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FOUR NEW EUCOSMINI (TORTRICIDAE) FROM SOUTHWESTERN UNITED STATES

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ABSTRACT. Four new species of the tribe Eucosmini (Tortricidae) are described from southwestern United States: *Pelochrista richersana*, *Pelochrista crabtreei*, *Eucosma patagoniana*, and *Eucosma metzleri*. Illustrations of adults and genitalia are provided.

Additional key words: Olethreutinae, *Pelochrista*, *Eucosma*

Approximately 300 North American species currently are assigned to the genera *Eucosma* Hübner and *Pelochrista* Lederer (Gilligan & Wright 2013). Many more remain to be described, particularly from western United States. This paper makes names available for four such taxa: *Pelochrista richersana*, **new species**, from coastal southern California; *Pelochrista crabtreei*, **new species**, from central Nevada; *Eucosma patagoniana*, **new species**, from southeastern Arizona; and *Eucosma metzleri*, **new species**, from southern New Mexico. The generic assignments are based on the revised definitions of *Eucosma* and *Pelochrista* in Gilligan et al. (2013); the names for other Eucosmini mentioned here follow Gilligan & Wright (2013).

Materials and Methods

I examined 33 specimens and 18 associated genitalia preparations from the following institutional and private collections: Laurence L. Crabtree, Placerville, California (LLC); Essig Museum of Entomology, UC Berkeley (EME); Michigan State University, East Lansing (MSU); Mississippi Entomological Museum, Mississippi State University (MEM); Kelly M. Richers, Bakersfield, California (KMR); United States Museum of Natural History, Washington D.C. (USNM); and Donald J. Wright (DJW).

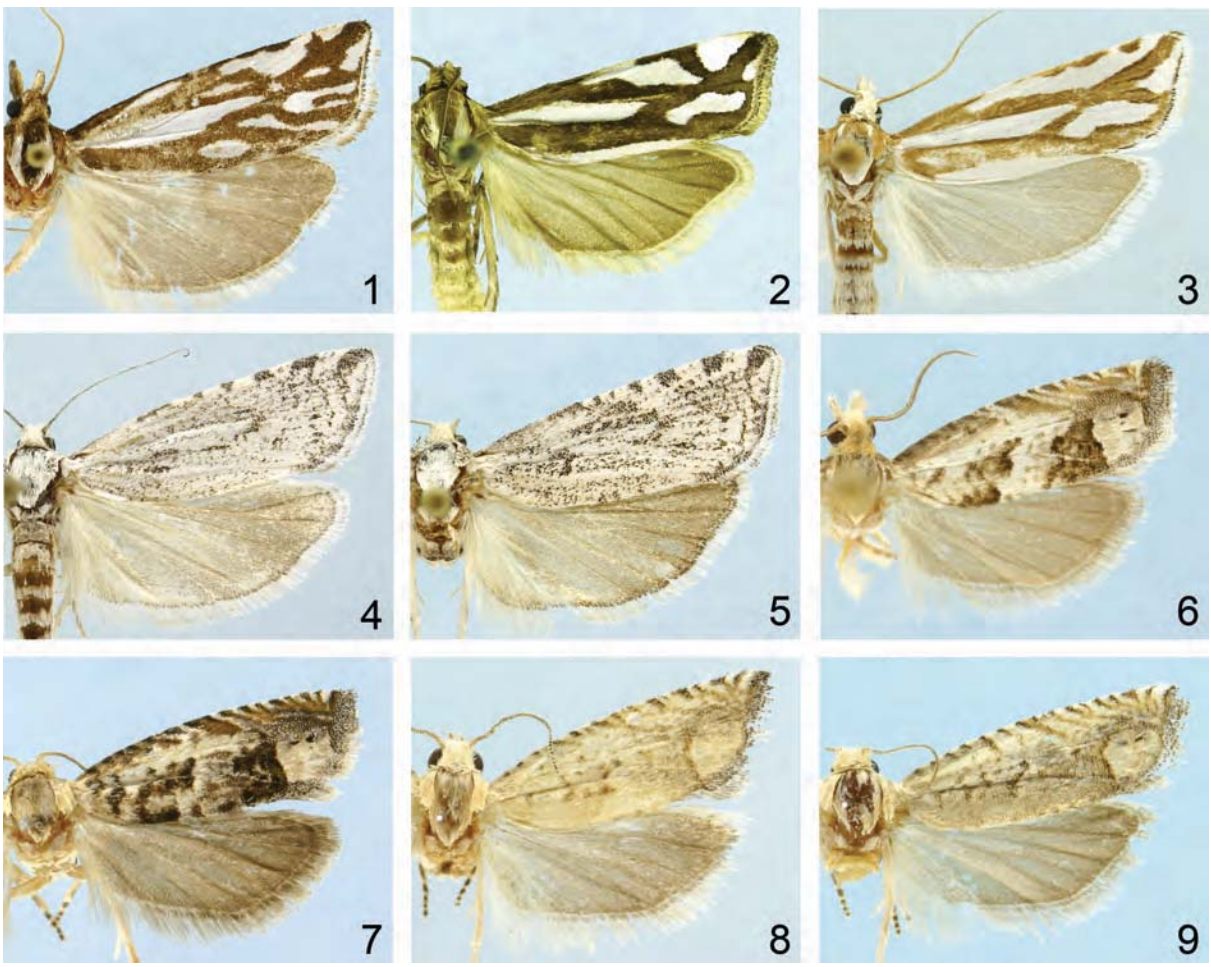
Morphological terminology follows Gilligan et al. (2008). Forewing length (FWL) is defined as the distance from base to apex including fringe, aspect ratio (AR) as FWL divided by medial forewing width. Forewing length is reported to the nearest one-tenth of a millimeter, AR as the average of several calculations rounded to two decimal places. Saccular angle (SA) refers to the angle-like projection on the male valva at the juncture of the ventral margins of the sacculus and neck. Valva neck ratio (NR) is defined as neck width divided by basal valva width, the former measurement taken at the narrowest point of the neck, the latter at approximately the distal margin of the basal excavation. The SA and NR were measured on a projected image of the valva to the nearest degree and to two decimal places, respectively, and are reported as averages of several such values. The number of cornuti in the vesica was determined by counting sockets. The number of observations supporting a statement is indicated by n, and "≈" stands for "approximately equal to". Adult images and genitalia drawings were edited in Adobe Photoshop CS5.

Species Accounts

Pelochrista richersana, **new species**
(Figs. 1, 10, 14)

Diagnosis. *Pelochrista richersana* is superficially similar to *Pelochrista ridingsana* (Riley) and its relatives but has a more intricate forewing pattern (Figs. 1, 2, 3). Figure 2 is a form of *P. ridingsana* that occurs in California coastal dune habitat, which includes the type locality of *P. richersana*. Its markings are of nearly the same dark brown color as those of *P. richersana*, but the pattern lacks several of the small white spots in the latter species. Typical *P. ridingsana* has golden-brown markings (Gilligan et al. 2008:103; Powell & Opler 2009, plate 15.23). *Pelochrista richersana* is the larger of the two species (mean FWL ≈ 15.5 vs. 11.0 mm). Figure 3 is *Pelochrista aurilineana* (Ferris), a *ridingsana*-like species that also occurs in sandy habitat in California. It is closer in size (mean FWL ≈ 14.5 mm.) to *P. richersana* but no more similar in forewing pattern than *P. ridingsana*. *Pelochrista richersana* is readily distinguished from *P. ridingsana* and *P. aurilineana* by genitalia: in males the apex of the cucullus is much less produced and the spiniform setae on the ventrodistal margin of the cucullus are larger and fewer in number (Fig. 13 vs. Gilligan et al. 2008:215 and Ferris 2005: fig. 3); in females the papillae anales have ventral extensions (Fig. 14a), a feature not present in the other two species. *Pelochrista richersana* resembles *Pelochrista crambitana* (Walsingham) in size (mean FWL ≈ 15.5 vs. 15.8 mm) and genitalia (Figs. 10, 14 vs. Heinrich 1923: fig. 213, Ferris 2005: fig. 6) but not in forewing pattern (Fig. 1 vs. Ferris 2005: fig. 2b).

Description. *Head*: Frons white with some brown suffusion; vertex dark brown, shading to white above eyes; labial palpus with medial surface white, lateral surface dark brown; antenna brown; ventral surface of scape white. *Thorax*: Dorsal surface white with dark brown medial streak; tegula dark brown; fore- and mid-legs with brown anterior surfaces, whitish posterior surfaces; hind-legs tan; tarsi lacking contrasting annulations. Forewing (Fig. 1). ♂ FWL 14.3–16.4 mm (mean = 15.6, n = 7), AR = 3.14; ♀ FWL 14.4 mm, AR = 3.06, n = 1; male with costal fold; costa weakly arched; apex acute; termen straight to weakly concave; dorsal surface white with dark brown markings as follows: a radial streak from base to vertex along radius and R_4, with a branch arching from base of R_1 to mid-costa and back to radial streak at distal end of cell, the two enclosing a narrow white spot in cell; a streak from base to mid-termen following A_{1+2} to mid-wing, angling toward radial streak and briefly fusing therewith at distal end of cell, then following M_1 to termen, with branches to dorsum, tornus, and termen, the first terminating at mid-dorsum, the second following CuA_2 and expanding at tornus, the third between CuA_2 and CuA_1; a variably expressed longitudinal dash in white spot between M_1 and CuA_1; a thin line along termen from tornus to R_5; a streak along dorsum from mid-wing to tornus; and a thin streak along costa from base to about three-fourths distance to apex, sometimes broken into one or two elongate marks beyond mid-costa; ocellus not expressed; termen with thin white line from tornus to apex, followed distally by thin black line and broader white band; fringe scales white with brownish apices. Hindwing brownish gray. *Abdomen*: Male genitalia (n = 4) (Fig. 10). Uncus moderately developed and well differentiated from dorsolateral shoulders of tegumen, with apex rounded to somewhat angular; socius long and pendulous, attenuating distally; phallus long and narrow, with base loosely surrounded by anellus; vesica with 2–5 deciduous cornuti; valva with costal margin weakly concave, ventral emargination shallow, neck elongate, NR = 0.63, mean SA = 141°; cucullus with apex weakly developed and variably rounded, distal margin sometimes weakly inflected near apex but otherwise convex, anal angle weakly developed, setation of medial surface coarse; ventrodistal margin of cucullus with four evenly spaced spiniform setae. Female genitalia (n = 1, in poor condition) (Fig. 14). Papillae anales with posterior lobes broad and ventrally facing, anterior lobes ventrolaterally facing and developed into moderately projecting ventral extensions; setation of papillae anales dense on lateral margins and margins of anal opening, sparse otherwise (indicated by sockets in Fig. 14a); lamella postvaginalis semi-rectangular and plate-like, with posterior margin concavely indented, posterolateral corners rounded, lateral margins weakly curled inward;



FIGS. 1–9. Adults. **1.** *P. richersana*, ♂ holotype. **2.** *P. ridingsana*, ♂ Contra Costa Co., California. **3.** *P. aurilineana*, ♂ Uintah Co., Utah. **4.** *P. crabtreei*, ♂ holotype. **5.** *P. crabtreei*, ♂ Nye Co., Nevada. **6.** *E. patagoniana*, ♂ holotype. **7.** *E. patagoniana*, ♀ Cochise Co., Arizona. **8.** *E. metzleri*, ♂ holotype. **9.** *E. metzleri*, ♀ Otero Co., New Mexico.

lamella antevaginalis absent; sternum 7 semi-triangular, with medial projection of posterior margin shielding ostium; ductus bursae lacking sclerotization; corpus bursae with two signa of markedly different size.

Holotype. ♂, California, San Luis Obispo Co., Montana de Oro State Park, 310 ft., K. Richers, 18 September 2009, slide DJW 2971, USNM.

Paratypes. Same location and collector as holotype, 18 September 2009 (3 ♂, slide DJW 2964, 2965), 25 August 2012 (2 ♂, slide DJW 3324), 23 August 2013 (1 ♂) DJW, EME, KMR, USNM; lacking data (1 ♀, slide DJW 2967) USNM.

Etymology. This species is named after Kelly M. Richers, the collector of the type series.

Remarks. The female is reported as "lacking data" but was probably collected at the type locality. It was found loose in a specimen container and is not associated positively with a particular site or date (K. Richers, pers. comm.). Most of the setae on the papillae anales are missing, but it is likely that those on the lateral margins are long, fine, and ventrally curving and that many of those on the margins of the anal opening have hooked tips, features common in *Pelochrista* species with this form of ovipositor.

Pelochrista crabtreei, **new species**
(Figs. 4, 5, 11)

Diagnosis. *Pelochrista crabtreei* is distinguished by its size (mean FWL = 13.4 mm) and forewing appearance (white with extensive fine black speckling, producing a pale grayish effect). The only well-defined forewing markings are rectangular black dots on the costa separating the strigulae (Figs. 4, 5). This combination of characters is unique in North American *Pelochrista*. The shape of the male valva is somewhat similar to that of *P. richersana* and *P. crambitana* (Fig. 11 vs. Fig. 10 and Heinrich 1923: fig. 213), but the apex of the cucullus is more broadly rounded, and the spiniform setae on the margin of the cucullus are more concentrated at the anal angle.

Description. *Head*: Frons and vertex white; labial palpus white with some pale gray shading on lateral surface; antenna white. *Thorax*: Dorsal surface white; tegula with basal scales white, distal scales white with black cross-marks; legs white with some gray shading on anterior surfaces; tarsi lacking contrasting annulations. Forewing (Figs. 4, 5). ♂ FWL 11.0-14.8 mm (mean = 13.4, n = 7), AR = 3.12; male with costal fold; costa weakly arched; apex acute; termen straight to weakly convex; dorsal surface white with uniformly distributed fine black speckling, the latter sometimes accentuating the median branches; costal strigulae white, separated by prominent black rectangular marks; ocellus barely discernable; termen with thin black line from tornus to apex, followed distally by a white band and another thin black line. Hindwing pale gray, darker toward apex, with fringe contrastingly whitish. *Abdomen*: Male genitalia (n = 3) (Fig. 11). Uncus rounded and weakly differentiated from dorsolateral shoulders of tegumen; socius with base narrow, middle one-third broad, distal one-third tapering to narrowly rounded apex; phallus long and narrow, with base loosely surrounded by anellus; vesica with 2–3 deciduous cornuti; valva with costal margin nearly straight, ventral emargination shallow, neck elongate, NR = 0.48, mean SA = 111°; distal margin of basal excavation with tab-like projection; cucullus with apex weakly developed and broadly rounded, distal margin convex, ventral angle acute, setation of medial surface coarse; margin of anal angle with cluster of 2–4 spiniform setae. Female genitalia. Unknown.

Holotype. ♂, Nevada, Nye County, 24 mi. N. Carvers, St. Hwy. 376, 5500 ft., L. L. Crabtree, 13 June 2005, slide DJW 2972, USNM.

Paratypes. NEVADA: Same location and collector as holotype, 27 May 2000, (1 ♂, slide DJW 2623) DJW; Nye County, 25 mi. N. Carvers, Big Smokey Valley, L. L. Crabtree, 30 May 2013 (2 ♂, slide DJW 3297) EME, USNM, 31 May 2013 (1 ♂) USNM, 1 June 2013 (1 ♂) EME, 11 June 2011 (1 ♂) DJW.

Etymology. This species is named after Laurence L. Crabtree, who in recent years has generously supplied me with interesting western eucosmines to examine.

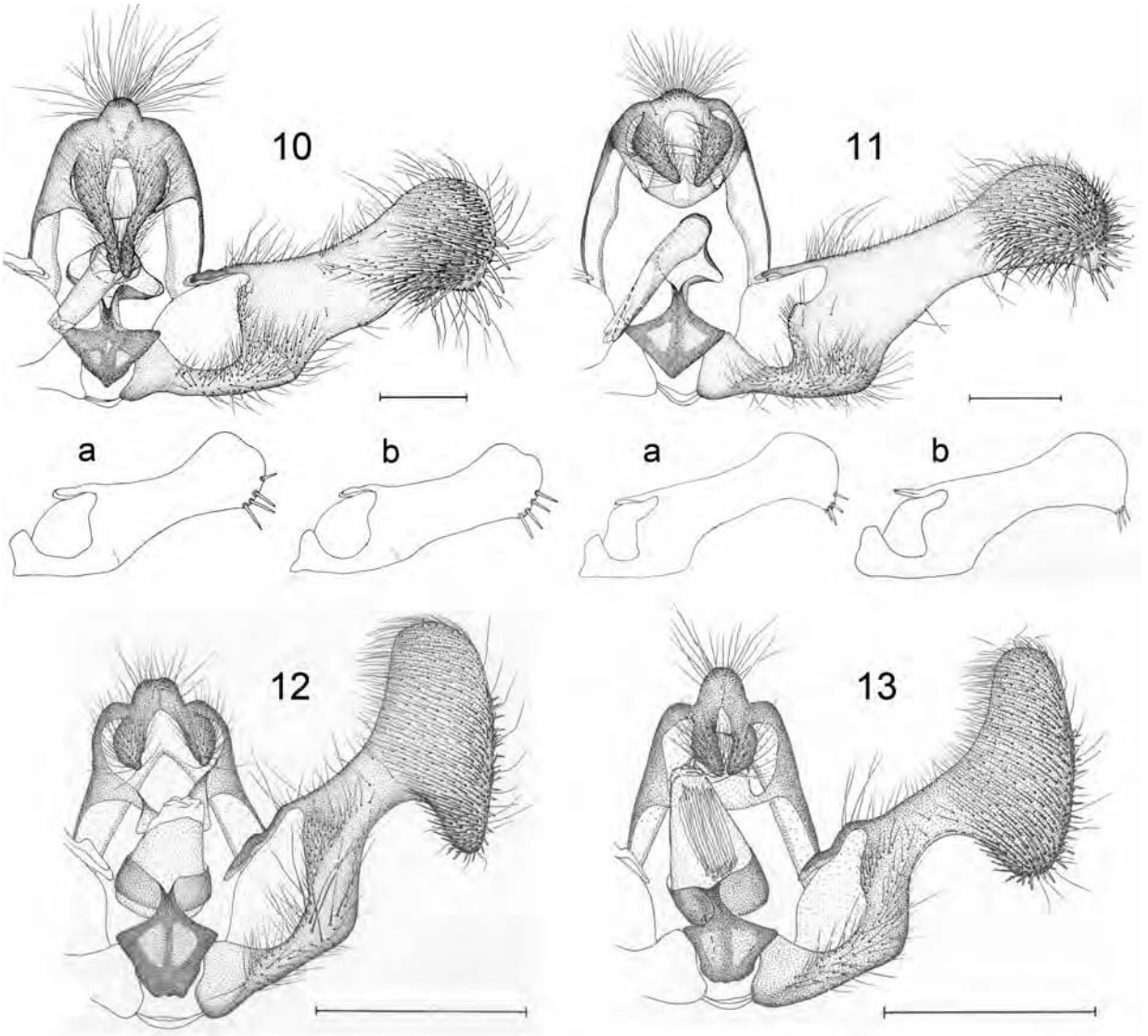
Distribution and biology. The types were collected in late May and early June at two locations about 150 miles SE of Reno, Nevada.

Remark. Lacking a female, this species is placed tentatively in *Pelochrista* based on similarity in male genitalia to some members of that genus (e.g. *P. crambitana*).

Eucosma patagoniana, **new species**
(Figs. 6, 7, 12, 15)

Diagnosis. *Eucosma patagoniana* is distinguished from other North American *Eucosma* of similar size (mean FWL ≈ 6.4 mm) by the following combination of forewing features (Figs. 6, 7): a diffuse white radial streak from base to distal end of cell, prominent black subbasal and median marks extending from dorsum to radial streak, orange-brown suffusion of the subcostal area from median fascia to apex, a conspicuous white ocellus, and lack of a costal fold in males. In the male genitalia, the cucullus has well-developed apical and ventral lobes, the former approximately twice as wide as the latter. The female genitalia are similar to those of a number of other species (e.g., compare Figs. 15, 16) and therefore not diagnostic.

Description. *Head*: Frons white; vertex pale fawn; labial palpus mostly white, with pale fawn shading on lateral surface of second segment; antenna white with pale brown streak along dorsal surface. *Thorax*: Dorsal surface with mesothorax pale fawn, metathorax whitish; tegula with brown base and whitish apex; fore- and mid-legs with anterior surfaces brown, posterior surfaces whitish; hind-legs largely whitish; tarsi with dark brown annulations. Forewing (Figs. 6, 7). ♂ FWL 5.2–7.1 mm (mean = 6.4, n = 12), AR = 2.79; ♀ FWL 6.7 mm, AR = 2.79 (n = 1); male lacking costal fold, costa weakly arched; apex slightly acute; termen straight; fasciate markings brown to blackish brown; interfascial areas white and variably reticulated with blackish brown; subbasal and median fasciae chevron shaped, interrupted by diffuse white streak along radius from base to distal end of cell; posterior component of median fascia extending from dorsum to cell along proximal margin of ocellus and crossed by thin white line along CuA_2; ocellus edged proximally and distally by lustrous fawn bars with gray anterior extremities; central field of ocellus white with one or two black marks/dashes; costal strigulae white, sharply defined, with associated grayish striae extending toward termen and anterior margin of ocellus; subcostal area from median fascia to apex suffused with orange brown; termen with band from tornus to apex of white scales with blackish cross-markings; fringe scales from tornus to M_2 white. Hindwing gray brown. *Abdomen*: Male genitalia (n = 4) (Fig. 12). Uncus strongly differentiated from dorsolateral shoulders of tegumen, with medial line of division on



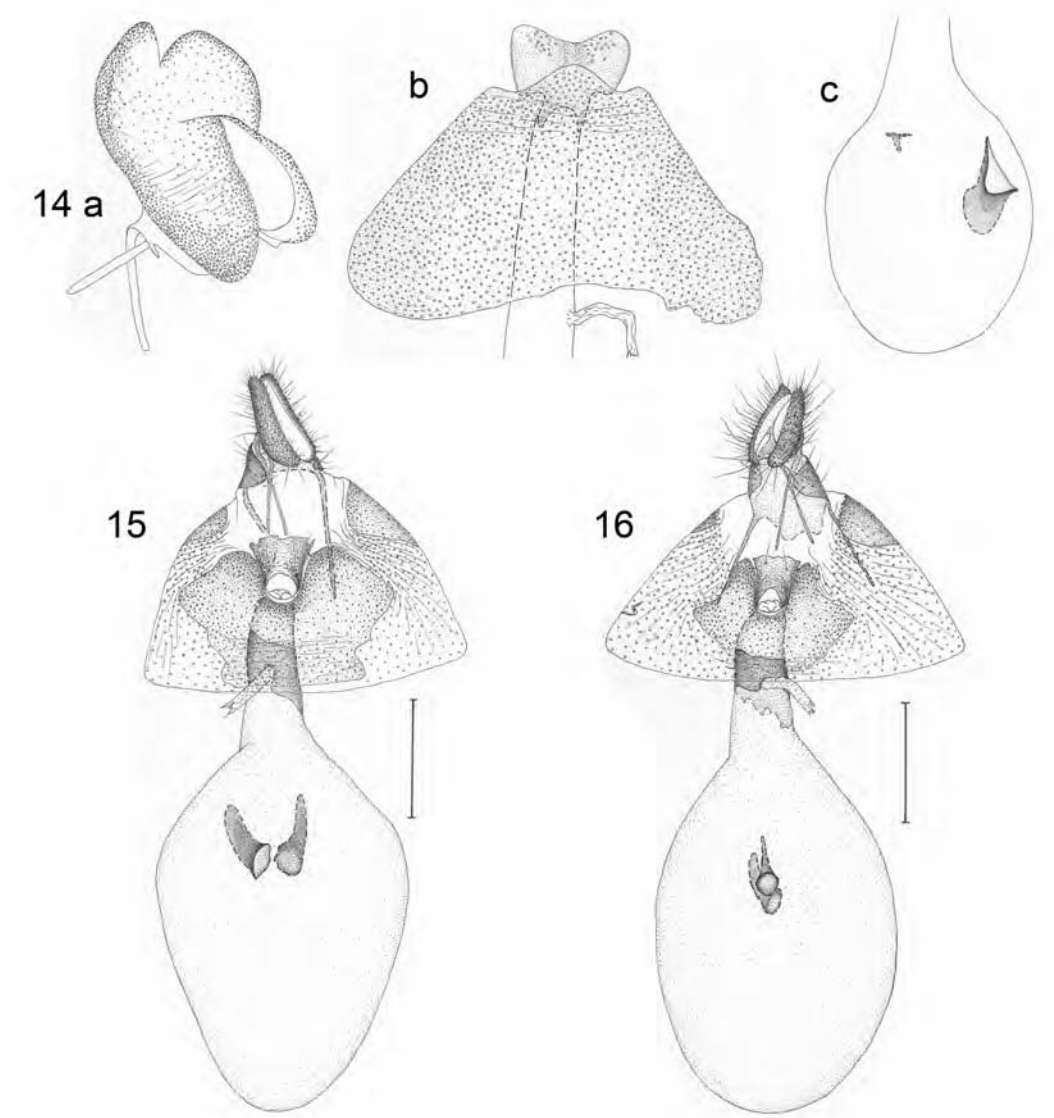
FIGS. 10–13. Male genitalia. **10.** *P. richersana*, slides DJW 2965, 2971 (holotype), 2964. **11.** *P. crabtreei*, slides DJW 2972 (holotype), 2623, 3297. **12.** *E. patagoniana*, slide DJW 607. **13.** *E. metzleri*, slide 3094. Scale bar = 0.5 mm.

ventral surface; socius digitate, with nipple-like apices; phallus stout, tapering gradually toward apex, with base closely surrounded by anellus; vesica with 24–30 deciduous cornuti; valva with costal margin concave, ventral emargination deep and U-shaped, NR = 0.43, mean SA = 113°; cucullus with apical lobe strongly developed and rounded, ventral lobe strongly developed and tapering to narrowly rounded anal angle, distal margin weakly convex, basoventral margin weakly overlapping medial surface of neck, setation of medial surface fine. Female genitalia (n = 1) (Fig. 15). Papillae anales facing ventrally along margins of anal opening, laterally otherwise; lamella postvaginalis with length ≈ ostium diameter, widening posteriorly (length of posterior margin ≈ 2 × ostium diameter), lateral margins weakly curled inward, central trough weakly depressed and microtrichiate; lamella antevaginalis ring-like; posterior margin of sternum 7 invaginated to nearly full length of sterigma and fused with lateral margins of lamella postvaginalis; scaling of sternum 7 dense on posterior projections and anterolateral margins, sparse otherwise; ductus bursae with broad sclerotized band at juncture with ductus seminalis; corpus bursae with two signa of nearly equal size.

Holotype. ♂, Arizona, Santa Cruz Co., 8 mi. SSE of Patagonia on Harshaw Creek Road, 31.468° N, 110.708° W, 5073 ft., D. J. Wright, 5 August 1999, slide DJW 531, USNM.

Paratypes. ARIZONA. Same data as holotype (1 ♂, slide DJW 607) DJW; Cochise Co., Southwestern Research Station, Chiricahua Mountains, 31.881° N, 109.207° W, 5350 ft., J. W. Brown (1 ♀, slide DJW 3199) USNM, Miller Canyon, Huachuca Mountains, J. A. Powell, 7 August 1974 (1 ♂), EME, Coronado National Forest, 31.899° N, 109.226° W, 5911 ft., R. L. Brown & S. Lee (1 ♂) MEM; Santa Cruz Co., Pena Blanca Lake, J. A. Powell, 10 August 1974 (5 ♂, slide DJW 1318) EME, DJW, 11 August 1974 (1 ♂), EME, Pena Blanca Canyon, R. W. Hodges, 11 August 1959 (1 ♂, slide DJW 3304) USNM.

Etymology. The specific epithet refers to the town of Patagonia, Arizona, which is centrally located with respect to the capture sites of the specimens in the type series.



FIGS. 14–16. Female genitalia. **14.** *P. richersana*, slide DJW 2967. **15.** *E. patagoniana*, slide DJW 3199. **16.** *E. metzleri*, slide DJW 2541. Scale bar = 0.5 mm.

Distribution and biology. The entire type series (11 ♂, 1 ♀) was collected in the Coronado National Forest in southeastern Arizona during the first half of August. Capture sites range in elevation from approximately 3,900 to 5,900 feet.

Eucosma metzleri, **new species**
(Figs. 8, 9, 13, 16)

Diagnosis. There are two western species of *Eucosma* that might be confused with *E. metzleri* based on size (FWL ≈ 6.0 mm), forewing color (pale yellow), and markings (dark brown): *Eucosma stramineana* (Walsingham) (Wright 2010: fig. 37) and *Eucosma baloghi* (Wright) (Wright 2010: fig. 47). *Eucosma metzleri* is separated from *E. stramineana* by the shape of the cucullus in the male genitalia (Fig. 13 vs. Wright 2010: fig. 63). The yellow form of *E. baloghi* (Wright 2010: fig. 47) has a complete median fascia, a partially expressed subbasal fascia consisting of a conspicuous spot on the cubitus and an associated spot on the dorsum, and yellowish interfascial areas. In *E. metzleri* the median fascia is reduced to a barely discernible dash at mid-costa, the subbasal fascia is represented by a loose collection of dots on the cubitus, and the interfascial areas are suffused with gray. In males, the valval neck is a little narrower and the anal angle of the

cucullus slightly more developed in *E. metzleri* than in *E. baloghi* (Fig. 13 vs. Wright 2010: fig. 62). The female genitalia of these two species are similar (Fig. 16 vs. Wright 2010: fig. 93), but the lamella postvaginalis is less rectangular in *E. metzleri*, with the posterolateral corners flared.

Description. *Head*: Frons white; vertex scales mostly white, those on lateral margins sometimes grading distally to pale grayish yellow; labial palpus creamy white, sometimes with pale grayish-brown tint on lateral surface of second segment; antenna concolorous with vertex. *Thorax*: Dorsal surface and legs pale yellow; fore- and mid-tibia with brown mark on anterior surface; tarsi with brown annulations. Forewing (Figs. 8, 9). ♂ FWL 5.7-6.3 mm (mean = 5.9, n = 3), AR = 2.89; ♀ FWL 6.4-6.6 mm (mean = 6.5, n = 2), AR = 2.99; male lacking costal fold, costa weakly arched; apex acute; termen straight; dorsal surface pale grayish yellow with brown to blackish-brown markings, the latter consisting of a small cluster of dots on the cubitus in the subbasal position, a thin line along CuA_2, small dashes delimiting costal strigulae, and pale striae on distal one-half of wing from costa to anterior margin of ocellus; ocellus with lustrous yellowish-white bars on proximal and distal margins and up to three blackish dashes on pale yellow central field, the entirety edged with narrow grayish-brown band; termen with band from tornus to apex of creamy white scales with blackish cross-marks; fringe scales creamy white, mostly with pale cross-marks. Hindwing grayish brown. *Abdomen*: Male genitalia (n = 3) (Fig. 13). Uncus well-developed, distally rounded, clearly differentiated from dorsolateral shoulders of tegumen, with ventral surface divided medially by thin flap-like projection; socius digitate, narrowing toward apex; phallus stout, tapering distally, with base closely surrounded by anellus; vesica with 25–31 deciduous cornuti; valva with costal margin concave, ventral emargination deep and U-shaped, NR = 0.37, mean SA = 109°; cucullus with dorsal lobe strongly developed, apex semi-circular, distal margin weakly convex, anal angle moderately produced and more broadly rounded than apex, setation of medial surface fine. Female genitalia (n = 2) (Fig. 16). Papillae anales facing ventrally along margins of anal opening, laterally otherwise; ventrolateral extremities of tergum 8 with a few intermixed scales and setae; lamella postvaginalis widening posteriorly (length ≈ medial width), microtrichiate; lamella antevaginalis ring-like; sternum 7 with posterior margin invaginated to full length of sterigma and weakly fused with lateral margins of lamella postvaginalis; scaling of sternum 7 dense on posterior projections and anterolateral margins, sparse otherwise; ductus bursae with sclerotized band at juncture with ductus seminalis; corpus bursae with two signa of nearly equal size.

Holotype. ♂, New Mexico, Otero County, White Sands National Monument, E. H. Metzler, 25 August 2009, 4000 ft., 32.762° N, 106.189° W, slide DJW 2540, USNM.

Paratypes. Same data as holotype (2 ♂, slides DJW 3094, 3095; 2 ♀, slides DJW 2541, 2544), MSU.

Etymology. This species is named after Eric H. Metzler, who collected the type series during his ongoing study of the Lepidoptera fauna of White Sands National Monument.

Distribution and biology. The five specimens (3 ♂, 2 ♀) were collected in late August in association with inter-dune vegetation at White Sands National Monument.

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