

## Taxonomic note on four poorly known Arizona *Eupithecia* Curtis (Lepidoptera: Geometridae: Eupitheciini)

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### Abstract

Adults and male and female genitalia of *Eupithecia biedermanata* and *E. classicata* are illustrated. The original descriptions and McDunnough's subsequent generic revision did not provide complete information on these species because of the paucity of material available for study. Based upon their respective genitalic characters and otherwise similar morphologies, *E. miamata* is proposed to be a junior synonym of *biedermanata*, and *penumbrata* a junior synonym of *classicata*.

**Key words:** Arizona, *biedermanata*, *classicata*, *Eupithecia*, Eupitheciini, Geometridae, *gilvipennata*, *miamata*, *penumbrata*, taxonomy

### Introduction

Four species of *Eupithecia* described from Arizona, *biedermanata* C. & S., *miamata* Cassino, *classicata* Pearsall, and *penumbrata* (Pearsall), are poorly known and sparsely represented in museum collections. All of the holotypes are in poor condition; those of *biedermanata* and *miamata* are in the Museum of Comparative Zoology, Harvard University, and those of *classicata* and *penumbrata* are in the American Museum of Natural History. To my knowledge, *E. biedermanata* has not been illustrated in the literature. McDunnough (1949) illustrated an adult male and partial male genitalia of *E. classicata*, the adult female holotype and partial male genitalia of *E. penumbrata*, and a topotypical male incorrectly identified as *miamata*, with genitalic drawings of both sexes. This paper provides illustrations in one place of the adults and genitalia of these taxa. In terms of current convention, the original descriptions of these four taxa are somewhat incomplete. They were summarized and emended by McDunnough (1949). Based upon my study, I am placing *miamata*

as a junior synonym of *biedermanata* (date priority), and *penumbrata* as a junior synonym of *classicata* (date priority).

In some instances, the stains chlorazole black E (bluish) and ponceau S (red) were used to enhance genitalic features. The following abbreviations are used in text descriptions and diagnoses: DFW = dorsal forewing; FW = forewing; FWL = forewing length; HT = holotype. The following institutional abbreviations are used: CNC = Canadian National Collection, Ottawa, Ontario, Canada; MCZ = Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts; NMNH = National Museum of Natural History, Washington, D.C.

All of the images by CDF were taken with a Fuji S1 FinePixPro digital SLR camera; other digital cameras were used for the museum photos. The genitalic images were made through an Olympus SZ60 stereozoom microscope using the Fuji camera body attached to the microscope photo tube. Adobe Photoshop® was used for post processing of all images.

***Eupithecia biedermanata* Cassino & Swett (Figs. 1–3; 5–9)**

**Original description:** Cassino, S. E. & Swett, L. W., 1922. *Lepidopterist* 3(10): 168.



**FIGURE 1.** Adults. *Eupithecia biedermanata*, Arizona, Cochise Co., Carr Canyon, Huachuca Mts., 1713m, 20.iv.2004, C.D. Ferris.



**FIGURE 2.** *Eupithecia* holotype males (MCZ). a, *biedermanata*; b, *miamata*.

**Type series and location:** Holotype male in MCZ; allotype female in NMNH.  
**Type locality:** Hereford, Arizona (Feb. 19); female allotype from Palmerlee, Arizona.  
**McDunnough revision:** 1949: 598.

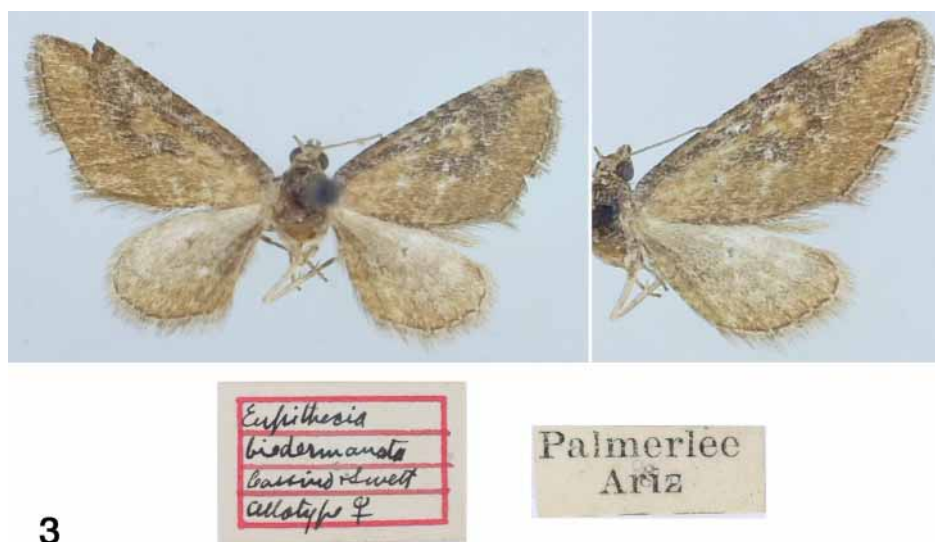


FIGURE 3. *Eupithecia biedermanata* female allotype and pin labels (NMNH).

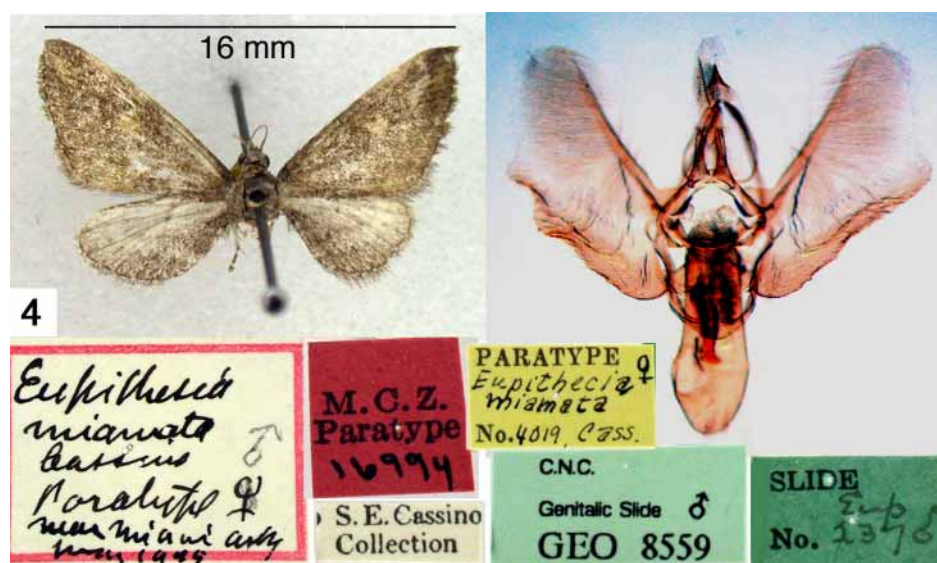


FIGURE 4. *Eupithecia miamata* male paratype, genitalic slide, and pin labels (CNC). The adult appears to be slightly deformed with foreshortened FW.

*Eupithecia miamata* Cassino [New Synonymy] (Figs. 2b, 4–9)

**Original description:** Cassino, S. E., 1925. *Lepidopterist* 4(6–7): 47–50.

**Type series and location:** Holotype male and allotype female in MCZ; one paratype male each in CNC and NMNH; one paratype female stated in description not found, second paratype female proved to be *E. vitreolata* Cassino upon examination of genitalic slide.

**Type locality:** Near Miami [Gila Co.], Arizona, March 1925.

**McDunnough revision:** 1949: fig. 16A male and female genitalia.

**Diagnosis:** Typical form immediately separated from other North American species by distinctive ferruginous color, small pale orange DFW discal spot with dark pupil, elongate FW, and small size (FWL = 9.0–10.5 mm, males; 9.0–11.0 mm, females).

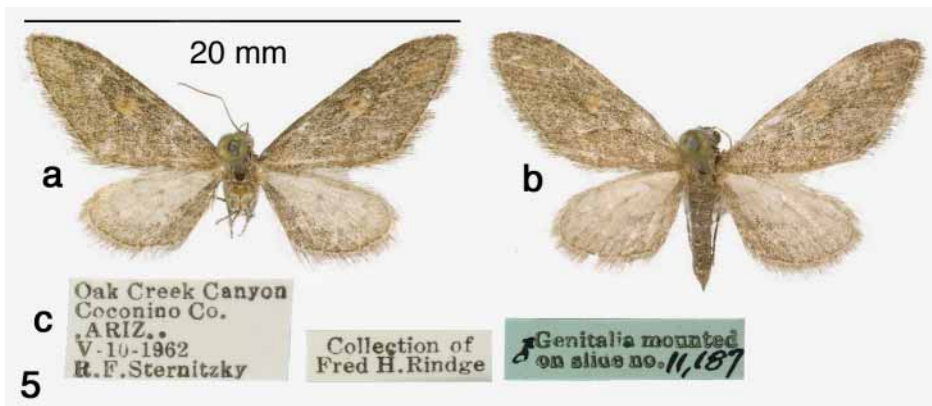


FIGURE 5. *Eupithecia miamata* males (AMNH). a, b, with same data; c, pin labels for adult in a.

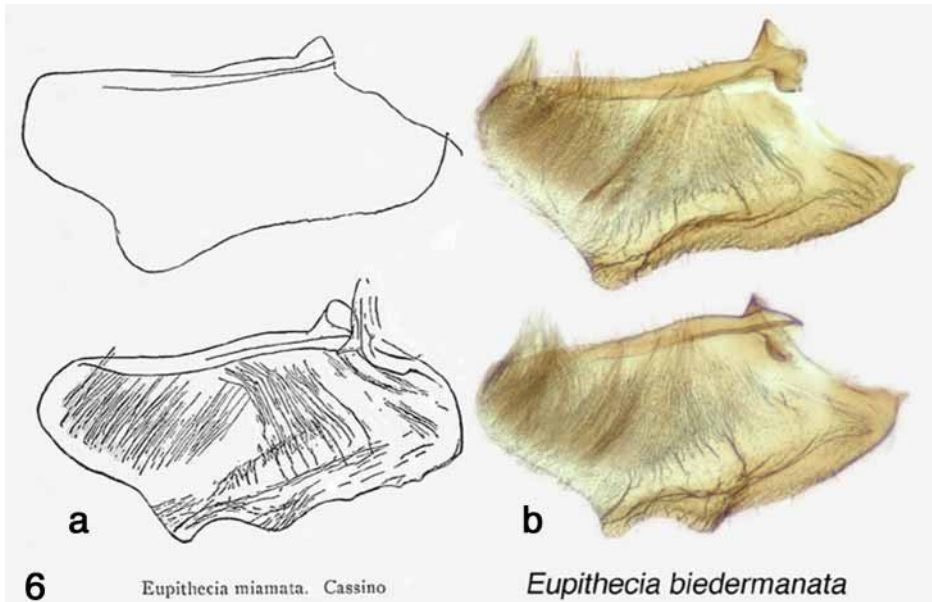


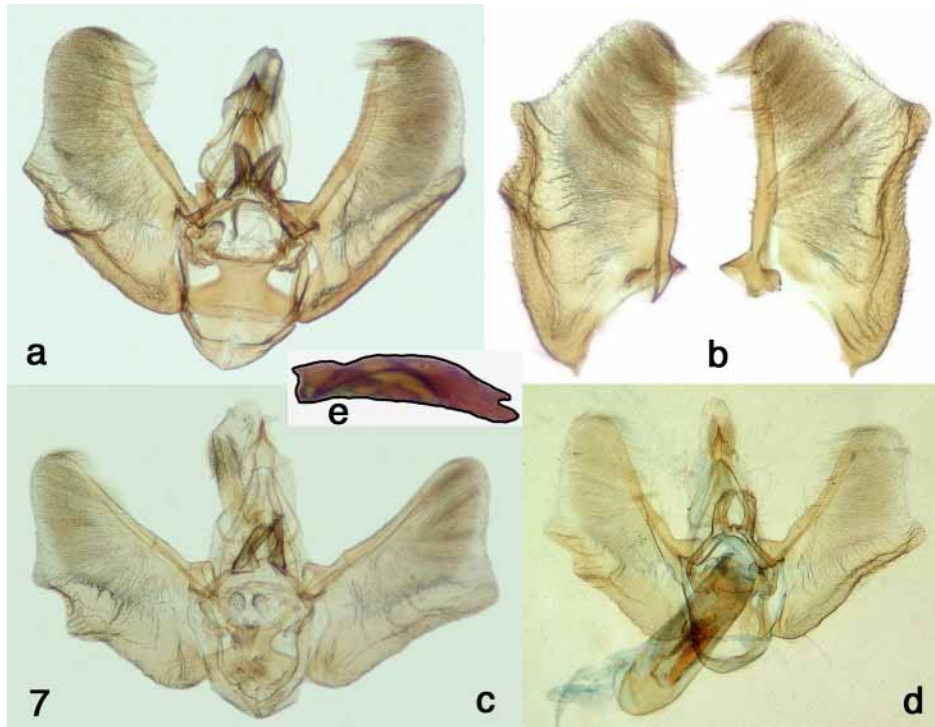
FIGURE 6. Comparison of valvae. a, *E. miamata* digitally reproduced from Cassino (1925, p. 49); b, *E. biedermanata* from Cochise Co., Arizona.

**Synoptic description:** The adult facies of *biedermanata* and *miamata* are very similar, differing in only two aspects: the intensity of DFW maculation; and the proportion of ferruginous and gray scales. Wing shapes are identical, ascertained by overlaying digital photos. Since there are no apparent genitalic differences between the two taxa, I consider *miamata* to be a gray phenotype of *biedermanata* that has adapted to a different larval host and roosting substrate color. A morphological synopsis is now presented.

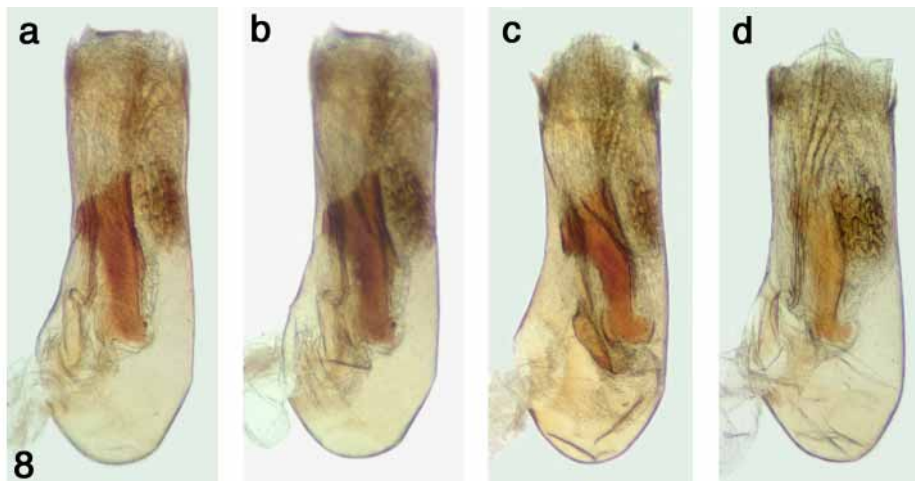
Character	<i>biedermanata</i>	<i>miamata</i>
Antennae	Slightly ciliate, brownish-gray	Same
Palpi	Short, broad, less than width of eye	Same
Palpi, head, and thorax	Mixture of brown and pale grayish scales with coppery overtones	Mixture of grayish-brown and pale gray scales
Abdomen	Mixture of brown, coppery, and paler scales D; whitish-gray V	Mixture of grayish-brown and paler scales D; whitish-gray V
Legs	Mixed brown and whitish scales; tarsi darker and ringed with white scales at joints	Similar, but paler
FWL	9.0–10.5 mm	9.0–10.5 mm
DFW	Ferruginous scales in pale areas; broad incomplete blackish diagonal median band extending to mid-wing below discal spot; pale orange discal spot with dark pupil; thin brown outer margin line; fringe with short brown white-tipped scales and long slender gray scales	Dull coppery-gray scales in pale areas; very faint incomplete brownish diagonal median band extending to mid-wing below discal spot; pale yellow-orange discal spot with dark pupil; thin, faint brown outer margin line; fringe with short grayish-brown white-tipped scales and long slender gray scales
DHW	Gray centrally speckled with a few brown scales; inner margin darker with brown scales; thin marginal line and fringe as in DFW	Similar, but much paler

**Discussion:** The male holotype of *biedermanata* probably was collected near Charles Robert Biederman's cabin in Carr Canyon, Huachuca Mountains, Cochise Co., Arizona. In April 2004 I visited the cabin, which is being maintained by the current property owners, and collected *biedermanata* in UV light traps placed below the nearby larval host trees, *Arbutus arizonica* (A. Gray) Sargent. Hereford, which is the closest community and Post Office, lies outside of Carr Canyon and lacks typical habitat for this moth. Palmerlee was a mining town and Post Office in the late 1800s and early 1900s located at the mouth of Miller Canyon, Huachuca Mountains.





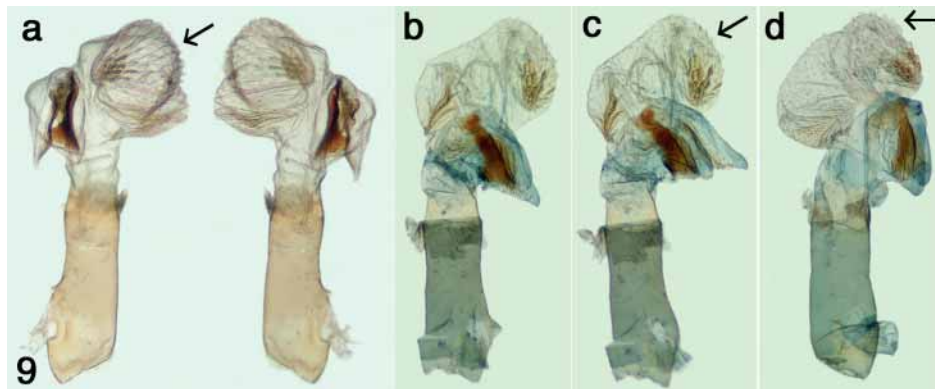
**FIGURE 7.** Male genital structures of *Eupithecia biedermanata* (Cochise Co., Arizona). a, genitalia less aedoeagus spread but not flattened; b, flattened valvae from another specimen; c, flattened genitalia less aedoeagus from adult in Fig. 5b; d, flattened genitalia less aedoeagus from adult in Fig. 5a; e, lateral view of uncus.



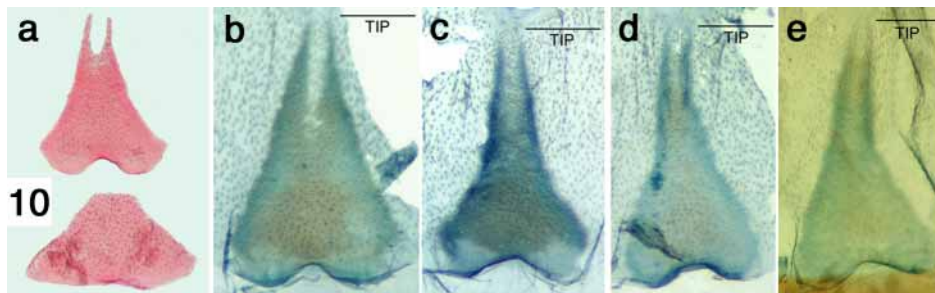
**FIGURE 8.** *Eupithecia biedermanata* aedoeagii variation. a–c, Arizona, Cochise Co.; d, Coconino Co.

Both type specimens are missing their abdomens, and according to McDunnough (1949: 598) the abdomen associated with the male was from a specimen of *E. miamata*: “An abdomen that had been glued on the holotype male at some time proved on dissection to be that of *miamata* Cassino, and obviously, therefore, the wrong abdomen. In the female allotype the abdomen is missing.” Cassino illustrated the male valvae of *miamata*, but Cassino & Swett did not for *biedermanata*. I contend that the abdomen examined by McDunnough was in fact that of the HT of *biedermanata*, and since he did not have additional specimens of *biedermanata* for examination, he did not realize that the genitalia of the two taxa are identical. To my knowledge, *miamata* is known from only 6 males (HT in MCZ, paratype in CNC, NMNH, 3 in AMNH) and the allotype female (MCZ) whose genitalia McDunnough illustrated. I examined the NMNH genitalic slide “HWC [H. W. Capps] #1100, 10 Mar. 1941” labeled a female paratype of *miamata*, but the genitalia are clearly from *E. vitreolata*, and bear no resemblance to those of *miamata* = *biedermanata*. I could not find Cassino’s second female paratype. Specimens from Cochise Co., Arizona identified as *miamata* in several museum collections proved to be typical *biedermanata*. This confusion has certainly arisen from McDunnough’s comment. The location of McDunnough’s genitalic slide of the glued-on abdomen from the *biedermanata* HT is unknown (not at the MCZ). Based on comments about *miamata* (1941, p. 190), his illustrations (fig. 16A) of the male genitalia probably were made from the paratype illustrated here in Fig. 4. Adults of *biedermanata* are illustrated in Figs. 1 (pair), 2a (male holotype), 3 (female allotype); adults of the *miamata* gray color form are shown in Figs. 2b, 3–5. The genitalia of both sexes of *biedermanata* match very closely McDunnough’s illustrations for *miamata* (text fig. 16A, p. 724), and Cassino’s drawings of the male valvae (Fig. 6 shows a direct comparison).

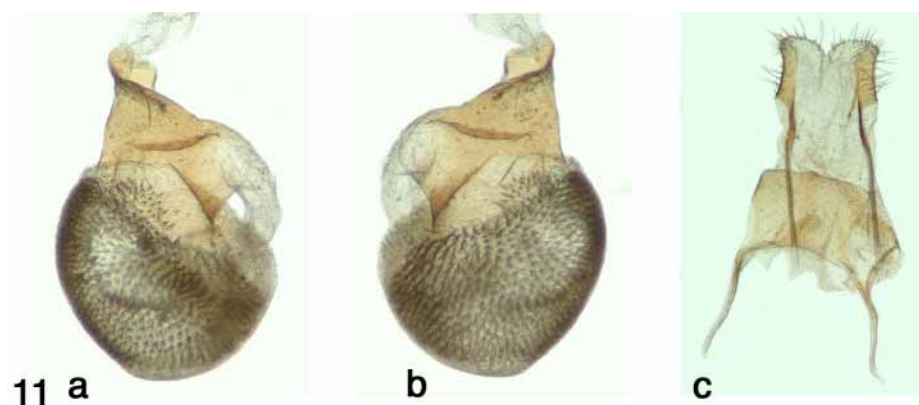
**Genitalic dissections:** (*biedermanata*) 6 males, 8 females; (*miamata*) 2 males by CDF; three prepared slides examined, one by photograph. **Male genitalia** (Figs. 6–10). As shown in the accompanying illustrations, the genitalic characters vary to some extent. Asymmetric left and right valvae (Figs. 4, 6–7); chitinous armament of vesica (Figs. 8–9) consists of a large contorted pointed spade-like piece, a slender slightly contorted parallel strip of essentially equal length, with a patch of the adjoining membrane slightly sclerotized. The surface of one of the globular lobes of the everted and inflated vesica has acute scobinations (arrow in Fig. 9). Bifid uncus tip (Fig. 7e). Sclerotized plate (ventral plate) on eighth sternite (Fig. 10) variable in length, short, bifurcated; chitinization weak and sternite as a whole is delicate. Segment IX two terminal hair pencils poorly developed and sparse, hairs immediately detached and dispersed into the dissection medium. **Female genitalia** (Figs. 12–13). Bursa copulatrix matches McDunnough’s drawings for *miamata*. Papilla analis and apophyses as shown (Figs. 11c–12c). Ductus bursae enlarged and produced into semicircular smoothly-tapering tube from which ductus seminalis originates. Corpus bursae essentially spherical with evenly-spined patches varying in extent among individuals.



**FIGURE 9.** *Eupithecia biedermanata* everted vesicae. a, lateral views of opposite sides of everted and inflated vesica (arrow points to scobinate membrane surface), Arizona, Cochise Co.; b–c, two views of the same flattened preparation; d, Coconino Co., flattened preparation.

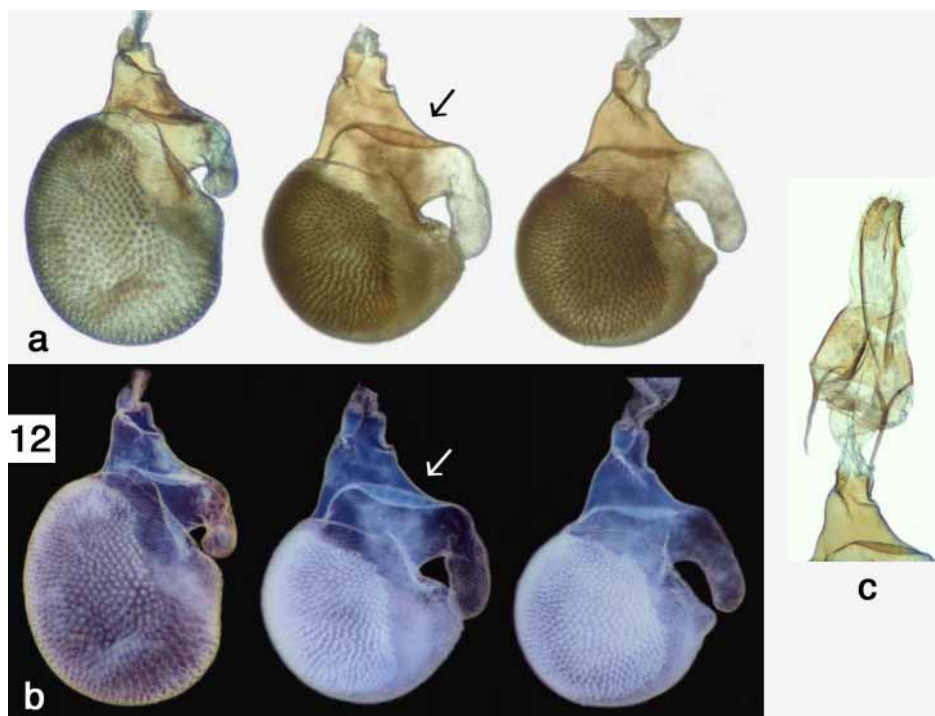


**FIGURE 10.** *Eupithecia biedermanata* ventral plate variation. a–c, Arizona, Cochise Co.; a, digitally enhanced image of sclerotized plates (surrounding membrane removed) on the 7th and 8th (top) abdominal sternites; b–c, ventral plates; d–e, Coconino Co.

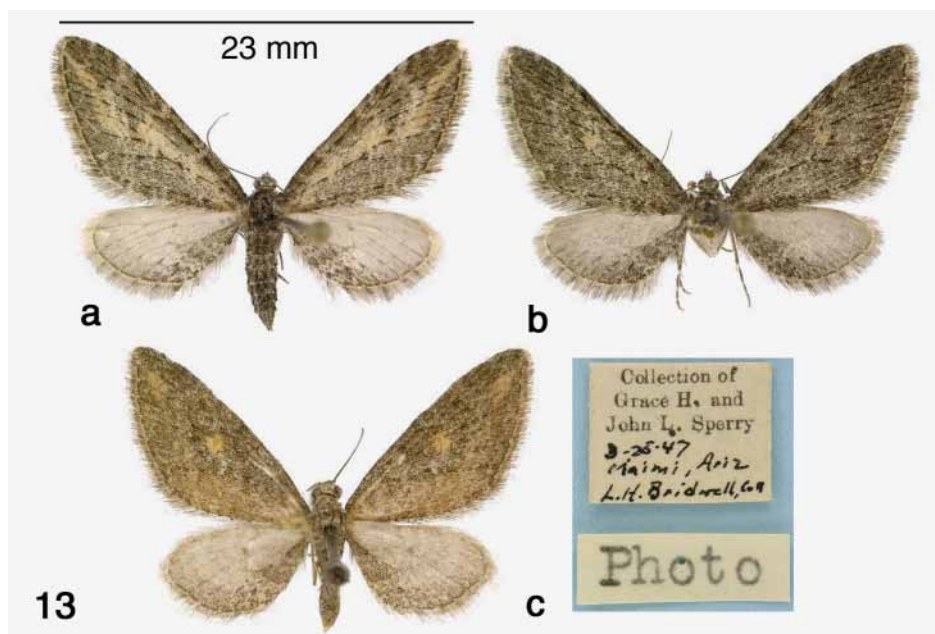


**FIGURE 11.** *Eupithecia biedermanata* female genitalia. a, ventral view of bursa copulatrix; b, dorsal view of bursa copulatrix; c, ovipositor lobes (flattened) and apophyses, Cochise Co., Arizona.





**FIGURE 12.** *Eupithecia biedermanata* female genitalia variation. a, ventral views from 3 Cochise Co., Arizona specimens (arrow points to smooth shoulder); b, image-inverted view of a to enhance structural features; c, upper portion of genitalia.



**FIGURE 13.** Variation in facies of *Eupithecia gilvipennata*. a–b, two females, Tex Canyon, 30.iii.2000, Cochise Co., Arizona, C. D. Ferris; c, adult male and pin labels for specimen illustrated by McDunnough in Pl. 31, f. 11 as *miamata*.

**Biology.** The larval host of typical *biedermanata* is *Arbutus arizonica* (A. Gray) Sargent, Arizona madrone. Adults emerge in April while the host flowers are budding, with oviposition apparently at the bud bases. Mature larvae feed in the white to pinkish flowers and are cryptically patterned and colored to blend with them; pupation occurs in May (*vide* N. McFarland). Adult color matches the bark of the newer growth branchlets on which the flowers occur and which are the presumed roosting substrate. Based upon specimen yields in light traps placed at the bases of the host trees and at distances, adults do not normally stray very far from hosts. Fig. 22 illustrates typical habitat, with vegetation in addition to Arizona madrone including oaks (*Quercus emoryi* Torrey, *Q. oblongifolia* Torrey), manzanita (*Arctostaphylos pungens* Humboldt, Bonpland, Knuth), and alligator juniper (*Juniperus deppeana* Steudel). *Arbutus arizonica* is restricted to Cochise, Graham, and Pima counties. The larval host of the gray phenotype may be another shrub with gray or grayish-brown bark to which the moth is color-adapted. Manzanita does occur where the gray form has been collected, but its bark is reddish-brown or mahogany colored. A possible host candidate is quinine bush (Garryaceae), *Garrya flavescens* Wats. (= *G. mollis* Greene), which is recorded from Coconino and Gila counties with Oak Creek Canyon the type locality for *G. mollis*. This shrub has grayish-green bark and blooms from January to April, depending upon elevation and location.

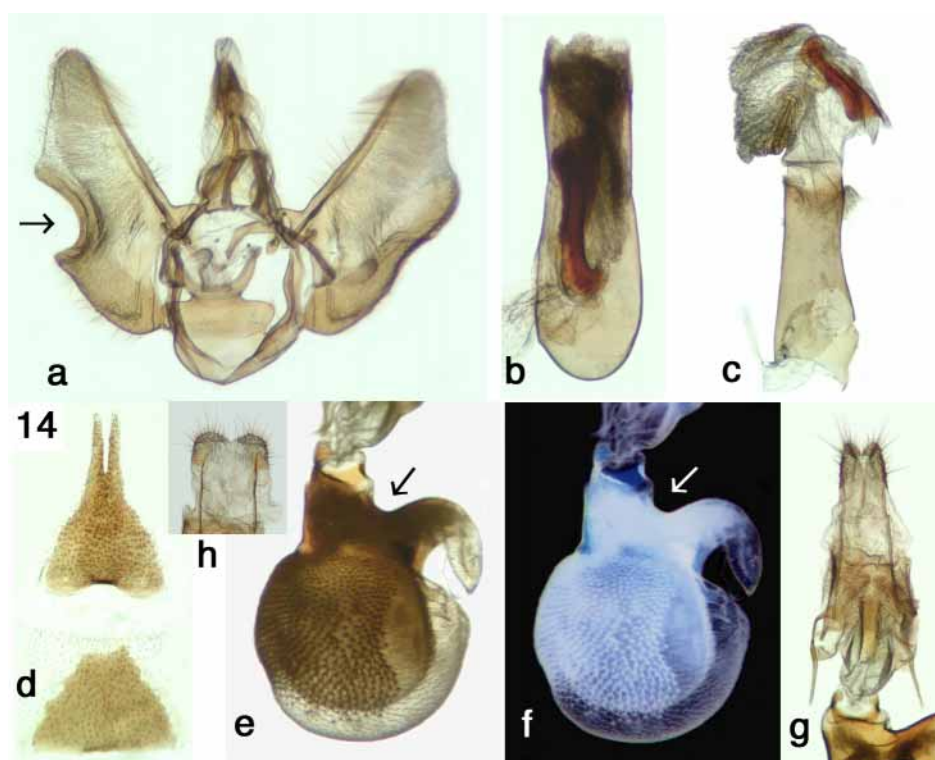
**Flight period.** ARIZONA, holotype 19 Feb.; contemporary records from 11 April to 7 May in Cochise Co. Gray phenotype: Gila Co., March, 1925; 25.iii.1947; Coconino Co., 10.v.1962.

**Geographic distribution:** ARIZONA, Cochise Co., (typical *biedermanata*); Coconino and Gila counties (gray phenotype).

**Material examined:** (*biedermanata*) (36m, 51f; holotype by photo): ARIZONA, Cochise Co., nr. Portal, E. side of Chiricahua Mts., ca. 1525 m, 13.iv.1988, G. Balogh (2m, 3f); Huachuca Mts.: Copper Canyon, 1675 m, 15.iv.86, J. Brown (2f); Miller Canyon, 1775 m, 13, 15.iv.88, J. Powell (2m), 14.iv.86, Powell & Wagner (1m, 2f); Ash Canyon, 1577 m, 11.vi–7.v.1982–2004, N. McFarland (8m, 3f); Ash Canyon, 1623 m, 17, 21.iv.2004, C.D. Ferris (21m, 37f); Carr Canyon, 1712 m, 20.iv.04, C. D. Ferris (2m, 4f); (*miamata*) (6m; holotype and 2 paratypes by photo and genitalic slide): ARIZONA, Coconino Co., Oak Creek Canyon, 10.v.1962, R. F. Sternitzky (3m).

**Additional discussion:** Because he did not have genitalic preparations of *biedermanata*, McDunnough placed this species in a different group from *miamata* and *gilvipennata* Cassino & Swett, 1922. Based upon the genitalia in both sexes, *biedermanata* and *gilvipennata* appear to be closely related, and have asymmetric male genitalia. *E. gilvipennata* has a broad geographic distribution in western North America from Arizona to southwest British Columbia. Adults are polyphenic (Fig. 13) and larger than *biedermanata*. The specimen (Fig. 13c) illustrated by McDunnough (1949: pl. 31, fig. 11) as a topotypical *miamata* proved upon my dissection to be *gilvipennata*. The genitalia (Fig. 14) differ in two major respects: male, the apex of the left valva is narrower and more acute than in *bie-*

*dermanata*, and although somewhat variable the concave indentation is smoothly curved with a strongly sclerotized edge; female, there is a distinct notch in the shoulder where the ductus seminalis emerges from the ductus bursae. There are two additional species in Arizona that sometimes have been confused with *gilvipennata*: *scabrogata* Pearsall and *hohokamae* Rindge (1963: fig. 3 male genitalia; fig. 7 female genitalia). Adults of the latter are polyphenic and look very similar to *gilvipennata*; *scabrogata* (McDunnough, 1949: pl. 31, fig. 12, adult; fig. 16B, genitalia) is nearly uniformly gray with variable fine dark DFW maculation. The valvae in the male genitalia are symmetrical with essentially smooth and convex outer margins; ventral plates are long, slender, and not bifurcated. The female genitalia differ substantially from *gilvipennata* and from one another. Bolte's (1990: fig. 286a, b) illustrations of the genitalia of *gilvipennata* show the extent of variation in the outer edge of the left valva (cf. fig. 14a). His illustration of the ventral plate (fig. 14e), however, appears to be from *scabrogata*.



**FIGURE 14.** *Eupithecia gilvipennata* genitalia. a, male genitalia less aedeagus spread but not flattened (arrow points to heavily chitinized smooth concavity), Cochise Co., Arizona; b, aedeagus; c, everted vesica; d, sclerotized plates on the 7th and 8th (top) abdominal sternites; e, bursa copulatrix (arrow points to notch in shoulder); f, inverted image of e to enhance view of structures; g, female ovipositor lobes and apophyses; h, ovipositor lobes (flattened).

*Eupithecia classicata* Pearsall (Figs. 15–21)

**Original description:** Pearsall, R. F., 1909. *Proc. ent. Soc. Wash.* 11(3):128.



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**FIGURE 15.** *Eupithecia penumbrata* female holotype and pin labels (AMNH).

**Holotype and location:** Holotype male in AMNH.

**Type locality:** Huachuca Mountains, Arizona, July, 1907, collected by Haimbach.

**McDunnough revision:** page 674; Plate 31, fig. 27 adult male, specimen collected by A. B. Klots at Superior, Pinal Co., Arizona in July (no year); text fig. 18A male genitalia.

*Eupithecia penumbrata* (Pearsall) [New Synonymy] (Fig. 16, HT)

**Original description:** *Eucymatoge penumbrata* Pearsall, R. F., 1912. *Can. ent.* 44: 29.

**Type series and location:** Holotype female in AMNH; allotype male in NMNH.

**Type locality:** Palmerlee [Miller Canyon, Huachuca Mts.], Arizona; male allotype from Redington, Arizona, January 1, 1910.

**McDunnough revision:** page 676; Plate 31, fig. 28 female holotype; text fig. 18B male genitalia. Additional illustration: Barnes, W. & McDunnough, J. H., 1918. *Contrib. nat. hist. Lepid. North America.* p. 202, plate 22, fig. 8 male allotype. Color photo in Knudson & Bordelon (2003), pl. 6, fig. 3 (Guadalupe Mts. Nat. Park section).

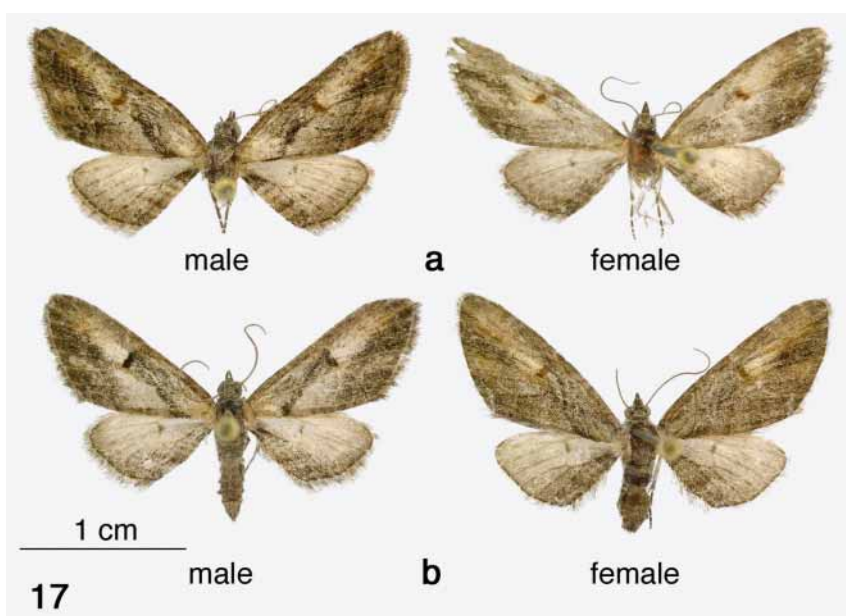
**Diagnosis:** Separated from other species by its elongate FW and relatively large size (FWL = 11.0–13.0 mm), DFW dark discal spot/dash with reddish center, heavily-scaled dark maculation, and antemedial transverse black bar (males and some females).





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FIGURE 16. *Eupithecia classicata* male holotype and pin labels (AMNH).



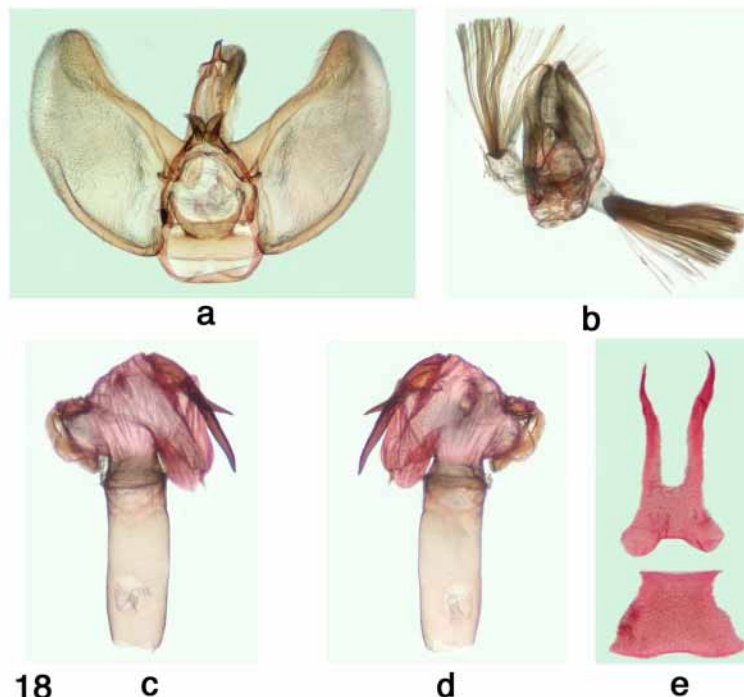
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FIGURES 17. *Eupithecia classicata* adults. a, male, Mexico, Durango, Las Rosias, 12 mi. E. La Ciudad, 2805m, 14-18.viii.72, J. Powell, D. Viers & C. D. MacNeill; female, Arizona, Cochise Co., Rustler Park, Chiricahua Mts., 2590m, 12.vii.72, J. Powell; b, male, Arizona, Cochise Co., Miller Canyon, Huachuca Mts., 1775m, 13.iv.88, J. Powell; female, same data as male but 12.iv.88.

**Discussion:** McDunnough (1949) recognized the similarities between *classicata* and *penumbrata*, but chose to maintain them as separate species [as did Scoble (1999)] based upon the difference in the time of occurrence (*penumbrata* early in the year and *classicata* in late summer) and the apparently smaller size of *classicata* relative to *penumbrata* in the few specimens he examined: *classicata*, HT, one additional male from Pinal Co., AZ; *penumbrata*, HT, allotype, one female in AMNH collection from Redington, AZ with the date February 1–10. McDunnough illustrated only the male genitalia.

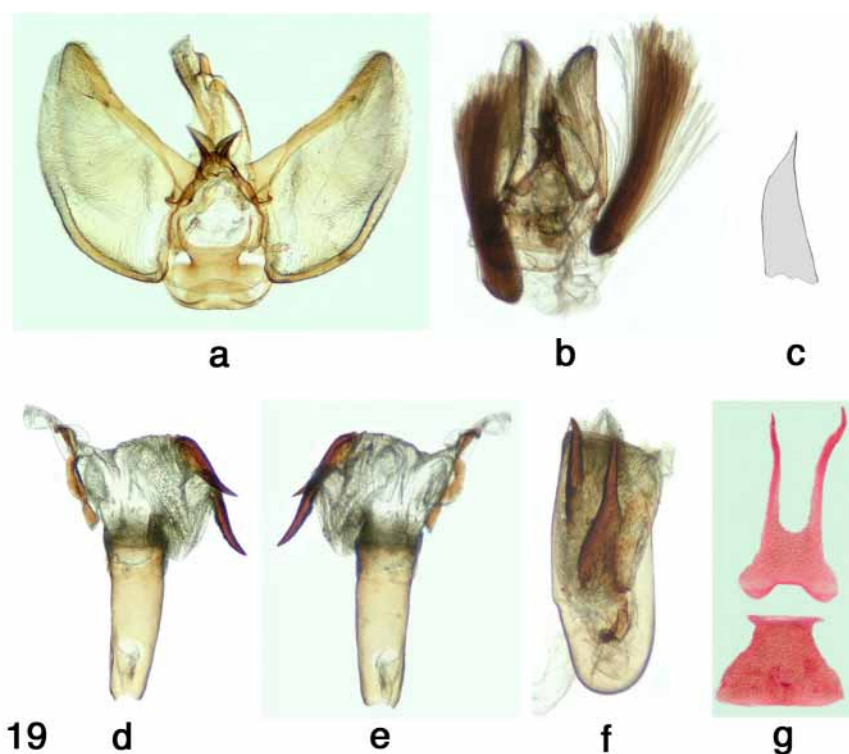


Based upon material I examined, I see no differences in gross morphology or genitalia to support maintaining two separate species and hereby place *penumbrata* as a synonym of *classicata*, which has date priority. Apparently this view was expressed at some point in the past based upon the comments by parties unknown on a pin label of the *penumbrata* type (Fig. 15): “Is this a synonym of *Eucymatoge classicata* Pears. type in Grossbeck Coll.” with “yes” overwritten. There is no temporal separation since adults have been collected in all months of the year (no June record for Cochise Co., AZ). The HT of *classicata* (Fig. 16) is a male and the HT of *penumbrata* a female. Adults are sexually dimorphic with some degree of variation (Fig. 17); most females essentially lack the DFW antemedial diagonal black bar found in the males, and it is replaced by some thin striations; the bar was distinct in 2 of 25 females examined. The apparent smaller size of late summer adults is easily explained. Presumably the larvae, which are assumed to be flower or leaf bud feeders, matured during the normally very dry spring months when forage is limited, and were thus malnourished leading to small adults. Larvae maturing after the summer monsoon rains or the late winter wet period would have adequate food to achieve full growth. The nature of the male and female genitalia suggests that *classicata* is allied to *E. graefii* (Hulst), but the two species differ substantially in wing shape and maculation. In both sexes there is a patch of ruddy scales located within the DFW black discal dash or spot, a character often seen in *graefii*.



**FIGURE 18.** *Eupithecia classicata* male genitalia (August specimen). a, genitalia less aedeagus; b, view of genitalia (less aedeagus) showing hair pencils, c–d, lateral views of opposite sides of everted and inflated vesica; e, digitally enhanced image with surrounding membrane removed of sclerotized plates on the 7th and 8th (top) abdominal sternites.

**Genital dissections:** 3 males, 7 females. **Male genitalia** (Figs. 18–19): Sclerotized plate on eighth sternite long, deeply dissected (18e, 19g), much more so than *graefii*, with two tines of unequal length. Symmetric valvae (18a, 19a). Terminal (segment IX) hair pencils well developed (18b, 19b). Vesica armature of aedoeagus (18c–d, 19d–f) consists of two robust unequal length pointed spines and a third contorted piece of chitin. Uncus tip forms a single point (similar to *graefii*).



**FIGURE 19.** *Eupithecia classicata* male genitalia (April specimen). a, genitalia less aedoeagus; b, view of genitalia (less aedoeagus) showing hair pencils; c, sketch of uncus tip (oriented vertically); d–e, lateral views of opposite sides of everted and inflated vesica; f, uncus; g, digitally enhanced image of sclerotized plates (surrounding membrane removed) on the 7th and 8th (top) abdominal sternites.

**Female genitalia** (Figs. 20–21). General form similar to *graefii*, with ductus seminalis (20b–d, 21a) moderately stout at base, but tapering quickly and essentially transparent, rendering it difficult to visualize under the microscope and to photograph. Dorsal surface of corpus bursae displays a prominent u-shaped array of robust spines attached to a chitinous base (20b:D, 21a, c:D).

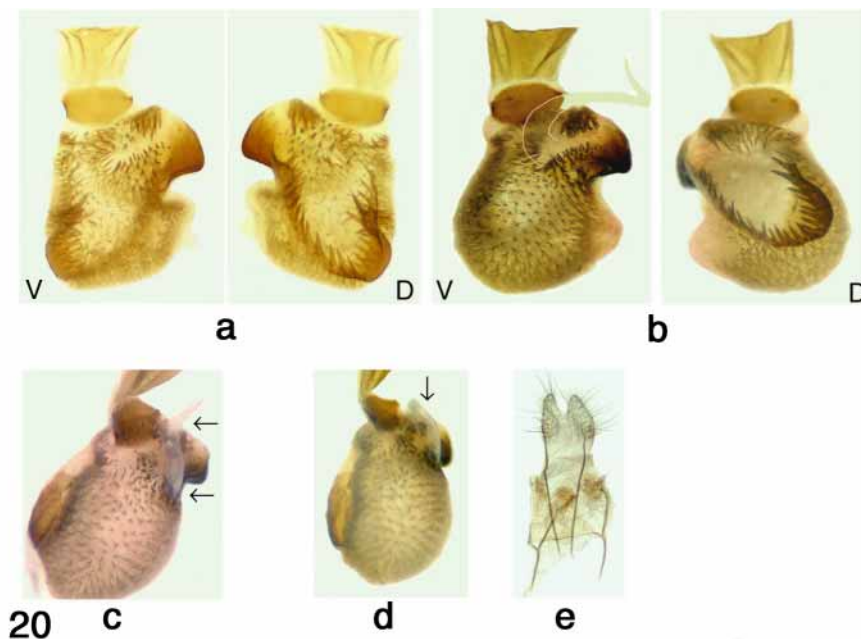
**Biology.** Pupae found by Ron Wielgus on *Arbutus arizonica*, Upper Ash Canyon, late February and early March, 1986. In view of the date, locality, and altitude records for this

species, there must be overlapping generations with various larval hosts. In the Huachuca Mts., *classicata* occurs in the same habitat as *biedermanata* (Fig. 22). It also occurs in open coniferous forest (Rustler Park, Chiricahua Mts.).

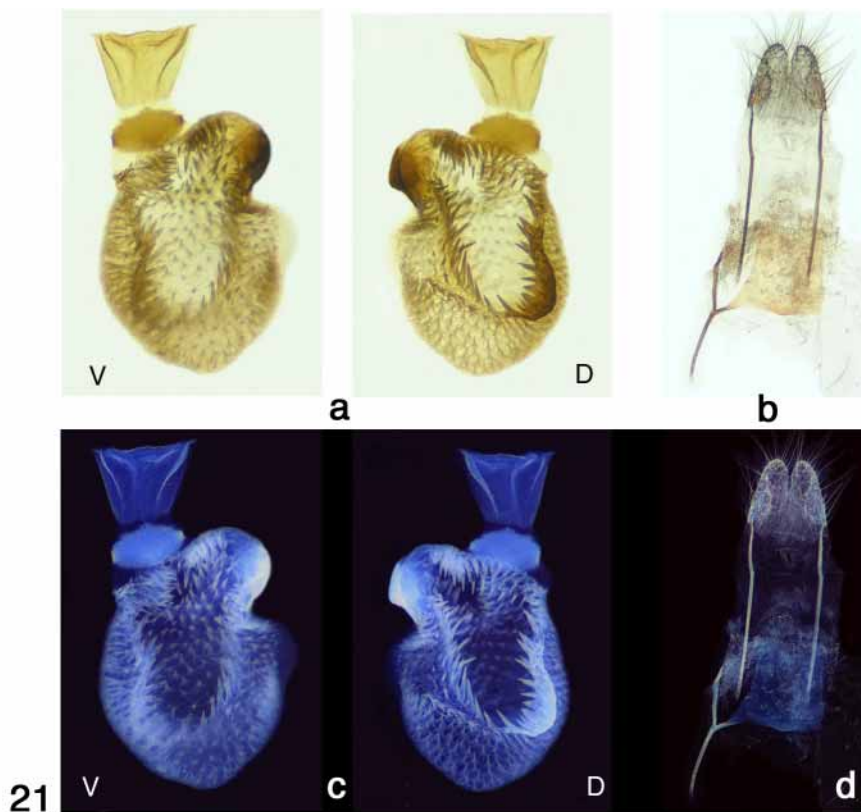
**Geographic distribution:** ARIZONA, Cochise & Pinal counties; OREGON, Baker Co. [one July record, Rindge (1963), possible misidentification of *graeffii*?]; TEXAS, Uvalde Co. (Dog Canyon); MEXICO, Durango.

**Flight period:** All year subject to climatic conditions. ARIZONA, Jan.–May, July–Dec.; TEXAS, Apr.–Sept.; MEXICO, Durango, August.

**Material examined** (17m, 25f; types by photos): ARIZONA, Cochise Co., Huachuca Mts.: Ash Canyon, early Sept.–mid-May, 1981–2002, N. McFarland (9m, 8f), 17, 21.iv.2004, C. D. Ferris (4f), 1.x.2004, C. D. Ferris (1m); Copper Canyon, 1830m, 15.iv.86, J. Powell (1f); Lutz Canyon, 1800 m, 28.iv.89, J. Powell (2f); Miller Canyon, 14.iv.86, Powell & Wagner (1m, 1f), 1775 m, 12–13.iv.88, J. Powell (3m, 3f); Townsite C.G., 7000', 1.v.89, J. Powell (2m, 1f); Chiricahua Mts.: Rustler Park, 2590m, 2.viii.73, J. Powell & S. Szerlip (1f); 12.vii.72, J. Powell (1f). MEXICO, Durango, Las Rosias, 12 mi. E. La Ciudad, 2805 m, 14–18.viii.72, J. Powell, D. Viers & C. D. MacNeill (1m, 1f); Tepalcates, 30 mi. W. Durango, 11.viii.86, Brown & Powell (1f); 10 mi. E. La Ciudad, Las Rusias Fire Lookout, 2805 m, 16.viii.72, J. Powell, D. Viers & C. D. MacNeill (1f).



**FIGURE 20.** *Eupithecia classicata* female genitalia (August specimens). a, ventral (V) and dorsal (D) views of bursa copulatrix of specimen shown in Fig. 17a (at right); b–d, specimen from Mexico with same data as male in Fig. 17a; b, bursa copulatrix with digital manipulation of ventral image (V) to show ductus seminalis; c–d, rotation of bursa copulatrix to show ductus seminalis (arrows); e, ovipositor lobes and apophyses of specimen shown in a.



**FIGURE 21.** *Eupithecia classicata* female genitalia (April specimen). a, ventral (V) and dorsal (D) views of bursa copulatrix; b, ovipositor lobes and apophyses; c, d, images a,b inverted to emphasize structure; Arizona, Cochise Co., Copper Canyon, 6000' (1830m), 15.iv.86, J. Powell.



**FIGURE 22.** Habitat of *E. biedermanata* and *classicata* in Huachuca Mts, Cochise Co., Arizona. a, Carr Canyon ca.100 m across arroyo from Biederman's cabin, 21.iv.2004; b, Ash Canyon with *A. arizonica* at center and *A. pungens* at left, 17.iv.2004.

**Comment.** Based on observations in Cochise Co., Arizona, Noel McFarland (pers. comm.) reports that under suboptimal conditions, *Eupithecia* pupae may remain dormant for several years until climatic conditions are suitable for emergence and survival of the subsequent larvae. Emergence seems to be triggered by increased humidity during the two seasonal rainy periods, mid-winter and summer monsoon. Vegetation flowering occurs following these rainy periods and supports *Eupithecia* larvae that feed in flower heads. Following the winter rainy period, *A. pungens* (manzanita) blooms in late winter into early spring. Its flowers support the larvae of *E. gilvipennata*, *hohokamae*, and *scabrogata*. The mature larvae of these species are virtually identical, being cryptically patterned and colored to match the white to pink flowers. April flowering of *A. arizonica* (madrone) supports *E. biederanata* larvae and apparently those of *classicata*.

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