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NEARCTIC EUCOSMINI (TORTRICIDAE) ASSOCIATED WITH *PELOCHRISTA OCCIPITANA* (ZELLER) AND *EUCOSMA BIQUADRANA* (WALSINGHAM): TWO NEW SYNONYMIES AND FOUR NEW SPECIES

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ABSTRACT. *Pelochrista occipitana* (Zeller), a species misidentified in North American collections for more than eighty years, is reviewed, illustrated, and reassigned to *Eucosma* Hübner. Two new species, *Pelochrista ainsliei* and *Pelochrista kingi*, are described from material formerly determined as *occipitana*. *Eucosma mediostriata* (Walsingham), *Pelochrista reversana* (Kearfott), and *Pelochrista palpana* (Walsingham) are interpreted as close relatives of these new taxa, based on male genitalia, and *mediostriata* is transferred to *Pelochrista*. *Pelochrista gilligani*, a new species with affinities to *palpana*, is described from Utah. *Pelochrista fuscosparsa* (Walsingham) is also reviewed, and a previously unrecognized species from California with similarities to both *fuscosparsa* and *mediostriata* is described as *Pelochrista fuscostriata*. Finally, *Pelochrista palousana* (Kearfott) and *Pelochrista tahoensis* (Heinrich) are recognized as junior synonyms of *Eucosma biquadrana* (Walsingham), and an account of the superficially similar *Eucosma shastana* (Walsingham) is included for comparison. Illustrations are provided of the adults and genitalia of the above mentioned species, and distributional information is reported. Lectotypes are designated for the five species described by Walsingham.

Additional key words: *fuscosparsa*, *mediostriata*, *palousana*, *palpana*, *reversana*, *shastana*, *tahoensis*.

Paedisca occipitana Zeller was described in 1875 from a single male specimen collected by G. W. Belfrage in Texas. It was later transferred to *Eucosma* Hübner by Fernald [1903], and that is where it resided at the time of Heinrich's (1923) revision of Nearctic Eucosmini. The holotype, which had been retained by Zeller, passed by way of the Walsingham Collection to the Natural History Museum, London (BMNH), and Heinrich did not have an opportunity to examine it. As a result, he mistakenly identified as *occipitana* a specimen in the United States Museum of Natural History (USNM) that had been collected by C. N. Ainslie in New Mexico. In the eighty some years that have elapsed, Heinrich's illustration (1923, Fig. 226) of that male's genitalia has been the basis for many incorrect determinations of *occipitana*. The genitalic structure depicted in that photograph is now associated with *Pelochrista* Lederer, which no doubt explains the current placement (Powell 1983) of *occipitana* in that genus. The purposes of this paper are to illustrate the species to which the name *occipitana* properly applies and show that it belongs in *Eucosma*; to make available names for two new species of *Pelochrista* previously misinterpreted as *occipitana*; to review the current Nearctic members of *Pelochrista* that appear to be most closely related to these new taxa, based on male genitalia; and to describe two additional new species of *Pelochrista* that have affinities with members of this group.

The taxon illustrated by Heinrich (1923) as *occipitana* is described below as *Pelochrista ainsliei*, new species. It is one of six Nearctic species of Eucosmini in which the valva has, in addition to several spiniform setae at the anal angle of the cucullus, a particularly large spine projecting from the ventral margin of the neck. A second such taxon, also misidentified in collections as *occipitana*, is described below as *Pelochrista kingi*, new species. The remaining members of the group are: *Eucosma mediostriata* (Walsingham), which is transferred here to *Pelochrista*, *Pelochrista reversana* (Kearfott), *Pelochrista palpana* (Walsingham), and a third new species described below as *Pelochrista gilligani*.

In assembling specimens for this study I encountered a previously unrecognized species from California that is superficially similar to some phenotypes of *mediostriata* but resembles *Pelochrista fuscosparsa* (Walsingham) in genitalic structure. It is described below as *Pelochrista fuscostriata*, new species, and an account of *fuscosparsa* is included.

Eucosma biquadrana (Walsingham) is another western taxon that has not been correctly identified in North American collections. Heinrich (1923) placed it close to *Eucosma palousana* (Kearfott) but was unable to compare male genitalia of the two species for lack of authoritatively determined specimens of *biquadrana*. In that same monograph, Heinrich described *Eucosma tahoensis*, based on three specimens that I judge to be *biquadrana*, and since then *biquadrana* material in North American collections has been referred consistently to *tahoensis*. I examined the types of *biquadrana*, *palousana*, and *tahoensis* and concluded that they represent a single taxon. Although the last two species are currently placed in *Pelochrista* (Powell 1983), I propose that *biquadrana* remain in *Eucosma* (until the distinction between the two genera can be

clarified) and that *palousana* and *tahoensis* be treated as junior synonyms. A brief account of *Eucosma shastana* (Walsingham), a little known species from California that is remarkably similar to *biquadrana* in forewing appearance, is included for comparison.

Materials and Methods

The conclusions in this paper are based on an examination of 475 adult specimens and 116 associated genitalia preparations from the following institutional and private collections: American Museum of Natural History, New York (AMNH); Charles D. Bird, Erskine, Alberta (CDB); George J. Balogh, Portage, Michigan; Canadian National Collection, Ottawa, Ontario (CNC); Colorado State University, Fort Collins, Colorado (CSU); BMNH; Essig Museum of Entomology, UC Berkeley (EME); Todd M. Gilligan, Loveland, Colorado (TMG); Edward C. Knudson, Houston, Texas; Los Angeles County Museum of Natural History, Los Angeles (LACM), Greg R. Pohl, Edmonton, Alberta; Strickland Museum, University of Alberta, Edmonton (UASM); USNM, and Donald J. Wright (DJW). Forewing length (FWL), defined as distance from base to apex (including fringe), is presented as an indication of specimen size. It was measured to the nearest one tenth of a millimeter with a reticule mounted in a Leica MZ95 stereomicroscope. Aspect ratio (AR), calculated as FWL divided by medial forewing width, is used as a crude measure of forewing geometry and is reported as the average, rounded to two decimal places, of a few such calculations. The number of observations supporting a particular statistic is indicated by n. The line drawings were made with the aid of a Ken-A-Vision Microprojector (Model X1000-1). Adult images were edited in Adobe Photoshop CS. Some figures were flipped horizontally, so what appears in an illustration to be a right forewing or valva is in fact the left such item on the specimen. Morphological terminology follows Gilligan *et al*. (2008).

Genitalia were mounted on slides for examination under a compound microscope. When observed *in situ*, by brushing scales from the posterior end of the abdomen, the large ventral spine on the valval neck of male specimens in the *mediostriata* group projects medially and is oriented roughly perpendicular to the surface of the valva. However, on slide mounts it was intentionally flattened as much as possible into the plane of the valva to show the size and shape of both the spine and the bulge on the ventral margin of the neck that supports it. Nevertheless, in some of the illustrations the spines appear somewhat foreshortened, depending on the angle of inclination between the spine and the surface of the slide.

In the 1950's, Obraztsov examined the syntypes of *mediostriata*, *fuscosparsa*, *palpana*, *biquadrana*, and *shastana* and selected a lectotype for each species, but his designations were never published. For the sake of nomenclatorial stability, I've included those designations here. I examined the specimens and associated genitalia slides of *palpana*, *biquadrana*, and *shastana*. For *mediostriata* and *fuscosparsa*, I relied on 35 mm color slides of the adults and black and white photographs of the genitalia made by Obraztsov.

Species Accounts

Eucosma occipitana (Zeller), **revised combination**
(Figs. 7, 8, 34, 37)

Paedisca occipitana Zeller 1875: 315.

Eucosma occipitana: Fernald [1903]: 456; Barnes and McDunnough 1917: 169; Heinrich 1923: 111; McDunnough 1939: 47.

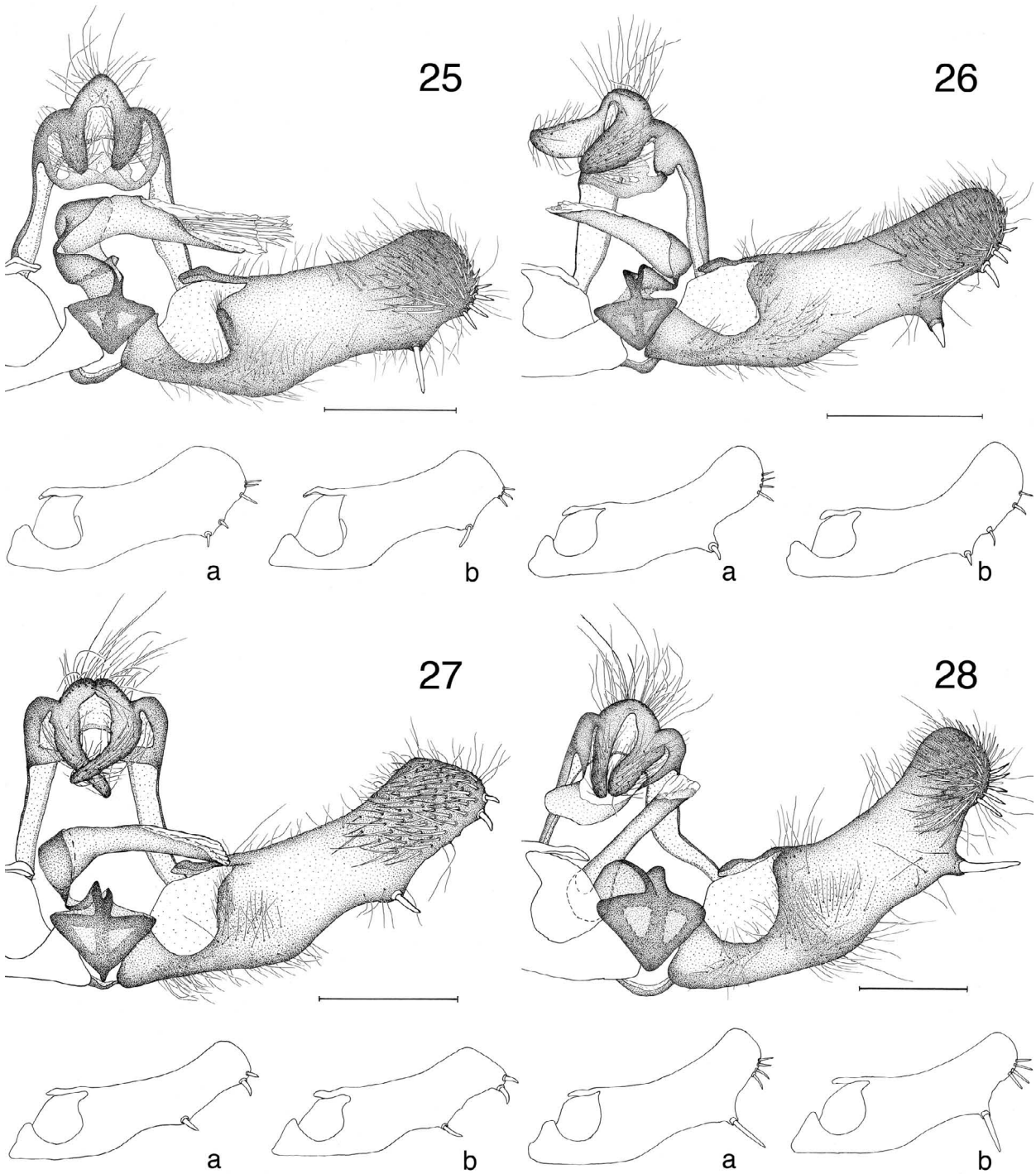
Pelochrista occipitana: Powell 1983: 35; Brown 2005: 480.

Discussion. The image of the holotype (Fig. 8) was provided by K. Tuck at the BMNH; that of its genitalia (Fig. 37) was obtained from a black and white negative made by Obraztsov of the slide he had prepared. Specimens other than the holotype that I located in institutional collections under the name *occipitana* all proved to be *P. ainsliei* or *P. kingi* (both described below). The specimen illustrated in Figure 7 is a male from Pawnee National Grassland, Weld Co., Colorado that I collected on 8 August 2004. Its forewing appearance is not an exact match to the holotype, but I have tentatively determined it as *occipitana* based on similarity of genitalia (Figs. 34, 37). The apparent differences in color could be a consequence of specimen age and/or photographic technique, and the more strongly mottled forewing appearance of the holotype might easily be attributed to variation. Of course, these issues cannot be resolved without additional material. In color, size, and forewing appearance, *occipitana* is similar to one of the phenotypes (Fig. 6) of *Pelochrista ainsliei* Wright and to *Eucosma kandana* Kearfott (Wright 2007, Fig. 12), but the three species are easily distinguished on the basis of male genitalia (Figs. 37, 26, & Wright 2007, Fig. 29). The shape and spining of the valva, together with the presence of a forewing costal fold, suggest that generic placement in *Eucosma* is appropriate.

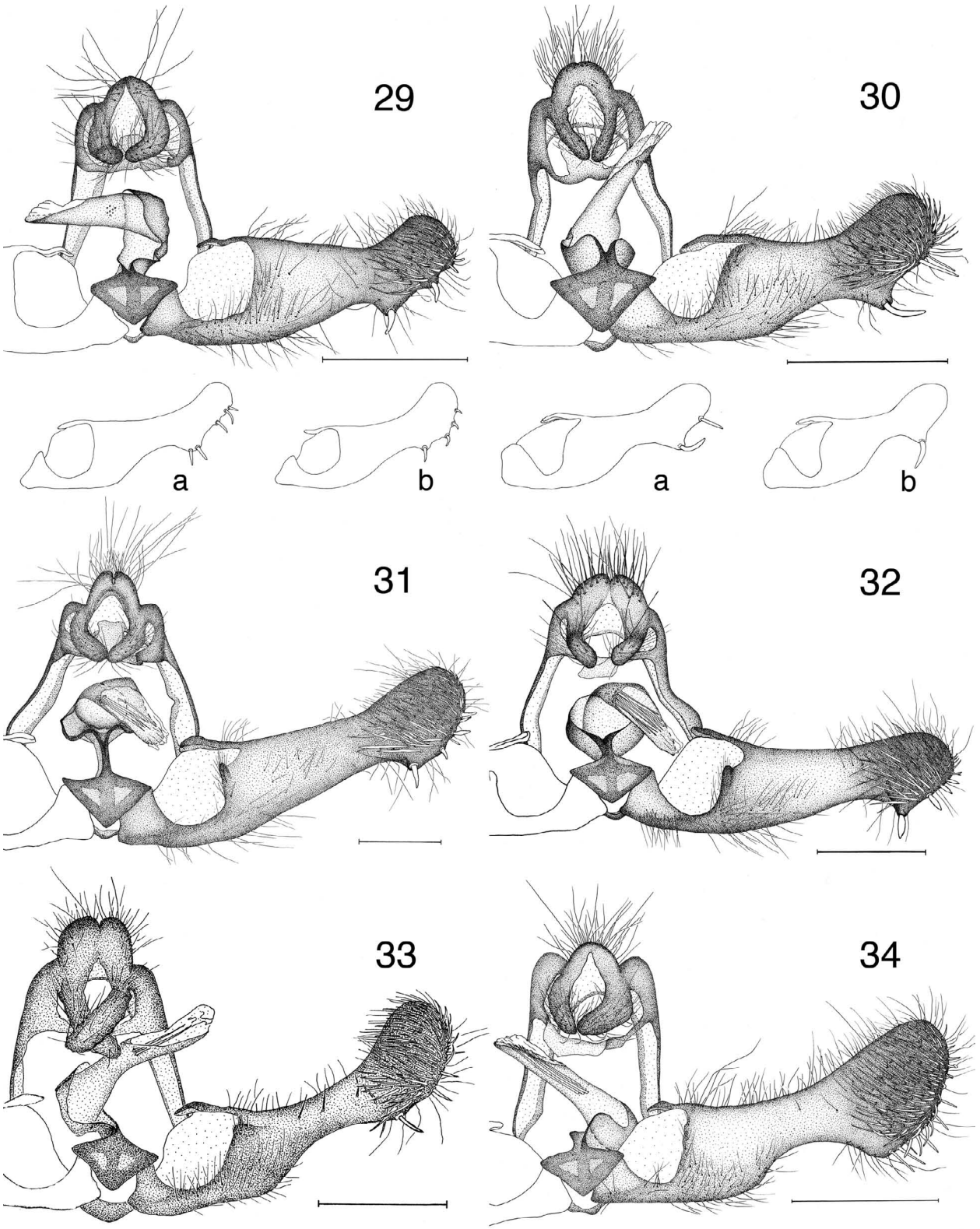
Type. Holotype: ♂, Bosque Co., Texas, 24 June 1871, Belfrage, genitalia slide 5756, BMNH.

Descriptive notes. The dorsal surface of the forewing (Figs. 7, 8) is yellow brown to brown and somewhat mottled in appearance. There are no well defined fascial markings, and the ocellus is very weakly expressed. The specimen from Colorado has a FWL of 6.6 mm, with AR = 3.30.

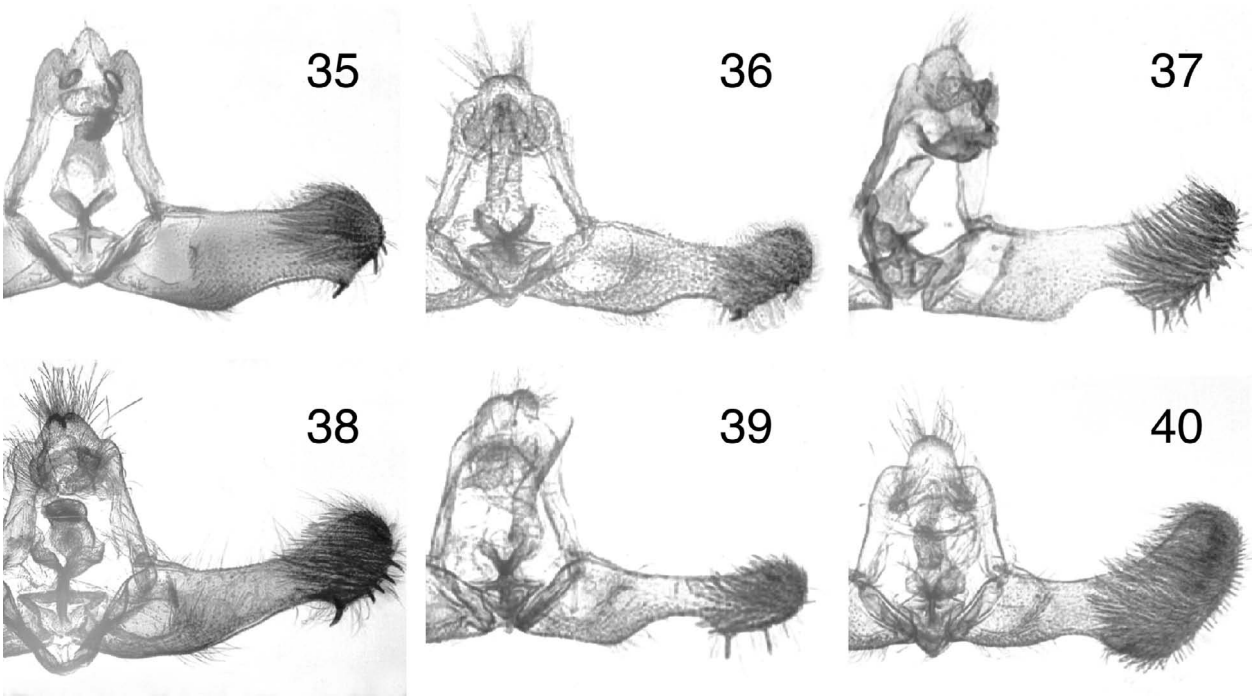
FIGS. 1–24. **1–4,** *P. mediostriata*. **1,** ♂ Albany Co., Wyoming. **2,** ♂ Larimer Co., Colorado. **3,** ♂ Sanpete Co., Utah. **4**, ♂ Oneida Co., Idaho. **5–6,** *P. ainsliei*. **5**, ♂ Morgan Co., Colorado. **6,** ♂ Otero Co., Colorado. **7–8,** *E. occipitana*. **7,** ♂ Weld Co., Colorado. **8,** holotype, Texas. **9–11,** *P. kingi*. **9,** holotype, Saskatoon, Saskatchewan. **10,** ♂ Albany Co., Wyoming. **11,** ♂ Nordegg, Alberta. **12,** *Pelochrista* sp., ♂ Sanpete Co., Utah. **13–14,** *P. reversana*, ♂, ♂ Kimble Co., Texas. **15,** *P. palpana*, lectotype, Shasta Co., California. **16,** *P. gilligani*, holotype, Sanpete Co., Utah. **17–20,** *P. fuscosparsa*. **17,** ♂ Oneida Co., Idaho. **18, 19, 20,** ♂, ♂, ♂ Albany Co., Wyoming. **21–22,** *E. biquadrana*. **21,** lectotype, Shasta Co., California. **22,** ♂, Grant Co., Oregon. **23,** E. *shastana*, lectotype, Siskiyou Co., California. **24,** *P. fuscostriata*, holotype, San Mateo Co., California.



FIGS. 25–28. Male genitalia. **25,** *P. mediostriata*, slides DJW1863, 383, 966. **26,** *P. ainsliei*, slides DJW1859, 1344, 148. **27,** *P. kingi*, slides DJW1855, 1671, 1065. **28,** *P. reversana*, slides DJW1908, USNM70623, USNM70623. Scale bar = 0.5 mm.



FIGS. 29–34. Male genitalia. **29,** *P. palpana*, slides DJW1924, USNM70633, DJW1158. **30,** *P. gilligani*, slides DJW1911, 1912, 1912. **31,** *P. fuscosparsa*, slide DJW1869. **32,** *P. fuscostriata*, slide DJW1970. **33,** *E. biquadrana*, (*palousana* lectotype), slide CH 20 April 1921. **34,** *E. occipitana*, slide DJW 1138. Scale bar = 0.5 mm.



FIGS. 35–40. Male genitalia. **35,** *Paedisca mediostriata*, lectotype. **36,** *Paedisca palpana*, lectotype, **37,** *Paedisca occipitana*, holotype. **38,** *Paedisca fuscosparsa*, lectotype. **39,** *Paedisca biquadrana*, lectotype. **40,** *Paedisca shastana*, lectotype.

Male genitalia (Figs. 34, 37): Uncus a rounded, dorsally setose lobe; dorsolateral shoulders of tegumen well developed and hunched; socii long, moderately setose and tapering distally; vesica with 6 (based on the one Colorado specimen) deciduous cornuti; valva with weakly concave costal margin, rounded apex, roughly right-angled anal angle, and moderately emarginated ventral margin; cucullus with 8–10 long spiniform setae evenly distributed along distal margin, the longest located near the anal angle; medial surface of cucullus densely covered with stout setae. *Female genitalia:* Unknown.

Pelochrista mediostriata (Walsingham), **new combination**
(Figs. 1–4, 25, 35, 41, 50)

Paedisca mediostriata Walsingham 1895: 508.

Eucosma mediostriata: Fernald [1903]: 460; Barnes and McDunnough 1917: 171; Heinrich 1923: 116, Fig. 245; McDunnough 1939: 47; Powell 1983: 34; Brown 2005: 323.

Eucosma sepulcrana Meyrick 1927: 334.

Eucosma sepulchrana: Clarke 1958: 420. [misspelling of *sepulcrana*].

Discussion. To make the comparison with *E. sepulcrana* Meyrick, Clarke (1958) dissected the specimen designated above as lectotype for *mediostriata*, but to my knowledge this choice of name bearing specimen for *mediostriata* has not been published previously.

The genitalia of the lectotype (Fig. 35) have a large spine on the ventral margin of the valval neck, which is the reason for the proposed reassignment of this species to *Pelochrista*. Heinrich's illustration of *mediostriata* (1923, Fig. 245) shows no indication of the spine on either valva, but an examination of the associated slide revealed that both spines had been broken off at the socket and apparently lost.

Types. *Paedisca mediostriata*. Lectotype here designated: ♂, [Larimer Co.], Loveland, Colorado, 5000 ft., July 1891, Smith, genitalia slide JFGC6388, Wlsm. No. 31141, BMNH. Paralectotypes: Loveland, Colorado, July 1891; 1 ♂, 5–10,000 ft, Wlsm. No. 31119; 1 ♂, 10,000 ft., Wlsm. No. 31118; 1 ♂, 5000 ft., Wlsm. No. 31192; 1 ♂ [no elevation indicated], Wlsm. No. 30429; all in the BMNH. *Eucosma* sepulcrana. Lectotype designated by Clarke (1958): ♂, [Tooele Co.], Dividend, Utah, 26 June, genitalia slide JFGC6386, BMNH. Paralectotypes: 11 specimens [according to Meyrick (1927) and Clark (1958)], same data as lectotype, BMNH.

Descriptive notes. The specific name derives from the presence in most individuals of a prominent pale forewing streak running anterior to the cubitus from base to distal end of cell (Fig. 2). Often thin streaks of the same pale color are present along the costa, the median branches, CuA2, and A1+A2. The streaking is variable and, in some instances (Fig. 1), barely discernable. Forewing color is also variable, from yellowish brown (Fig. 1) to whitish gray (Fig. 4), with numerous intermediate combinations of yellow brown, olive brown, whitish gray, and blackish gray. There are no discernable fascial markings, and the ocellus is not expressed. The hindwing is black to blackish gray, with fringe varying from white to pale gray. Forewing statistics: ♂ FWL: 6.7–12.4 mm (mean = 10.1, n = 71), AR = 3.35; ♀ FWL: 8.1–11.8 (mean = 9.8, n = 14), AR = 3.21.

Male genitalia (Figs. 25, 35): Uncus semitriangular with rounded apex; socii fingerlike and moderately setose; vesica with 18–42 deciduous cornuti (n = 13); valva with raised clasperlike

process on margin of basal excavation and with large spine on ventral margin at distal end of neck; cucullus semirectangular, with 3 or 4 spiniform setae at anal angle. Figure 25 illustrates the variation in valval shape and in the spining of the ventral margin of the cucullus. *Female genitalia* (Fig. 41): Papillae anales laterally facing and sparsely setose; lamella antevaginalis ringlike; lamella postvaginalis well developed and semirectangular, with variably wrinkled lateral margins and a shallow medial trough from center of posterior margin to ostium; posterior margin of sternum 7 with weakly developed, convex, medial bulge; ductus bursae with small sclerotized patch at juncture with ductus seminalis; corpus bursae with one small signum.

Distribution and biology. Figure 50 shows the geographic distribution of *mediostriata*, based the 165 specimens (151 ♂; 14 ♀) in the study sample. Capture dates range from mid-April (in Texas) to early August, but the vast majority of the records are from June and July. No larval host has been reported.

Pelochrista ainsliei, new species

(Figs. 5, 6, 26, 43, 50)

Eucosma occipitana: (not Zeller 1875) Heinrich 1923: 111, Fig. 226; McDunnough 1939: 47.

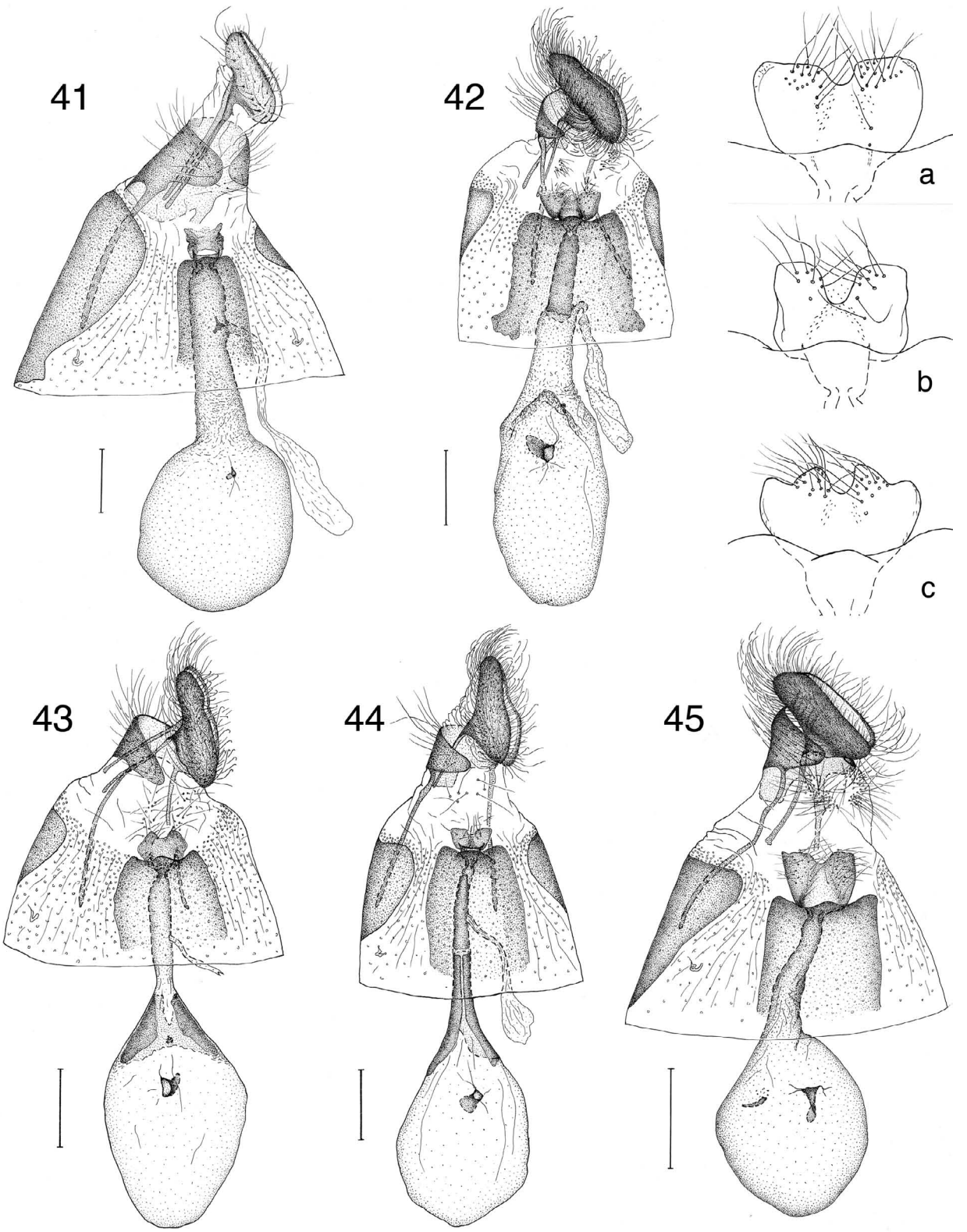
Pelochrista occipitana: (not Zeller 1875) Powell 1983: 35; Brown 2005: 480.

Diagnosis. This species is separated from other western Eucosmini of similar forewing pattern and coloration by features of the genitalia. Males are distinguished by the following combination of characters (Fig. 26): uncus moderately developed and not medially divided; ventral margin of valval neck not emarginated but with strongly developed projection supporting one particularly stout spine; and cucullus either rounded or with broadly rounded apex and anal angle, the latter with three or more spiniform setae. Distinctive female genitalic characters include (Fig. 43): diamond shaped lateral projections of lamella postvaginalis; medial projection of posterior margin of sternum 7 fused with sterigma; posterior one-fourth of corpus bursae sclerotized on dorsal and lateral surfaces; and corpus bursae with two signa. In size, color, and general appearance, the *ainsliei* phenotype with weakly expressed forewing markings (Fig. 6) is quite similar to *E. occipitana* (Fig. 7) and *E. kandana* Kearfott (Wright 2007, Fig. 12), but the three taxa have very different valvae (Figs. 26, 34 & Wright 2007, Fig. 29). Based on forewing pattern, well-marked specimens of *ainsliei* (Fig. 5) might be confused with *Pelochrista emaciatana* (Walsingham) (Wright 2005, Fig. 10). Moreover, females of these two species have rather similar sclerotized plates on the surface of the corpus bursae (Fig. 43, Wright 2005, Fig. 24). However, *emaciatana* is larger (mean FWL ≈ 10.5 mm vs. 7.8 mm in *ainsliei*), it differs from *ainsliei* in the shapes of the cucullus and valval neck (Wright 2005, Fig. 17 vs. Fig. 26), and it has only one signum in the corpus bursae. The apical area of the forewing in *ainsliei* lacks the reddish-brown suffusion that is prominent in many specimens of *kingi*. Genitalic differences between *ainsliei* and *kingi* are discussed below under the latter species.

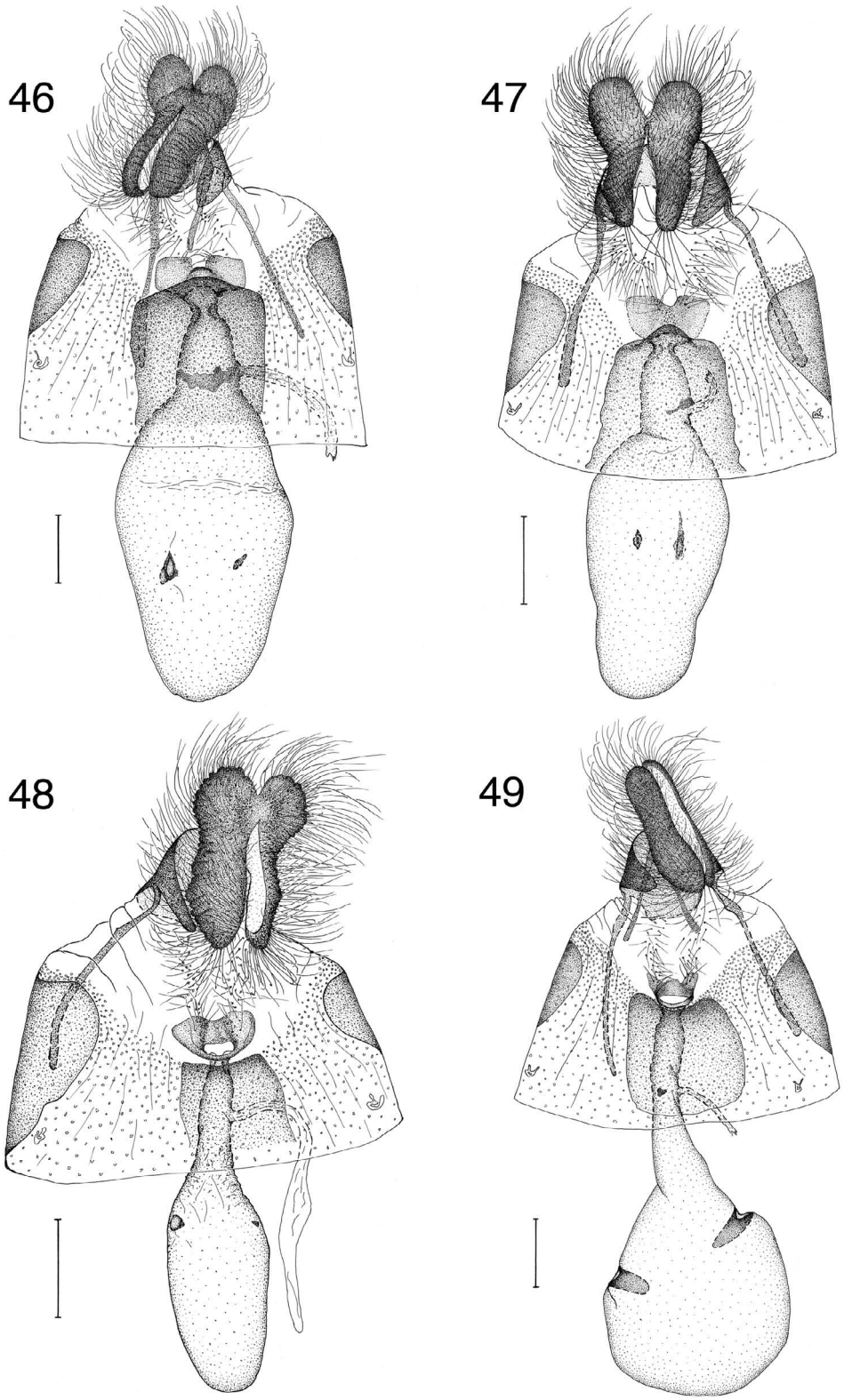
Description. *Head*: Frons white to pale tan, scales of vertex pale tan with white apices; labial palpi with medial surfaces white, lateral surfaces pale brown; antenna pale tan. *Thorax*: Dorsal surface concolorous with head; ventral surface whitish tan; legs pale brown, with whitish-tan tarsal annulations. *Forewing* (Figs. 5, 6): ♂ FWL 6.4–8.4 mm (mean = 7.7, n = 17), AR = 3.38; ♀ FWL 7.7–8.5 mm (mean = 8.1, n = 4), AR = 3.26; costa straight, apex acute, termen weakly convex; dorsal surface brown to yellowish brown, with variably expressed darker brown markings as follows: subbasal fascia an outwardly oblique bar from dorsum to radius, usually interrupted on A1+A2, median fascia consisting of a narrow dash at mid costa and an irregularly shaped blotch at distal end of cell, pretornal patch triangular and projecting anteriorly from dorsum along basal margin of ocellus; ocellus with pale tan central field, crossed longitudinally by up to three dark dashes, bordered basally and distally by transverse bars of lustrous pale-tan and/or silvery-white scales; a longitudinal patch of white-tipped brown scales anterior to ocellus extends basally nearly to the subbasal fascia, dividing the median fascia on the radius. *Hindwing*: Gray brown with paler fringe. *Male genitalia* (Fig. 26): Uncus a semitriangular, dorsally setose lobe; socius moderately setose, broad at base, tapering to narrowly rounded apex; gnathos bandlike; aedeagus long, tapering distally; vesica without cornuti; valva with costal margin weakly concave, cucullus weakly differentiated, and ventral margin of neck with strongly developed projection supporting a large spinelike seta; cucullus with apex and anal angle rounded, the latter with three or four spiniform setae; medial surface of cucullus covered with stout setae. *Female genitalia* (Fig. 43): papillae anales laterally facing, with long ventrally curving setae along lateral margins and hook-tipped setae along medial margins; lamella postvaginalis with diamond-shaped lateral extensions and a shallow, microspinulate, medial trough from V-shaped indentation of posterior margin to ostium; posterior extremities of sterigma and membrane between sterigma and ventral extremities of tergum 8 with numerous, long, hairlike setae; posterior margin of sternum 7 with medial triangular projection that fuses with lamella antevaginalis and shields ostium bursae; corpus bursae with large sclerotized plate at junction with ductus bursae, extending over dorsal and lateral surfaces but not closing ventrally; one small signum located at center of anterior margin of sclerotized patch, a second large signum on ventral surface of bursa.

Holotype. ♂, New Mexico, [Dona Ana Co.], Mesilla, C. N. Ainslie, genitalia slide USNM 70620, USNM.

Paratypes. COLORADO: Larimer Co., Fort Collins, 15 June 1920 (1 ♂), AMNH, 16 June 1920 (1 ♂), CSU; no locality data (1 ♂, genitalia slide USNM 70621), USNM; [Arapahoe Co.], Platte Can[y]on, Oslar (1 ♂, genitalia slide USNM 70622), USNM; Morgan Co., 3.5 mi. W. of Co. Rd. 19 on Co. Rd. I, 4610 ft, D. J. Wright, 28 July 1995 (1 ♂, genitalia slide DJW 148), DJW; Otero Co., Vogel Cyn. Picnic Area, 15 mi. S. of La Junta, 4340 ft, D. J. Wright, 18 August 1997 (1 ♂), DJW; Otero Co., Comanche NG [National Grassland], 15 mi. S. of La Junta, D. J. Wright, 27 August 2000 (2 ♂), DJW; Weld Co., Pawnee Site, L.T.E.R. USDA, P. A. Opler, 27 July 1991 (2 ♂), CSU; 0.25 mi. N. I–76 on CR 91, T. M. Gilligan & P. A. Opler, 17 August 2007 (1 ♀, genitalia slide DJW 1909), TMG; Pawnee NG, Jct CR-96 & CR-61, 5030 ft., T. M. Gilligan & P. A. Opler, 31 August 2007 (1 ♂, genitalia slide DJW 2039; 1 ♀, genitalia slide DJW 2038), TMG. NEW MEXICO: Same data as holotype (2 ♂, 2 ♀: ♀ genitalia slides DJW 1860, 1984, USNM; 1 ♂, genitalia slide DJW 1344, AMNH; 1 ♂, LACM). WYOMING: [Weston Co.], 6 mi. NW Newcastle, R. W. Hodges, 23 June 1965 (1 ♂, genitalia slide DJW 1859), USNM.



FIGS. 41–45. Female genitalia. **41,** *P. mediostriata*, slide DJW1862. **42,** *P. reversana*, slides USNM95247, DJW1926, USNM90506, DJW1925. **43,** *P. ainsliei*, slide DJW1860. **44,** *P. kingi*, slide DJW1856. **45.** *P. palpana*, DJW 771. Scale bar = 0.5 mm.



FIGS. 46–49. Female genitalia. **46,** *P. fuscosparsa*, slide DJW1871. **47,** *P. fuscostriata*, slide DJW1971. **48,** *E. biquadrana*, slide DJW1596. **49,** *E. shastana*, slide DJW1973. Scale bar = 0.5 mm.

Etymology. This species is named in honor of Charles N. Ainslie, a cereal entomologist who worked for the Federal Bureau of Entomology from 1906 to 1930 (Walton & Caffrey 1940). His specimens of *ainsliei* from Mesilla, New Mexico seem to be the first collected examples. Though the pin labels do not indicate date of capture, it is likely these specimens were collected in 1908, when Ainslie was on assignment to New Mexico to study a population peak of *Hemileuca oliviae* Cockerell (Saturniidae).

Distribution and biology. The type series consists of 21 adults (17 ♂, 4 ♀) from Colorado, New Mexico and Wyoming (Fig. 50). Capture dates, which are available for only 13 of the specimens, range from 15 June to 31 August. No larval host is known.

Remarks. The holotype of *ainsliei* is the specimen illustrated by Heinrich (1923, Fig. 226) as *occipitana*. The shape of the cucullus is variable, as indicated in Fig. 26. All specimens have the large spine on the ventral margin of the neck and a cluster of three or four smaller spines near the anal angle of the cucullus, but in some individuals (Fig. 26b) one spine seems to be displaced to midway between these positions. In a given specimen, this condition may be present on one valva and absent on the other.

Pelochrista kingi, new species

(Figs. 9–11, 27, 44, 50)

Diagnosis. This species often can be distinguished from congeners with similar forewing markings by the presence of at least some reddish-brown suffusion in the apical portion of the forewing. The male genitalia (Fig. 27) are similar to those of *ainsliei* (Fig. 26), but the uncus is distinctly divided medially, the socii are narrower, the support for the large spine on the ventral margin of the neck is less strongly developed, the cucullus is semirectangular, and the anal angle of the cucullus usually has only two spiniform setae. Females (Fig. 44) are characterized by the ringlike lamella antevaginalis, the nearly complete sclerotization of the ductus bursae, and the presence of only one signum in the corpus bursae.

Description. *Head*: Frons and vertex white to pale tan, vertex scales sometimes marked medially with pale grayish brown; labial palpi with medial surfaces white, lateral surfaces pale grayish brown; antenna concolorous with vertex. *Thorax*: Dorsal surface concolorous with head but often a shade darker, ventral surface pale whitish tan; legs brown with whitish tarsal annulations. *Forewing* (Figs. 9–11): ♂ FWL 7.9–10.0 mm (mean = 8.9, n = 25), AR = 3.14; ♀ FWL 8.0–8.9 mm (mean = 8.4, n = 7), AR = 3.04; costa and termen weakly convex, apex acute; dorsal surface tan to grayish brown with brown to blackish-brown markings; termen and distal one half of costa with reddish-brown suffusion; subbasal and median fasciae variably expressed, the former an outwardly oblique bar from dorsum to radius that is often interrupted on A1+A2, the latter an irregularly shaped mark at distal end of cell that is connected to the costa by a barely discernable brownish streak; pretornal patch irregular in shape and extending anteriorly from dorsum along basal margin of ocellus; costal fold darker than adjacent interfascial scaling; ocellus with brownish central field crossed longitudinally by up to four dark dashes and bordered basally and distally by lustrous gray transverse bars; apex and termen lined with about five rows of scales with bright white apices and sharply contrasting, dark, grayish-brown, medial markings. *Hindwing*: Pale grayish brown. *Male genitalia* (Fig. 27): Uncus weakly developed and divided medially; dorsolateral shoulders of tegumen hunched; socii long, narrowing distally, and moderately setose; gnathos bandlike; aedeagus long and narrow; vesica without cornuti; valva with costal and ventral margins nearly parallel and with a weakly developed projection on ventral margin at mid neck supporting a large spiniform seta; cucullus semirectangular; apex obtuse to right-angled; anal angle often narrowly rounded but with moderately developed ventral projection in some individuals (Fig. 27b), in either case supporting two large spiniform setae; medial surface of cucullus covered with stout setae. *Female genitalia* (Fig. 44): Papillae anales laterally facing, lateral margins with long ventrally curving setae, medial margins sinuate and lined with hook-tipped setae; sterigma ringlike anteriorly; lamella postvaginalis a shieldlike plate with a shallow central trough joining ostium to medial indentation in posterior margin; posterior margin of sternum 7 bulging ventrally and weakly shielding ostium; sclerotization of sternum 7 more strongly pronounced along posterior and lateral margins, ductus bursae almost entirely sclerotized, but with a narrow membranous ring between juncture with ductus seminalis and corpus bursae and with a narrow membranous strip on ventral surface from ring to corpus bursae, anterior component of sclerotization projecting laterally on surface of corpus bursae; corpus bursae with one large signum on ventral surface.

Holotype. ♂, CANADA, Saskatoon, Saskatchewan, 26 July 1923, Kenneth M. King, CNC.

Paratypes. CANADA: ALBERTA: Dry Island Prov. Pk., C. D. Bird, 15 August 2004 (1 ♂, genitalia slide DJW 1458), CDB; Jasper, J. McDunnough, 24 July 1926 (1 ♂, 5 ♀, ♀ genitalia slides DJW 1856, 1858), CNC; Lethbridge, H. L. Seamans, 4 July 1922 (1 ♂, genitalia slide TOR 3258), 16 July 1922 (1 ♂), CNC; Nordegg, J. McDunnough, 24 July 1921 (1 ♂, genitalia slide TOR 3257), 25 July 1921 (1 ♂, genitalia slide DJW 1857), CNC; K. Bowman, 24 July 1922 (1 ♂), 22 July 1933 (10 ♂), UASM. BRITISH COLUMBIA: 100 Mlle [Mile ?] House, G. S. Walley, 4 July 1938 (1 ♀), CNC; Jesmond, J. K. Jacob, 5000', 15 July 1937 (1 ♂), 23 July 1938 (1 ♀), CNC; Kamloops, J. K. Jacob, 20 June 1937 (1 ♂, genitalia slide TOR 3260), CNC. SASKATCHEWAN: Indian Head, J. J. de Gryse, 22 July 1925 (1 ♂), 26 July 1925 (1 ♂, genitalia slide TOR 3259), CNC. USA: ARIZONA: [Coconino Co.], North Rim, Crickmer, August 1949 (1 ♂, genitalia slide DJW 1983) USNM. MONTANA: Carter Co., Medicine Rocks SP, George J. Balogh, 5 September 2002 (1 ♂, genitalia slide DJW 1095), DJW. SOUTH DAKOTA: [Yankton Co.], Yankton, M. O. Glenn, 3 August 1949 (1 ♂, genitalia slide DJW 1065), USNM. WYOMING: Albany Co., 2217 Sky View Lane, 7468', J. S. Nordin, 23 June 2007 (1 ♂, genitalia slide DJW 1855), 1 August 2006 (1 ♂, genitalia slide DJW 1671), DJW.

Etymology. The specific epithet honors Kenneth M. King, a Dominion Entomologist based at the Agriculture Canada station at Saskatoon, Saskatchewan during the 1920's and 1930's.

Distribution and biology. The type series consists of 33 adults (26 ♂, 7 ♀) from Alberta, British Columbia, Saskatchewan, Arizona, Montana, South Dakota, and Wyoming (Fig. 50). Capture dates range from 20 June

to 5 September, but most specimens were collected in July. No larval host is known.

Remarks. The collection sites in the Canadian Provinces, Montana, and South Dakota are at elevations ranging from roughly 1200 ft to 5000 ft.; those in southeastern Wyoming and Arizona are at about 7500 ft and 8290 ft., respectively. I examined 13 specimens in the AMNH collected by F. Rindge that I am tentatively determining as *P. kingi* due to general agreement in forewing appearance and male genitalia. Ten were taken on 25–30 July 1967 at 8800 ft. along St. Louis Creek, Grand Co., Colorado; the other three on 10–11 August 1959 at ca. 10,000 ft in Carbon Co., Wyoming. I did not include this material in the type series because the apical area of the forewing has only a faint indication of reddish-brown suffusion, and no females were available for comparison. I have seen similar but grayer specimens (Fig. 12) collected at 10,100 ft. along Ephraim Canyon Road, Sanpete Co., Utah. This last material may represent another new species, but the male genitalia are not sufficiently distinctive to support that conclusion, and I have seen no associated females. These subtle differences in forewing coloration might be the result of altitude adaptation in a single species.

Pelochrista reversana (Kearfott)
(Figs. 13, 14, 28, 42, 50)

Eucosma reversana Kearfott 1907: 22; Barnes & McDunnough 1917: 170; Heinrich 1923: 112, Fig. 223; McDunnough 1939: 47.

Pelochrista reversana Powell 1987: 35; Brown 2005: 481.

Discussion. The description of *reversana* was based on three specimens belonging to Dr. William Barnes, all of which were collected at San Antonio, Texas. It appears that Kearfott kept two of the syntypes, a male and a female now residing in the AMNH, and the third, a male, was acquired by the USNM along with the Barnes collection. Heinrich (1923, Fig. 223) illustrated the genitalia of the male in the AMNH and labeled the slide TYPE, thus clearly selecting that specimen as the name bearer. He also pointed out that the female syntype is not *reversana* but rather *Eucosma exclusoriana* Heinrich, a somewhat smaller species which, based on male genitalia (Heinrich 1923, Fig. 160), is not a close relative of any of the species treated here.

Types. Lectotype designated by Heinrich (1923): ♂, [Bexar Co.], San Antonio, Texas, genitalia slide CH 16 Dec 1919, AMNH. Paralectotype: ♂, San Antonio, Texas, USNM.

Descriptive Notes. The forewing pattern of *reversana* (Figs. 13, 14) features conspicuous brown markings with whitish interfascial areas, the latter with pale orange-brown striations. The basal, subbasal and median fasciae are strongly expressed. The subbasal fascia often is interrupted in the cell and on A1+A2 by bands of orange-brown to whitish-tan scales. The median fascia is represented by an outwardly oblique bar at the distal end of the cell and a dark rectangular mark at mid-costa, the two being at least weakly connected along the radius. A triangular pretornal patch on the dorsum is separated from the median fascia by a band of whitish scales. The ocellus has a pale tan central field that is crossed longitudinally by three or four, short, dark dashes and is bordered basally and distally by transverse bars of lustrous white scales. Anterior to the ocellus is a large patch of scales with white to pale gray apices and dark grayish-brown medial markings. Forewing statistics: ♂ FWL: 7.7–10.7 mm (mean = 9.0, n = 17), AR = 3.20; ♀ FWL: 7.7–10.9 (mean = 9.1, n = 13), AR = 3.04. *Abdomen*: Intersegmental abdominal membrane between sternites 6 and 7 of female with a pair of pocketlike invaginations (not illustrated). *Male genitalia* (Fig. 28): Uncus a rounded, dorsally setose lobe; socii long, nearly uniform in width, and moderately setose; aedeagus long and narrow; vesica without cornuti; valva with a strongly developed projection on ventral margin of neck supporting a particularly large spine; cucullus narrower than neck, with apex rounded and with anal angle rounded and somewhat bulging; distal margin of cucullus densely lined with stout setae, the largest 3–4 located near anal angle; medial surface of cucullus covered with stout setae. *Female genitalia* (Fig. 42): Papillae anales laterally facing, with long ventrally curving setae on lateral margins and hook-tipped setae along margins of anal opening; lamella postvaginalis with variably shaped lateral extensions (Fig. 42), with a pronounced medial indentation in posterior margin, and with patches of long hairlike setae flanking the indentation; posterior margin of sternum 7 with weakly developed medial projection that fuses with the sterigma and partially shields the ostium; ductus bursae sclerotized from constriction anterior to ostium to juncture with ductus seminalis; juncture of corpus bursae and ductus bursae contorted by variable thickening and wrinkling of membrane; corpus bursae with a large signum on ventral surface and a small signum on thickened membrane of dorsal surface.

Distribution and biology. I examined 73 adults (54 ♂, 19 ♀) from Arizona, Colorado, Kansas, New Mexico, and Texas (Fig. 50). Three specimens were collected in mid-April; the rest between mid-July and mid-October. Most records are from August or September. The capture dates suggest the possibility of two generations per year in Texas. No larval host has been reported.

Pelochrista palpana (Walsingham)
(Figs. 15, 29, 36, 45, 51)

Paedisca palpana Walsingham 1879: 54.

Eucosma palpana: Fernald [1903]: 457; Barnes and McDunnough 1917: 170; Heinrich 1923: 113, Fig. 225; McDunnough 1939: 47.

Pelochrista palpana: Powell 1983: 35; Brown 2005: 480.

Discussion. In his description of *palpana*, Walsingham (1879) mentioned six syntypes (5 ♂, 1 ♀). One male is unaccounted for; the other five specimens are clearly labeled as indicated above and reside in the BMNH. In addition to the syntypes, there are 42 specimens that appear to have been collected by Walsingham, probably at the type locality. They are located as follows: 36 in the BMNH (K. Tuck, pers.

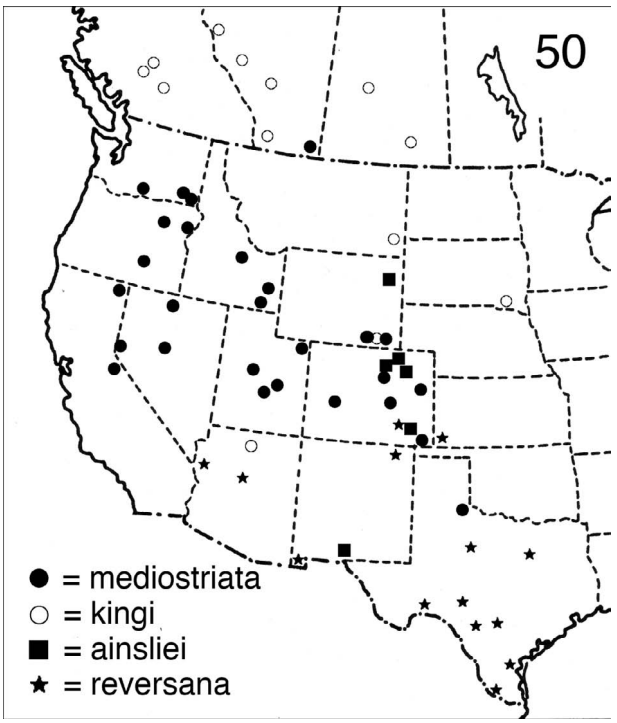


FIG. 50. Geographic distribution of *P. mediostriata*, *P. kingi*, *P. ainsliei*, and *P. reversana*.

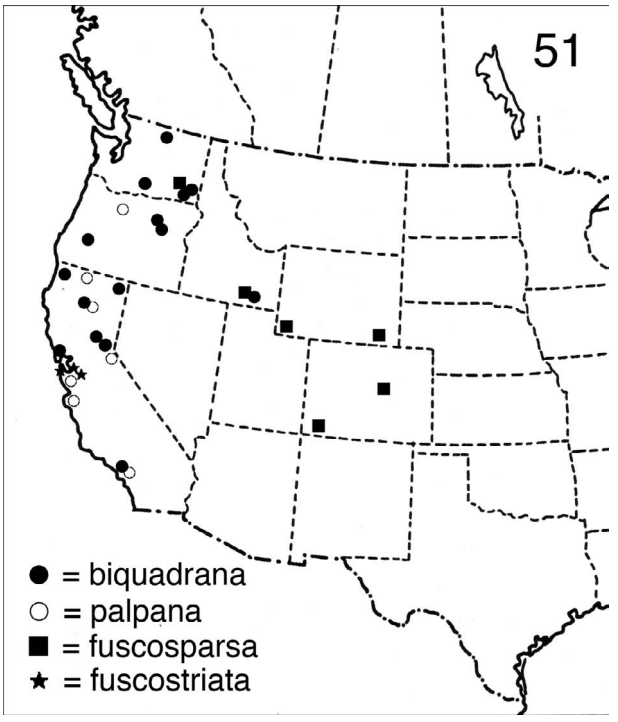


FIG. 51. Geographic distribution of *E. biquadrana*, *P. palpana*, *P. fuscosparsa*, and *P. fuscostriata*.

comm.); 1 in the AMNH; and 5 in the USNM. The last five were part of the Fernald collection and bear the red-bordered determination labels typical of exemplars that Walsingham gave to Fernald. There is no capture data associated with them except for a reference to California, and three of the specimens were actually determined as *Paedisca graminana* Walsingham, a name that has never been published. The specimen in the AMNH has pin labels with the inscriptions "Cotype" and "Lord Walsingham Collection."

Types. Lectotype here designated (Figs. 15, 36): ♂, Pit River, Shasta Co., California, 21–26 July 1871, Walsingham, genitalia slide 11519, BMNH. Paralectotypes: same locality data as lectotype (3 ♂, 1 ♀, ♀ genitalia slide 11536, BMNH). [Walsingham (1879) mistakenly reported these specimens as collected in August.]

Descriptive Notes. The forewing is yellowish brown, with rather poorly defined darker brown markings (Fig. 15). The subbasal fascia is usually discernable from dorsum to discal cell, its distal margin being marked with blackish-brown scales. There is an irregularly shaped pretornal patch on the dorsum abutting the proximal margin of the ocellus and a narrow post median band extending from costa to mid-termen. Often these markings contrast weakly with the interfascial coloration, resulting in a rather uniformly irrorated forewing appearance. Forewing statistics: ♂ FWL: 6.3-7.6 mm (mean = 6.8, n = 18), AR = 3.03; ♀ FWL: 6.5–7.5 (mean = 7.1, n = 4), AR = 2.90.

Male genitalia (Figs. 29, 36): Uncus with medial line of division developed into a prominent indentation in some individuals, basal width ca. 2 × height; socii fingerlike and moderately setose; vesica with 8–14 deciduous cornuti (n = 6); valva tapering from base to neck, with concave costal margin and moderately emarginated ventral margin; cucullus with apex semirectangular to rounded and with several stout setae distributed along ventral margin, the largest at distal end of neck. Female genitalia (Fig. 45): Papillae anales laterally facing, finely ridged transversely, with long ventrally curving setae along lateral margin; lamella postvaginalis roughly U-shaped, with a prominent medial indentation in the posterior margin and a shallow central trough from there to ostium; lateral sections of sterigma with long hairlike setae flanking central trough; posterior margin of sternum 7 with convex medial projection that fuses with sterigma to form a shallow lip at anterior margin of ostium; ductus bursae without sclerotization; corpus bursae with two signa, one small and tacklike, the other larger with winged apex.

Distribution and biology. I examined 26 specimens (21 ♂, 5 ♀), one from Jefferson Co., Oregon, and the rest from Monterey, San Bernardino, Shasta, Siskiyou, and Toulumne counties, California (Fig. 51). Capture dates range from early June to late July. No larval host has been reported.

Pelochrista gilligani, new species

(Figs. 16, 30)

Diagnosis. This species is separated from its congeners by forewing color and maculation (Fig. 16), most conspicuously by the white polygonal line extending from subbasal fascia to ocellus. In size and male genitalia *gilligani* is closest to *palpana*, but the valva is more sharply constricted at the neck, the large ventral spine at the distal end of the neck is longer and more curved, and the projection supporting that spine tends to be larger.

Description. *Head*: Frons white to pale yellowish tan, vertex pale golden brown; labial palpi white with pale golden-brown scaling on lateral surface of second segment; antenna concolorous with vertex. *Thorax*: Dorsal surface concolorous with vertex, ventral surface white, legs pale yellowish tan with white tarsal annulations. *Forewing* (Fig. 16): ♂ FWL 6.6–7.0 mm (mean = 6.8, n = 4), AR = 3.25; costa weakly convex, apex acute, termen straight; dorsal surface light golden brown with white markings as follows: strongly expressed strigulae on distal one half of costa, a streak along the radius from base to distal end of discal cell, a narrow band along dorsum from base to subbasal fascia, a narrow band along termen, and a conspicuous, four segmented, polygonal line with proximal segment arising on dorsum and following distal margin of subbasal fascia to cubitus, next segment following cubitus half way to tornus, third segment bending toward apex and continuing to ocellus, and fourth segment following basal margin of ocellus to dorsum; ocellus pale golden brown, crossed longitudinally by two or three faint black dashes, bordered basally and distally by lustrous, transverse, ivory bars; termen lined with several rows of whitish scales with black medial marks; fringe pale golden brown. *Hindwing*: Dark gray with lighter fringe. *Male genitalia* (Fig. 30): Uncus a semicircular, dorsally setose lobe, basal width ca. 2 × height; dorsolateral shoulders of tegumen well developed, socii fingerlike and moderately setose; gnathos bandlike; aedeagus bulbous anteriorly, narrow and tapering distally; vesica with 3 deciduous cornuti (n = 2); valva with costal margin concave, apex rounded, ventral margin moderately emarginated, with large, semitriangular, ventral projection at distal end of neck supporting a particularly long curved spine; cucullus with up to 3 spiniform setae at anal angle and with stout setae on medial surface. *Female genitalia*: Unknown.

Holotype. ♂, Utah, Sanpete Co., Ephraim Canyon Road, 9450 ft, 20 July 2006, T. M. & J. M. Gilligan, USNM. Type locality at 39°18'35" N, 111°27'36.7" W.

Paratypes. Same data as holotype (3 ♂, genitalia slides DJW 1911, 1912), TMG, DJW, USNM.

Etymology. This insect is named after Todd M. Gilligan, one of the collectors of the type series.

Distribution and biology. The four specimens in the type series were taken in a light trap placed in an aspen grove, elevation 9450 ft., a few miles east of Ephraim, Utah. Nothing is known about larval hosts.

Remarks. The number of stout spines on the distal margin of the cucullus is variable, both from specimen to specimen and from valva to valva of a single individual (Fig. 30).

Pelochrista fuscosparsa (Walsingham)
(Figs. 17–20, 31, 38, 46, 51)

Paedisca fuscosparsa Walsingham 1895: 507.

Eucosma fuscosparsa: Fernald [1903]: 460; Barnes and McDunnough 1917: 171; Heinrich 1923: 116; McDunnough 1939: 47.

Pelochrista fuscosparsa: Powell 1983: 35; Brown 2005: 479.

Types. Lectotype here designated (Fig. 38): ♂, [Larimer Co.], Loveland, Colorado, 5000 ft, Smith, July 1891, genitalia slide 11572, BMNH. Paralectotype: ♂, same data as lectotype, BMNH.

Descriptive Notes. This medium sized, grayish-brown moth is variable in forewing appearance. In some individuals (Fig. 17) the color is nearly uniform, from pale tan to grayish brown, with only the slightest hint of darker markings; in others (Fig. 18) the ground color is sparsely overlaid with blackish-brown spots and speckles; and frequently (Figs. 19, 20) the areas between the veins are suffused with blackish-brown coloration, adding a longitudinally streaked effect. Dark marks in the median area sometimes (Fig. 18) appear to be remnants of a largely disintegrated median fascia, but otherwise there are no recognizable transverse markings. The ocellus is not expressed, and the fringe is uniformly pale tan. Hindwing color ranges from gray brown to dark gray brown, with fringe pale and contrasting. Forewing statistics: ♂ FWL: 7.9–13.3 mm (mean = 11.1, n = 80), AR = 3.22; ♀ FWL: 10.8–12.3 (mean = 11.6, n = 3), AR = 3.12.

Male genitalia (Figs. 31, 38): Uncus a strongly developed, semitriangular lobe with pronounced medial indentation, basal width ca. 1.5 × height; dorsolateral shoulders of tegumen well developed, socii fingerlike and moderately setose; vesica with 12–27 deciduous cornuti (n = 12); valva with long, gradually narrowing neck; cucullus with apex rounded, anal angle moderately developed and supporting one stout spiniform seta, and distal margin with three or four more or less evenly distributed spines; margin of basal excavation with a raised clasperlike process. *Female genitalia* (Fig. 46): Papillae anales with posterior lobes ventrally facing, anterior lobes finely ridged transversely and ventrolaterally facing, lateral margins with long ventrally curving setae, anterior extremities and margins of anal opening with hook-tipped setae; lamella postvaginalis a broadly developed rectangular plate, width greater than 2 × length, with rectangular medial indentation in posterior margin and long hairlike setae flanking indentation; lamella antevaginalis fusing with convex posterior margin of sternum 7; membrane between sterigma and ventral extremities of sternum 8 with long thin setae; ductus bursae short, broad, and encircled by narrow sclerotized ring at juncture with ductus seminalis; corpus bursae with some thickening of the membrane posterior to mid bursa and with two signa, one small and tacklike.

Distribution and biology. I examined 87 specimens (84 ♂, 3 ♀) from Colorado, Idaho, Washington, and Wyoming (Fig. 51). They document a flight period extending from late May to mid-August, but 85% of the capture dates fall between mid-June and the end of July. No larval host has been reported.

***Pelochrista fuscostriata*, new species**
(Figs. 24, 32, 47, 51)

Diagnosis. This species has similarities with *mediostriata*, *fuscosparsa*, and *biquadrana*. In forewing pattern it most resembles *mediostriata* (Figs. 2, 3, 24), but worn specimens could be confused with dark phenotypes of *fuscosparsa* (Fig. 20). However, in *fuscostriata* the forewing fringe has a central band of pale coloration that is edged basally and distally by thin dark lines; in the other two species the fringe is unicolorous. Genitalic characters place *fuscostriata* closest to *fuscosparsa*. Males are separated by the shape of the uncus: broad and bulbous in *fuscostriata* (Fig. 32) vs. tapered and semitriangular in *fuscosparsa* (Fig. 31). Females of *fuscosparsa* have two well developed signa in the corpus bursae and a narrow sclerotized band that encircles the ductus bursae at the

junction with the ductus seminalis; in *fuscostriata* the signum on the ventral surface of the corpus bursae is reduced to a sclerotized linear scar, and the band on the ductus bursae is reduced to a small sclerotized patch. The shapes of the valva, sterigma, and papillae anales easily distinguish *fuscostriata* from *mediostriata* (Figs. 41, 47). The structure of the uncus in *fuscostriata* is very similar to that of *biquadrana*, but the two species are easily separated by forewing pattern (Figs. 24, 21), shape and armament of the cucullus (Figs. 32, 33), and structure of the lamella antevaginalis (Figs. 47, 48).

Description. *Head*: Frons pale tan to dark grayish brown, scales of vertex tan to brown medially, paler toward base and apex; labial palpi tan basally, shading to brown distally; antenna concolorous with vertex. *Thorax*: Dorsal surface concolorous with head; tegulae with pale tan apices; ventral surface tan; legs with ventral surfaces tan, dorsal surfaces brown; distal ends of tarsal segments ringed with paler scales. *Forewing* (Fig. 24): ♂ FWL 8.1–9.5 mm (mean = 8.9, n = 3), AR = 3.11; ♀ FWL 8.9–10.7 mm (mean = 9.8, n = 2), AR = 3.12; dorsal surface olive brown to blackish brown, with tan to whitish streaks along the veins; ocellus, fasciae, and costal strigulae not expressed; fringe with pale tan to whitish central band, bordered basally and distally by thin brownish-gray lines. *Hindwing*: Dark brownish gray; fringe lighter. *Male genitalia* (Fig. 32): Uncus a semicircular, medially divided, setose lobe, basal width ca. 3 × height; dorsolateral shoulders of tegumen weakly developed; socii fingerlike and moderately setose; aedeagus long and tapering; vesica with 12 to 24 deciduous cornuti (n = 4); valva with costal margin weakly concave, apex evenly rounded, ventral margin weakly emarginated, and anal angle developed into a semitriangular projection supporting one large spine; margin of basal excavation with raised clasperlike process; cucullus with 2 to 4 spiniform setae along distal margin and with stout, densely distributed setae on medial surface. *Female genitalia* (Fig. 47): Papillae anales densely setose, with long ventrally curving setae along lateral margins; posterior lobes facing ventrally, anterior lobes very finely ridged transversely and facing ventrolaterally; lamella postvaginalis developed laterally into a shieldlike plate with rounded medial indentation of posterior margin; sternum 7 with semitriangular medial protrusion of posterior margin fused with sterigma; membrane between sterigma and ventral extremities of tergum 8 with numerous, long, hairlike setae; ductus bursae short, with small sclerotized patch at juncture with ductus seminalis; corpus bursae with two signa, one small and bladelike, the other reduced to a sclerotized linear scar on surface of membrane.

Holotype. ♂, California, San Mateo Co., Edgewood Park "A", J. A. Powell, 14 May 1991, genitalia slide DJW1968, EME.

Paratypes. CALIFORNIA: Same data as holotype (1 ♂, genitalia slide DJW1970; 1 ♀, genitalia slide DJW1971), USNM; Santa Clara Co., Kirby Cyn. Ridge NE of Morgan Hill, A. E. Launer, 21 May 1990 (1 ♂, genitalia slide JAP6365; 1 ♀, genitalia slide DJW1969), EME; San Benito Co., 15 mi. E of Gonzales, 19 May 1962, C. D. MacNeill (1 ♂, genitalia slide JAP1100), EME.

Etymology. The specific epithet is formed from the names *fuscosparsa* and *mediostriata*, the two congeners that this species most closely resembles.

Distribution and biology. Five of the six specimens in the type series were collected diurnally in serpentine grassland habitat (J. A. Powell pers. comm.) in central California.

Eucosma biquadrana (Walsingham)
(Figs. 21, 22, 33, 39, 48, 51)

Paedisca biquadrana Walsingham 1879: 45.
Eucosma biquadrana: Fernald [1903]: 457, Barnes and McDunnough 1917: 170; Heinrich 1923: 129; McDunnough 1939: 47; Powell 1983: 35; Brown 2005: 316.
Eucosma palousana Kearfott 1907: 34; Barnes and McDunnough 1917: 170; Heinrich 1923: 130, Fig. 222; McDunnough 1939: 47, **new synonymy**.
Pelochrista palousana: Powell 1983: 35; Brown 2005: 480.
Eucosma tahoensis Heinrich 1923: 112, Fig. 230; McDunnough 1939: 47, **new synonymy**.
Eucosma tahoensis subditiva Heinrich 1929: 9.
Pelochrista tahoensis: Powell 1983: 35; Brown 2005: 481.

Discussion. The lectotype of *palousana* and the holotype of *tahoensis* are in rather poor condition, but in each specimen what can be seen of the forewing pattern is consistent with the markings of *biquadrana*. I compared the genitalia slides prepared by Heinrich for the two types with Obraztsov's slide for the *biquadrana* lectotype and found no significant differences. These observations are the basis for the proposed synonymies. Heinrich (1929) proposed the name *E. tahoensis subditiva* for what he considered to be a large variety of *tahoensis*, but there are numerous specimens of intermediate size, which render that distinction untenable, a conclusion previously reached by Powell (1983).

Walsingham (1879) reported two syntypes for *biquadrana*, the lectotype and paralectotype mentioned below, but his collection contained additional specimens from the type locality bearing labels such as "*PAEDISCA BIQUADRANA* Wlsm, ♂ PARATYE 4/7." This suggests that the original series consisted of the "Type" and at least 7 "paratypes." When Obraztsov examined the syntypes, he concluded that three of these additional specimens, Wlsm. Nos. 91892-91894, were not conspecific with the lectotype, and he placed on them labels with the inscription "not a paratype, N. Obraztsov det. 195_." I examined the lectotype as well as specimens 91893 and 91894 and could find no basis for treating the three as more than one species. Specimen 91894 is considerably smaller than the other two but is not substantially different in forewing appearance or genitalic structure. The size differences

are similar to those observed by Heinrich (1929) in separating *E. tahoensis subditiva* from *E. tahoensis*.

In the description of *palousana*, Kearfott (1907) mentioned 10 syntypes, 5 from Pullman, Washington, dated 11 July, 10 August, and 18 September, and 5 from Los Angeles, California, dated August and October. Heinrich (1923) pointed out that the California specimens are *Sonia filiana* Busck, and he stated that the "Type" of *palousana* is a male in the AMNH from Pullman, Washington. Klots (1942) reported three male syntypes in the AMNH: a lectotype from Pullman, labeled "*Eucosma palousana* K. Type CH 1921," and two paralectotypes [*S. filiana*] from Los Angeles. Under these circumstances, I think Heinrich did designate a particular specimen to be the name bearer, and consequently the lectotype selection is properly attributed to him. It appears that Kearfott (1907) misreported one or more of the capture dates of the syntypes, since the date on the lectotype (14 Aug 1898) does not agree with any of those mentioned in the description. In addition to the three AMNH specimens, I examined three syntypes at the USNM (1 ♂, 1 ♀ from Pullman; 1 ♂ from Los Angeles) bearing Kearfott's handwritten "Cotype" labels. Heinrich (1923) considered the female from Pullman to be conspecific with the lectotype, but it is not. Both of the USNM specimens from Pullman are representatives of an undescribed species of *Eucosma* in the *E. pulveratana* (Walsingham) species group. Finally, I examined one female specimen of *S. filiana* in the LACM which I think could be part of the *palousana* type series. It does not have a Kearfott determination label, but the date and locality labels are identical to one of the syntypes in the AMNH.

Types. *Paedisca biquadrana*. Lectotype here designated (Figs. 21, 39): ♂, Pit River, Shasta Co., California, 21–26 July 1871, Walsingham, No. 91890, genitalia slide 11517, BMNH. Paralectotype: ♂, same capture data as lectotype, abdomen missing, Wlsm. No. 91891, BMNH. *Eucosma palousana*. Lectotype designated by Heinrich (1923, Fig. 33): ♂, Pullman, [Whitman Co.], Washington, 14 August 1898, C. V. Piper, genitalia slide CH 20 Apr 1921, AMNH. *Eucosma tahoensis*. Holotype: ♂, Deer Park Springs, Lake Tahoe, California, 8–15 July, genitalia slide 72829, USNM. Paratypes: Deer Park Springs, Lake Tahoe, California, 1–7 July (1 ♂, AMNH; 1 ♂, USNM).

Descriptive Notes. The *biquadrana* forewing pattern (Figs. 21, 22) consists of a partially expressed subbasal fascia extending from dorsum to radius, a conspicuous pretornal patch on the dorsum that abuts the basal margin of the ocellus, and a well defined postmedian band extending from costa to termen and bordering the anterior and distal margins of the ocellus. The orientation of the subbasal fascia varies from oblique (Fig. 22) to nearly perpendicular to the dorsal margin (Fig. 21). There is some variation in the amount of contrast between the whitish ground color and the dark brown markings, which is due largely to differences in the intensity of the brown irrorations and gray suffusion in the interfascial areas. The ocellus is bordered basally and distally by lustrous white transverse bars which often are suffused with pale pinkish-brown. Forewing statistics: ♂ FWL: 7.2–12.2 mm (mean = 10.2, n = 40), AR = 3.02; ♀ FWL: 8.2–11.2 (mean = 9.2, n = 7), AR = 2.89.

Male genitalia (Figs. 33, 39): Uncus well developed, height nearly equal to basal width, divided medially into two, laterally setose, bulbous lobes; socii long, pendulous, and moderately setose; aedeagus long and narrow; vesica with up to 7 deciduous cornuti; valva with costal margin concave, apex evenly rounded, distal margin convex, anal angle weakly developed, and neck long and narrow (width less than 0.5 × width of valval base); cucullus with long spine at anal angle and three or four similar spines evenly distributed along distal margin; margin of basal opening with weakly developed medial ridge. *Female genitalia* (Fig. 48): Papillae anales with posterior lobes ventrally facing, anterior lobes finely ridged transversely and ventrolaterally facing, lateral margins densely covered with long ventrally curving setae, and medial margins lined with hook-tipped setae; lamella postvaginalis with lateral semitriangular projections, acute posterolateral vertices, and a shallow trough extending from medial indentation of posterior margin to ostium; posterior margin of sternum 7 weakly concave and not closely approximate to sterigma; ductus bursae with weakly sclerotized patch opposite juncture with ductus seminalis; corpus bursae with two signa, one stubby and conelike, the other considerably smaller and tacklike; membrane in vicinity of juncture with ductus bursae variably wrinkled and thickened.

Distribution and biology. I examined 53 specimens (46 ♂, 7 ♀) from California, Idaho, Oregon, and Washington (Fig. 51). Capture dates range from late June to mid-August, but nearly all the records are from July. No larval host has been reported.

Eucosma shastana (Walsingham)
(Figs. 23, 40, 49)

Paedisca shastana Walsingham 1879: 46.

Eucosma shastana: Fernald [1903]: 457; Barnes and McDunnough 1917: 171; Heinrich 1929: 9, Fig. 10; McDunnough 1939: 47; Powell 1983: 34; Brown 2005: 327.

Discussion. This species is very poorly represented in collections; I was able to locate only two specimens besides the syntypes. One, in the USNM, is an exemplar given to Fernald by Walsingham. It was probably captured at the type locality, but there are no collection data on the pin (J.W. Brown pers. comm.). The other is a female in the AMNH from Mono Co., California. I examined the lectotype and the female in the AMNH; the following comments are based on those two specimens.

In his 1923 monograph, Heinrich confused *shastana* with *tahoensis* and included under the former name an illustration (Heinrich, 1923, Fig. 221) of the male genitalia of the latter species. He later (1929) corrected the error after receiving the Walsingham specimen of *shastana* from the Fernald collection.

Types. Lectotype here designated (Figs. 23, 40): ♂, Mt. Shasta, Siskiyou Co., California, 2 Aug.–1 Sept. 1871, Walsingham 91895, genitalia slide 11516, BMNH. Paralectotype: ♀, same data as lectotype, genitalia slide 11534, BMNH.

Descriptive Notes. The forewing pattern is very similar to that of *biquadrana* (Figs. 21–23), but the pretornal patch is broader, the postmedian band connects to the apical spot, and the overall appearance is more reddish brown than brown. The specimens examined had forewing lengths of 12.8 mm (♂) and 13.7 mm (♀), suggesting that this species is somewhat larger than *biquadrana*, which has a mean FWL of approximately 9.7 mm.

Male genitalia (Fig. 40): Uncus a rounded, dorsally setose lobe; dorsolateral shoulders of tegumen well developed; socii fingerlike, vesica with 14 deciduous cornuti (n = 1); valva with dorsal margin concave, apex strongly produced and evenly rounded, distal margin convex, anal angle weakly developed and evenly rounded; cucullus with medial surface densely covered with fine setae and with distal margin lacking stout setae. *Female genitalia* (Fig. 49): Papillae anales laterally facing and finely ridged transversely, with lateral margins lined with long ventrally curving setae and medial margins near anal opening lacking hook-tipped setae; sterigma ringlike, with acute posterolateral projections; membrane between sterigma and ventral extremities of sternum 8 with numerous, long, hairlike setae; ductus bursae with small sclerotized patch at juncture with ductus seminalis; corpus bursae with two signa of nearly equal size.

Distribution and biology. Of the four specimens mentioned above, two were collected at Mt. Shasta in northern California and one at Casa Diablo Hot Springs, a few miles southeast of Mammoth Lakes, California. All appear to have been captured in August. No larval host has been reported.

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