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A Revision of the Genera *Anavinemina* and *Vinemina* (Lepidoptera, Geometridae)

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INTRODUCTION

The genera *Anavinemina* and *Vinemina* are closely related to *Melanolophia* and *Pherotesia*, recently studied by me (Rindge, 1964). The species of these two genera are found from Utah and Colorado in the north to mountains of Guatemala in the south. In addition there is one other taxon, known only from the unique male type taken in southern Brazil, that appears to be correctly placed in *Anavinemina*. Of the remaining 11 species included in the present paper, 10 are known from the mountains of Mexico, and six of these have been taken there only, usually at elevations of from 7000 to 11,500 feet. Three species are known from the southwestern United States, and two of these extend south into Mexico. One has been taken only in the mountains of Guatemala, while a second species extends from this country into Mexico.

Vinemina was described by McDunnough, and he placed two species in this genus. It now includes four species; one was transferred from *Cidaria*, two have been described in *Vinemina*, and a fourth species is proposed in this paper. Of the eight species placed in *Anavinemina*, two were described in *Tephrosia* and another two in *Pherotesia*; the remaining four species are described as new in this paper.

Much work remains to be done with these two genera. The life histories of all the species are completely unknown. The distribution of these taxa

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is inadequately known, with the possible exception of *Vinemina opacaria* (Hulst). Three species are known only from one sex, two being represented by unique types only, and several others have been described from old and worn specimens.

Part of the material studied by the author was described by Druce (1881–1900) in the "Biologia Centrali-Americana." The spellings of some localities cited in this paper have been changed from their original orthography to conform with those of Selander and Vaurie (1962).

MATERIAL STUDIED

During the preparation of this paper 633 specimens and 94 genitalic preparations from the collections of several museums were studied; of this total, however, 475 specimens and 47 dissections belonged to one species.

ACKNOWLEDGMENTS

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. D. S. Fletcher of the British Museum (Natural History); Dr. J. A. Powell of the University of California, Berkeley; Mr. L. M. Martin of the Los Angeles County Museum; Mr. C. F. Harbison of the San Diego Natural History Museum; Dr. E. L. Todd of the United States National Museum, Smithsonian Institution; and Dr. J. F. G. Clarke of the Smithsonian Institution. The author also wishes to thank Miss Marjorie Statham of the Department of Entomology of the American Museum of Natural History for the drawings of the male genitalia and for the preparation of the maps.

Wherever possible the illustrated material has been taken from the collection of the Department of Entomology of the American Museum of Natural History. In certain cases such choice has not been possible, so the source of all other material is indicated. The following abbreviations have been used:

A.M.N.H., the American Museum of Natural History
B.M.N.H., British Museum (Natural History), London
C.A.S., the California Academy of Sciences, San Francisco
C.N.C., Canadian National Collection, Ottawa
U.S.N.M., United States National Museum, Smithsonian Institution, Washington, D. C.

Some of the specimens used in the preparation of this paper were collected by the author with the support of National Science Foundation Grant G-9037; this assistance is gratefully acknowledged.

ANAVINEMINA, NEW GENUS

Similar in most characters to *Melanolophia*, differing mainly as follows: Antennae of male bipectinate, with pectinations extending almost to apex; antennae of female simple. Fore tibia with moderate process in male, one-half of length of tibia, shorter in female; hind tibia with two pairs of spurs, with hair pencil in male. Abdomen of male with third segment having medioventral row of bristles, with lateral hair pencil at posterior portion of third segment prominent or reduced, and with large double comb between seventh and eighth segments.

Forewings broad, with 12 veins and elongate areole; R_{1+2} from top of cell, short to moderately stalked, R_2 with small cross vein to R_{3+4} , R_5 arising basad of cross vein; base of wing without fovea. Hind wings broad; outer margin rounded or shallowly concave between veins; with nine veins; Sc paralleling cell for about one-half of length, branching just before wing margin; $m+ldc$ prominently biangulate. (See fig. 1.)

MALE GENITALIA: Uncus thin and tapering, terminating in single point, rarely broad, with truncate apex having two points; socius absent; gnathos strongly developed, rounded; valves large, symmetrical, costa simple, swollen or with tubercle and tuft of elongate setae at end, ornamentation variable, symmetrical; cristae either present, in some cases very long, or absent; anellus membranous; aedeagus of moderate length, relatively thick; vesica either unarmed or with several cornuti.

FEMALE GENITALIA: Apophyses posteriores varying from two to three times as long as apophyses anteriores; sterigma small, weakly sclerotized; ductus bursae short, membranous or sclerotized, joining corpus bursae posteriorly; ductus seminalis arising from posterior portion of corpus bursae; corpus bursae elongate, slender, of even width or with ends swollen; signum absent.

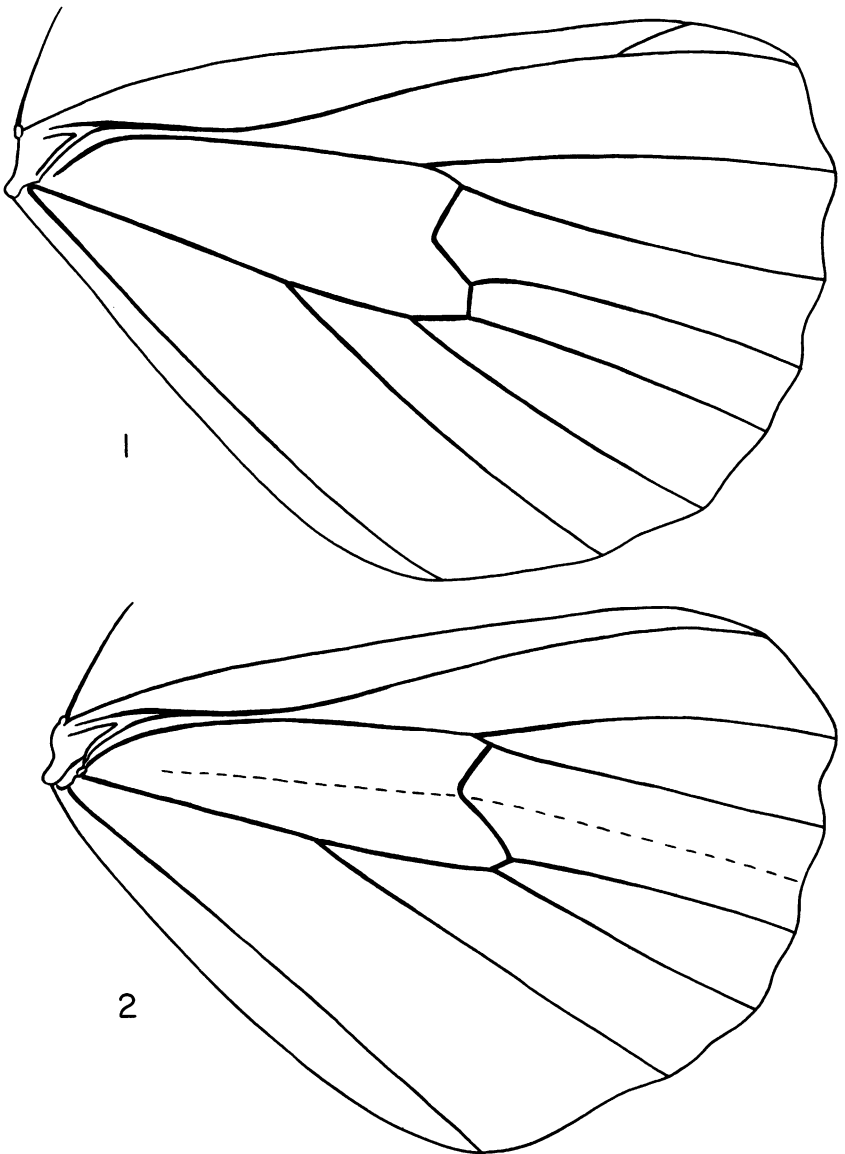
Forewings olivaceous green, gray, or brown, often with rather indistinct pattern. Upper surface of forewings with t. a., median, and t. p. line variably represented, weakly indicated or absent in some species; s. t. line usually present although weak; discal spot dark, often elongate and shaded distally by pale scales; terminal line of small, black, intravenular spots. Hind wings dull gray or grayish brown, with indistinct maculation above. Under side of wings grayish or grayish brown, variably overlain with dark scales, with maculation weakly represented or absent.

EARLY STAGES: Unknown.

TYPE SPECIES: *Tephrosia muraena* Druce.

RANGE: Mexico and Guatemala; southern Brazil.

This is a small genus, occurring mainly in the mountains of Mexico and Guatemala, where seven species are known. One other species, from



FIGS. 1, 2. Venation of hind wings. 1. *Anavinemina muraena* (Druce). 2. *Vinemina opacaria* (Hulst).

southern Brazil, is also placed here. This genus is allied to *Melanolophia* but can be separated from that large genus by the biangulate $m+ldc$

cross vein of the secondaries, and by the fact that the forewings and hind wings are not concolorous. In the genitalia, the valves and their ornamentation in the male are symmetrical in this genus, the sterigma of the female is small and weakly sclerotized, and the signum is absent.

Anavinemina is similar to *Pherotesia* in that the forewings and hind wings are not concolorous, and that the valves of the male genitalia are symmetrical. The present genus can be distinguished from *Pherotesia* by the biangulate $m+ldc$ cross vein of the secondaries. None of the males of *Anavinemina* has the raised scent patch on the hind wing that is found in *Pherotesia*.

KEY TO SPECIES

BASED ON EXTERNAL CHARACTERS AND RANGE

1. From South America *aequilibera*
 From Central America 2
- 2(1). Pectinations of male antennae about 0.5 mm. in length 3
 Pectinations of male antennae about 1.2 mm. in length 6
- 3(2). Upper surface of forewings brown; maculation indistinct except for
 s. t. line; length of forewing, 15 to 16 mm. *indistincta*
 Upper surface of forewings olivaceous brown or grayish brown; macula-
 tion usually distinct; length of forewing, 16 to 21 mm. 4
- 4(3). Upper surface of forewings olivaceous brown, with ochraceous scaling
 on cubital vein 5
 Upper surface of forewings grayish brown, without ochraceous scaling
 on cubital vein *molybra*
- 5(4). Length of forewing, 16 to 21 mm.; from the mountains of western Mexico
 *muraena*
 Length of forewing, 18 to 21 mm.; from the mountains of central Mexico
 *promuraena*
- 6(2). Upper surface of forewings dark brown; maculation obsolescent except
 for white s. t. line *orphna*
 Upper surface of forewings brownish gray or olivaceous brown; macula-
 tion weakly represented 7
- 7(6). S. t. line of upper surface of forewings paralleling outer margin; from
 the mountains of central Mexico *axicata*
 S. t. line of forewings with spot above tornus extending farther basad
 than other spots; from eastern Mexico *axica*

BASED ON MALE GENITALIA¹

1. Uncus elongate, tapering to a slender, single point 2
 Uncus broad, truncate, terminating in two widely separated points
 *axicata*
- 2(1). Aedeagus unarmed; sacculus extending as long, free arm *indistincta*
 Aedeagus with prominent armature; sacculus simple 3
- 3(2). Aedeagus with from four to six heavy spines in one group *muraena*
 Aedeagus with single longitudinal spine or spinose patch 4
- 4(3). Distal portion of valve with large, semicircular, sclerotized area, having

¹ The males of *molybra* are unknown.

- spines around outer edge *orphna*
 Distal portion of valve with small spine patch only 5
 5(4). Very large, sclerotized, pointed objects near base of each valve
 *aequilibera*
 Bases of valves without such processes 6
 6(5). Cristae consisting of from one to three, very long, S-shaped setae extending
 to beyond base of uncus *axica*
 Cristae of three to nine small, inconspicuous setae *promuraena*

BASED ON FEMALE GENITALIA¹

1. Ductus seminalis arising posteriorly on left side of corpus bursae
 *muraena*
 Ductus seminalis arising ventrally or on right side of corpus bursae . . . 2
 2(1). Anterior portion of corpus bursae broadly swollen, somewhat foot-like
 in outline 3
 Anterior portion of corpus bursae not swollen 4
 3(2). Posterior one-sixth of corpus bursae heavily sclerotized *axicata*
 Posterior portion of corpus bursae not sclerotized *indistincta*
 4(2). Ductus bursae joining corpus bursae dorsally *promuraena*
 Ductus bursae joining corpus bursae posteriorly *molybra*

Anavinemina muraena (Druce), new combination

Figures 1, 3, 9

Tephrosia muraena DRUCE, 1892 (1891–1900), p. 78 (*partim*); 1893 (1881–1900),
 pl. 48, figs. 17, 18.

This species has dark olivaceous brown forewings, white transverse lines, and yellowish scaling along the cubital vein. The females have a pattern that is more distinct than that found in the males. The species is known only from the mountains of Guerrero and Oaxaca, Mexico.

MALE: Head, vertex buff, with scattered olivaceous scales; maximum length of pectinations of antennae about 0.5 mm.; front olivaceous brown, narrowly buff across ventral margin, palpi with mixed buff and olivaceous brown or dark brown scales. Thorax with mixed buff and olivaceous brown scales above; below buff, with scattered brown scales; legs buff, variably spotted with brown and blackish brown scales. Abdomen buff above, with olivaceous brown scales; paler below.

UPPER SURFACE OF WINGS: Forewings with ground color white or whitish buff, heavily and evenly overlain with olivaceous and dark brown scales, and with faint ochraceous scaling along cubital vein; cross lines weakly defined, incomplete, of ground color, with curved median and t. p. lines best represented; discal spot inconspicuous; subterminal and terminal areas slightly darker than remainder of wing, with slender,

¹ The females of *axica*, *orphna*, and *aequilibera* are unknown.

white, incomplete s. t. line, and with spots of ground color in cells R_5 and M_3 ; terminal line black, narrowed or interrupted by veins; fringe checkered, olivaceous black and whitish buff. Hind wings whitish gray, overlain with pale grayish black scales, becoming more concentrated distally; discal spot grayish black, diffuse; extradiscal line present in lower part of wing; terminal line blackish gray, enlarged in cells; fringe buff.

UNDER SURFACE OF WINGS: Forewings whitish buff, heavily and evenly overlain with gray and grayish black scales except along inner margin; costa ochraceous buff, with scattered blackish brown scales; hind wings creamy white, with grayish black scales and strigations; veins tending to be buff; maculation of upper surface weakly represented on all wings.

LENGTH OF FOREWING: 17 to 18 mm.

FEMALE: Similar to male, but with upper surface of forewings less heavily overlain with dark scaling, with stronger discal spot and cross lines, and with more ochraceous scaling on cubital vein; median area paler than in male; hind wings with discal spot, extradiscal and sub-terminal lines more strongly represented than in male. Under surface with forewings tending to have less grayish scaling, and with secondaries tending to be more heavily overlain with dark scales than in male.

LENGTH OF FOREWING: 16 to 21 mm.

MALE GENITALIA: Uncus tapering, concave ventrally, terminating in single, rounded point; gnathos slender laterally, varying from broadly rounded to bluntly pointed medially, with rugose surface; valves with swollen costa and tuft of elongate setae; valvula with sclerotized, setose band, splitting anteriorly, outer arm terminating in raised knob with five or six heavy setae arising around edge and curving medially and postero-medially, inner arm terminating in spine patch with from 12 to 14 slender setae; sacculus sclerotized, curving mediad in center of valve, terminating in raised flap-like process just posterior to raised knob of valvula; cristae consisting of approximately 18 small setae and one very long seta extending posteriorly beyond base of uncus; anellus with broad base, narrowed posteriorly, slightly enlarged apically; tegumen broad, rectangular; saccus bluntly rounded; aedeagus shorter than combined lengths of uncus, tegumen, and saccus; vesica with from four to six heavy spines in one group, and with several smaller, slender spines between the heavy spines. Abdomen with lateral tufts on A_3 very weakly represented.

FEMALE GENITALIA: Sterigma a weakly sclerotized plate, small, ovate, with central portion slightly more strongly sclerotized, increasing in width anteriorly, anterior margin with median cleft; ductus bursae larger than sterigma, dorsoventrally flattened, with punctate surface, lateral margins convex, asymmetrical, right side swollen medially, left side

enlarged anteriorly, with maximum width more than one-half of length of apophyses anteriores; ductus seminalis arising from small, lightly sclerotized, posteriorly directed, digitate process on left side of posterior portion of corpus bursae; corpus bursae enlarged at both ends.

TYPES: Druce described *muraena* from a number of specimens from Mexico and Guatemala. The lectotype is hereby designated as the male labeled Omilteme, Mexico; this is the specimen that was illustrated by Druce on his plate 48, figure 17, and it is in the collection of the British Museum (Natural History). The single male from Sierra de las Aguas Escondidas, Guerrero, Mexico, is correctly placed as this species. The specimens included in the original description from Guatemala are not conspecific with *muraena*; these represent an undescribed species of the genus *Vinemina* which is described in this paper.

TYPE LOCALITY: Omiltemi (given as Omilteme in the original description), Guerrero, Mexico, elevation 8000 feet.

RANGE: This species is known from the states of Guerrero and Oaxaca in western Mexico, having been taken in the mountains at elevations from 7000 to 9000 feet. The only known date of capture is September.

REMARKS: Thirty-seven specimens and five genitalic dissections were studied. This species can be recognized from the generic characters, and from the illustrations accompanying the original description.

***Anavinemina promuraena*, new species**

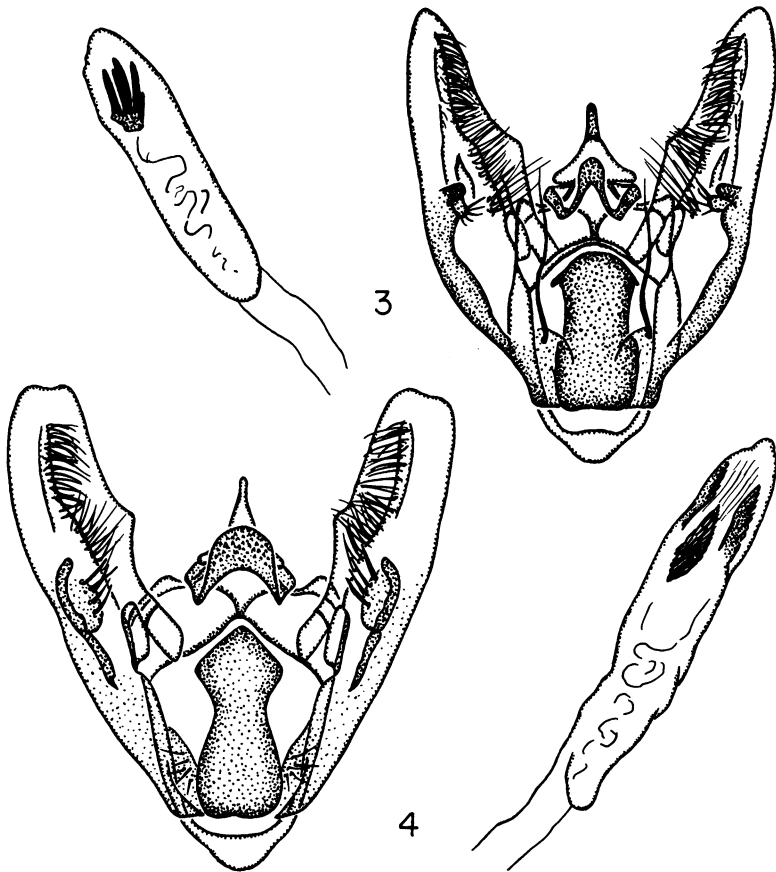
Figures 4, 11

Melanolophia phyararia DYAR, 1926, p. 186 (*partim*).

This moth is very similar to *muraena*. The genitalia offer good characters for the separation of the two species. This taxon occurs in the mountains of central Mexico.

MALE: Head, thorax, and abdomen similar to those of *muraena*; maximum length of pectinations of antennae, about 0.6 mm.

UPPER SURFACE OF WINGS: Forewings with ground color pale buff, heavily overlain with dark olivaceous brown and brownish gray scales, and with some ochraceous scaling on cubital vein; maculation similar to that of *muraena* but with larger area of ground color distad of round, black discal spot, and with s. t. line slightly farther from wing margin. Hind wings pale grayish buff, overlain with light brownish gray scales; veins faintly buff; discal spot dull brownish gray; extradiscal line geminate, present in lower part of wing; subterminal line weakly indicated, prominent at anal angle; terminal line paler and smaller than that on forewings; fringe buff.



FIGS. 3, 4. Male genitalia. 3. *Anavinemina muraena* (Druce), Cerro Pelon, Oaxaca, Mexico, September 12, 1961 (E. C. Welling; A.M.N.H.). 4. *A. promuraena*, new species, paratype, Popocatepetl Park, Mexico, July, 1906 (U.S.N.M.).

UNDER SURFACE OF WINGS: Forewings pale grayish white, very heavily overlain with grayish brown scales, becoming darker near apical angle; costa pale buff, with dark brown scaling; apex of wing with small patch of ground color; discal spot and s. t. line weakly indicated. Hind wings pale buff, overlain with brown scales and strigations; discal spot dark brown; cross lines weakly indicated; terminal line and fringe like those of upper surface.

LENGTH OF FOREWING: 18 mm. (holotype) to 21 mm.

FEMALE: Similar to male, but with upper surface of forewings less heavily overlain with dark scaling, with stronger discal spot and cross

lines, and with more ochraceous scaling on cubital vein; median area paler than that in male; hind wings with discal spot, extradiscal and subterminal lines more strongly represented than those in male. Under surface tending to have less grayish brown scaling than that of male, with pattern more clearly represented.

LENGTH OF FOREWING: 20 mm. (allotype).

MALE GENITALIA: Uncus with basal section tapering, terminal portion with parallel sides, apically rounded; gnathos very broad medially, in width equal to width of base of uncus, broadly rounded, surface shortly spinose; valves with swollen costa and tuft of elongate setae; valvula with weakly sclerotized, setose band, splitting anteriorly, outer arm more heavily sclerotized, having raised median area with from three or four (right side) to five (left side) heavy setae; inner arm weakly sclerotized, terminally with five or six elongate, slender setae; sacculus sclerotized, narrowing posteriorly, terminating in inwardly curving sclerotized strip, situated just posterior to raised area of valvula; cristae of from three to nine small, inconspicuous setae; anellus with broad base, tapering and becoming slightly more heavily sclerotized posteriorly; tegumen broad, rectangular; saccus broadly rounded; aedeagus slightly longer than combined lengths of uncus, tegumen, and saccus, posteriorly with numerous longitudinal striations and with posterolateral, sclerotized, weakly spinose bands; vesica with elongate, broad, median spine patch, consisting of numerous, individually almost indistinguishable spines. Abdomen with lateral tufts on A_3 very weakly represented.

FEMALE GENITALIA: (Based on one molded specimen). Sterigma small, weakly sclerotized, ovate; ductus bursae longer than sterigma, apparently extending anterodorsally to left, joining corpus bursae posterodorsally and with each side appearing thicker than narrower median area; ductus seminalis apparently arising from posterior end of corpus bursae; corpus bursae elongate, anterior end swollen, somewhat foot-like, posterior end weakly sclerotized and striate.

TYPE: Holotype, male, and allotype, female, Popocatepetl Park, [Mexico], Mexico, July, 1906, elevation "8-1000 feet." Paratype, same data, one male. All three specimens are in the collection of the United States National Museum. The holotype is one of Dyar's paratypes of *Melanolophia phyararia*. The elevation given on the specimens is obviously incorrect; it probably should read 8000-10,000 feet.

RANGE: This species is known only from the type series from the mountains of central Mexico.

REMARKS: Three specimens and three genitalic dissections were studied. In color and maculation this species is very similar to *muraena*;

the genitalia offer the best way to separate the two species.

In the male genitalia the large median spine patch of the vesica and the big, finely spinose gnathos can be used for recognition of this taxon, as compared with the four to six heavy spines of the vesica and the smaller, rugose gnathos of *muraena*. In the female genitalic structures the narrower ductus bursae, joining the corpus bursae dorsally, is characteristic of *promuraena*.

Anavinemina molybra, new species

Figure 10

This species flies with, and is quite similar to, *muraena*. It can be distinguished from that species by its smaller size, grayer coloration, and genitalia.

FEMALE: Head, thorax, and abdomen similar to those of *muraena* but with more pale gray and whitish gray scaling.

UPPER SURFACE OF WINGS: Forewings with ground color white, heavily overlain with gray and blackish brown scales, and with some brown scaling below and distal to discal spot and in cubital cell; cross lines represented by bands of ground color, with t. p. line broadest and best defined but more or less interrupted by dark scaling on veins; basal and median areas of ground color, lightly overlain with dark scaling, the latter area with dark median shade line; discal spot black, subtriangular; s. t. line white, slender, more or less broadly shaded with white in posterior part of wing; terminal line of black cellular spots, narrowly connected or with line broken at veins; fringe of ground color, with variable number of gray scales, tending to be darkened opposite cell. Hind wings whitish gray, overlain with pale grayish brown scales, becoming more numerous distally; discal spot grayish brown, diffuse; extradiscal and subterminal lines weakly indicated in lower part of wing; terminal line blackish brown; fringe of ground color.

UNDER SURFACE OF WINGS: Forewings grayish white, heavily overlain with gray scales except along paler inner margin; costa buff, with blackish brown scaling; subterminal and terminal areas, from costa to vein M_3 , dull black, with whitish spot at apex and with small area of ground color in cell M_3 ; t. p. band of upper surface weakly reflected. Hind wings slightly paler than forewings, with gray and grayish brown scales and strigations; veins faintly buff colored; discal spot grayish black, large; dark subterminal band present, wider in anterior part of wing; terminal line and fringe like those on upper surface.

LENGTH OF FOREWING: 17 to 18 mm. (holotype).

MALE: Maximum length of pectinations of antennae, about 0.5 mm. Similar to female, but with upper surface of forewings more heavily overlain with dark scaling; median area like that of female; hind wings with extradiscal line present. Under surface with stronger dark band basad of t. p. line; secondaries with extradiscal line and without subterminal band, and with smaller discal spots.

LENGTH OF FOREWING: 17 mm.

MALE GENITALIA: Unknown (the single male did not have an abdomen when studied).

FEMALE GENITALIA: Sterigma very weakly sclerotized, broad, subtriangular, with apex at junction with ductus bursae; ductus bursae with narrow, sclerotized, very finely punctate posterior portion, longer than wide, anteriorly becoming membranous and enlarging to width of posterior end of corpus bursae; ductus seminalis arising ventrally near posterior end of corpus bursae; corpus bursae elongate, with anterior end enlarged, somewhat foot-like.

TYPES: Holotype, female, Cerro Pelon, Municipio Yolox, Oaxaca, Mexico, September 12, 1961, elevation 7052 feet (E. C. Welling). Paratypes: Same data as type, one female; same data but September 13, 1961, one male. All the type material is in the collection of the American Museum of Natural History.

RANGE: This species is known only from the type series, taken in the mountains of Oaxaca.

REMARKS: Three specimens and one genitalic dissection were studied. Unfortunately both paratypes did not have abdomens when studied; more material is needed to complete the genitalic descriptions and to find the amount of genitalic variation in this species.

Anavinemina molybra is similar to *muraena*, but the adults are smaller in size. The upper surface of the forewings is grayer in coloration, and the veins lack the yellow scaling that is found in *muraena*.

The female genitalia of the present species can be distinguished from those of the preceding species by the narrower ductus bursae, by the broader sterigma, and by the ventral origin of the ductus seminalis.

Anavinemina axica (Druce), new combination

Figure 5

Tephrosia axica DRUCE, 1892 (1891–1900), p. 78; 1893 (1881–1900), pl. 48, fig. 19.

This species is similar to the preceding ones but can be separated from them by the longer pectinations of the male antennae. This taxon is known only from Veracruz, Mexico.

MALE: Head, thorax, and abdomen similar to those of *muraena*, but tending to have more brown scaling; maximum length of pectinations of antennae, about 1.2 mm.

UPPER SURFACE OF WINGS: Forewings with ground color whitish buff, heavily and evenly overlain with dark olivaceous brown and dark brown scales; maculation similar to that of *muraena* but without the contrasting coloration of that species; median area only weakly indicated by paler scaling, shaded distally by broad, rather nebulous band of dark brown; s. t. line prominent, of ground color, the cellular spots broadly marked basally and distally with dark brown, with spot above tornus with basal shading larger than on others; fringe brown in basal one-half, grayish white distally. Hind wings pale gray, lightly overlain with light brownish gray scales, becoming stronger distally; veins faintly buff; discal spot dull brownish gray; extradiscal line absent; subterminal line nebulous, extending across entire wing; fringe like that on forewings.

UNDER SURFACE OF WINGS: Forewings pale grayish brown, overlain with brownish gray scales, becoming darker near outer margin; apex dull white in field of dark brown, the latter becoming paler posteriorly along outer margin; discal spot weakly indicated. Hind wings pale grayish white, lightly overlain with pale brownish gray scales and strigations, becoming more concentrated distally; discal spot large, brown; cross lines absent except for nebulous extradiscal line, broad in upper part of wing and becoming obsolescent posteriorly; fringe concolorous with wing.

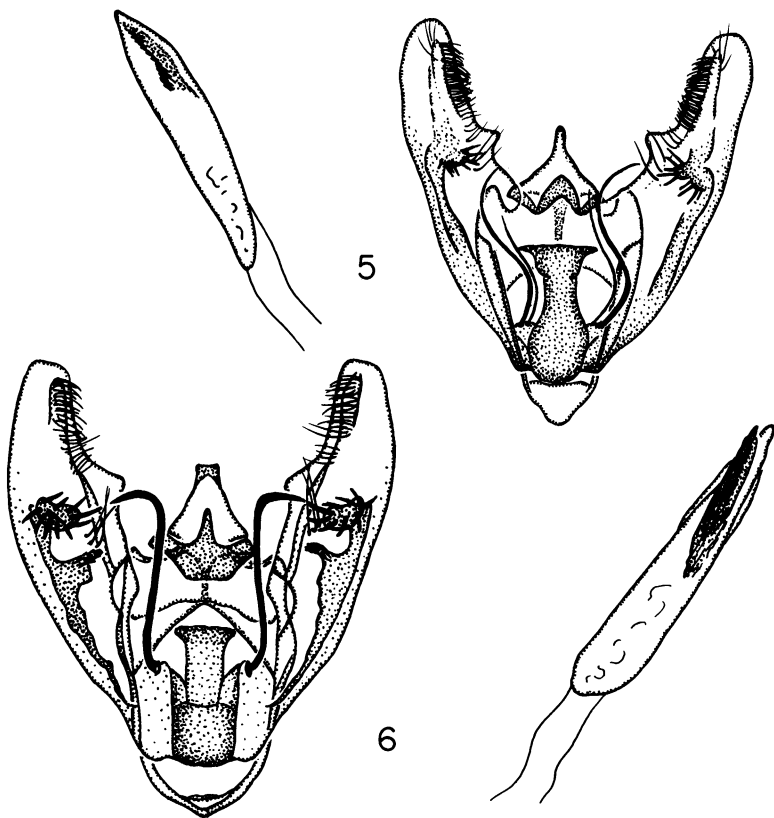
LENGTH OF FOREWING: 17 mm.

FEMALE: Unknown.

MALE GENITALIA: Uncus with basal section evenly tapering, terminal section short and with parallel sides; gnathos swollen medially, bluntly pointed, in width slightly more than one-half of width of base of uncus; valves with swollen costa and tuft of elongate setae; valvula with weakly sclerotized band terminating in raised, more heavily sclerotized, knob-like projection medially, situated transversely, with 10 or 11 short, heavy setae directed inwardly and anteriorly; area anteromedial of projection with six to eight elongate, slender setae; sacculus sclerotized medially, terminally slightly curved inwardly and adjoining projection of valvula; cristae of from one to three very long, S-shaped setae, one much heavier than the others, extending posteriorly beyond base of uncus, and with several short, inconspicuous setae at base of long ones; anellus with broad, rounded base, tapering posteriorly; tegumen broad, rectangular; saccus slightly tapering, bluntly pointed anteriorly; aedeagus slightly shorter than combined lengths of uncus, tegumen, and saccus; vesica with elongate, very minutely spinose area on right side posteriorly, arising from broad basal

area, in length about three-eighths of length of aedeagus. Abdomen with lateral tufts on A_3 apparently absent.

FEMALE GENITALIA: Unknown.



FIGS. 5, 6. Male genitalia. 5. *Anavinemina axica* (Druce), holotype, "Vera Cruz," Mexico (U.S.N.M.). 6. *A. axicata*, new species, paratype, Popocatepetl Park, Mexico, June, 1906 (U.S.N.M.).

TYPE: Druce described *axica* from a single male; this specimen is U.S.N.M. No. 12495.

TYPE LOCALITY: "Vera Cruz," Mexico. It was not stated in the original description whether this referred to the city or the state of that name.

RANGE: This species is known only from the unique type, taken in eastern Mexico.

REMARKS: One specimen and one genitalic dissection were studied. In

color, size, and maculation, *axica* is similar to the preceding species. It can be distinguished from them by the presence of an extradiscal band on the secondaries, both above and below, and by the pale spot at the apex of the forewings beneath, surrounded by a dark brown area. The males can be separated by the greater length of the pectinations of the antennae.

***Anavinemina axicata*, new species**

Figure 6

This species is very similar to *axica*, but it tends to have a straighter s. t. line on the primaries, and lacks the definite subterminal band on the under side of the secondaries. Good genitalic differences are present in the male. This taxon is known from the mountains of central Mexico.

MALE: Head, thorax, and abdomen similar to those of *muraena* but with more buff scaling; maximum length of pectinations of antennae, about 1.2 mm.

UPPER SURFACE OF WINGS: Forewings with ground color pale buff, heavily overlain with brownish gray and dark brown scales; cross lines weakly defined, except for s. t. line, of ground color, with t. p. line broadest, interrupted by dark scaling on veins; discal spot blackish brown, of moderate size; s. t. line of rounded cellular spots, of ground color, more or less overlain with white scales, especially opposite cell and above tornus, and broadly shaded basally by blackish brown scales; terminal area tending to be shaded with dark scales opposite cell and in lower part of wing; terminal line of black intravenular spots; fringe concolorous with wing, lightly marked with pale scales opposite veins. Hind wings with outer margin weakly angled at vein Cu_1 ; whitish gray, lightly overlain with pale brownish gray scales, tending to become more concentrated distally; discal spot brownish gray, variable in size; extradiscal and subterminal lines weakly represented in lower part of wing; terminal line dark brown or brownish black, narrowed or broken by veins; fringe concolorous with wing.

UNDER SURFACE OF WINGS: Forewings pale grayish white, heavily overlain with gray scales except along paler inner margin; costa pale buff, with brownish scaling; subterminal and terminal areas, from costa to cell M_2 , brownish gray, with spot of ground color at apex, and with more poorly defined areas of ground color in cells M_3 and Cu_2 ; discal spot dark, small, shaded distally by larger area of ground color; s. t. line weakly indicated in some specimens. Hind wings paler than forewings, overlain with brownish gray scales and strigations; discal spot brown; subterminal

band weakly represented or obsolescent; terminal line obsolescent; fringe like that on upper surface.

LENGTH OF FOREWING: 18 (holotype) to 19 mm.

FEMALE: Similar to male (as far as can be determined from the single worn specimen) but tending to have considerably less brown scaling on upper surface of forewing, and with discal spots and lower portion of t. p. line more prominent; hind wings slightly paler than those of male. Under surface tending to be somewhat paler than that of male.

LENGTH OF FOREWING: 17 mm. (allotype).

MALE GENITALIA: Uncus slightly tapering, apex broad, approximately one-third of width of base of uncus, with two widely separated points, concave between; gnathos becoming more slender ventrally, then enlarged into slender, median, digitate process; valves with costal tubercle and tuft of elongate setae; valvula with weakly sclerotized, setose, raised area; sacculus swollen, with weakly sclerotized area along inner margin, tapering anteriorly, sharply enlarged medially just basad of prominent, slender, raised, sclerotized, digitate projection with closely appressed setae, in length almost one-half of width of valve, this projection succeeded distally by raised, lobate process, with large, erect setae; cristae consisting of one or two very long, slender, apically flattened setae, extending posteriorly to beyond base of uncus, then recurving, and with several small setae at base; anellus with broad base, narrowed posteriorly, slightly enlarged apically; tegumen broad, rectangular; saccus bluntly pointed; aedeagus shorter than combined lengths of uncus, tegumen, and saccus; vesica with elongate, closely appressed, setose row of spines. Abdomen with lateral tufts on A_3 prominent.

FEMALE GENITALIA: Sterigma consisting of weakly sclerotized, ovate, or elliptical areas lateral to ostium; ductus bursae short, increasing in width anteriorly, joining corpus bursae posteriorly; ductus seminalis arising ventrally near posterior end of corpus bursae; the latter very long and slender, weakly enlarged anteriorly, posterior one-sixth heavily sclerotized, and with faint, very weakly spiculate band near anterior end.

TYPES: Holotype, male, and allotype, female, Mexico City, [Distrito Federal], Mexico, June, 1920 (R. Muller). Paratypes: Same data as type but dated August, 1921, one male; Popocatepetl Park, [Mexico], Mexico, June, 1906, elevation 9500–11,500 feet, two males, July, 1906, elevation "8–1000" feet, one male. All the type material is in the collection of the United States National Museum.

RANGE: Known only from the type series from the mountainous regions of central Mexico.

REMARKS: Six specimens and four genitalic dissections were studied.

The five males that have been examined are somewhat worn and perhaps faded. In maculation, this species is similar to *muraena*, but the forewings above are browner and have a more clearly defined s. t. line. The male antennae have the pectinations about twice as long as those found in all of the preceding species, with the exception of *axica*.

The male genitalia of *axicata* are quite distinct in the shape of the uncus, the ornamentation of the valves, the cristae, and the armature of the vesica. The female genitalia are distinctive in having the lateral ovate areas in the sterigma, and the heavily sclerotized posterior end of the corpus bursae.

Anavinemina orphna, new species

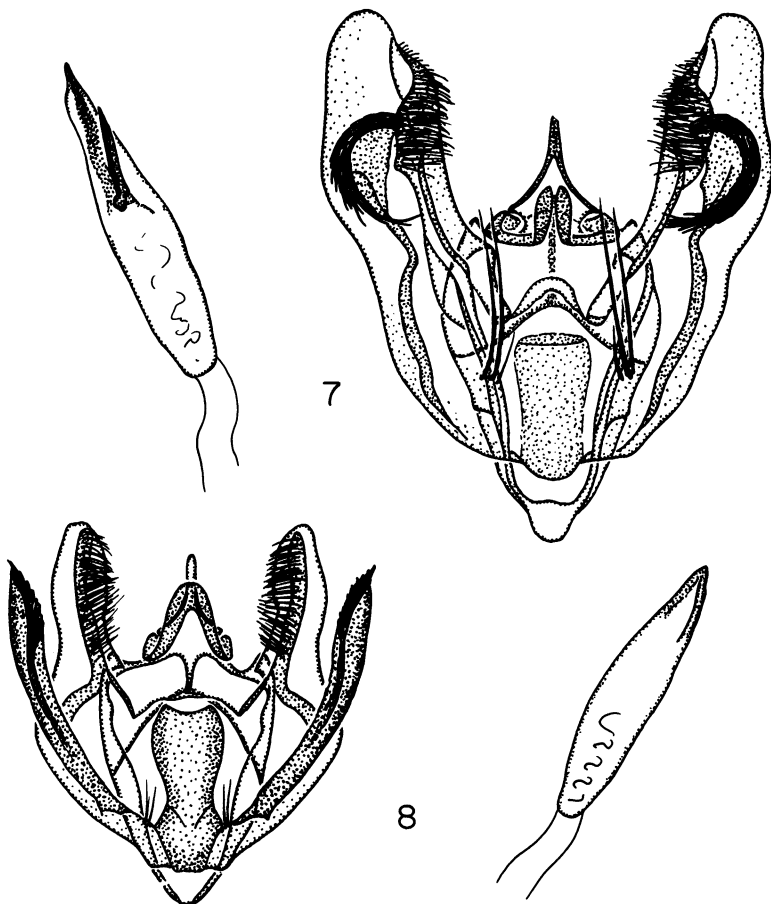
Figure 7

This species is similar to *axicata*; the pectinations of the male antennae of both are more than 1 mm. in length. The present taxon has the upper surface of the forewings dark brown, and they are virtually without maculation except for the narrow, white s. t. line. This species occurs in central Mexico.

MALE: Head, thorax, and abdomen similar to those of *muraena*, but with much more dark brown scaling; maximum length of pectinations of antennae, about 1.1 mm.

UPPER SURFACE OF WINGS: Forewings with ground color dark brown, lightly overlain with brownish black scales; cross lines, except for s. t. line, weakly defined, of blackish brown scales; discal spot blackish brown; s. t. line white, narrow except for rounded spot in cell R_5 , outwardly curved opposite cell, obsolescent and swinging basally in cells M_2 and M_3 , becoming stronger above tornus, shaded on both sides by brownish black scales, distally tending to be extended in cells toward wing margin; terminal line of black intravenular spots, connected by narrow black line; fringe of ground color, weakly marked with pale scales opposite some veins. Hind wings broad and deep; grayish buff, heavily overlain with pale brownish gray and light brown scales and strigations, becoming darker along anal margin; without maculation except for narrow, dark terminal line; fringe concolorous with wing.

UNDER SURFACE OF WINGS: Forewings pale grayish buff, heavily overlain with grayish brown scales except for costa and, more broadly, along outer margin; costa buff, with dark brown scaling; without pattern except for dark t. p. line in upper part of wing and for terminal line; fringe concolorous with wing basally, becoming brownish black distally. Hind wings pale buff, with numerous brownish gray scales and strigations;



FIGS. 7, 8. Male genitalia. 7. *Anavinemina orphna*, new species, holotype, Popocatepetl Park, Mexico, June, 1906 (U.S.N.M.). 8. *A. indistincta* (W. Warren), Mexico (R. Muller; U.S.N.M.).

without maculation except for brownish black discal spot and narrow terminal line; fringe concolorous with wing.

LENGTH OF FOREWING: 20 mm. (holotype).

FEMALE: Unknown.

MALE GENITALIA: Uncus tapering, apically attenuate and with tip elongate, ventrally produced; gnathos enlarged medially, weakly spoon-shaped, with small median cleft; valves with sclerotized costa, enlarged distally, with rounded swelling on outer margin before apex of valve and with inward swelling situated more basally, about in middle of costa;

sacculus with narrow sclerotized ridge, gently curving into center of valve, then swinging outwardly and swelling into large, sclerotized, semicircular area, flat side mediad, with outer, rounded margin thickly and broadly set with numerous, closely appressed, anteriorly and then anteromedially directed setae, and with distal end of semicircular area lying beneath inward swelling of costa; cristae of two elongate setae, extending just beyond posterior margin of tegumen, and with several short setae; anellus with broad base, narrowing posteriorly; tegumen broad, with lateral margins swollen; saccus bluntly pointed; aedeagus shorter than combined lengths of uncus, tegumen, and saccus; vesica with posteromedian row of fine, overlapping spines, in length subequal to length of uncus, and with terminal thorn-like process, supported basally by narrow, elongate, weakly sclerotized band or strip. Abdomen with lateral tufts on A_3 weakly represented.

FEMALE GENITALIA: Unknown.

TYPE: Holotype, male, Popocatepetl Park, [Mexico], Mexico, June, 1906, elevation 8000 feet; in the collection of the United States National Museum.

RANGE: Known only from the unique type, taken on Mt. Popocatepetl.

REMARKS: One specimen and one genitalic dissection were studied. This species can be recognized by the dark brown coloration of the upper surface of the forewings and by the obsolescent nature of the cross lines, except for the white s. t. line.

The diagnostic characters of the male genitalia include the nature of the valves, with the large, semicircular plate and outer fringe of spines, and the armature of the vesica.

Anavinemina indistincta (W. Warren), new combination

Figures 8, 12

Pherotesia indistincta W. WARREN, 1906, p. 514.

This is a small species with brown forewings. The type of maculation is similar to that of *orphna*, but in *indistincta* there is even less of a definite pattern. The males of this species have short antennal pectinations (0.5 mm.). The moth occurs in Mexico and Guatemala.

MALE: Head, thorax, and abdomen similar to those of *muraena*, but with more dark brown scaling; maximum length of pectinations of antennae, about 0.5 to 0.6 mm.

UPPER SURFACE OF WINGS: Forewings with ground color brown, more or less heavily overlain with blackish brown scales, and with some dull brownish orange scales; cross lines, except for s. t. line, obsolescent, in

some specimens weakly and incompletely indicated; s. t. line varying from being obsolescent to nearly complete, when present whitish or pale buff, narrow, enlarged in cell R_5 , outwardly curved opposite cell, usually obsolescent in middle of wing, becoming stronger above tornus, and shaded on both sides by blackish brown scales; terminal line of black, intravenular spots; fringe concolorous with wing, faintly marked with pale scales opposite some veins. Hind wings pale grayish brown, overlain with brownish gray scales; without maculation except for short length of subterminal line above anal angle; terminal line narrow, dark; fringe concolorous with wing.

UNDER SURFACE OF WINGS: Forewings pale grayish buff, heavily overlain with grayish brown scales except along paler inner margin; costa buff, heavily marked with blackish brown scales; without maculation except for faint discal spot and terminal line, and with apical area overlain with grayish black scales; fringe concolorous with wing. Hind wings pale buff, overlain with brown and brownish gray scales, tending to become more concentrated distally; without maculation except for small, dark discal spot and incomplete terminal line; fringe concolorous with wing.

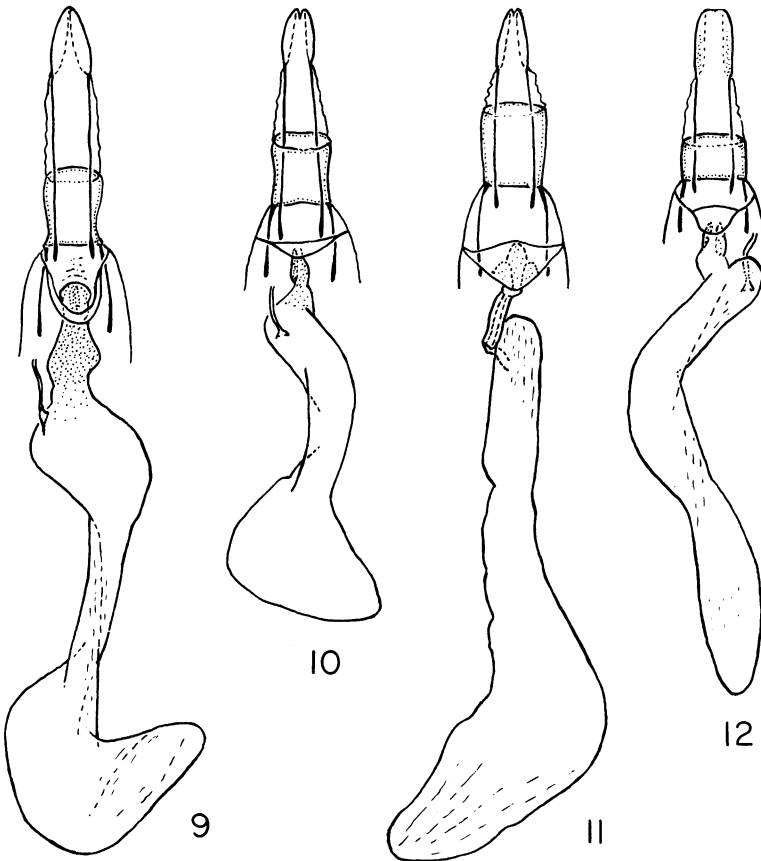
LENGTH OF FOREWING: 15 to 16 mm.

FEMALE: Similar to male, but with forewing tending to be slightly more contrastingly marked.

LENGTH OF FOREWING: 15 to 16 mm.

MALE GENITALIA: Uncus sharply tapered from base, terminal portion elongate, slender, ending in single ventral point; gnathos strongly enlarged medially, elongate, rounded, with rough surface; valves with weak costal swelling; valvula with weakly sclerotized, setose, raised ridge, branching anteriorly near base, extending diagonally across face of valve as sclerotized strip; sacculus with raised, sclerotized piece, arising at base, extending as elongate, free arm, extending beyond middle of uncus, with median row of fine setae, distally curving mediad and extending to just beyond pointed apex of arm; cristae of three or four small setae; anellus with narrow base, enlarging posteriorly, with small posterolateral lobes; tegumen broad, with strong posterolateral angles; saccus bluntly pointed; aedeagus shorter than combined lengths of uncus, tegumen, and saccus, with posterior end bluntly pointed, sclerotized; vesica unarmed. Abdomen with lateral tufts on A_3 obsolescent.

FEMALE GENITALIA: Sterigma transverse, very weakly sclerotized, widest posteriorly, rounded and narrowed anteriorly, with ductus bursae joining medially; ductus bursae short, membranous, slightly enlarged before joining corpus bursae ventrally on left side near end; ductus seminalis arising dorsally near end of slender, elongate, corpus bursae; the



FIGS. 9-12. Female genitalia. 9. *Anavinemina muraena* (Druce), Cerro Pelon, Oaxaca, Mexico, September 13, 1961 (E. C. Welling; A.M.N.H.). 10. *A. molybra*, new species, holotype, Cerro Pelon, Oaxaca, Mexico, September 12, 1961 (E. C. Welling; A.M.N.H.). 11. *A. promuraena*, new species, allotype, Popocatepetl Park, Mexico, July (U.S.N.M.). 12. *A. indistincta* (W. Warren), Mexico (R. Muller; U.S.N.M.).

latter with weakly punctate posterior end and with faint, very weakly spiculate band near anterior end.

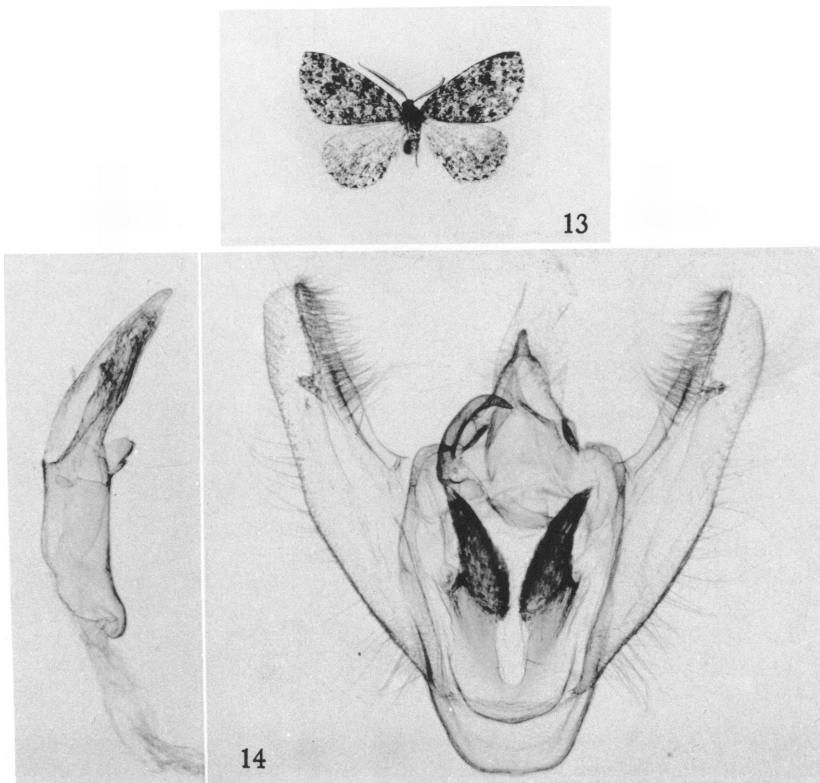
TYPE: Warren described *indistincta* from a single male specimen (U.S.N.M. No. 9370).

TYPE LOCALITY: Orizaba, [Veracruz], Mexico.

RANGE: Central Mexico (the state of Veracruz) and Guatemala (the department of Quezaltenango). The moths have been captured in Jan-

uary, March, and November.

REMARKS: Six specimens and five genitalic dissections were studied. This species can be distinguished by its small size, as it is the smallest species in the genus, and by the brown forewings. In the latter character



FIGS. 13, 14. *Anavinemina aequilibera* (Prout). 13. Holotype, natural size. 14. Male genitalia, with aedeagus on the left (B.M.N.H. photographs).

it is reminiscent of *orphna*, but *indistincta* can be separated from that species by the shorter pectinations of the male antennae, as well as by its size.

The male genitalia of *indistincta* are very distinctive in having the long, free arm of the valve. The female genitalia can be recognized by the transverse sterigma, the small ductus bursae, and the dorsal origin of the corpus bursae.

The preceding six species form a homogeneous group. The present taxon, and the one that follows, are apparently less closely related, as the

male genitalia are of a somewhat different type than is to be found in the preceding species.

Anavinemina aequilibera (Prout), new combination

Figures 13, 14

Pherotesia aequilibera PROUT, 1933, p. 93.

Prout described this species from a single male specimen, taken at Jaragua do Sul, Santa Catarina, Brazil; the type is in the collection of the British Museum (Natural History), and it has not been examined by the present author. Photographs of the type and its genitalia were furnished through the kindness of Mr. D. S. Fletcher of that institution. This species is known only from the unique type. The moth is about the same size as *indistincta*, but the male genitalia are very different. Fletcher notes (*in litt.*) that what appears to be a strongly developed cornutus is attached to the manica and did not come apart when the aedeagus was removed.

GENUS *VINEMINA* MCDUNNOUGH

Vinemina McDUNNOUGH, 1920, p. 16; 1938, p. 163.

Similar in most characters to *Melanolophia*, differing mainly as follows: Antennae of male bipectinate, with pectinations extending almost to apex; antennae of female simple. Hind tibia with two pairs of spurs, with well-developed hair pencil in male. Abdomen of male with third segment having medioventral row of bristles.

Forewings broad, with 12 veins, without an areole; R_1 and R_2 separate, from top of cell; base of wings in male with large, complex fovea, in some rather poorly defined, displacing base of Cu anteriorly, in female weakly modified, in some with denser scaling. Hind wings broad; outer margin rounded; with eight veins; Sc paralleling cell for about one-third of length; $m+ldc$ angulate. (See fig. 2.)

MALE GENITALIA: Uncus tapering, terminating in single point; socius absent; gnathos strongly developed, with moderate, rounded, median projection; valves large, slender, symmetrical, costa swollen near base, sacculus with sclerotized strip and with one or more spines or small projections, and with area of elongate setae from near base of costa; cristae strongly represented as large group of elongate setae on each side; anellus weakly sclerotized; tegumen rectangular; saccus bluntly rounded; aedeagus elongate, slender, tapering posteriorly, with sclerotized area on right side; vesica armed with one prominent, sclerotized cornutus.

FEMALE GENITALIA: Apophyses posteriores about twice as long as

apophyses anteriores; sterigma small or moderate in size, weakly sclerotized; ductus bursae short, membranous or sclerotized, joining corpus bursae posteriorly; ductus seminalis arising either posteriorly, or dorsally at or near posterior end of corpus bursae; corpus bursae either very long, slender, partially sclerotized posteriorly, or with both ends swollen, membranous; signum either absent or of small size.

Forewings with maculation of two types: one with wings predominantly pale gray, with black and brown maculation, with very prominent, curved or angled median line and slender S-shaped t. p. line; the other type with over-all pattern of dull gray or dark olivaceous brown, with cross lines moderately or weakly represented, and with rather indistinct pattern. Hind wings of all species dull gray or pale grayish brown, with indistinct maculation above. Under side of wings grayish or grayish brown, lightly overlain with dark scales; maculation weakly represented or absent.

EARLY STAGES: Unknown.

TYPE SPECIES: *Cidaria opacaria* Hulst, by original designation.

RANGE: Southwestern United States, Mexico, and Guatemala.

This small genus contains four species. It is related to *Anavinemina* and can be distinguished from that group by the lack of the areole in the venation of the forewings, by the presence of the fovea in the male, and by the angulate, rather than strongly biangulate, nature of $m+ldc$ in the secondaries.

The male genitalia of *Vinemina* can be recognized by the single strong cornutus in the vesica and by the large area of cristae. The female structures are characterized by the very short ductus bursae and the reduced ostium; the ductus bursae is either membranous and enlarged at both ends, or it is very long, slender, and partially sclerotized posteriorly.

KEY TO SPECIES

BASED ON MACULATION

1. Forewings above pale gray, with dark brown and black maculation; median line black, heavy, angled or curved, much thicker than other cross lines 2
 - Forewings above dull gray, faintly grayish green or olivaceous brown, with indistinct maculation; median line weakly represented or absent, not more strongly represented than other cross lines 3
- 2(1). Basal area of forewing with obsolescent t. a. line, curving outwardly but usually not meeting broad median band; entire wing slightly suffused with black and brown scales *opacaria*
 - Basal area of forewing with t. a. line usually joining broad median band; entire wing more or less heavily suffused with black and dark brown scales *catalina*
- 3(1). Forewings above pale grayish or faintly grayish green *perdita*
 - Forewings above dark olivaceous brown *muraenata*

BASED ON MALE GENITALIA

1. Sacculus with two projections near middle of valve, the outer small, digitate, and extending over inner, larger, apically spinose projection *muraenata*
 Sacculus with single, spinose projection only 2
- 2(1). Spine in vesica short, 0.3 to 1.0 mm. in length, straight, broad, with bifurcate base *opacaria*
 Spine in vesica long, 1.1 to 1.5 mm. in length, slender, with truncate or rounded base 3
- 3(2). Spine straight; basal portion sharply and broadly swollen *perdita*
 Spine with apex curved; basal portion only slightly enlarged and evenly tapering *catalina*

BASED ON FEMALE GENITALIA

1. Corpus bursae an elongate, slender, tube-like structure with a sclerotized area posteriorly 2
 Corpus bursae enlarged at both anterior and posterior ends, without sclerotized areas *muraenata*
- 2(1). Entire posterior one-fourth to one-fifth of corpus bursae heavily sclerotized *opacaria*
 Posterior two-fifths to one-half sclerotized, with the posterior end membranous 3
- 3(2). Posterior two-fifths of corpus bursae lightly sclerotized, more strongly so on right side *perdita*
 Posterior one-half heavily sclerotized, of equal strength around circumference of corpus bursae *catalina*

***Vinemina muraenata*, new species**

Figures 15, 23

Tephrosia muraena DRUCE, 1892 (1891-1900), p. 78 (*partim*).

In general appearance this species is very similar to *Anavinemina muraena* and *promuraena*. The present species can be recognized by the generic characters. It occurs in Guatemala.

MALE: Head similar to that of *muraena*; maximum length of pectinations of antennae, about 1.0 mm. Thorax and abdomen similar to those of *muraena*.

UPPER SURFACE OF WINGS: Forewings with ground color white or whitish buff, heavily and evenly overlain with olivaceous, dark brown and buff scales, with faint ochraceous scaling along veins; maculation similar to that of *muraena*, but tending to have larger areas of ground color, and with cross lines slightly more prominent, blackish brown; terminal line of prominent, blackish brown, intravenular spots; fringe whitish buff, checkered with brown or grayish brown opposite spots of terminal line. Hind wings whitish gray, overlain with pale grayish brown scales; discal

spot dark gray, small; extradiscal line grayish brown, extending straight across wing; subterminal line partially represented; terminal line brownish black, enlarged in cells; fringe whitish buff.

UNDER SURFACE OF WINGS: Forewings whitish buff, heavily overlain with gray and grayish brown scales; costa ochraceous buff, with scattered brownish black scales; hind wings whitish buff, with ochraceous tinge, and with grayish brown and brownish black scales and strigations; veins of all wings tending to be buff; maculation of upper surface weakly represented on all wings; forewings with brownish black terminal area opposite cell, enclosing buff apex of wing, and hind wing with brownish black spot in cell M_1 in terminal area.

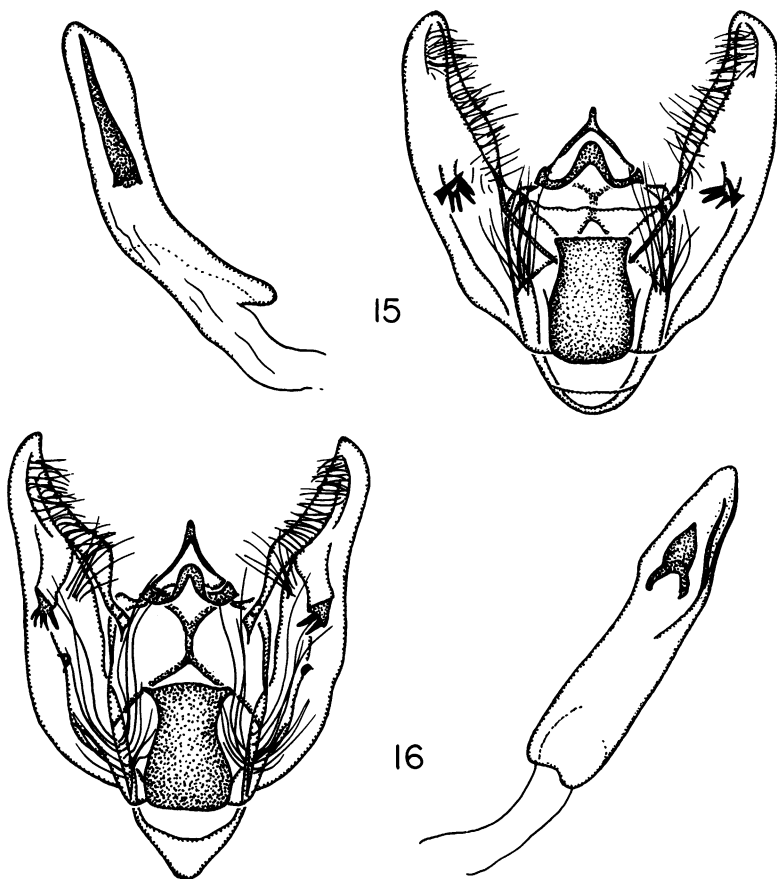
LENGTH OF FOREWING: 18 to 21 mm.; holotype, 18 mm.

FEMALE: Similar to male, but with upper surface of forewings less heavily overlain with dark scaling, with more prominent discal spot and slightly heavier cross lines, and with median area as in male; hind wings similar to those of males. Under surface of wings similar to that of males but paler.

LENGTH OF FOREWING: 18 mm. (allotype).

MALE GENITALIA: Uncus tapering, the elongate apex extending ventrally; gnathos slender laterally, enlarged and rounded medially, tapering, distal end bluntly pointed, with spiculate dorsal surface; valves elongate, slightly tapering; costa weakly swollen; sacculus enlarged along antero-lateral margin, continuing posteriorly as weakly sclerotized area, with narrow, sclerotized, digitate process from near outer margin directed medioposteriorly, and with sclerotized, broader, rounded, anteriorly directed protuberance near middle of valve, the latter with from three to five heavy spines arising from rounded apical region; setose area near base of costa weakly represented; anellus with broad, U-shaped base; aedeagus slightly longer than combined lengths of uncus, tegumen, and saccus, slender, with right side posteriorly lightly sclerotized; cornutus in vesica elongate, approximately 0.8 mm. in length, tapering to slender point from slightly swollen base.

FEMALE GENITALIA: Sterigma lightly sclerotized, tending to be membranous medially, elliptical or ovate in outline, with sinus vaginalis at base of large, funnel-like structure formed by sterigma and ventral portion of abdominal segment; ductus bursae short, slender, weakly sclerotized, joining corpus bursae posteriorly; ductus seminalis arising from posterior surface of large swelling on right side posteriorly of corpus bursae; corpus bursae elongate, membranous, posterior end attenuate on left side, joining ductus bursae, swollen on right side slightly anteriorly to form large protuberance, with median section slender and anterior end swollen;



FIGS. 15, 16. Male genitalia. 15. *Vinemina muraenata*, new species, holotype, Totonicapán, [Guatemala] (Champion; U.S.N.M.). 16. *V. opacaria* Hulst, Camp Harding, Colorado (A.M.N.H.).

signum elongate, of two rather small, widely separated, inwardly projecting points.

Types: Holotype, male, and allotype, female, Totonicapán (printed as Totonicapám), [Totonicapán, Guatemala], elevation 8500–10,500 feet (Champion). Paratypes, same data as types, five males and one female (of these, one male and the female are labeled “Godman-Salvin coll., B.C.A. Lep. Het., *Tephrosia muraena* Druce”); one male, Volcan Santa Maria, [Quezaltenango], Guatemala (Schaus and Barnes). The holotype and the allotype are in the collection of the United States National Museum; paratypes are in the collections of that institution and of the

British Museum (Natural History).

RANGE: The mountains of Guatemala. No information is available as to the time of flight of this species.

REMARKS: Nine specimens and nine genitalic dissections were studied. This species is unique in the genus in having the forewing olivaceous brown. The moths more closely resemble some of the species of *Anavinemina* than the other taxa in *Vinemina*. In maculation and color this species resembles *Anavinemina muraena* (Druce, 1881–1900, pl. 48, figs. 17, 18). However, the two species are not congeneric and can be separated by the generic characters.

Vinemina perdita Guedet

Figures 17, 21, 24

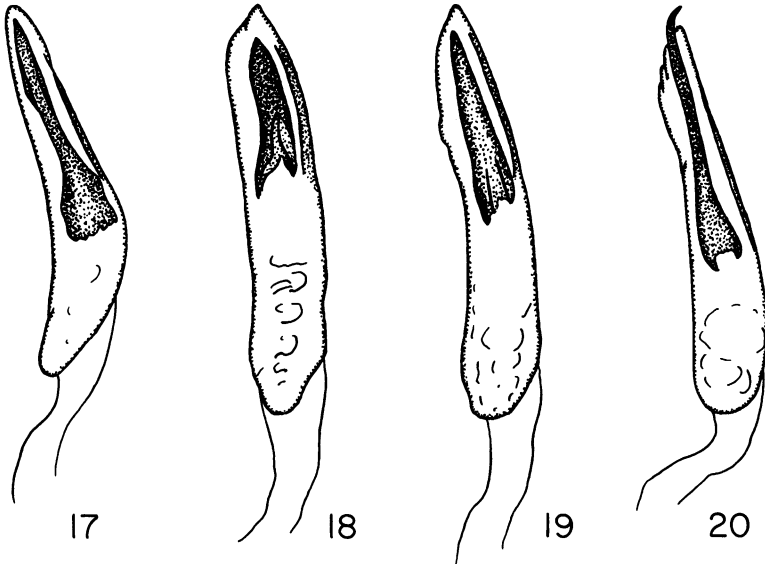
Vinemina perdita GUEDET, 1939, p. 34.

This species is unique in this genus in having pale gray or faintly grayish green forewings, with an even, over-all type of maculation. It is known only from southeastern Arizona.

MALE: Head, vertex white, with scattered grayish white and grayish black scales; front pale grayish white, with dark line below antennae; palpi pale grayish white, becoming grayish black terminally; maximum length of pectinations of antennae, about 0.8 mm. Thorax white above, with scattered black scales, the latter often concentrated to form band on collar and across patagia, and as two small posterior tufts on metathorax; below grayish white; legs pale grayish brown, with variable amounts of dark brown and brownish black scaling.

UPPER SURFACE OF WINGS: Forewings with ground color white or pale grayish white, overlain with gray, dark gray, and black scales, producing a mottled, faintly grayish green appearance; cross lines varying from indistinct to prominent, black or brownish black when represented; t. a. line arising from costal spot about one-fifth of distance from base, in form of three convex arcs in cells after crossing radial vein, and with a second basal, paler, thinner line; median line usually indistinct after leaving costal spot; discal spot black or grayish black, elongate; t. p. line arising from costal spot about two-thirds of distance from base, weakly S-shaped, more or less sharply concave in cells, outwardly projecting on veins, and shaded distally by a second paler line, the two separated by narrow strip of ground color; s. t. line arising from costal spot five-sixths of distance from base, paralleling outer margin, consisting of black, subtriangular, cellular dots pointed basally, their outer edges shaded with white, and with additional dark scaling present in some specimens opposite cell;

terminal line of black, intravenular points, separated by ground color on veins; fringe of ground color, weakly checkered with dark scales opposite points of terminal line in some specimens. Hind wings pale gray, overlain with pale brownish gray scales; discal spot small; extradiscal line usually absent, weakly indicated in some specimens; subterminal line grayish brown, rather nebulous, extending across wing but tending to be inter-



FIGS. 17-20. Aedeagus. 17. *Vinemina perdita* Guedet, upper camp, Pinery Canyon, Cochise County, Arizona, July 9, 1956 (Martin, Comstock, and Rees; A.M.N.H.). 18. *V. opacaria* Hulst, White Mountains, Arizona, June 22, 1935 (G. H. and J. L. Sperry; A.M.N.H.). 19. *V. opacaria* Hulst, Pavant, Utah, July 11, 1937 (G. H. and J. L. Sperry; A.M.N.H.). 20. *V. catalina* McDunnough, McMillan Camp, Grant County, New Mexico, July 22, 1961 (F., P., and J. Rindge; A.M.N.H.).

rupted by veins; terminal line tending to be obsolescent anteriorly, becoming brown or blackish brown posteriorly; fringe concolorous with wing.

UNDER SURFACE OF WINGS: Forewings pale grayish white, with scattered dull grayish black scales; costa whitish buff, with scattered brown scales; hind wings dull white, with scattered pale brownish gray scales and faintly ochraceous veins; maculation of upper surface weakly reflected on all wings.

LENGTH OF FOREWING: 16 to 19 mm.

FEMALE: Similar to male.

LENGTH OF FOREWING: 15 to 17 mm.

MALE GENITALIA: Very similar to those of *muraenata*, differing mainly as follows: uncus with evenly concave sides; gnathos with median swelling broader than long, distal margin gently rounded; valves with prominent costal swelling and with area of very long setae basal thereto; sacculus lightly sclerotized, weakly swollen, without outer digitate process but with from one to three small, raised, weakly setose areas anterior to median projections; rounded median projections with from five to eight antero-medially directed spines; aedeagus weakly and evenly sclerotized; cornutus in vesica elongate, approximately 1.1 mm. in length, anterior portion broad, occupying two-thirds of width of aedeagus, constricted at one-fourth to one-third of distance from base, with remainder of cornutus slender, tapering to sharp point.

FEMALE GENITALIA: Sterigma lightly sclerotized posteriorly, elliptical, with posterior margin flattened; ductus bursae short, broad, sclerotized, lateral margins apparently doubled over; ductus seminalis arising posteriorly; corpus bursae long and slender, posterior portion striate, sclerotized and punctate on right side at about one-fourth of distance from posterior end, the sclerotized area extending across corpus bursae to left side and extending slightly anteriorly; median portion of corpus bursae slender and anterior end moderately swollen; signum small, rounded posteriorly, anterior margin flat, with two separated, sclerotized points projecting anteriorly from margin.

TYPE: Holotype, male (C.A.S. No. 4796).

TYPE LOCALITY: Fly's Peak, Chiricahua Mountains, Cochise County, Arizona.

RANGE: This species is known only from Cochise County, Arizona. It has been taken in July and August. The type series was captured at elevations of from 8000 to 9000 feet. (See fig. 21.)

REMARKS: Eight specimens and six genitalic dissections were studied. The species is the only one in the genus having pale gray or faintly grayish green forewings; the pattern is of an even, over-all type. In appearance this taxon more closely resembles *Carphoides setigera* Rindge than any other species of *Vinemina*.

The male genitalia can be distinguished from those of the preceding species by the larger cornutus in the vesica, with its broad base. This species lacks the digitate process of the sacculus that is to be found in *muraenata*. The median portion of the gnathos is broader than long in *perdita*, and the distal margin is gently rounded.

The female genitalia of *perdita* can be distinguished by the elongate and

slender corpus bursae, which has a small signum and the right side more sclerotized than the left.

Vinemina opacaria (Hulst)

Figures 2, 16, 18, 19, 22, 25

Cidaria opacaria HULST, 1881, p. 27. ANON., 1882, p. 22. BEUTENMÜLLER, 1892, p. 194. RINDGE, 1955, p. 151.

Petrophora opacaria: J. B. SMITH, 1891, p. 74.

Cleora opacaria: DYAR, "1902" [1903], p. 325. J. B. SMITH, 1903, p. 77. BARNES AND McDUNNOUGH, 1917, p. 118.

Vinemina opacaria: McDUNNOUGH, 1920, p. 16, pl. 1, fig. 9 (male genitalia), pl. 7, fig. 17 (adult); 1938, p. 163; 1945, p. 97, figs. 1-3 (aedeagus).

Vinemina opacaria nigaria CASSINO, 1928, p. 95. McDUNNOUGH, 1938, p. 163. New synonymy.

This species can be recognized by the broad, pale gray basal area on the forewings and the prominent, black, median band. The outer portion of the wing is gray, more or less heavily overlain with black and dark brown scales. This taxon occurs in the southwestern United States and in the adjacent portion of Mexico.

MALE: Head, vertex with mixed gray and grayish black scales; front with mixed gray and dark grayish brown scales, paler below antennae, with broad, transverse, black or brownish black band; palpi with gray, grayish black, and grayish brown scales; maximum length of pectinations of antennae, about 0.6 mm. Thorax above with a mixture of pale gray, grayish brown, and grayish black scales, some specimens with dark band on collar and across patagia; below grayish white; legs grayish white to pale grayish brown, with variable amounts of brown and brownish black scaling. Abdomen pale grayish brown above, with scattered brown and brownish black scales, and with posterior margins of segments tending to be narrowly pale; below grayish white.

UPPER SURFACE OF WINGS: Forewings with ground color pale gray or grayish white, with outer portion of wings more or less heavily overlain with ochraceous brown, dark brown and brownish black scales; wing bisected just basal to middle by prominent, black, median shade line, and with other cross lines reduced or obsolescent; t. a. line usually absent in most specimens, when present arising about one-fifth of distance from base, crossing costa with outward course, then curving posteriorly, subparalleling median shade to inner margin; median band black, broad, curving across wing or with angle on cubital vein; discal dash black, elongate; t. p. line S-shaped, outwardly curved around discal spot and with prominent concave area in cell Cu_2 , the concavity tending to be

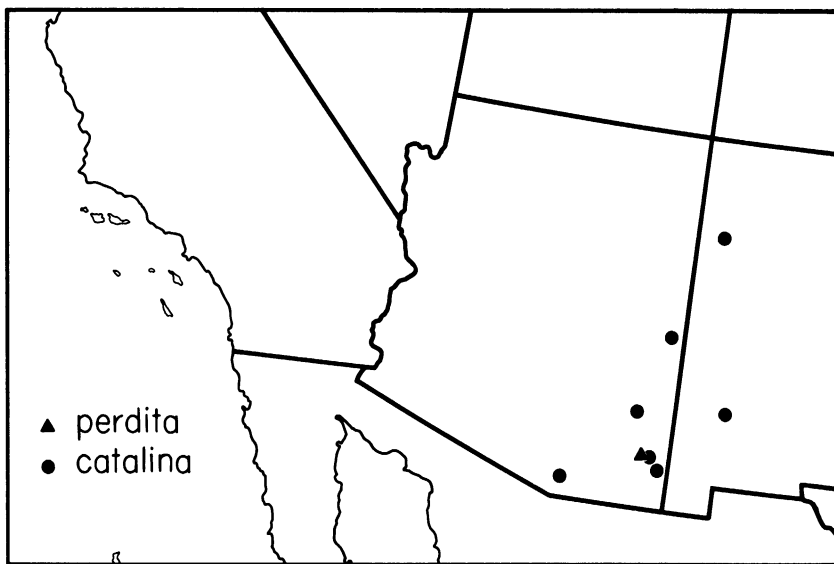


FIG. 21. Distribution of *Vinemina perdita* Guedet and *V. catalina* McDunnough in the United States.

filled with brown scales in many specimens; subterminal area broad, tending to be lightly overlain with darker scales, and with veins tending to be black, particularly vein M_3 with dull black shading on both sides; s. t. line arising in prominent, elongate costal spot, tending to become obsolescent in lower portion of wing; terminal line black, with elongate, narrow, intravenular spots; fringe gray or grayish brown, outer portion white, and faintly checkered with white opposite veins. Hind wings dull gray, overlain with pale grayish brown scales; discal spot small or absent; extradiscal line absent, weakly indicated in lower portion of wing in some specimens; subterminal line obsolescent, when present paralleling outer margin; terminal line brownish gray; fringe concolorous with wing.

UNDER SURFACE OF WINGS: Forewings pale grayish white, with scattered gray and grayish brown scales; costa pale buff, with brownish black or grayish black scaling; hind wings dull white, evenly overlain with brown scales; maculation of upper surface weakly reflected on all wings.

LENGTH OF FOREWING: 14 to 19 mm.

FEMALE: Similar to male, but tending to be slightly paler.

LENGTH OF FOREWING: 14 to 19 mm.

MALE GENITALIA: Very similar to those of *perdita*, differing as follows: larger; gnathos with median swelling approximately as wide as long,

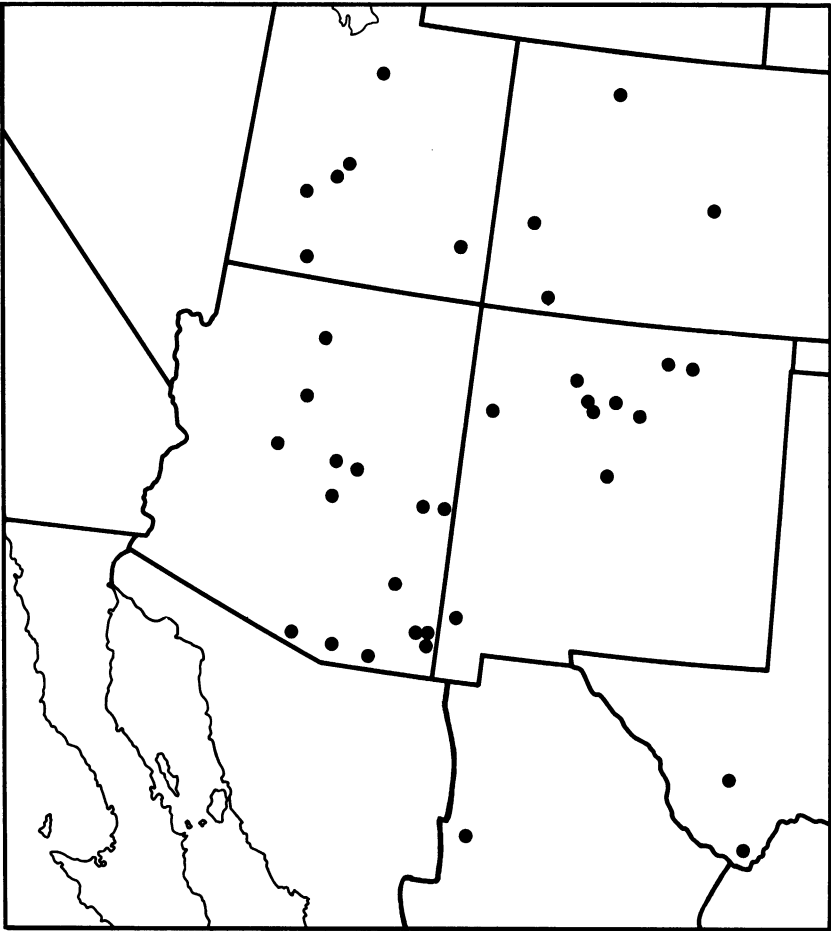


FIG. 22. Distribution of *Vinemina opacaria* (Hulst).

distal margin evenly rounded; valves with moderate costal swelling, and with moderate area of elongate setae basal thereto; sacculus with slightly more heavily sclerotized area extending to median projection, and with small, single, weakly spinose area situated farther anteriad; median projection tending to be elongate and to have two or three anteriorly directed spines; aedeagus with right side sclerotized posteriorly; cornutus in vesica varying from short to moderately long, ranging from 0.3 to 1.0 mm. in length, more or less evenly tapering from broad base, the latter concave in most specimens.

FEMALE GENITALIA: Sterigma lightly sclerotized laterally and posteriorly, elongate, slightly tapering anteriorly; ductus bursae short, wide, increasing in width anteriorly to join corpus bursae, with lateral margins apparently doubled over, membranous posteriorly, becoming sclerotized anteriorly; ductus seminalis arising from posterior end of corpus bursae, dorsad of ductus bursae; corpus bursae long and slender, posterior end curved, heavily sclerotized and punctate for about one-sixth to one-eighth of length, with median portion of same width as posterior region, and with anterior end slightly enlarged; signum absent.

TYPES: Hulst described *opacaria* from four specimens, without specifying the numbers of males or females. Two of these are in the collection of the American Museum of Natural History; one is a male, from the Henry Edwards collection (Beutenmüller, 1892), while the other is a female from the Hulst collection (Rindge, 1955). This male is hereby designated as the lectotype. There are also two specimens in the collection of the United States National Museum that carry Hulst's type labels.

The holotype male of *nigaria* is in the collection of the Museum of Comparative Zoölogy at Harvard College.

TYPE LOCALITIES: Colorado (*opacaria*); Alpine, Brewster County, Texas (*nigaria*).

RANGE: The southern Rocky Mountain states of Colorado, Utah, Arizona, and New Mexico, extending into western Texas and the Mexican state of Chihuahua. (See fig. 22.) The moths have been taken from late March through September.

REMARKS: Four hundred and seventy-five specimens and 47 genitalic dissections were studied. This moth can be distinguished without any difficulty from the preceding species by its pale gray color and by the prominent black median band on the forewings. It can, however, be confused with the following species.

There is some geographic variability in the color and size of this moth. Freshly caught specimens from Colorado, Utah, and New Mexico tend to be rather small and relatively dark, while examples from Arizona tend to be larger and paler. Some specimens from Texas are rather heavily suffused with dark scaling on the forewings (topotypical *nigaria* Cassino); examples from about 80 miles farther south in Brewster County are more like the New Mexico moths but have the basal area of the forewings slightly darkened. This variation appears to be clinal, though specimens from Alpine, Texas, may average a bit darker than the moths from adjacent areas. Consequently the name *nigaria* is placed in the synonymy.

The male genitalia of *opacaria* can be identified by the shape and size of the spine in the vesica. McDunnough (1945) called attention to the

variation in the size of this spine. In the course of the present study a number of dissections were made of the male genitalia from several different localities throughout the range of the species. The length and width of the spine were measured; these data are presented in table 1, together with the localities. The specimens with the shortest spines occur in and adjacent to the Rocky Mountains in Colorado, southeastern Utah, and northern New Mexico. The longest spines are found in material from Utah west of the Colorado River. Specimens from the rest of the range of the species fall between these extremes, and they tend to be rather uniform in the length of the spine.

The female genitalia of *opacaria* can be easily recognized by the heavily sclerotized posterior end of the corpus bursae.

Vinemina catalina McDunnough

Figures 20, 21, 26

Vinemina catalina McDUNNOUGH, 1945, p. 98, fig. 4 (aedeagus).

This species is very similar to *opacaria*. It can be distinguished by its smaller size, and by the darker and more contrastingly colored upper surface of the forewings. The genitalia of both sexes are distinctive. This species occurs in Arizona, New Mexico, and Durango.

MALE: Head, thorax, and abdomen similar to those of *opacaria*, but tending to be slightly darker; maximum length of pectinations of antennae, about 0.7 mm.

UPPER SURFACE OF WINGS: Forewings with ground color light gray, heavily overlain with dark brown and black scales; maculation similar to that of *opacaria*, tending to differ as follows: basal area suffused with dark scales in most specimens; t. a. line, when present, going diagonally across wing to join median shade line in cubital cell, then curving basad to inner margin; t. p. line with upper, convex portion broadly shaded on both sides with dark scales; median area below cell heavily suffused with black scales in many specimens; subterminal area with broad black area on vein M_3 , and with contrasting white spot in cells M_1 and M_2 ; terminal area tending to be darker than subterminal area, and to have black cellular spots distal to s. t. line, tending to unite with terminal line in some specimens. Hind wings like those of *opacaria*, or tending to have subterminal line slightly more strongly represented.

UNDER SURFACE OF WINGS: Similar to that of *opacaria*, with some specimens tending to have slightly more maculation.

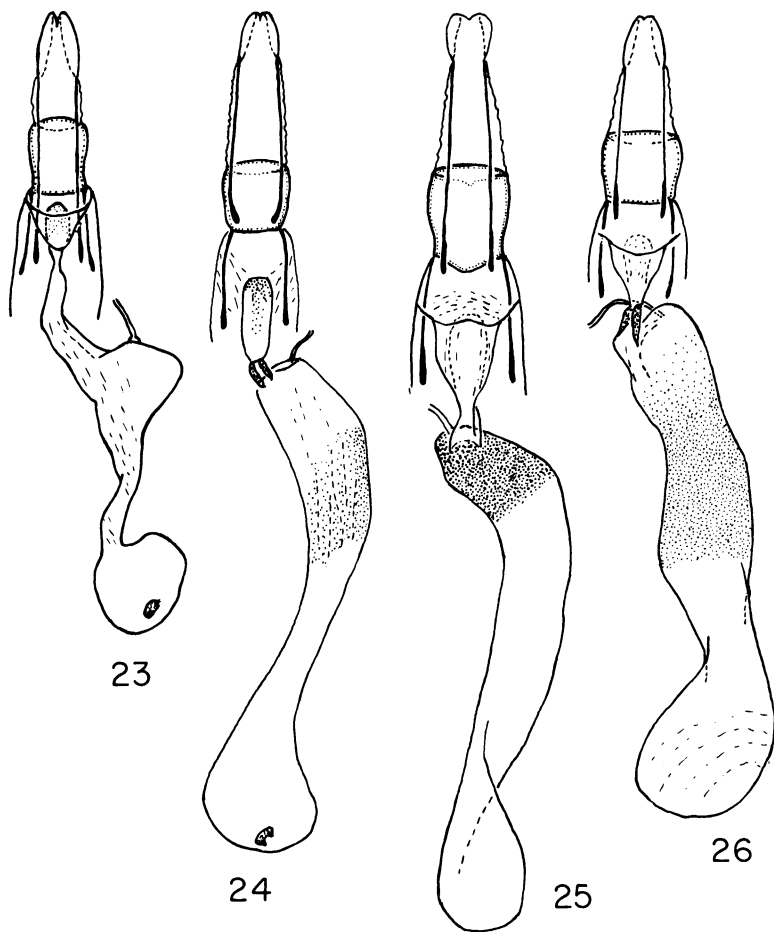
LENGTH OF FOREWING: 12 to 16 mm.

FEMALE: Similar to male, but with less contrasting maculation, as

TABLE 1
SIZE OF SPINE IN AEDEAGUS (IN MILLIMETERS) OF *Vinemina opacaria*
(HULST) AND *Vinemina catalina* McDUNNOUGH

	State and County	No. of Localities	No. of Specimens	Range		Average	
				Length	Width	Length	Width
<i>opacaria</i>							
	Arizona						
	Apache	1	3	0.69–0.81	0.19–0.23	0.72	0.22
	Cochise	3	5	0.79–0.90	0.23–0.25	0.84	0.23
	Coconino	1	1	—	—	0.69	0.23
	Gila	2	2	0.77	0.23	0.77	0.23
	Pima	1	3	0.77–0.92	0.23–0.29	0.85	0.26
	Yavapai	1	1	—	—	0.85	0.23
	Colorado						
	El Paso	1	1	—	—	0.39	0.25
	Montrose	1	1	—	—	0.39	0.17
	Routt	1	1	—	—	0.39	0.23
	—	1	1	—	—	0.42	0.23
	Chihuahua						
	—	1	2	0.85–0.96	0.25–0.27	0.90	0.26
	New Mexico						
	Hidalgo	1	1	—	—	0.81	0.21
	McKinley	1	1	—	—	0.85	0.23
	Sandoval	4	4	0.40–0.69	0.21–0.25	0.50	0.23
	Taos	1	1	—	—	0.31	0.23
	Texas						
	Brewster	2	1	0.73–0.83	0.21–0.27	0.78	0.23
	Utah						
	Beaver	1	2	1.06	0.19–0.25	1.06	0.22
	Kane	1	1	—	—	1.02	0.25
	San Juan	1	2	0.31–0.39	0.23–0.27	0.35	0.25
	Sevier	1	1	—	—	1.00	0.21
<i>catalina</i>							
	Arizona						
	Apache	2	2	1.19–1.25	0.14–0.15	1.22	0.14
	Cochise	2	3	1.11–1.21	0.15–0.23	1.16	0.19
	New Mexico						
	Grant	1	2	1.23–1.36	0.19–0.21	1.29	0.20
	McKinley	1	1	—	—	1.25	0.19
	Durango						
	—	1	1	—	—	1.46	0.12

entire upper surface of forewing tends to be more or less evenly suffused with dark gray and brownish black scales; median shade line tending to be narrow or obsolescent; hind wings more heavily suffused with dark



FIGS. 23-26. Female genitalia. 23. *Vinemina muraenata*, new species, paratype, Tonicapán, [Guatemala] (Champion; B.M.N.H.). 24. *V. perdita* Guedet, Pinery Canyon, Cochise County, Arizona, July 8, 1956 (C. W. Kirkwood; A.M.N.H.). 25. *V. opacaria* Hulst, Southwestern Research Station of the American Museum of Natural History, Cochise County, Arizona, May 6, 1956 (M. Statham; A.M.N.H.). 26. *V. catalina* McDunnough, Otinapa, Durango, August 11, 1947 (Gertsch and Cazier; A.M.N.H.).

scales than those of male. Under surface also more heavily suffused with dark scales than that of males.

LENGTH OF FOREWING: 13 to 18 mm.

MALE GENITALIA: Very similar to those of *opacaria*, differing mainly as

follows: valves with sclerotized area of sacculus well defined, with small, raised, setose area tending to be slightly larger, and with median projection tending to be slightly longer; aedeagus longer; cornutus in vesica very long and slender, ranging from about 1.2 to 1.5 mm. in length, evenly tapering from hollowed-out base, and with apex slightly twisted to right.

FEMALE GENITALIA: Sterigma with posterior one-half weakly sclerotized, elongate, slightly tapering anteriorly; ductus bursae short, broad, increasing in width anteriorly, sclerotized, lateral margins apparently doubled over; ductus seminalis arising from posterior end dorsad of ductus bursae; corpus bursae elongate, slender, posterior end membranous, becoming sclerotized and punctate anteriorly and extending to about middle, anterior portion membranous; median section of same width as posterior part, and with anterior end slightly swollen; signum absent.

TYPE: Holotype, male (C.N.C. No. 5569).

TYPE LOCALITY: Santa Catalina Mountains, Pima County, Arizona.

RANGE: Arizona and New Mexico, south into the Mexican state of Durango. (See fig. 21.) The moths have been caught in the months of June, July, and August.

REMARKS: Eighty-four specimens and 12 genitalic dissections were studied. This species is very similar to *opacaria*, with which it sometimes flies. The males of the present taxon tend to have more heavily suffused and contrastingly marked forewings above; they are also smaller. A series of 12 males of *catalina* from Cochise County, Arizona, range in length of forewing from 13 to 15 mm.; the average length is 14 mm. A series of 22 males of *opacaria* from the same county vary from 15 to 19 mm., with an average length of 17 mm. The females of *opacaria* have the same type of maculation and coloration as do the males, although some examples tend to be slightly paler. The females of *catalina* are less contrastingly marked than the males, and tend to have a reduced median shade line on more or less evenly gray-colored wings.

The genitalia of both sexes of *catalina* indicate a close relationship with *opacaria*. The male structures can be most easily recognized by the very long and slender spine of the vesica. Data are given in table 1 on the length and width of this structure in specimens from several different localities. In every case the spine is longer and, with one exception, more slender than that found in *opacaria*.

The female genitalia of *catalina* are intermediate, to some degree, between those of *perdita* and those of *opacaria* in the extent and position of the sclerotized area of the corpus bursae.

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