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A Revision of the American Species of *Deilinia* (Lepidoptera, Geometridae)

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The New World species of *Deilinia* form a small but interesting group of moths. Three of our species are quite similar to the Old World representatives, while the remaining two have become modified. No revisionary work has been done on this genus from a continental viewpoint since Packard (1876), although Forbes includes four of the five species in his work on the Lepidoptera of New York and neighboring states (1948). Much work still needs to be done with this group, especially with the early stages; more material is needed from many parts of western North America, so that a more complete picture of the distribution can be obtained.

MATERIALS STUDIED: During the preparation of the present paper, over 1500 specimens and more than 150 genitalic preparations were studied. Also included were all the types in this country. Part of the material has been made available to the author through the kindness of the authorities of several museums and the cooperation of private collectors, who are referred to specifically below. The genitalic preparations were made largely by the author from specimens in the collections of the American Museum of Natural History and of the author. Additional slides were studied from the United States National Museum and the Canadian National Collection.

Upon completion of this paper, identification labels were placed on all

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specimens studied at the American Museum of Natural History, so that future workers will know what specimens were examined.

ACKNOWLEDGEMENTS: The author wishes to acknowledge with thanks the cooperation and aid of the following men who have examined types at his request or who have allowed him to study specimens in their charge: Mr. Harry P. Clench of the Carnegie Museum, Mr. D. S. Fletcher of the British Museum (Natural History), Dr. E. G. Munroe of the Canadian National Collection, Dr. E. L. Todd of the United States National Museum, and Mr. P. E. L. Viette of the Muséum National d'Histoire Naturelle, Entomologie, Paris. To the officers in charge of the Laboratories of Forest Biology at Fredericton, New Brunswick, Winnipeg, Manitoba, Indian Head, Saskatchewan, Vernon and Victoria, British Columbia, the Forest Insect Laboratory at Sault Ste. Marie, Ontario, and the Forest Zoology Laboratory at Calgary, Alberta, go similar thanks for the loan of materials. Lastly, another word of gratitude goes to Mr. J. H. Baker of Baker, Oregon, Mr. M. O. Glenn of Henry, Illinois, and Mr. A. K. Wyatt of Chicago, Illinois, for the privilege of studying specimens from their private collections. The author acknowledges with thanks the photographic work done by Mr. Rudolph Schrammel, and the drawings of the genitalia and the preparation of the maps and graphs by Miss Marjorie Statham, both of the Department of Insects and Spiders.

GENUS *DEILINIA* HÜBNER

Deilinia HÜBNER, 1825, Verzeichniss bekannter Schmettlinge (*sic!*), p. 310. PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 305. GROTE, 1882, New check list of North American moths, p. 47. J. B. SMITH, 1891, List of the Lepidoptera of boreal America, p. 69; 1903, Check list of the Lepidoptera of boreal America, p. 73. HULST, 1896, Trans. Amer. Ent. Soc., vol. 23, p. 327. DYAR, "1902" [1903], Bull. U. S. Natl. Mus., no. 52, p. 305. HEMMING, 1937, Hübner, vol. 1, pp. 513-516; vol. 2, p. 179. McDUNNOUGH, 1938, Check list, p. 156.

Dilina L. AGASSIZ, 1846, Nomenclatoris zoologici index universalis (Soloduri), p. 124 (emendation; preoccupied by *Dilina* Dolman, 1816, K. Vetenskaps. Acad. Handl., Stockholm, p. 205).

Dilinia HAMPSON, 1895, Fauna of British India, vol. 3, p. 216 (emendation).

Deilinea (*sic!*), HOLLAND, 1903, Moth book, p. 338. J. B. SMITH, 1909, Ann. Rept. New Jersey State Mus., p. 500. BRITTON, 1920, State Geol. and Nat. Hist. Surv. Bull., Connecticut, no. 31, p. 119. FORBES, 1928, in Leonard, Cornell Univ. Agr. Exp. Sta. Mem. 101, p. 599. FRANCLEMONT, 1949, Lepidopterists' News, vol. 3, p. 5. FERGUSON, 1954, Proc. Nova Scotian Inst. Sci., vol. 23, p. 308.

Cabera TREITSCHKE, 1825, Die Schmetterlinge von Europa, vol. 5, p. 437; 1827, *op. cit.*, vol. 6, p. 343. OKEN, 1826, Isis, vol. 19, p. 1066. GUENÉE, 1857, Histoire naturelle des insectes, vol. 10, p. 52. WALKER, 1861, List of the speci-

mens of lepidopterous insects in the collection of the British Museum, pt. 23, p. 867. ANON., 1882, Check list of Macro-lepidoptera, publ. by Brooklyn Entomological Society, p. 23. BARNES AND McDUNNOUGH, 1917, Check list of the Lepidoptera of boreal America, p. 111. FORBES, 1948, Cornell Univ. Agr. Exp. Sta. Mem. 274, p. 71. FRANCLEMONT, 1949, Lepidopterists' News, vol. 3, p. 5.

Cabira SODOFFSKY, 1837, Bull. Soc. Imp. Nat. Moscou, no. 6, p. 90 (emendation). GUMPENBERG, 1887, Nova Acta Deutschen Akad. Naturf., Halle, vol. 49, p. 323; 1892, *ibid.*, vol. 58, p. 271.

Head, front flat, slightly swollen or bulging, smooth scaled; eyes large, round, wider than front, rarely reduced to narrower than front; antennae of male bipectinate, with apex simple, the pectinations arising from middle or towards apex of segments, of female simple; tongue present; labial palpi short to moderate, porrect, rough scaled, third joint small. Thorax without tufts, with scattered hair-like scales; fore tibia with short to moderately long process; hind tibia not dilated, with two pairs of spurs, without hair pencil. Abdomen without crests; ventral surfaces of third and eighth segments unmodified. Forewings broad, 12 veins, no areole; R_1 from top of cell, R_{2+5} long stalked from top of cell, R_5 from stalk before R_2 ; M_1 from upper angle, M_2 from just above middle of dc, M_3 from lower angle; Cu_1 from well before angle, Cu_2 from two-thirds of distance from angle; fovea absent. Hind wings broad, triangular, frenulum strong in both sexes; Sc with base broadly swollen (fovea), then separate from cell; R and M_1 from just before upper angle; M_3 from angle; Cu_1 from before angle, Cu_2 from two-thirds of distance to angle. Forewings and hind wings concolorous, white, creamy white, or grayish white, with yellowish or gray cross lines, these sometimes reduced or absent, discal dots absent. Beneath similar to upper surface, with obsolescent maculation.

MALE GENITALIA: Uncus simple, long, curved, the apex pointed; socius present, with approximately 12 to 24 hairs; gnathos present, lightly sclerotized, complete and simple or with medioventral portion obsolescent; valves elongate, rather narrow, symmetrical, with groups of heavy setae near base and near apex on inner surface, outer surface at base with hair pencil of very long, hair-like setae extending beyond apex of valve; costa with relatively short sclerotized arm near base, or simple; valvula and sacculus undifferentiated; transtilla a narrow, sclerotized rod, rarely obsolescent; cristae present; juxta elongate, narrow, well sclerotized, rarely ovate in shape; furca absent; tegumen elongate, with many elongate setae arising from dorsal surface; saccus projecting beyond base of valves, in length subequal to length of uncus; aedeagus elongate, narrow, usually subequal in length to combined

lengths of uncus, tegumen, and saccus, rarely longer or shorter and broader; vesica armed with numerous cornuti, rarely reduced to one.

FEMALE GENITALIA: Ostium simple, without plates; operculum small or absent; ductus bursae sclerotized posteriorly, widest at posterior end, tapering anteriorly, with intermediate membranous area before joining bursa copulatrix; ductus seminalis arising ventrally from anterior region of intermediate membranous area; bursa copulatrix very large, simple, sclerotized, anterior margin narrowly membranous, with numerous longitudinal striations, these having a large number of inwardly pointing, sclerotized teeth.

EARLY STAGES: The following descriptions have been made chiefly from preserved material reared by Margaret MacKay of the Division of Forest Biology, Ottawa, and they are based almost entirely on *variolaria* Guenée.

EGGS: Elongate, with one end truncate, the other rounded, somewhat flattened and wedge shaped, being thicker at truncate end; surface faintly sculptured, with numerous, low, longitudinal ridges and with very slight transverse markings between them; truncate end sharply defined, with faint rim around edge, slightly indented below this with central area flattened. Color light green when first laid, turning reddish before hatching.

LARVAE, FIFTH INSTAR: Head: First adfrontal seta (Adf_1) above middle of clypeus, second adfrontal seta (Adf_2) above branching of epicranial suture; first posterior seta (P_1) slightly below Adf_2 , second posterior seta (P_2) directly above or slightly laterad to P_1 , these three setae forming a right angle; lateral seta (L_1) slightly below P_1 ; first anterior seta (A_1) on level with ocellus 3, second anterior seta (A_2) higher than ocellus 1, third anterior seta (A_3) on level with, or slightly below, Adf_1 , the three anterior setae forming an obtuse angle; six ocelli well developed, upper five ocelli on lateral margin of head capsule, sixth one on or partially on ventral surface; second ocellar seta (O_2) higher than ocellus 1, third ocellar seta (O_3) posterior to ocelli 1 and 2, the three ocellar setae forming an acute angle; subocellar seta (SO_2) above lowest ocellus.

Thorax: Prothorax with setae 1a, 1b, and 2a, 2b fairly well separated; setae 3 double, above spiracle; setae 4 and 5 from a plate, below lower rim of spiracle; setae 6 and 7 approximate. Mesothorax, setae 2a ventrad of 1b, with 2b farther anterior; seta 3 slightly posterior to, or ventrad of, 1a, on a horizontal plane with 4; seta 5 anteroventral and approximate to 4; seta 6 ventrad to 2. Metathorax with seta 1b directly below, or slightly anterior to, 1a; seta 2a slightly anterior to 1b, 2b well anterior of 2a, in line with seta 4; other setae as on mesothorax.

Abdomen: Segment I: seta 1 above spiracle; seta 2 posterior to 1; seta 3 above and anterior to spiracle; seta 4 on level with top of spiracle; seta 5 well anterior to 3 and below spiracle; seta 6 slightly anterior of 3; seta 7 located between 5 and 6 on a horizontal plane, posterior to 2. Segments II to VI: seta 1 anterior to spiracle; seta 2 posterior to, or slightly ventrad of, 1; seta 3 ventrad of, or slightly posterior to, 1 and higher than spiracle; seta 4 below spiracle; seta 5 posterior to 1 and 3; seta 6 below spiracle, setae 3, 5, and 6 forming an almost straight line; seta 7 posterior to 2. Segment VII similar, but seta 1 closer in a vertical plane to spiracle. Segment VIII similar, except seta 6 missing, and seta 7 becoming ventrad of 2. Hooks of anal prolegs biordinal, interrupted medially.

PUPA: Shiny brown, naked. Head, epicranial suture absent; antennae extending as far caudad as metathoracic legs, subequal in length to wing cases; labial palpi small, triangular; maxillae slightly shorter than wing cases. Thorax, metathorax about one-fourth of the length of mesothorax on dorsal surface; mesothoracic spiracle with small, straight, raised ridge on posterior margin, the ridge sometimes obsolescent; mesothoracic wings extending to posterior portion of fourth abdominal segment; metathoracic wings narrowly exposed to anterior portion of fourth abdominal segment; prothoracic legs approximately two-thirds of the length of maxillae, femora exposed or not; mesothoracic legs extending as far posteriad as maxillae; metathoracic legs exposed beyond tip of maxillae for short distance. Abdomen, spiracles without furrows; dorsum with distinct furrow between segments IX and X, irregularly toothed on posterior margin, with the median one tending to be slightly larger than remainder; cremaster of eight recurved spines, the terminal two thicker and longer than remainder.

The descriptions given above are based primarily on North American material, together with examples of the adults of *pusaria* Linnaeus and *exanthemata* Scopoli. It may be necessary to amend the above definitions when the genus is studied from a world viewpoint. It should also be noted that the generic bibliography does not include the Old World references, except those used in this paper.

TYPE SPECIES: *Phalaena Geometra pusaria* Linnaeus.

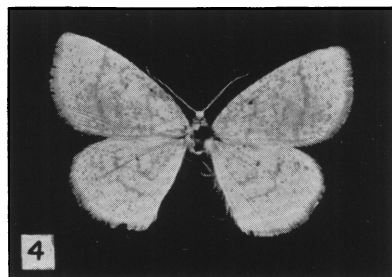
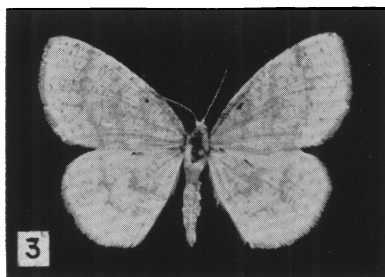
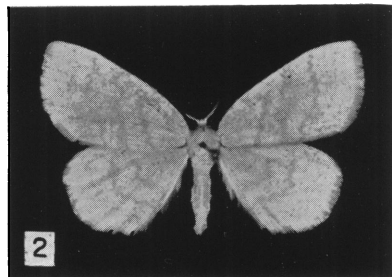
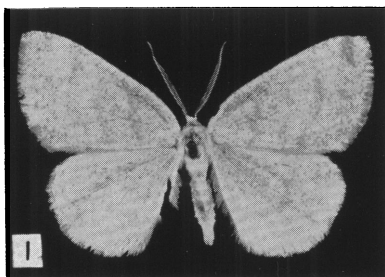
DISTRIBUTION: A relatively small holarctic genus, extending into the Indo-Australian area. In North America, the species occur in Alaska, south as far as North Carolina in the east and down the Rocky Mountains to Arizona and New Mexico in the west.

Dyar described (1913, Proc. U. S. Natl. Mus., vol. 44, p. 311) *Deilinia graciosa* from the mountains of central Mexico. This species cannot remain in this genus, as its characters are greatly different. The males

have simple antennae; in the genitalia, the gnathos is an elongate, pointed, hook-like structure, and a single furca is present on the right side. Correct generic placement is not possible at the present time, without further study of the tropical geometrid genera.

The moths included in this genus are similar in venation and most external characters to the species in the *Drepanulatrix* group (Rindge, 1949, Bull. Amer. Mus. Nat. Hist., vol. 94, pp. 231–298.) The species included in the present genus have a different basic color difference, usually being white or cream colored, with concolorous forewings and hind wings, while the species of *Drepanulatrix* and *Apodrepanulatrix* are basically brown or reddish brown, with paler secondaries. *Eudrepanulatrix rectifascia* (Hulst) has concolorous, light gray wings, but discal spots are present, and the genitalia are distinct. The genitalia offer the best means of separating the two groups. In the males of *Deilinia* the uncus is more slender and is not hook-like, the gnathos is more reduced, the valves have groups of heavy setae near the base and near the apex on the inner surface that are lacking in *Drepanulatrix*, the transtilla is thinner and appears to be located more anteriorly than in *Drepanulatrix*, and there are the usually large number of cornuti in the elongate aedeagus. The female genitalia of *Deilinia*, as compared with those of *Drepanulatrix*, have a much shorter and a more membranous ductus bursae, and the bursa copulatrix has a large number of longitudinal striations with inwardly pointing teeth that extend almost the entire length of the bursa. The food plants of the two groups furnish another good differentiating character, as the *Drepanulatrix* group feeds on *Ceanothus*, while the species of *Deilinia* are basically *Salix* feeders.

There is still a question as to the proper generic name to be used for this group, as both *Deilinia* and *Cabera* were apparently published in 1825. Unfortunately, the author has not been able to find sufficient evidence to date either publication accurately. Hemming has shown that *Deilinia* was published in signature 20 of the "Verzeichniss bekannter Schmettlinge," and that no exact date of publication could be established for this signature. However, it is shown that signatures 20 to 27 were probably published sometime between January and September, 1825 (Hemming, pp. 513–516). *Cabera*, the alternative name, was published in the second part of volume 5 of "Die Schmetterlinge von Europa." Part 1 of this volume was apparently also issued in 1825, while the third part came out in 1826. Oken reviews part 2 in *Isis*, volume 19, part 11, page 1064, which was published in 1826. Apparently this was issued rather late in the year, as volumes 18 and 19 are both dated 1826; in addition, at least the first three parts of volume 20 are also dated 1826.



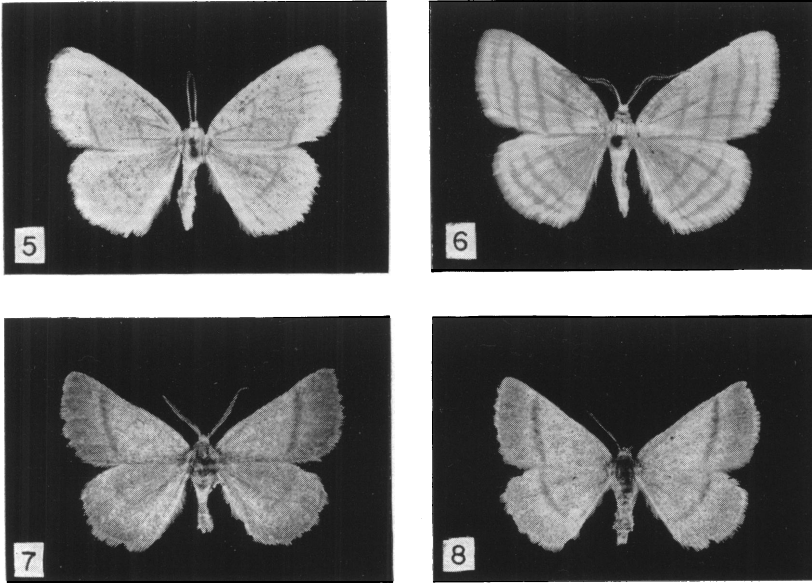
FIGS. 1-4. Adults of *Deilinia*. 1. *D. exanthemata bryantaria* Taylor, male, Banff, Alberta, June 29, 1922 (C. B. D. Garrett). 2-3. *D. erythemaria erythemaria* (Guenée), males. 2. Catskill Mountains, New York, July 15, 1904. 3. Wellington, British Columbia, July 6, 1949 (R. Guppy). 4. *D. erythemaria undularia* Barnes and McDunnough, male, south fork of Little Colorado River, White Mountains, Arizona, June 25, 1947 (G. H. and J. L. Sperry).

All figures $\times 1.5$.

- 2(1). Vesica of aedeagus with a single, heavy spine *quadrifasciaria*
 Aedeagus with numerous cornuti 3
 3(2). Valves with elongate, curving costal arm, in length slightly shorter than
 width of valves *variolaria*
 Valves with or without short costal arm 4
 4(3). Valves with small, bluntly pointed costal arm . . . *exanthemata bryantaria*
 Valves without costal arm *erythemaria*

KEY TO ADULTS BY FEMALE GENITALIA

1. Ductus bursae curved, the ostium and bursa copulatrix being connected
 by a sclerotized strip *quadrifasciaria*
 Ductus bursae straight, membranous between ostium and bursa copu-
 latrix 2
 2(1). Ductus seminalis arising on left side; bursa copulatrix subovoid, segment
 VII with posterior margin of sternite deeply concave
 *exanthemata bryantaria*
 Ductus seminalis arising medioventrally; bursa and sternite without this
 combination of characters 3



FIGS. 5-8. Adults of *Deilinia*. 5. *D. variolaria* (Guenée), male, Catskill Mountains, New York, August 15, 1905. 6. *D. quadrifasciaria* (Packard), male, Valley Park, Missouri, May 16, 1926 (E. P. Meiners). 7-8. *D. borealis* Hulst. 7. Male, Banff, Alberta, June 9, 1922 (C. B. D. Garrett). 8. Female, Banff, Alberta, June 24, 1925 (O. Bryant).
All figures $\times 1.5$.

- 3(2). Membranous portion of ductus bursae as long as wide, with bursa copulatrix swollen on left side at point of attachment with ductus bursae *borealis*
Membranous portion of ductus bursae longer, gradually increasing in width to form junction with bursa copulatrix 4
4(3). Bursa copulatrix cone-shaped; segment VII with posterior margin of sternite deeply concave *erythemaria*
Bursa copulatrix broadly subovate; segment VII with posterior margin of sternite biconcave *variolaria*

***Deilinia exanthemata bryantoria* Taylor, new combination**

Figures 1, 16, 17, 18

Deilinia bryantaria TAYLOR, 1906, Canadian Ent., vol. 38, p. 402. BOWMAN, 1951, Canadian Jour. Zool., vol. 29, p. 149. J. R. J. L. JONES, 1951, Occas. Paper Ent. Soc. British Columbia, no. 1, p. 124.
Delinea (*sic!*) *bryantaria*, BARNES AND McDUNNOUGH, 1912, Canadian Ent., vol. 44, p. 275.
Cabera bryantaria, BARNES AND McDUNNOUGH, 1917, Check list, p. 111.

MALE: Head, vertex white; front slightly bulging, slightly wider than width of either eye, pale grayish brown, becoming lighter ventrally; palpi with third joint reaching front, pale grayish brown, with a few scattered dark scales. Thorax light grayish brown above and below, with white collar and patagia; legs gray-brown, with brown-black scales on outer surface, especially on forelegs. Abdomen light grayish brown or light gray above and below.

UPPER SURFACE OF WINGS: Ground color light grayish white, with numerous gray-brown scales and strigae, producing a more or less grayish colored wing; cross lines grayish brown, rather weakly defined and diffuse, usually with three on forewings and two on hind wings, although the inner ones may be reduced or absent. Forewings with t. a. line outwardly oblique from costa, sharply curving in cell and going to inner margin; median line usually weakly represented, often obsolescent, when traceable appearing in cell and paralleling t. a. line to inner margin; t. p. line usually the best defined cross line, going across wing from costa with a gentle curve, subparalleling outer margin, tending to be concave between veins; s. t. and terminal lines absent; fringe concolorous with wing, sometimes with outer portion darkened. Hind wings with intradiscal line often obsolescent, curving from cell to anal margin when present; extradiscal line running from vein R to anal margin, subparalleling outer margin, concave between veins; fringe as on primaries.

UNDER SURFACE OF WINGS: Ground color grayish white, heavily suffused with dark gray-brown scales and strigae; discal dots usually present on all wings; forewings with t. p. line and hind wings with extradiscal line, all other maculation absent.

Length of forewing: 13 to 17 mm.

FEMALE: Similar to male, with maculation tending to be slightly weaker.

Length of forewing: 13 to 17 mm.

MALE GENITALIA: Uncus elongate, slender; gnathos very weakly sclerotized, usually complete although median portion may be membranous; valves narrow, tapering to a slightly recurved, bluntly pointed apex, with small costal arm; transtilla complete, strongly sclerotized, rod-like; juxta elongate, narrow, widest near base, sometimes slightly enlarged distally; tegumen narrow, elongate, the ratio of the width at base of uncus to maximum width 0.6–0.7/1.0; saccus short and broad, sides of posterior one-half parallel, then gently rounded or tapering to apex; aedeagus elongate, narrow, length slightly greater than combined lengths of uncus, tegumen, and saccus, straight, apical end rounded, basal end slightly thickened; vesica armed with a variable number of slender

cornuti, usually between 12 and 24 in number, all cornuti more or less parallel with long axis of aedeagus, the heaviest and longest ones located basally, these subequal in length to length of uncus.

FEMALE GENITALIA: Ostium apparently without operculum, the opening itself being quite wide; ductus bursae sclerotized, subtriangular, with the sides slightly rounded or straight, becoming membranous anteriorly; ductus seminalis arising on left side from end of bursa copulatrix; bursa copulatrix very large, subovoid in outline, with posterior end attenuated, medially with a relatively narrow, transverse, sclerotized area, the more membranous areas on both sides as wide as or wider than the sclerotized area, posterior end without striations but with numerous inwardly pointing teeth, median area with both longitudinal striations and teeth, the anterior membranous area small to medium sized, being of about equal

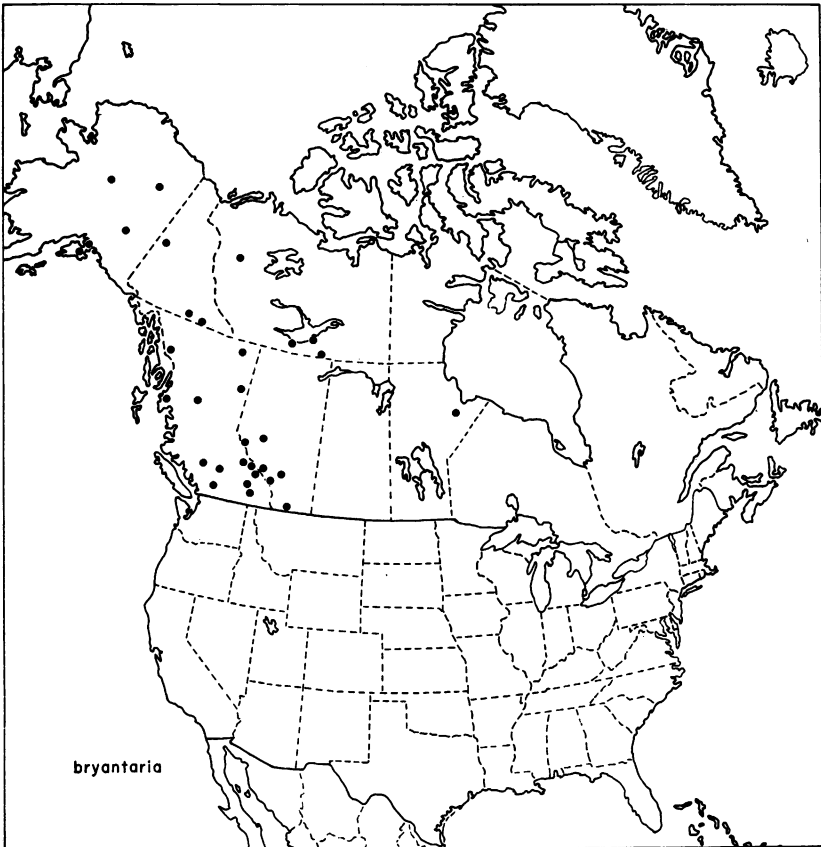


FIG. 9. Distribution of *D. exanthemata bryantaria* Taylor.

length on both dorsal and ventral surfaces. Segment VII with posterior margin of sternite deeply concave.

EARLY STAGES: Undescribed from this country, but may be found discussed in European publications.

FOOD PLANTS: *Salix*. A single specimen has been seen reared from larch (*Larix*; at 17 North Brimshaw, Alberta) and another one from poplar (*Populus*; at Mile 2338, Alaska Highway).

TYPE: In the United States National Museum.

TYPE LOCALITY: On the international boundary line, near the Stickeen River, British Columbia.

RANGE: From Alaska east into the Yukon and District of MacKenzie, south into British Columbia and Alberta, east as far as Hudson Bay. (See fig. 9.) On the wing in late May and June, flying until August.

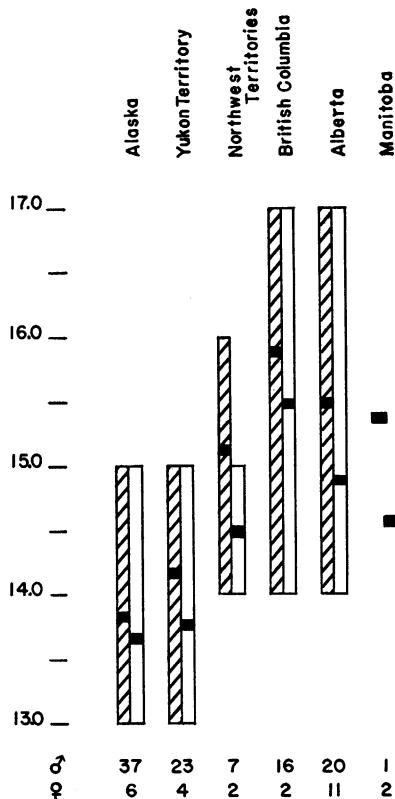


FIG. 10. Length (in mm.) of forewing of *D. exanthemata bryantaria* Taylor by localities. Shaded column represents males, white column the females; bar is average size. Number of specimens measured given below.

REMARKS: One hundred and forty-seven specimens and 20 genitalic preparations examined, including the type. This is the largest of the American species of *Deilinia*, as specimens from the southern portion of the range are quite large. (See fig. 10.) The more southern examples tend to be lighter in color and to have less grayish scaling on the wings than do the moths from the north and Alaska. As no break can be found in the distribution of these characters, it is believed that they represent clinal variations and hence are not namable.

In addition to the size and more northern distribution of this moth it may be further distinguished from the other American species by the grayer wings and the more diffuse cross lines that tend to be concave between the veins. The genitalia are similar to those of *erythemaria*, but may be separated by the presence of a costal arm on the valve and the narrower tegumen in the male, and by the subovoid shape of the bursa copulatrix, with the ductus seminalis arising on the left side in the female.

This American population is placed as a subspecies of the Old World *exanthemata* Scopoli, as they agree in structure, pattern, and color. *Bryantaria* may be separated from European specimens in that it is slightly larger and more heavily suffused with grayish scales. It would be interesting to compare the North American population with specimens from Siberia, but the latter are not available. Japanese specimens from the island of Honshu have relatively little gray scaling and are easily separated from our population.

Deilinia erythemaria erythemaria (Guenée)

Figures 2, 3, 19, 20, 21

Cabera erythemaria GUENÉE, 1857, Histoire naturelle des insectes, vol. 10, p. 56. WALKER, 1861, List of the specimens of lepidopterous insects in the collection of the British Museum, pt. 23, p. 869. OBERTHÜR, 1923, Études de lépidoptérologie comparée, fasc. 20, p. 233, pl. 553, fig. 4698. MOORE, 1930, Occas. Papers Mus. Zool. Univ. Michigan, no. 214, p. 22; 1955, Misc. Publ. Mus. Zool. Univ. Michigan, no. 88, p. 68. VIETTE, 1950, Bull. Mensuel Soc. Linnéenne, Lyon, yr. 19, p. 204.

Cabira variolaria erythemaria, GUMPPENBERG, 1892, Nova Acta Deutschen Akad. Naturf., Halle, vol. 58, p. 276.

Deilinia erythemaria, PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 306, pl. 10, fig. 27. BEUTENMÜLLER, 1890, Ann. New York Acad. Sci., vol. 5, p. 221. F. M. JONES AND KIMBALL, 1943, Publ. Nantucket Maria Mitchell Assoc., vol. 4, p. 113. BOWMAN, 1944, Canadian Ent., vol. 76, p. 192; 1951, Canadian Jour. Zool., vol. 29, p. 149. PROCTER, 1946, Biological survey of the Mount Desert region, pt. 7, p. 275. J. R. J. L. JONES, 1951, Occas.

Paper Ent. Soc. British Columbia, no. 1, p. 124. TIETZ, 1952, Lepidoptera of Pennsylvania, p. 132.

Deilinea (sic!) erythemaria, FERGUSON, 1954, Proc. Nova Scotian Inst. Sci., vol. 23, p. 308.

Deilinia eurythemaria (sic!), KROGERUS, 1954, Acta Zool. Fennica, no. 82, p. 73.

Cabera erythremaria (sic!), WALKER, 1861, List of the specimens of lepidopterous insects in the collection of the British Museum, pt. 23, p. 869 (in part).

Cabera (Cabera) erythremaria (sic!), FORBES, 1948, Cornell Univ. Agr. Exp. Sta. Mem. 274, p. 71.

Deilinia erythremaria (sic!), J. B. SMITH, 1891, List of the Lepidoptera of boreal America, p. 69. HULST, 1896, Trans. Amer. Ent. Soc., vol. 23, p. 327. HANHAM, 1901, Canadian Ent., vol. 33, p. 217. DYAR, "1902" [1903], Bull. U. S. Natl. Mus., no. 52, p. 306; 1903, Psyche, vol. 10, p. 195. PROCTER, 1938, Biological survey of the Mount Desert region, pt. 6, p. 237.

Deilinea (sic!) erythremaria (sic!), J. B. SMITH, 1909, Ann. Rept. New Jersey State Mus., p. 500. BRITTON, 1920, State Geol. and Nat. Hist. Surv. Bull., Connecticut, no. 31, p. 119. FORBES, 1928, in Leonard, Cornell Univ. Agr. Exp. Sta. Mem. 101, p. 599.

Deilinea (sic!) variolaria, HOLLAND (*nec* Guenée), 1903, Moth book, p. 338, pl. 43, fig. 36.

Cabera intentaria WALKER, 1861, List of the specimens of lepidopterous insects in the collection of the British Museum, pt. 23, p. 870 (*partim*, paratype, not lectotype).

Ellopia incoloraria WALKER, 1862, List of the specimens of lepidopterous insects in the collection of the British Museum, pt. 26, p. 1509. PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 498 (synonym of *Gueneria basilaria* Walker = *G. similaria* Walker). (New synonymy.)

Deilinia pacificaria PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 307, pl. 10, fig. 28. TAYLOR, 1908, Canadian Ent., vol. 40, p. 100. J. R. J. L. JONES, 1951, Occas. Paper Ent. Soc. British Columbia, no. 1, p. 124. HARDY, 1955, Rept. Provincial Mus. British Columbia, for 1954, p. B 54. (New synonymy.)

Deilinia erythremaria (sic!) pacificaria, DYAR, 1904, Proc. U. S. Natl. Mus., vol. 27, p. 905.

Cabera pacificaria, ANON., 1882, Check list of Macro-lepidoptera, publ. by Brooklyn Entomological Society, p. 23.

Cabira variolaria pacificaria, GUMPPENBERG, 1892, Nova Acta Deutschen Akad. Naturf., Halle, vol. 58, p. 276.

Cabera (Cabera) erythremaria (sic!) pacificaria, FORBES, 1948, Cornell Univ. Agr. Exp. Sta. Mem. 274, p. 71.

MALE: Head, vertex white; front slightly bulging, as wide as width of either eye, yellow-brown; palpi with third joint extending beyond front, pale yellow-brown. Thorax cream-white above and below; legs whitish, with yellow-brown scales on outer surface, especially on forelegs. Abdomen cream-white above and below, with scattered yellow-brown scales.

UPPER SURFACE OF WINGS: Ground color cream-white, with scattered yellow-brown scales and strigae, especially along the costa; cross lines yellow-brown, rather diffuse, broad, and somewhat irregular, three on forewings and two on secondaries. Forewings with t. a. line appearing in cell, running inwardly oblique to inner margin; median line with slight curve at end of cell, then subparalleling outer margin to inner margin; t. p. line also subparalleling outer margin; s. t. and terminal lines absent; fringe concolorous with wings. Hind wings with slightly less yellow-brown scaling than on forewings; intradiscal line curving from cell to anal margin; extra-discal line running from vein R to anal margin, subparalleling outer margin; fringe as on primaries.

UNDER SURFACE OF WINGS: Ground color white, with scattered yellow-brown and gray-brown scales, especially along costa and in cell of forewing; forewings with faint indications of an incomplete median line and the t. p. line; hind wings with faint extradiscal line.

Length of forewing: 12 to 16 mm.

FEMALE: Like male, sometimes with a little less yellow-brown dusting on the wings above.

Length of forewing: 12 to 15 mm.

MALE GENITALIA: Uncus elongate, slender; gnathos complete, very weakly sclerotized, narrowed medially; valves narrow, tapering to a slightly recurved, bluntly pointed apex, without costal arm; transtilla complete, strongly sclerotized, rod-like; juxta elongate, narrow, widest near base; tegumen widening anteriorly, the ratio of the width at base of uncus to maximum width 0.45–0.53/1.0; saccus short and broad, sides of posterior one-half parallel, then tapering to bluntly pointed apex; aedeagus elongate, length slightly greater than combined lengths of uncus, tegumen, and saccus, straight, apical end rounded, basal end slightly thickened; vesica armed with a variable number of slender cornuti, usually between 18 and 26 in number, with one group of relatively heavy cornuti arising on left side ventrally and extending somewhat diagonally across aedeagus, the remainder arranged longitudinally, the two groups merging apically, the longest cornuti being shorter than length of uncus.

FEMALE GENITALIA: Ostium with small operculum, the opening itself being quite wide; ductus bursae sclerotized, subtriangular, with the sides rounded, becoming membranous anteriorly; ductus seminalis arising ventrally from near mid-line; bursa copulatrix very large, broadest near anterior end, somewhat cone-shaped in well-inflated examples, lightly sclerotized medially, with numerous longitudinal striations, beset with many teeth, running longitudinally but tending to curve when reach-

ing posterior portion of bursa, the anterior membranous area small, mainly on the ventral surface near anterior end. Segment VII with posterior margin of sternite deeply concave.

EARLY STAGES: The egg and the five larval instars were described by Dyar (1903) from rearings at Kaslo, British Columbia. They have also been given by Forbes (1948).

FOOD PLANTS: *Salix* and *Populus*; also reared from blueberry (*Vaccinium*; at Kazubazua, Quebec) and birch (*Betula*; at Big Indian Valley, Catskill Mountains, New York). Forbes (1948) reports New York specimens as refusing willow, but reared specimens have been examined from this food plant from Nova Scotia, Ontario, and Quebec. The food plant for eastern specimens should be verified, as *Salix* appears to be the most commonly accepted food for the larvae.

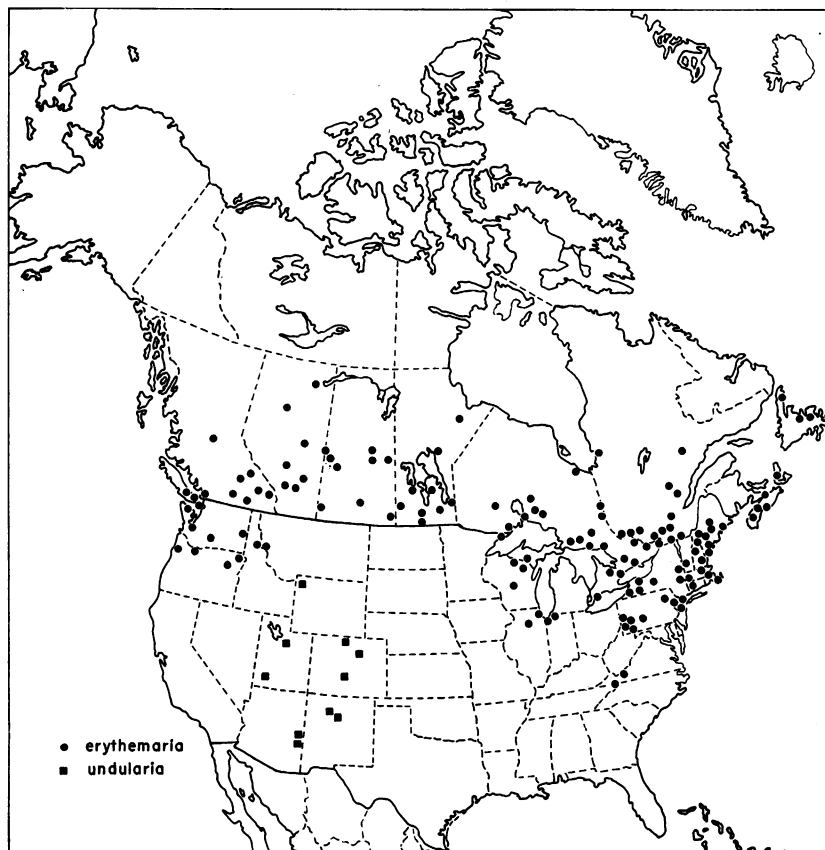


FIG. 11. Distribution of *D. erythemaria* (Guenée).

Types: Lectoholotype male and lectoallotype female of *erythemaria* in the Muséum National d'Histoire Naturelle, Entomologie, Paris; designated by Viette (1950). Of *incoloraria*, in the British Museum (Natural History); of *pacificaria*, in the Museum of Comparative Zoölogy, Harvard College. Walker's specimen "b" of *Cabera intentaria* is referable here; it is in the British Museum (Natural History).

TYPE LOCALITIES: Pennsylvania (*erythemaria*); New York (*incoloraria*); Victoria, British Columbia (*pacificaria*); St. Martin's Falls, Albany River, Hudson Bay (paratype of *intentaria*).

RANGE: From North Carolina north to Newfoundland, across Canada

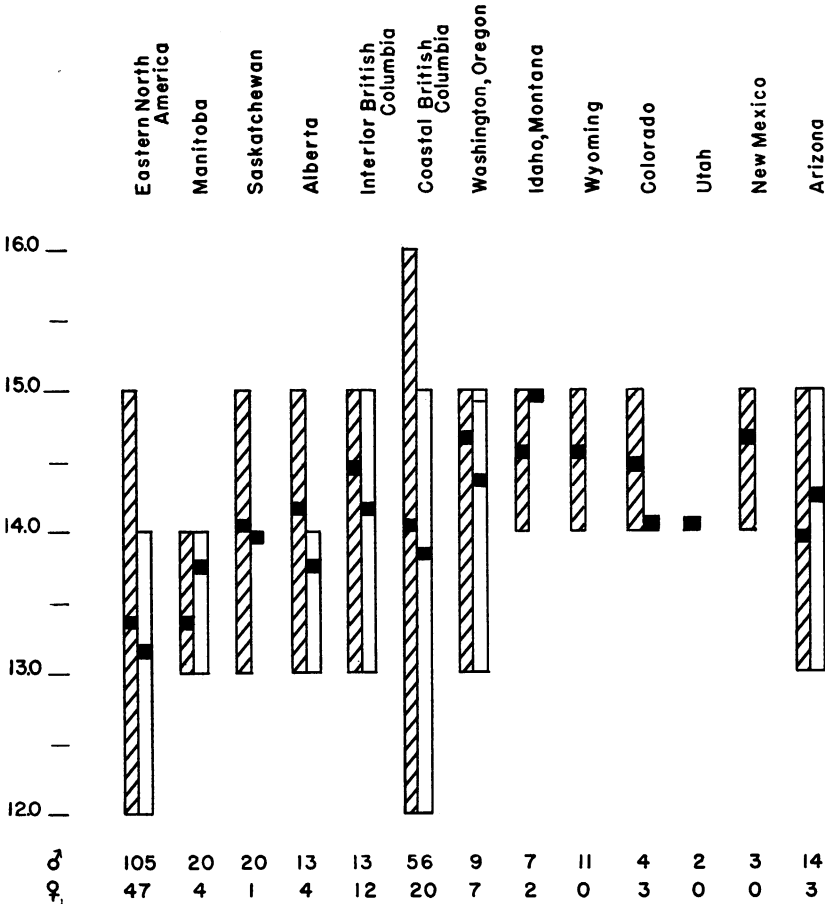


FIG. 12. Length (in mm.) of forewing of *D. erythemaria* (Guenée) by localities. The symbols used are as in figure 10.

to Vancouver Island, south into Washington, Oregon, Montana, and Idaho. (See fig. 11.) On the wing from late April (Vancouver Island) and May, flying until September.

REMARKS: Six hundred and twenty-seven specimens and 51 genitalic preparations examined. This species is most likely to be confused with *bryantaria*, but may usually be distinguished by the smaller size, the more clearly defined cross lines, and by being only lightly dusted with yellow-brown scales. The genitalia are distinguished by the lack of the costal arm on the valves in the male genitalia, plus the numerous cornuti in the aedeagus; in the female, by the rather conical shape of the bursa copulatrix and by the deeply concave posterior margin of the sternite of segment VII.

In this species there is also some variation in the length of the primaries, as the moths are larger in the west than they are in the east. (See fig. 12.) Once again this appears to be a clinal variation.

As no consistent differences have been found in western specimens, particularly those from coastal British Columbia, with the exception of a greater range in the length of the forewings, the name *pacificaria* is placed in the synonymy. This was suggested by Dyar (1903), but it was never followed.

Another species that sometimes is confused with *erythemaria* is *Gueneria similaria* (Walker). The present species can be separated by the pectinate antennae in the male, as the male antennae of *similaria* are simple. In addition, the latter species has on the under side of each wing a small discal dot and a faint row of postmedial dots, which are not present in *erythemaria*.

***Deilinia erythemaria undularia* Barnes and McDunnough,**
new combination

Figure 4

Deilinea (sic!) undularia BARNES AND McDUNNOUGH, 1913, Contributions to the natural history of the Lepidoptera of North America, vol. 2, p. 124, pl. 8, figs. 5, 6 (holotype, allotype).

Cabera undularia, BARNES AND McDUNNOUGH, 1917, Check list, p. 111.

Deilinia undularia, McDUNNOUGH, 1938, Check list, p. 156.

MALE: Upper surface of wings: Ground color as in nominate subspecies, but with cross lines greatly reduced or altogether absent, with reduced amounts of yellow-brown scaling and strigae, and rarely, with traces of discal dots.

Under surface of wings: Similar to upper surface in having reduced amounts of dark scaling and less maculation.

Length of forewing: 13 to 15 mm.

FEMALE: Similar to male, but with maculation even more obsolete, as far as can be determined from the limited material available.

Length of forewing: 13 to 15 mm.

MALE GENITALIA: Similar to those of nominate subspecies, but tending to have fewer cornuti in aedeagus, the number usually ranging from about 12 to 20.

FEMALE GENITALIA: Similar to those of nominate subspecies, but with slightly fewer longitudinal striations in bursa copulatrix.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPE: In the United States National Museum.

TYPE LOCALITY: White Mountains, Arizona.

RANGE: The southern Rocky Mountain states of Arizona, New Mexico, Colorado, and Utah, extending north into Wyoming.

REMARKS: Thirty-six specimens and 14 genitalic preparations examined. This subspecies is distinguishable from nominate *erythemaria* by the fact that the upper surface of the wings have reduced or obsolescent cross lines and dusting, the wings thus appearing cleaner and slightly lighter in color.

Deilinia variolaria (Guenée)

Figures 5, 22, 23, 24

Cabera variolaria GUENÉE, 1857, Histoire naturelle des insectes, vol. 10, p. 56. WALKER, 1861, List of the specimens of lepidopterous insects in the collection of the British Museum, pt. 23, p. 869. MOORE, 1922, Occas. Papers Mus. Zool. Univ. Michigan, no. 114, p. 25; 1930, *ibid.*, no. 214, p. 22; 1955, Misc. Publ. Mus. Zool. Univ. Michigan, no. 88, p. 68. OBERTHÜR, 1923, Études de lépidoptérologie comparée, fasc. 20, p. 233. VIETTE, 1950, Bull. Mensuel Soc. Linnéenne, Lyon, yr. 19, p. 204.

Cabera (Cabera) variolaria, FORBES, 1948, Cornell Univ. Agr. Exp. Sta. Mem. 274, p. 72.

Cabira variolaria, GUMPPENBERG, 1892, Nova Acta Deutschen Akad. Naturf., Halle, vol. 58, p. 276.

Deilinia variolaria, PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 306, pl. 10, fig. 26. BEUTENMÜLLER, 1890, Ann. New York Acad. Sci., vol. 5, p. 221. HULST, 1894, Ent. News, vol. 5, p. 304. HANHAM, 1901, Canadian Ent., vol. 33, p. 217. BLACKMORE, 1915, Proc. Ent. Soc. British Columbia, vol. 6, p. 119. PROCTER, 1938, Biological survey of the Mount Desert region, pt. 6, p. 237; 1946, *op. cit.*, pt. 7, p. 275. F. M. JONES AND KIMBALL, 1943, Publ. Nantucket Maria Mitchell Assoc., vol. 4, p. 113. BOWMAN, 1951, Canadian Jour. Zool., vol. 29, p. 149. J. R. J. L. JONES, 1951, Occas. Paper Ent. Soc. British Columbia, no. 1, p. 124. TIETZ, 1952, Lepidoptera of Pennsylvania, p. 132.

Deilinea (sic!) variolaria, PEARSALL, 1906, Sci. Bull. Brooklyn Inst. Arts Sci.,

vol. 1, p. 206. J. B. SMITH, 1909, Ann. Rept. New Jersey State Mus., p. 500. BRITTON, 1920, State Geol. and Nat. Hist. Surv. Bull., Connecticut, no. 31, p. 119. FORBES, 1928, in Leonard, Cornell Univ. Agr. Exp. Sta. Mem. 101, p. 599. FERGUSON, 1954, Proc. Nova Scotian Inst. Sci., vol. 23, p. 308.

Deilimia (sic!) variolaria, MCALPINE, 1918, Occas. Papers Mus. Zool. Univ. Michigan, no. 54, p. 23.

Cabera intentaria WALKER, 1861, List of the specimens of lepidopterous insects in the collection of the British Museum, pt. 23, p. 870 (*partim*, lectotype, not paratype). PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 306 (synonymy).

Cabira intentaria, GUMPENBERG, 1892, Nova Acta Deutschen Akad. Naturf., Halle, vol. 58, p. 276.

Cabera intentata (sic!), BARNES AND McDUNNOUGH, 1917, Check list of the Lepidoptera of boreal America, p. 111.

Deilinia intentata (sic!), DYAR, "1902" [1903], Bull. U. S. Natl. Mus., no. 52, p. 305.

MALE: Head, vertex white; front slightly bulging, as wide as width of either eye, upper portion yellow-brown, white below; palpi just reaching front, pale yellow-brown. Thorax white above and below; legs white, with yellow-brown scales on outer surface, especially on forelegs. Abdomen white above and below.

UPPER SURFACE OF WINGS: Ground color pure white, with scattered yellow-brown or gray-brown scales and strigae; all cross lines and discal dots usually absent, although some lines may be vaguely indicated; fringe concolorous with wing.

UNDER SURFACE OF WINGS: Ground color pure white, with a few scattered yellow-brown or gray-brown scales, especially along costa of forewings; cross lines absent; discal dots weakly represented on secondaries by dark brown scales, and sometimes present on forewings.

Length of forewing: 12 to 16 mm.

FEMALE: Like male, but with darker scales and strigae on upper surfaces of wings tending to be more numerous, sometimes forming traces of t. a., median, and t. p. lines.

Length of forewing: 11 to 16 mm.

MALE GENITALIA: Uncus elongate, slender; gnathos complete, very weakly sclerotized, subrectangular, narrowed medially; valves with elongate, narrow, curving, costal arm, extending two-thirds of width of valve above costal margin; transtilla complete, strongly sclerotized, rod-like; juxta elongate, slightly tapering from base; saccus rather short and broad, subtriangular; aedeagus elongate, length slightly greater than combined lengths of uncus, tegumen, and saccus, straight, apical end bluntly pointed, narrowly sclerotized, basal end rounded; vesica armed with a variable number of slender cornuti, usually between 16 and 24 in number,

consisting of approximately six larger cornuti, with many of the remainder being quite short, the longest about equal in length to the length of the tegumen, the bundle of cornuti occupying about one-half of the length of the aedeagus.

FEMALE GENITALIA: Ostium with small operculum, the opening itself quite wide; ductus bursae sclerotized, subtriangular, becoming membranous anteriorly; ductus seminalis arising ventrally from membranous area near bursa copulatrix; bursa copulatrix very large, broadest near anterior end, tapering posteriorly, the dorsal posterior margin rounded, connecting with ductus bursae ventrally, the sclerotized area with a variable number of longitudinal striations, these having numerous strong teeth, the anterior membranous area small, being mainly on the ventral

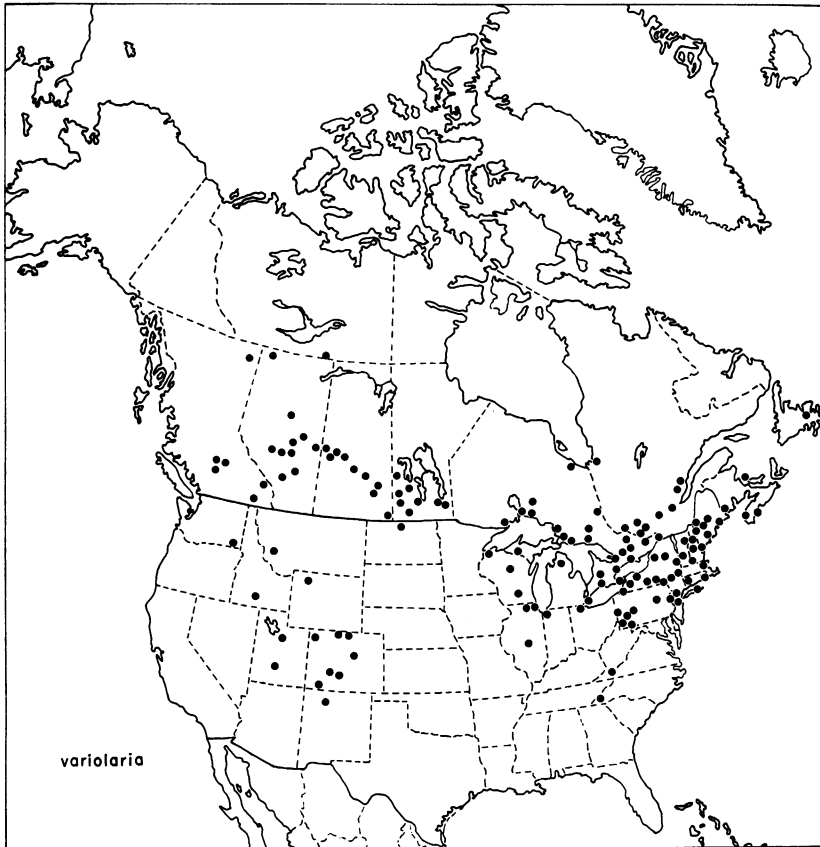


FIG. 13. Distribution of *D. variolaria* (Guenée).

surface near the anterior end. Segment VII with posterior margin of sternite biconcave, with a median swelling.

EARLY STAGES: The caterpillar has been briefly described by Forbes (1948).

FOOD PLANTS: *Salix*, *Populus*.

TYPES: Of *variolaria*, in the Muséum National d'Histoire Naturelle, Entomologie, Paris. Lectotype male, hereby designated, of *intentaria*, in the British Museum (Natural History); this is Walker's specimen "a," labeled "US. 46-110 *Cabera intentaria*"; 46-110 is the registration num-

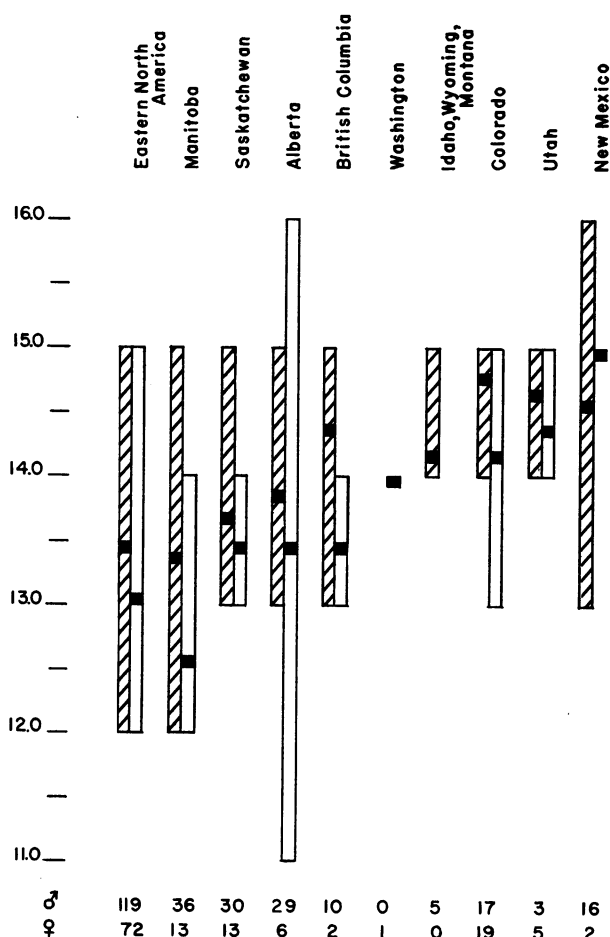


FIG. 14. Length (in mm.) of forewing of *D. variolaria* (Guenée) by localities. The symbols used are as in figure 10.

ber, collection number 110 in 1846, collected by Doubleday in North America in 1837-1838. Walker's specimen "b," under the name of *intentaria*, is an example of *erythemaria*.

TYPE LOCALITIES: Pennsylvania (*variolaria*) ; New York (*intentaria*).

RANGE: From North Carolina north to Newfoundland, across Canada to interior British Columbia, south in the Rocky Mountains into New Mexico. (See fig. 13.) On the wing from late May to early September.

REMARKS: Five hundred and ninety-five specimens and 48 genitalic preparations examined. This is the North American species with the whitest and most immaculate wings. The male genitalia are distinctive in having the elongate costal arm, and the female can be separated by the slightly W-shaped posterior margin of the sternite of segment VII, and by the shape of the bursa copulatrix, particularly the ventral connection with the ductus bursae.

There is some variation in the length of the primaries, but this appears to be correlated with geographical distribution. (See fig. 14.) If specimens from the southern Rocky Mountain states are compared with examples from the eastern seaboard, a considerable difference is obvious. All the specimens from the east, ranging from North Carolina to Newfoundland and west to Ontario and the northern mid-west states, appear quite similar in size. If the average wing expanse is plotted by states and provinces from east to west, it then appears that this difference in wing length may be a clinal variation. However, much more material is needed from the northern Rocky Mountains before a clear picture can be obtained for this area.

Other species that may be confused with *variolaria* include *Eudeilinia herminiata* (Guenée) and *Protitame virginalis* (Hulst). A quick way to separate these species is to examine the front of the head. In *herminiata* it is entirely white; in *virginalis* there is a narrow transverse band of brown-black scales below the antennae; in *variolaria* the upper portion of the front is broadly yellow-brown.

Deilinia borealis Hulst

Figures 7, 8, 25, 26, 27

Deilinia borealis HULST, 1896, Trans. Amer. Ent. Soc., vol. 23, p. 327. BOWMAN, 1951, Canadian Jour. Zool., vol. 29, p. 149. J. R. J. L. JONES, 1951, Occas. Paper Ent. Soc. British Columbia, no. 1, p. 124. RINDGE, 1955, Bull. Amer. Mus. Nat. Hist., vol. 106, p. 138.

Cabera borealis, BARNES AND McDUNNOUGH, 1917, Check list, p. 111. FORBES, 1948, Cornell Univ. Agr. Exp. Sta. Mem. 274, p. 72.

Deilinia solamata HULST, 1900, Jour. New York Ent. Soc., vol. 8, p. 217.

HANHAM, 1901, Canadian Ent., vol. 33, p. 217. RINDGE, 1955, Bull. Amer. Mus. Nat. Hist., vol. 106, p. 154. (New synonymy.)

Cabera borealis solamata, BARNES AND McDUNNOUGH, 1917, Check list, p. 111.

Deilinia borealis solamata, McDUNNOUGH, 1938, Check list, p. 156.

MALE: Head, vertex with mixed light luteous gray and black scales; front bulging, wider than width of eyes, with mixed light luteous gray and black scales; palpi moderate, light gray, with a few black scales on last two segments. Thorax with a mixture of scales and hair-like scales, luteous gray, with numerous closely appressed black scales above, light gray below; legs light gray. Abdomen light gray or luteous gray above and below, with scattered black scales.

UPPER SURFACE OF WINGS: Forewings, ground color light luteous gray, more or less heavily overlain with gray-black scales so as to appear dark gray or grayish black; basal, t. a., and median cross lines absent, although the last may be sometimes faintly suggested; discal dot absent; t. p. line a diffuse, dark gray band extending across wing; s. t. line absent; terminal area broadly suffused with dark scales; fringe concolorous with wing in basal portion, becoming lighter distally. Hind wings concolorous with forewings; intradiscal line absent, rarely very faintly indicated; extradiscal line very diffuse, usually fading out completely before reaching inner margin; terminal area not so heavily suffused as on forewings; faint terminal line; fringe of ground color.

UNDER SURFACE OF WINGS: Ground color of both wings light luteous gray, with scattered dark gray and gray-brown scales; without maculation except for diffuse t. p. line on primaries and for very faint trace of extradiscal line on secondaries.

Length of forewing: 11 to 13 mm.

FEMALE: Like male, but with upper surface of wings tending to be less heavily suffused with dark scales, hence appearing lighter in color.

Length of forewing: 11 to 13 mm.

MALE GENITALIA: Uncus elongate, relatively wide, narrowed medially; gnathos large, extending almost to juxta, broad, complete; valves without costal arm, but with oblique sclerotized band near base; transtilla strongly sclerotized, complete; juxta short, rounded, with posterior portion tending to be constricted, and with median V-shaped indentation; tegumen and saccus broad, the latter constricted apically, terminating in an elongated, bluntly rounded apex; aedeagus short and broad, subequal in length to combined lengths of tegumen and saccus, in width slightly narrower than width of base of uncus, apical end bluntly pointed, basal end broadly rounded; vesica armed with 10 to 12 slender cornuti, the longest less than one-half of the length of the aedeagus.

FEMALE GENITALIA: Ostium with small operculum extending posteriorly of ostial opening, ventral surface of the latter sclerotized, slightly broader than long; dustus bursae short, broad; ductus seminalis arising medially from posterior margin of bursa copulatrix; bursa copulatrix very large, asymmetrical, increasing in width anteriorly, the lightly sclerotized area extending farther down left side than right and farther on dorsal side than on ventral, with longitudinal striations numerous, often weakly represented, and with sclerotized teeth relatively short. Segment VII with posterior margin of sternite concave.

EARLY STAGES: Undescribed.

FOOD PLANTS: *Salix*, *Populus*, *Betula*.

TYPES: Lectotype male of *borealis*, hereby designated, in the collection of the American Museum of Natural History; a second, very fragmented, specimen with a type label is in the United States National Museum collection. Of *solamata*, in the collection of the American Museum of Natural History.

TYPE LOCALITIES: Edge of Calgary, Alberta (*borealis*); Winnipeg, Manitoba (*solamata*).

RANGE: Canada, extending from Labrador to British Columbia and the Yukon Territory, and into Alaska. (See fig. 15.) On the wing from late May to mid July.

REMARKS: Eighty-two specimens and 12 genitalic preparations studied, including both types. A widely occurring species that is on the wing early in the season. It is a rapid flying, diurnal moth, which perhaps accounts for the reduced size of the eyes. It is rather atypical for a *Deilinia*, not only in the structure of the head, but in the gray wing color and the modified genitalia, which at once separate this species from all others. The color of the wings is rather variable, being almost pure gray-black in the type of *solamata* and some of the other male specimens, while the females tend to be lighter in coloration.

Deilinia quadrifasciaria (Packard)

Figures 6, 28, 29, 30

Aspilates 4-fasciaria PACKARD, 1873, Fifth Ann. Rept. Peabody Acad. Sci., p. 62.

Aspilates quadri-fasciaria, PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 205.

Perconia quadrifasciaria, GUMPPENBERG, 1892, Nova Acta Deutschen Akad. Naturf., Halle, vol. 58, p. 280.

Deilinia quadrifasciaria, HULST, 1896, Trans. Amer. Ent. Soc., vol. 23, p. 327.

Cabera quadrifasciaria, BARNES AND MCDUNNOUGH, 1917, Check list, p. 111.

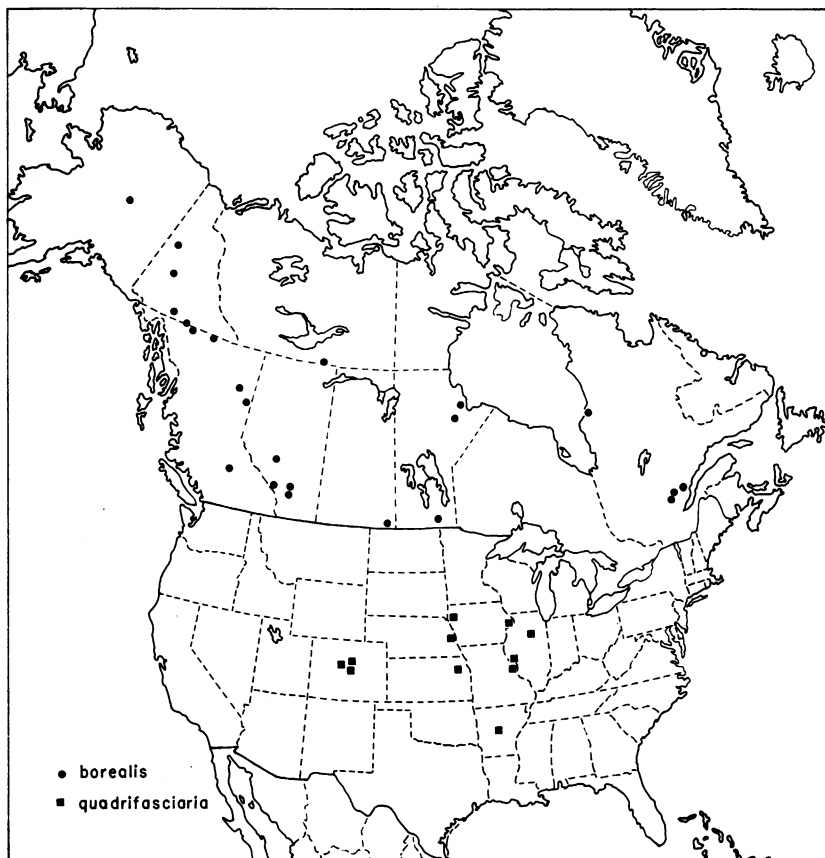


FIG. 15. Distribution of *D. borealis* Hulst and *quadrifasciaria* (Packard).

Cabera (*Cabera*) *quadrifasciaria*, FORBES, 1948, Cornell Univ. Agr. Exp. Sta. Mem. 274, p. 72.

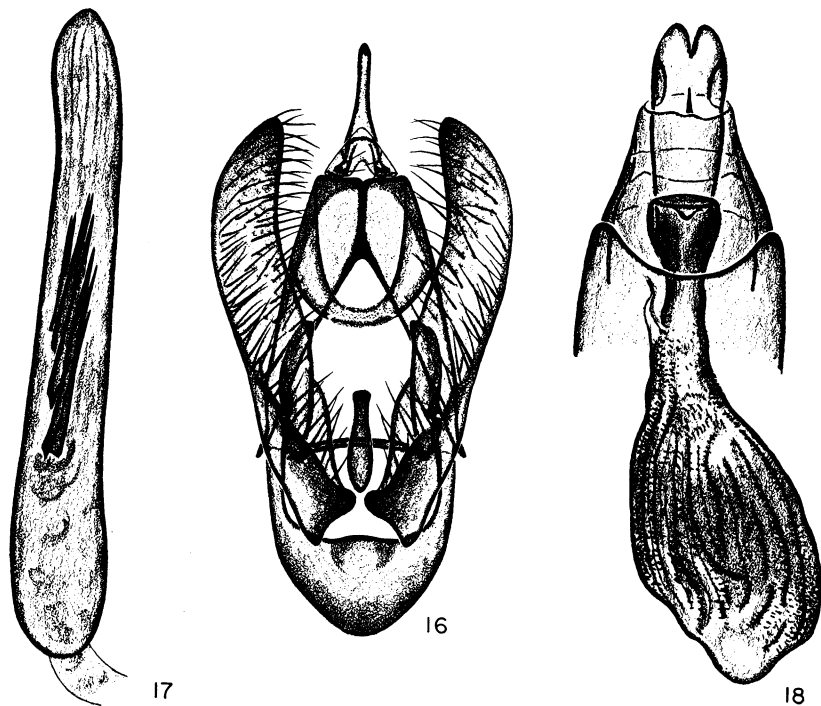
Acidalia elimaria HULST, 1887, Ent. Amer., vol. 2, p. 186. RINDGE, 1955, Bull. Amer. Mus. Nat. Hist., vol. 106, p. 142.

Deilinia elimata (*sic!*), HANHAM, 1901, Canadian Ent., vol. 33, p. 217.

Deilinia elimaria, DYAR, "1902" [1903], Bull. U. S. Natl. Mus., no. 52, p. 305.

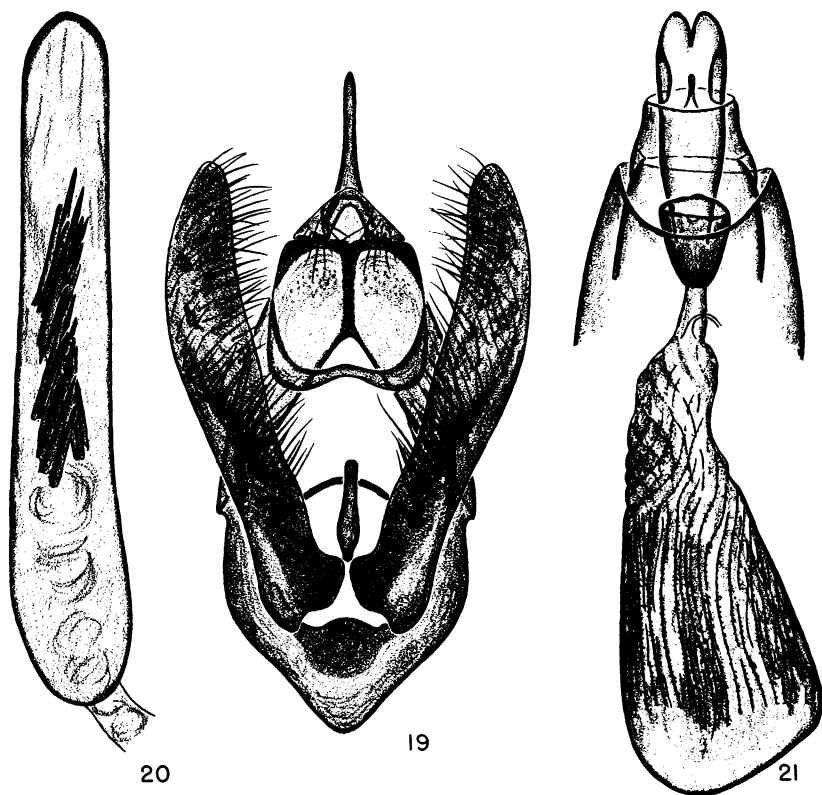
Cabera elimaria, BARNES AND McDUNNOUGH, 1917, Check list, p. 111 (synonymy).

MALE: Head, vertex white; front flat, narrower than width of either eye, upper portion light gray-brown, white below; palpi short, barely reaching front, with mixed white and light gray-brown scales. Thorax white above and below; legs with mixed white and light gray-brown scales. Abdomen white above and below.



FIGS. 16-18. Genitalia of *D. exanthemata bryantaria* Taylor. 16 Male, Anchorage, Alaska, June 26, 1951 (R. S. Bigelow). 17. Aedeagus of same. 18. Female, same data, July 5, 1951.

UPPER SURFACE OF WINGS: Forewings, ground color white or pale creamy-white, with a few scattered light buff scales, with four well-defined, light buff cross lines, without discal dots; basal line absent; t. a. line arising one-fourth of distance from base on costa, strongly outwardly oblique to radial vein, angled sharply and running straight to inner margin, sometimes with a slight bend or dislocation on cubital vein; median line obsolescent between costa and radial vein, below the latter strongly represented, straight, extending to inner margin; t. p. line obsolescent between costa and vein R_4 , below this strongly represented, often with slight outward bulge between veins R_5 and M_1 , then subparallel to outer margin, with slight outward bulge on anal vein; s. t. line thinner than preceding, subparallel to it; terminal line cream colored; fringe of ground color. Hind wings concolorous with forewings, with three light buff cross lines; intradiscal line beginning in cell, running straight across wing, with basal bend at anal margin; extradiscal line beginning about vein Sc , going across wing with very slight curve to



FIGS. 19-21. Genitalia of *D. erythemaria erythemaria* (Guenée). 19. Male, Big Indian Valley, Catskill Mountains, New York, June 21, 1906 (R. F. Pearsall). 20. Aedeagus of same. 21. Female, Victoria, British Columbia, July 22, 1911.

anal margin; s. t. line subparalleling extradiscal line, but becoming slightly closer to it near anal angle; terminal line cream colored; fringe of ground color.

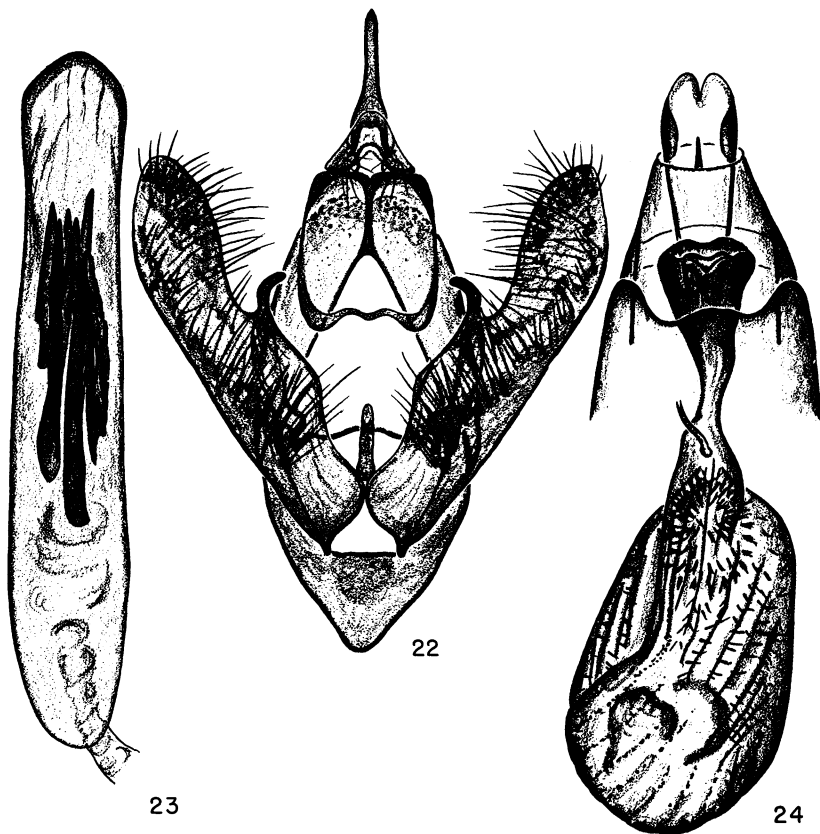
UNDER SURFACE OF WINGS: Ground color of both wings white, with scattered brown scales along costa of forewings; maculation obsolescent, sometimes with faint traces of cross lines of upper surface showing.

Length of forewing: 14 to 16 mm.

FEMALE: Like male, but with cross lines tending to be slightly narrower.

Length of forewing: 13 to 15 mm.

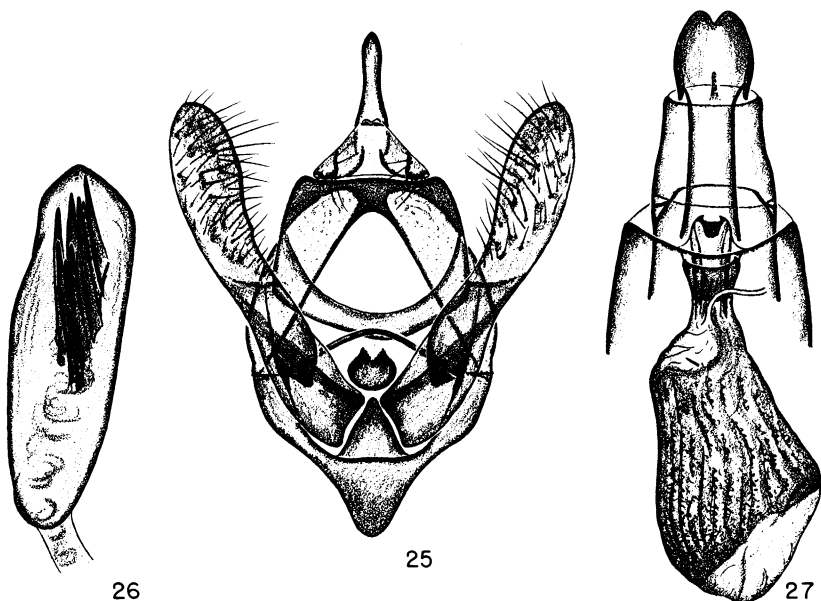
MALE GENITALIA: Uncus elongate, slightly swollen apically, with small spine at apex; gnathos incomplete, the side pieces lightly sclerotized, tapering; valves with costal arm projecting slightly more than width



FIGS. 22-24. Genitalia of *D. variolaria* (Guenée). 22. Male, Litchfield, Connecticut, August 16, 1904 (L. B. Woodruff). 23. Aedeagus of same. 24. Female, Pittsburgh, Pennsylvania, June 16, 1905 (H. Engel).

of uncus; transtilla broadened laterally, tapering medially, then becoming membranous; juxta elongate, tapering from base; saccus elongate, the apex projecting well beyond base of valves; aedeagus very long and slender, length greater than combined lengths of uncus, tegumen, and saccus, slightly S-shaped, apex with sclerotized ventral surface, basal end strongly curved; vesica armed with a single, strong cornutus, length greater than length of saccus.

FEMALE GENITALIA: Ostium without operculum, the opening slightly flared and with a small ventral flange; ductus bursae elongate, with a bend medially, the ventral surface sclerotized from ostial opening as far as medial bend, continued antieriad as a single sclerotized layer into bursa



FIGS. 25-27. Genitalia of *D. borealis* Hulst. 25. Male, type, edge of Calgary, Alberta, July 1, 1894. 26. Aedeagus of same. 27. Female, Mare du Sault, Laurentides Park, Quebec, July 11, 1954 (Klots, F. and P. Rindge).

copulatrix; ductus seminalis arising ventrally or slightly on left side from membranous area near bursa copulatrix; bursa copulatrix very large, the sclerotized area elliptical in outline and with numerous longitudinal striations with many strong teeth, anterior membranous area extending well beyond sclerotized area. Segment VII with posterior margin of sternite concave.

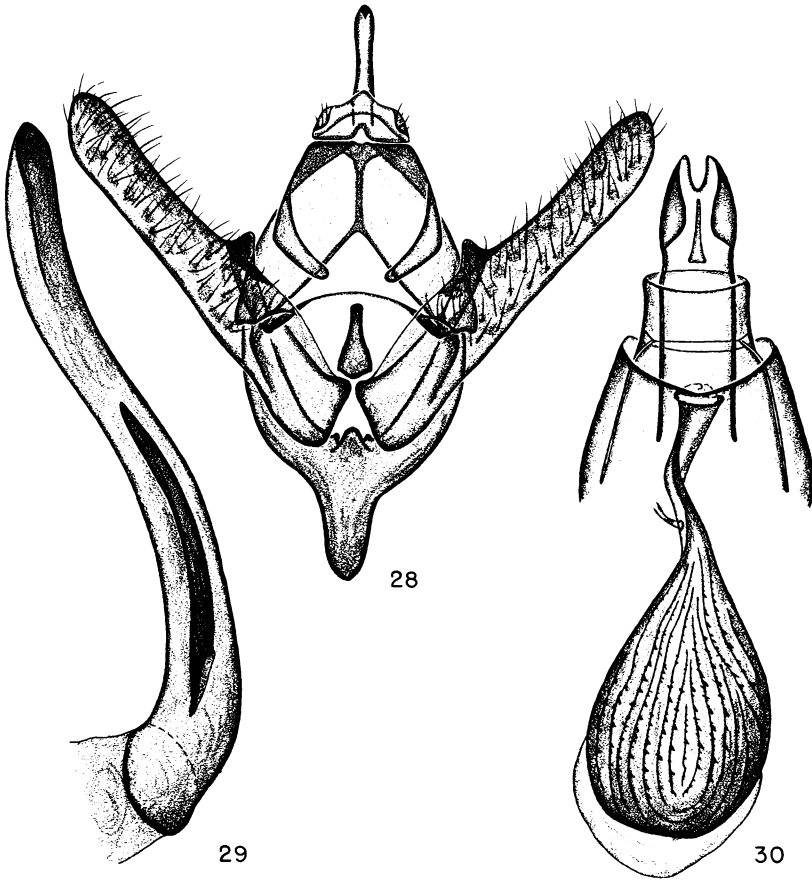
EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Of *quadrifasciaria*, in Museum of Comparative Zoölogy, Harvard College. According to the original description *elimaria* was described from four males in the Hulst collection. Two males were received when this collection was incorporated into the collection of the American Museum of Natural History, one of them being labeled as the type of *elimaria*. This specimen is hereby designated as the lectotype, even though it carries a "Fla." locality label, which is obviously in error (Rindge, 1955).

TYPE LOCALITIES: Kansas (*quadrifasciaria*); Colorado (*elimaria*).

RANGE: Central United States, extending into Colorado, and usually closely associated with the Mississippi River and its tributaries. (See fig. 15.) On the wing in May, June, and July.



FIGS. 28-30. Genitalia of *D. quadrifasciaria* (Packard). 28. Male, type of *elimata* Hulst, "Florida." 29. Aedeagus of same. 30. Female, Putnam County, Illinois, June 12, 1954 (M. O. Glenn).

REMARKS: Twenty specimens and nine genitalic preparations studied, including the lectotype of *elimaria*. A very distinct species, easily recognized by the pattern of the forewings with their four sharply defined cross lines. The male genitalia are a bit divergent for the genus, as the aedeagus and its single, very large cornutus are a unique feature. The female genitalia are distinctive in the curved nature of the ductus bursae, but the bursa copulatrix is quite normal for the group.

