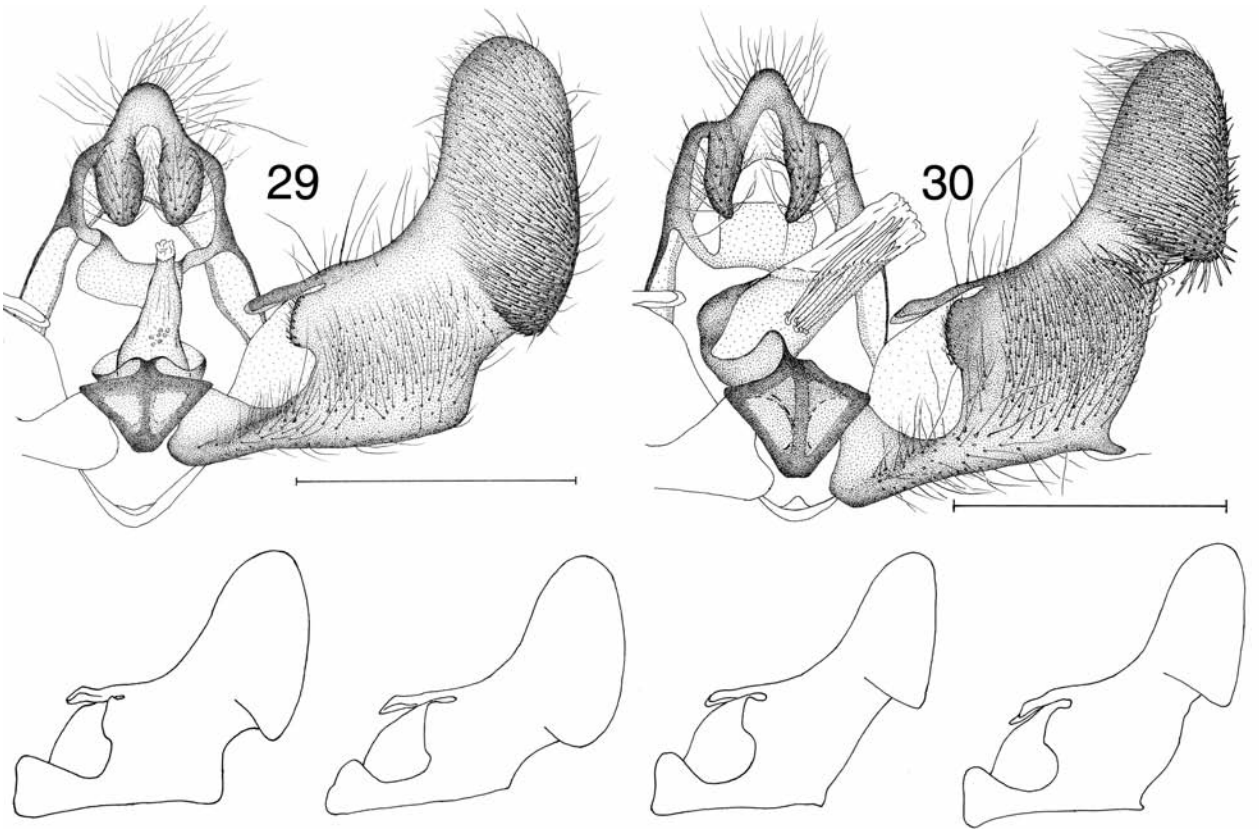
Diagnosis. This species is recognized by the combination of a bright white forewing and two incomplete brown fasciate markings on the inner margin. The male genitalia (Fig. 26) suggest an affiliation with *Eucosma snyderana* Kearfott (Wright 2007, Fig. 31), but *E. candida* lacks the brownish-gray suffusion in the forewing typical of that species (Wright 2007, Figs. 9–11).



FIGS. 21-24.*Male genitalia*. **21**, *E. blanchardi*, slides DJW 2410, 1743, USNM 90419. **22,** *E. mescalerana*, slides DJW 1319, 1154, 1122. **23,** *E. maculosa*, slides DJW 1411, 1928, 1927. **24,** *E. lafontainei*, slides DJW 2423, 1164, 1929. Scale bar = 0.5 mm.



FIGS. 25-28. *Male genitalia*. **25,** *E. angelana*, slides DJW 1312, JAP 2292, 4602. **26,** *E. candida*, slides DJW 1159, 1062, JAP 2476. **27,** *E. johnstoni*, slides DJW 2421, 1167, 2420. **28,** *E. rufocostana*, slides DJW 758, EME 5718, JAP 2490. Scale bar = 0.5 mm.



FIGS. 29–30. *Male genitalia*. **29,** *E. conspiciendana*, slides DJW 695, 1231, 1668. **30,** *E. cataclystiana*, slides DJW 2517, 1141, 2514. Scale bar = 0.5 mm.

Description. *Head*: Frons, vertex, labial palpi, and antennae white. *Thorax*: Dorsal and ventral surfaces white; legs with femur and tibia white, sometimes shading to brown on anterior surfaces; tarsus brown with white annular markings at distal extremity of each tarsomere. *Forewing* (Fig. 10): ♂ FWL 10.4–11.3 mm (mean = 10.8, n = 3), AR = 3.50; costa straight; apex acute; termen straight; dorsal surface bright white with brown markings, the latter variably edged with black; subbasal fascia represented by blackish mark on costa and bar extending from inner margin nearly to radius, the two components separated by white sub-costal scaling; median fascia composed of mark at mid-cost and bar along proximal margin of the ocellus from inner margin to distal end of cell; ocellus inconspicuous, bordered proximally and distally by white to pale gray lustrous bars and surmounted by patch of pale gray scales; central field of ocellus white with two or three blackish-brown dashes; costal strigulae delimited by prominent brown marks; termen with blackish line from approximately CuA2 to apex but interrupted by two white terminal strigulae (on R5 and M2); terminal strigulae joined by narrow white bar proximal to dark terminal line; fringe scales white from tornus to R5, blackish gray at apex. *Hindwing*: Grayish brown, paler toward base. *Male genitalia* (Fig. 26) (n = 3): Uncus well developed, with rounded apex; dorsolateral shoulders of tegumen weakly hunched; socii finger-like; vesica with 9–10 deciduous cornuti; valva with costal margin concave, apex semitriangular, distal margin convex, anal angle weakly developed and broadly rounded, ventral emargination of neck shallow, saccular angle obtuse. *Female genitalia*: Unknown.

Holotype. ♂: California, Los Angeles Co., Hungry Valley, 4 air miles S. Gorman, J. A. Powell, 16 July 1975, genitalia slide DJW 1159, EME.

Paratypes. ARIZONA: Coconino Co., Hochderffer Hill, 12.5 mi. NNW Flagstaff, 8500 ft., J. G. Franclemont, 17 July 1964 (1 ♂, genitalia slide DJW 1062). CALIFORNIA: Ventura Co., Ozena Forestry Camp, upper Cuyana, C. W. Kirkwood, 18 July 1986 (1 ♂, genitalia slide JAP 2476). Depositories: EME, USNM.

Etymology. The specific name comes from the Latin candidus, meaning shining white.

Distribution and biology. The three known specimens, captured in mid-July, are from southern California and north central Arizona (Fig. 47).

Eucosma johnstoni, new species

(Figs. 11, 12, 27, 41, 42, 47)

Diagnosis. *Eucosma johnstoni* is distinguished by the following combination of characters: relatively small size (mean FWL ≈ 7.6 mm), irregular brownish-yellow streaking on an otherwise whitish forewing (Figs. 11, 12), and genitalic structure (Figs. 27, 41, 42). It is similar to *Eucosma morrisoni* (Walsingham) in forewing appearance (Gilligan et al. 2008:103) and to *Eucosma serpentana* (Walsingham) in maculation, but these two species are larger (mean FWL ≈ 8.6 mm and 8.4 mm, respectively), and *E. serpentana* has gray-brown to

blackish-brown markings with no yellowish coloration. The genitalia of *E. johnstoni* are easily distinguished from those of *E. morrisoni* (Figs. 27 & 42 vs. Gilligan et al. 2008: 215 & 268), the latter having the structure typical of the *Eucosma agricolana* (Walsingham) species group. The male genitalia of *E. johnstoni* and *E. serpentana* (Fig. 27 vs. Heinrich 1923, Fig. 207) differ in cucullus shape (apex and anal angle more rounded in *E. johnstoni*), in neck length (shorter in *E. johnstoni*), and in the presence in *E. serpentana* of ca. 6 stout setae along the distal margin of the cucullus (absent in *E. johnstoni*). The female genitalia of *E. johnstoni* have an unusually simple lamella postvaginalis (Fig. 42), a flat rectangular plate with weakly curled lateral margins.

Description. *Head*: Frons and vertex white; labial palpus white with brownish-gray shading on lateral surface of second segment and with long brownish-gray scales on second segment concealing third segment; antenna white, scape with pale brown dot on medial surface. *Thorax*: Dorsal surface white, variably suffused with brownish yellow; ventral surface white; legs white, shading to gray brown on anterior surfaces; tarsi darker with white annulations. *Forewing* (Figs. 11, 12): ♂ FWL 6.4–8.7 mm (mean = 7.7, n = 16), AR = 3.37; ♀ FWL 6.4–8.3 mm (mean = 7.3, n = 7); costa nearly straight; apex acute; termen weakly convex; dorsal surface white with brownish-yellow markings, including: a longitudinal streak extending along cubitus from base to CuA2, slanting from there to apex, and often overlaid with brownish-gray dash from mid-wing to ocellus; a streak arising at distal end of costal fold and merging with cubital streak anterior to ocellus; a narrow band along termen from tornus to apex; some irregular suffusion along inner margin; and narrow oblique dashes associated with strigulae on distal one-half of costa; ocellus inconspicuous, with a few black scales on a pale brownish-yellow central field and with barely distinguishable lustrous white bars at proximal and distal margins; some fringe scales white, others white with pale blackish-gray cross-markings, the markings roughly aligning to form two grayish lines parallel to termen. *Hindwing*: Grayish brown. *Male genitalia* (Fig. 27) (n = 6): Uncus semitriangular, with basal width ≈ 2 × height and apex narrowly rounded; dorsolateral shoulders of tegumen weakly hunched; socii long and finger-like; vesica lacking cornuti; valva with costal margin concave, apex evenly rounded, distal margin convex of nearly uniform curvature, anal angle weakly developed and broadly rounded, ventral emargination of neck shallow to moderate, saccular angle obtuse. *Female genitalia* (Figs. 41, 42): Papillae anales laterally facing and densely setose, lamella postvaginalis a semirectangular plate with lateral margins curled inward, lacking microspinulae, but with a few hair-like setae flanking medial section; lamella antevaginalis ring-like and very weakly sclerotized; posterior margin of sternum 7 weakly concave and separated from sterigma by narrow strip of membrane; ductus bursae with sclerotized ring anterior to juncture with ductus seminalis; corpus bursae with two small cone-like signa, one distinctly larger than the other.

Holotype (Fig. 11). ♂: Arizona, Mojave Co., 3 mi. S.E. Kingman, P. Opler & J. Powell, 3 June 1968, genitalia slide JAP 3656, EME.

Paratypes. ARIZONA: same data as holotype (8 ♂, genitalia sides DJW 1167, 2421; 5 ♀, genitalia slides JAP 3657, DJW 1169, 2419); Mojave Co., Hualapai Mtn., P. Opler & J. Powell, 2 June 1968 (1 ♂). CALIFORNIA: Orange Co., 7 mi N.E. El Toro, P. A. Opler, 8 June 1968 (3 ♂, genitalia slide JAP 2421). NEW MEXICO: Hidalgo Co., Lordsburg, E. C. Johnston, 9 May 1950 (2 ♂, genitalia slides DJW 2130, 2420; 2 ♀, genitalia slides DJW 2131, 2418). TEXAS: Brewster Co., Alpine, E. C. Johnston, 22 May 1950 (1 ♂). Depositories: CNC, CSU, DJW, EME, USNM.

Etymology. This species is named after E. C. Johnston, whose specimens from New Mexico and Texas in 1950 appear to be the earliest records of this moth.

Distribution and biology. The 23 examined specimens (16 ♂, 7 ♀) document a range extending from Orange County in southern California to the vicinity of Big Bend National Park in west Texas (Fig. 47). Capture dates range from 9 May to 3 June.

Eucosma rufocostana, new species

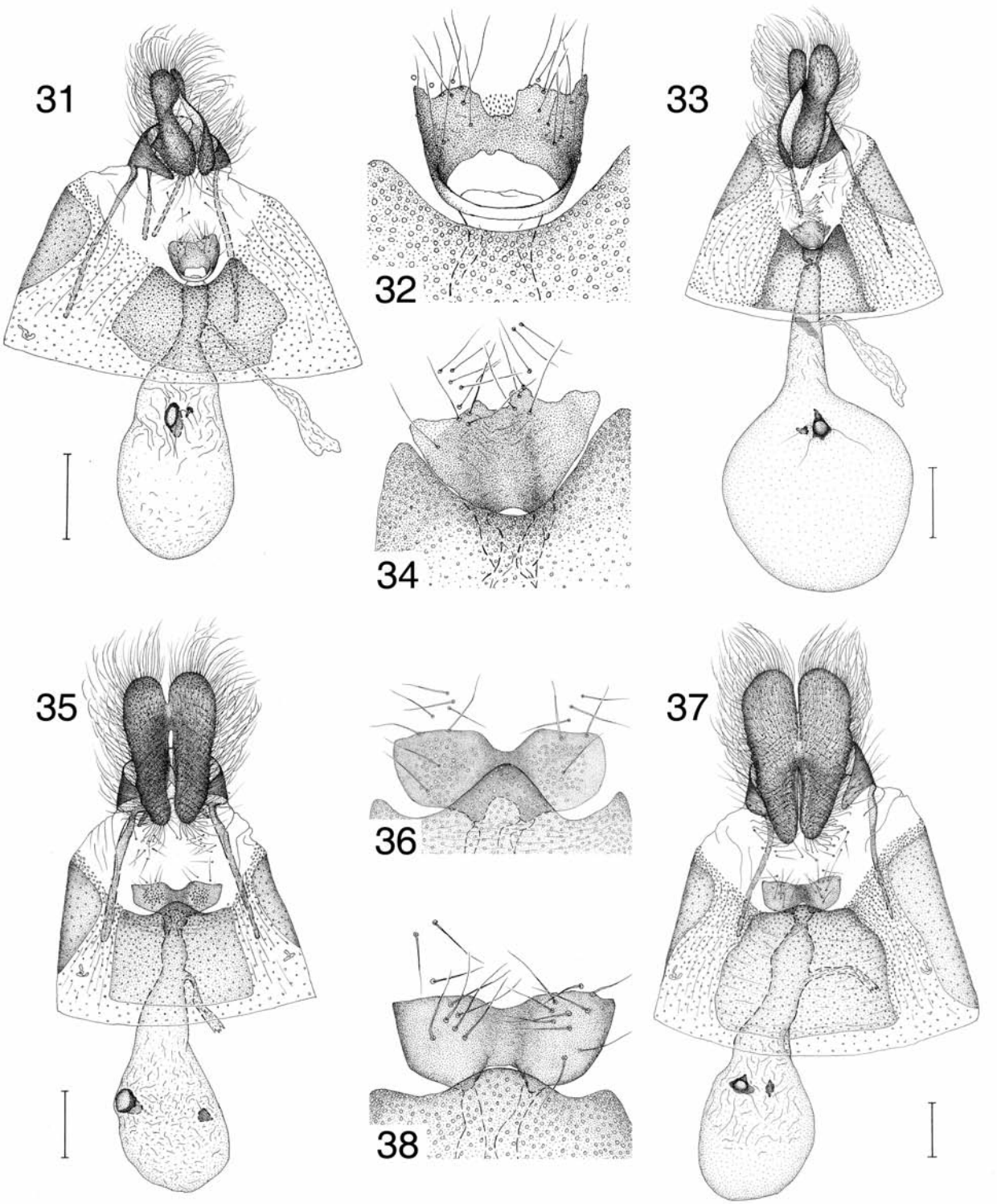
(Figs. 16, 20, 28, 48)

Diagnosis. *Eucosma rufocostana* is similar in forewing color and maculation to *E. conspiciendana* and *E. cataclystiana* (both reviewed below), but is larger (mean FWL = 10.6 vs. 8.4 and 8.0 mm, respectively) and has different male genitalia (Fig. 28 vs. 29 and 30). The conspicuous reddish-brown streak on the costal margin is usually sufficient to separate *E. rufocostana* from *E. conspiciendana* and *E. cataclystiana*.

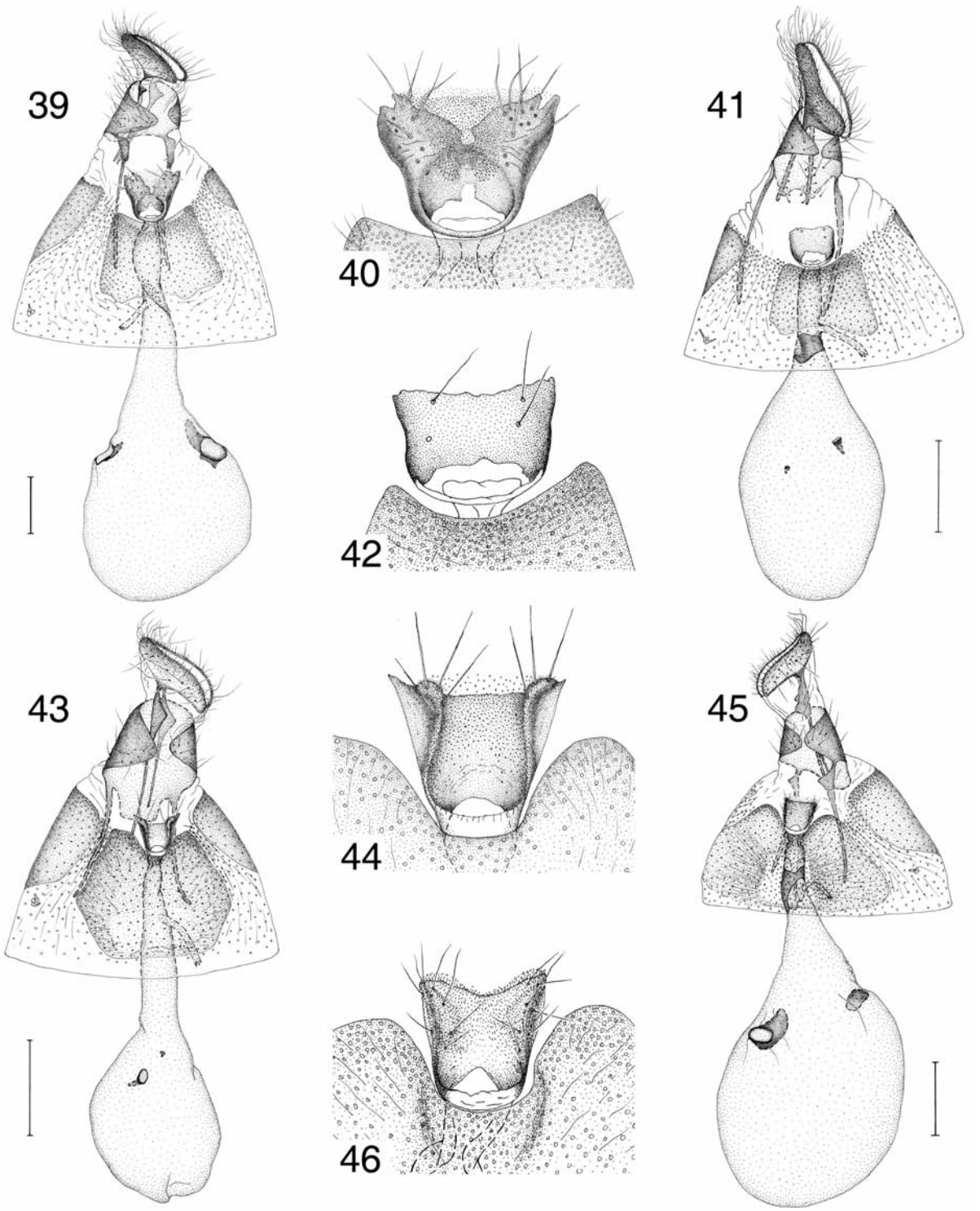
Description. *Head*: Lower frons creamy white; upper frons and vertex pale reddish brown; labial palpus reddish brown, shading to creamy white on medial surface and dorsal edge; antenna concolorous with vertex. *Thorax*: Dorsal surface pale brownish yellow; ventral surface creamy white; legs with anterior surfaces reddish brown, posterior surfaces creamy white; tarsi lacking pale annulations. *Forewing* (Fig. 16, 20): ♂ FWL 9.2–11.8 mm (mean = 10.6, n = 19), AR = 3.07; costa weakly convex; apex acute; termen straight; dorsal surface pale brownish yellow at base, shading to pale reddish brown on distal one-half of wing; costal margin reddish brown; basal and subbasal fasciae not expressed; median fascia represented by reddish-brown shade from mid-costa to proximal margin of ocellus; distal one-half of wing with whitish lines emanating from costal strigulae, separating apical portion of wing into pale reddish-brown oblique bands, the margins of which are sparsely dotted with black and/or silver scales; scales along termen white with black cross-markings, the cross-markings aligning to produce a thin black line preceded proximally by a white terminal line; fringe scales pale brownish yellow with reddish-brown tints. *Hindwing*: Pale grayish brown. *Male genitalia* (Fig. 28) (n = 8): Uncus broad, with apical margin straight to semitriangular and often weakly indented medially; dorsolateral shoulders of tegumen well differentiated; socii broad, with rounded apices; vesica lacking cornuti; valva with costal margin weakly concave, apex rounded, distal margin convex, anal angle rounded; cucullus with basoventral margin weakly overlapping ventral margin of neck and with medial surface densely covered with fine setae; neck wide and weakly differentiated from basal portion of valva; medial surface of valva with broad lobe projecting basally from distal margin of basal excavation. *Female genitalia*: Unknown.

Holotype (Fig. 16). ♂: Idaho, Oneida Co., Curlew National Grassland, 5 mi SSE of Holbrook, 4800 ft., 42° 06.234' N, 112° 36.958' W, D. J. Wright, 18 July 2001, USNM.

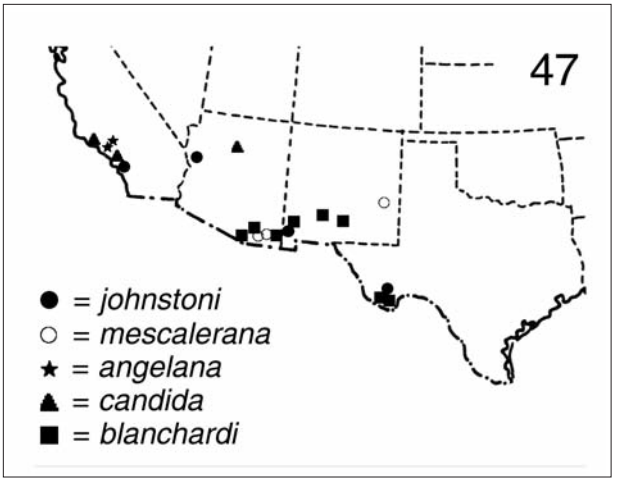
Paratypes. CALIFORNIA: Modoc Co., 8 mi S. Eagleville, J. A. Powell, 23 July 1968 (1 ♂, genitalia slide JAP 2490); Surprise Valley, 6 mi. E. Cedarville, 4500 ft., L. L. Crabtree, 30 June 2007 (1 ♂); Plumas Co., 2 mi SE Beckwourth, Sierra Valley, 4870 ft., L. L. Crabtree, 4 July 2010 (1 ♂). IDAHO: same data as holotype (1 ♂, genitalia slide DJW 2203); Oneida Co., Malad City, D. J. Wright, 18 July 2001 (1 ♂, genitalia slide DJW 758). NEVADA: Nye Co., 24 mi N Carvers, St. Hwy. 376, 5500 ft., L. L. Crabtree, 31 May 2002 (1 ♂), 3 July 2002 (1 ♂, genitalia slide DJW 2622). UTAH: Garfield Co., 3 mi. W. Bryce Jctn., 7552 ft., J. A. Powell, 28/29 June 1992 (5 ♂, genitalia slides EME 5718, DJW 2412); [Weber Co.], Ogden, G. F. Knowlton & L. E. Fronk, 28 July 1959 (1 ♂, genitalia slide EME 5719). WYOMING: Albany Co., T15N R73W S1, 2217 Sky View

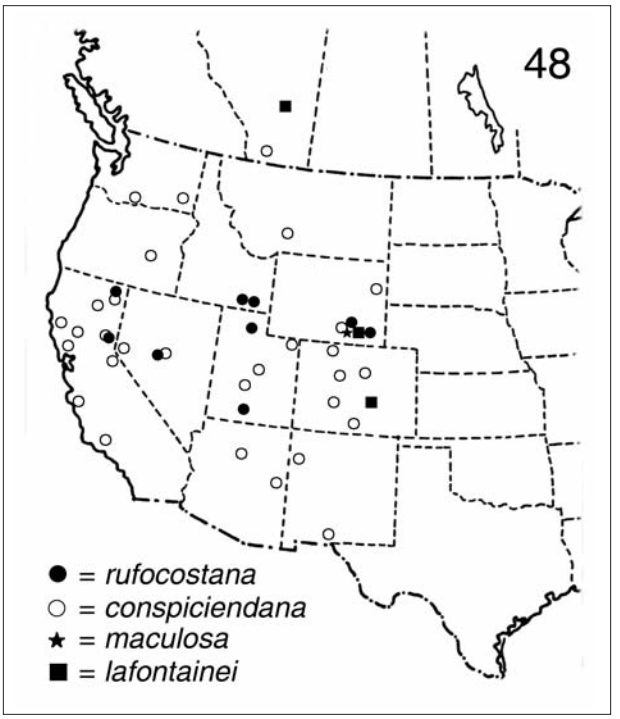


FIGS. 31–38.Female genitalia. **31-32,** *E. blanchardi*, slides DJW 2406, 2408. **33-34,** *E. mescalerana*, slides DJW 1934, 1153. **35-36,** *E. maculosa*, slides DJW 1874, 1666. **37-38,** *E. lafontainei*, slides DJW 1899, 1930. Scale bar = 0.5 mm.



FIGS. 39–46. Female genitalia. **39-40,** *E. angelana*, slides DJW 2056, 1313. **41-42,** *E. johnstoni*, slides DJW 2419, 1169. **43-44,** *E. conspiciendana*, slide DJW 2414. **45-46,** *E. cataclystiana*, slides DJW 2555, 2556. Scale bar = 0.5 mm.





FIGS. 47–48.Geographic distribution of species.

Lane, J. S. Nordin, 28 July 2002 (1 ♂); NE of Pole Mtn, SE of Happy Jack Rd., J. S. Nordin, 2 July 2003 (1 ♂); W. side Gelatt Lake, 7250 ft., J. S. Nordin, 19 June 2006 (1 ♂, genitalia slide DJW 2204), 12 July 2004 (1 ♂), 15 July 2005 (1 ♂). Depositories: BMNH, DJW, EME, LLC, USNM.

Etymology. The specific name refers to the distinctive reddish-brown streak along the costal margin of the forewing.

Distribution and biology. I examined 19 male specimens collected at elevations between 4500 ft. and 8300 ft. in northeastern California, southern Idaho, central Nevada, Utah, and southeastern Wyoming (Fig. 48). They document a flight period extending from mid-June through July.

Eucosma conspiciendana Heinrich
(Figs. 13–15, 29, 43, 44, 48)

Eucosma conspiciendana Heinrich 1923:135, fig. 157; McDunnough 1939:48; Powell 1983:35; Brown 2005:318.

Discussion. *Eucosma conspiciendana* is similar in forewing appearance to *Eucosma cataclystiana* (Walker) (Figs. 13–15 vs. 17–19) but lacks the concave indentation of the termen typical of the latter species. The two taxa are easily separated by genitalia (Figs. 29, 43, 44 vs. 30, 45, 46): valval differences include cucullus size, neck length, and presence/absence of a nipple-like projection at the saccular corner; females differ in sterigma structure (Figs. 44, 46) and the presence/absence of a sclerotized band on the ductus bursae (Figs. 43, 45).

Description. *Head*: Lower frons creamy white; upper frons and vertex yellow gray to bright reddish brown; labial palpus with medial surface creamy white, lateral surface yellow gray to pale reddish brown; antenna concolorous with vertex. *Thorax*: Dorsal surface yellow gray, usually with reddish-brown tints; ventral surface whitish; fore- and mid-legs with anterior surfaces blackish gray to reddish brown, posterior surfaces whitish; hind-legs paler; tarsi with pale annulations. *Forewing* (Figs. 13-15): ♂ FWL 7.1-10.0 mm (mean = 8.7, n = 45), AR = 3.10; ♀ FWL 6.0-8.1 (mean = 7.3, n = 13), AR = 2.92; costal margin weakly convex; apex acute; termen nearly straight; dorsal surface yellowish gray to bright reddish brown; basal and subbasal fasciae not expressed; median fascia represented by indistinct dark shade extending obliquely from mid-costa to proximal margin of ocellus; distal one-half of wing with thin outwardly oblique white lines arising at costal strigulae and terminating on inner margin, anterior edge of ocellus and termen, the lines thinly and variably edged with silvery gray; ocellus inconspicuous, edged proximally and distally with white and a few lustrous gray scales; central field of ocellus pale reddish brown to yellowish gray, crossed by up to three black dashes; scales along termen whitish, with black cross-bars that form a thin line from tornus to apex; fringe concolorous with wing. *Hindwing*: Gray brown. *Male genitalia* (Fig. 29) (n = 14): Uncus a tapering lobe with rounded apex; dorsolateral shoulders of tegumen moderately developed and somewhat slouched; socii pendulous, broad medially, with rounded apices; vesica with 0-8 deciduous cornuti; valva with costal margin concavely curved at neck, apex broadly rounded, distal margin straight to weakly convex, anal angle acute and weakly developed, neck short and wide, sacculus long, saccular angle obtuse; medial surface of valva with rectangular lobe projecting basally from margin of basal excavation and with numerous fine setae distributed from sacculus and ventral margin of neck to three-fourths distance to costal margin; cucullus with basoventral margin weakly overlapping ventral margin of neck and medial surface densely covered with fine setae. *Female genitalia* (Figs. 43, 44) (n = 4): Papillae anales laterally facing and sparsely setose; lamella postvaginalis widening posteriorly (length ≈ medial width), with raised microspinulate ridges flanking medial trough and flaring at posterior margin toward posterolateral corners; lamella antevaginalis ring-like and very weakly sclerotized; sternum 7 with posterior margin incurved to two-thirds length of sterigma and with medial section very weakly sclerotized; ductus bursae entirely membranous; corpus bursae with moderately large signum on ventral surface and minute signum on dorsal surface.

Types. Holotype: ♂, Utah, [Tooele Co.], Stockton, T. Spalding, 4 July 1904, AMNH [not examined; genitalia illustrated by Heinrich (1923, fig. 157)]. **Paratypes.** CALIFORNIA: San Bernardino Co., Loma Linda (1 ♂), USNM; MONTANA: [Lake Co.], St. Ignatius (1 ♂), AMNH; UTAH: same as holotype except date, 29 June 1904 (1 ♀) [Heinrich (1923) misreported the date as VI-27-4], USNM; [Juab Co.], Eureka, T. Spalding, 31 May 1910 (1 ♂), USNM.

Distribution and biology. I examined 95 specimens (72 ♂, 23 ♀), documenting a range extending from the eastern slope of the Rocky Mountains to the west coast and from southern Alberta to the Mexican border (Fig. 48). Adults fly primarily in June and July.

Eucosma cataclystiana (Walker)
(Figs. 17–19, 30, 45, 46)

Paedisca cataclystiana Walker 1863: 378; Walsingham 1879: 46.

Eucosma cataclystiana: Fernald [1903]: 456; Barnes and McDunnough 1917: 169; Heinrich 1923: 135, fig. 156; McDunnough 1939: 48; Powell 1983: 35; Miller 1987:54; Brown 2005: 317; Gilligan et al. 2008:115.

Discussion. Walker described *E. cataclystiana* from two females. One was dissected in 1965, probably by W. G. Tremewan, and is labeled lectotype, but it seems the designation was not published. Brown (2005) cited this specimen as a holotype. For stability of nomenclature, the lectotype designation is given below. Walsingham (1879) redescribed the species, noting that he had encountered it in California. I examined seven specimens so determined by Walsingham, six of which proved to be *E. conspiciendana*, one *E. comatulana* (Zeller). So far as I know there are no valid records of *E. cataclystiana* from west of the Rocky Mountains. *Steganoptycha ochreana* Clemens, described from Virginia in 1864, was treated as a synonym of *E. cataclystiana* by Walsingham (1879), Barnes & McDunnough (1917), Heinrich (1923), McDunnough (1939), and Miller (1973), but Miller (1974) pointed out that it belongs in the synonymy under *Eucosma agricolana argentialbana* (Walsingham). All that remains of the lectotype are the right wings, which are pictured in Miller (1973, Fig. 31).

Description. *Head*: Frons creamy white to tan; vertex yellowish brown to reddish brown, with scales between antennae darker; antenna brown to blackish brown dorsally, tan ventrally. *Thorax*: Dorsal surface reddish brown to yellowish brown; ventral surface whitish; fore- and mid-legs with brown anterior surfaces, whitish posterior surfaces, and whitish tarsal annulations; hind-legs whitish, with darker tarsomeres and whitish tarsal annulations. *Forewing* (Figs. 17–19): ♂ FWL 6.6–9.2 mm (mean = 8.0, n = 27), AR = 3.03; ♀ FWL 6.6–8.9 mm (mean = 7.9, n = 9), AR = 3.03; costa weakly convex; apex acute; termen concave from apex to M3; dorsal surface pale yellowish tan with reddish-brown markings, including an irregularly defined streak along cubitus from base to ocellus and a median fascia weakly expressed as a narrow shade from mid-costa to ocellus; ocellus bordered proximally, distally, and posteriorly by lustrous gray scaling, the distal component usually reduced; central field of ocellus tan, crossed by two longitudinal brown streaks, the latter marked at proximal extremities and occasionally at distal extremities by black dots; ocellus capped anteriorly by patch of dark scales with pale apices; costal strigulae conspicuous from mid-costa to apex and usually accompanied by lustrous gray striae; termen with band from tornus to apex consisting of white scales with dark cross-markings; outer fringe scales yellowish brown to pale reddish brown. *Hindwing*: Brownish gray. *Male genitalia* (Fig. 30) (n = 9): Uncus semitriangular with rounded apex; dorsolateral shoulders of tegumen well developed; socii finger-like, tapering toward apex; vesica with 9–12 deciduous cornuti (n = 5); valva with costal margin concavely curved at neck, apex rounded, distal margin nearly straight, anal angle acute, neck narrowing from saccular corner to cucullus, saccular corner with nipple-like projection; valva with broad basally-directed projection on margin of basal excavation; medial surface of neck densely setose; cucullus with basoventral margin overlapping neck, medial surface densely setose, and several spiniform setae at anal angle and along basoventral margin. *Female genitalia* (Figs. 45, 46) (n = 4): As in *E. conspiciendana* except: the ridges flanking the shallow central trough of the lamella postvaginalis are greatly reduced, the ductus bursae has a sclerotized patch posterior to the juncture with the ductus seminalis, and the two signa do not differ as much in size.

Type. Lectotype here designated: ♀, North America, genitalia slide 11531, BMNH. Paralectotype: ♀, same data, abdomen missing, BMNH.

Distribution and biology. *Eucosma cataclystiana* occurs throughout eastern North America, from southern Canada to the Gulf Coast. Its range extends as far west as the Rocky Mountains, where it is sympatric with *E. conspiciendana*. Capture dates range from late April to the end of September. *Euthamia graminifolia* (Linnaeus) Nutt. (flat-top goldenrod) was reported by Putman (1942) as a host in Ontario, Canada, the larva boring in the lower stem and rhizomes.

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