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INTRODUCTION

THE SPECIES COVERED in the present paper form a compact tribe within the Ennominae. For this highly evolved group, Forbes (1948) has used the name Nacophorini. The stem genus *Nacophora* is placed in the synonymy in this paper, but the tribal name is being retained in accordance with the provisions of the International Code of Nomenclature.

Anything approaching adequate material has not been available until the past few years and, in most cases, much more material is needed before a really thorough study can be undertaken on this tribe. However, this paper attempts to reevaluate these moths, to answer some of the questions pertaining to their phylogeny, distribution, and taxonomy, and to propose a more satisfactory systematic arrangement of the species.

The members of this tribe are found from southern Canada to southern South America. They are usually not well represented in collections, as several of the species, in this country at least, do not readily come to standard electric lights or to lanterns. They respond more readily to the ultra-violet frequencies, and the increased use of "black lights" by collectors in the past few years has brought increased numbers of specimens to hand. Much more collecting with this type of light is needed, both in the temperate region and in the tropical and subtropical areas, so that we can obtain adequate study material and acquire a more thorough idea of the distribution of the different species.

MATERIALS AND METHODS

MATERIALS STUDIED

This revision is based on a study of the specimens in some of the major eastern and western museums, the collection of the British Museum (Natural History), and the private collections of several individuals; these are referred to specifically in the section on acknowledgments. All the type specimens in this country have been studied by the author. The several types in the British Museum (Natural History) have not been personally examined, but, through the generous cooperation of Mr. D. S. Fletcher, the

genitalia of those types have been studied and compared.

All the specimens studied by the author at the American Museum of Natural History during the preparation of this paper have had identification or type labels affixed. Consequently future workers will recognize material studied by the author. All too often such labeling has not been done in the past, so that there is always the question of whether or not certain specimens were examined by a reviser. The specimens photographed for this revision bear a typewritten "photo" label. In general, the adults and genitalia that are figured have been taken from the collection of the American Museum of Natural History. When this was not practical, the fact is specifically noted. 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.M., Carnegie Museum, Pittsburgh
- L.A.M., Los Angeles County Museum, Los Angeles
- M.C.Z., Museum of Comparative Zoölogy at Harvard College
- U.S.N.M., United States National Museum, Washington, D. C.

During the course of this study, 1516 specimens were studied. A large number of genitalic slides were prepared by the author, who also had at his disposal the slides made by Grossbeck and Sperry at the American Museum of Natural History, by Capps, Franclemont, and Todd of the United States National Museum, and by Cassino at the Museum of Comparative Zoölogy at Harvard College. In all, 145 genitalic slides were examined. In addition, the author also made a number of slide preparations of wings, legs, and antennae; these, plus slides of similar nature made by Grossbeck, totaled 21.

DESCRIPTIONS

A binocular dissecting microscope was used throughout when descriptions of the adults and genitalia were written. The same basic pattern of descriptions is followed throughout

this paper for all generic and specific descriptions. All species are characterized by a detailed description of the adult male, with comparative notes on the female, and full descriptions of the genitalia of both sexes are given, when both sexes are known.

GENITALIC FIGURES

The genitalia of each sex within each genus were drawn to the same scale and received a uniform reduction; however, the genitalic organs of the two sexes were not necessarily drawn to the same scale. Some caution must be taken in the use of these figures, especially of the males, as the appearance of certain parts may vary depending upon the degree to which the preparations are flattened. The author attempted to overcome such discrepancies by making, if necessary, several dissections to obtain comparable mounts, but such dissections were sometimes impossible because of insufficient material.

ACKNOWLEDGMENTS

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The author also wishes to thank Miss Marjorie Statham for the genitalic drawings and distribution maps included in this paper,

and Mr. Rudolph J. Schrammel for the photographic work.

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HISTORICAL BACKGROUND

The species of this tribe have not been collected very extensively in this country, as they apparently do not readily come to lights. This paucity of material explains, in part at least, the relative lack of knowledge about these moths. The first species was described in 1797 by J. E. Smith. It was not until 60 years later that Guenée published the next description; this was followed in the next seven years by several more specific descriptions by Walker and Grote. Near the end of the last century Grote and Hulst named both North American genera and four more species. Between 1917 and 1923 the last four specific names were proposed by Barnes and McDunnough, Dyar, and Cassino and Swett. It was not until 1917 that Barnes and McDunnough brought some semblance of order to the specific level in the genus *Phaeoura*.

In South and Central America the history of this group is even sketchier. One of the earlier writers, Stoll, described and illustrated the first South American species, while Guenée, Walker, Herrich-Schäffer, and the Felders added others at a later date. Druce, in the "Biologia Centrali-Americana," proposed several specific names for Central American forms, and Dyar extended the tribe into Mexico. Schaus described one species from southern South America in 1927. The only synonymic notes for this entire faunal region were published by Prout in 1910 for the widespread species *arnobia*.

PHYLOGENY

A comparative study of the four genera included in this tribe shows certain evolutionary trends, not only in the external structures of the adults, but in the genitalia of both sexes as well. Unfortunately the early stages are almost completely unknown, so no comparisons can be made at this level at the present time.

Betulodes is the most primitive genus, based on the external characters. Some of the

primitive characters of this genus include the possession of two pairs of spurs on the hind tibia, moderately long palpi, the usual, long terminal seta as well as a second, slightly shorter seta at the end of each pectination on the male antennae, simple female antennae, scalloped wing margins, and the fact that veins R and M_1 arise before the upper angle in the secondaries. The more advanced characters are a single pair of spurs on the hind tibia, short palpi, a long terminal seta only on the male antennae, shortly serrate or shortly bipectinate female antennae, smooth wing margins, and the fact that veins R and M_1 arise at, or are stalked beyond, the upper angle in the hind wings. The other three genera have some or most of these characters.

Evolutionary trends in the male genitalia are to be found in the progressively more membranous gnathos, in the appearance of the diagonal or transverse sclerotized ridge on the inner face of the valves, and in the progressive loss of the cornuti in the aedeagus. Based on these characters, *Thyriniteina* and *Holochroa* are more primitive than *Betulodes*, with *Phaeoura* being the most advanced type.

Comparisons of the female genitalia show a progressive reduction in the size and sclerotization of the sterigma, a reduction in the size of the corpus bursae, and a reduction in the signum, which varies from heavily sclerotized and large to being completely absent. *Betulodes* and *Thyriniteina* have the most primitive characters here, while *Holochroa* and *Phaeoura* are more advanced.

A summary of the above results shows that *Betulodes* is the most primitive genus, and *Phaeoura* the most advanced. In a number of characters these two genera appear similar, so are thought to be rather closely allied. Of the other two genera, *Thyriniteina* has more primitive characters, and it is probably rather closely related to *Betulodes*. *Holochroa* apparently represents a more isolated genus, as it seems to be more distantly related to the others in this tribe.

TAXONOMY

The moths of this tribe can be recognized without much difficulty. They usually have abdominal tufts, a single spur on the hind tarsus, and a characteristic elongate seta at

the end of each pectination of the antenna of the males. The female ovipositor lobes are characterized by the fact that the point of attachment of the apophyses posteriores is in the center of the lobes. A number of them have been confused with the members of the Bistonini in the past, but these characters will serve to distinguish the Nacophorini.

The four included genera are all quite distinct, as are most of the species. The greatest difficulty will be found in properly determining some of the species of *Phaeoura* from the western United States. One problem is a lack of material, particularly of the females of certain species, as only one or two specimens of this sex may be known, while 50 or 75 males may be at hand. It is not unusual to find good specific characteristics in the female, and the members of this sex are sometimes easier to determine than the corresponding males.

The genera included in this paper have a number of characters in common. The tribal characters are summarized here to avoid needless repetition in the generic descriptions:

Head, eyes large, round; front flat, rarely extending beyond eyes; tongue reduced, vestigial, or absent; palpi short to moderate; antennae of male very strongly pectinate, the pectinations arising in basal portion of segments, extending completely to end of antenna or with a few apical segments simple, each pectination with numerous transverse setae and simple, longer terminal seta, of female simple or shortly pectinate, with paired terminal setae. Thorax stout, with mixture of scales and hair-like scales dorsally, often heavily covered with hair-like scales below; fore tibia unarmed, with process arising in male near base or from center and extending to or beyond end of segment, in female arising near center and extending from one-half to all the way to end of segment; hind tibia usually with terminal pair of spurs only, rarely with two pairs, not dilated and without hair pencil. Abdomen stout, with middorsal segmental tufts, varying from small and inconspicuous to large and prominent; ventral surface of third segment without row of bristles in males, and eighth segment without plate. Forewings broadly triangular to elongate, larger and more

elongate in females than in males; forewings with variable radial venation, 12 veins, with a single, narrow areole, C connected with R_1 , R_1 and R_2 from top of cell, R_5 from stalk before R_{3+4} ; M_1 from upper angle, M_2 usually tending to be rather weak, with dc weak; Cu_1 from below lower angle; fovea absent. Hind wings broad, tending to be concave between veins; frenulum strong in both sexes; Sc approximate to R near base, near middle of cell, or not at all; R and M_1 from before or beyond upper angle; M_3 from lower angle; cell elongate, extending beyond middle of wing; Cu_1 from one-third or one-half distance between angle and Cu_2 .

MALE GENITALIA

Uncus simple, narrow, elongate, curving ventrally, in some specimens reduced; socius present, although it may be greatly reduced; gnathos rather weakly sclerotized or membranous; valves moderately large, broad, symmetrical, costal region sclerotized but not reaching apex, remainder of valve membranous or with a broad, heavily sclerotized, transverse, toothed structure; transtilla well developed; anellus with a pair of large, lateral, pointed, heavily sclerotized structures; juxta well sclerotized, broad, variously modified, either with central or with central and lateral sclerotized projections; cristae and furca absent; tegumen broad; saccus as long as, or longer than, length of tegumen, broad, truncate or broadly rounded anteriorly; aedeagus slender or swollen at base, about equal in length to combined lengths of tegumen and saccus; vesica unarmed, with several small cornuti, or with a single, heavy cornutus.

FEMALE GENITALIA

Ovipositor lobes elongate and narrow, with apophyses attached near middle of sclerotized anterior margin; sterigma with wide, elongate plate, longer than wide; ductus bursae either a well-sclerotized, subtriangular, or a more membranous rectangular structure; ductus seminalis arising dorsally or on right side just anterior to ductus bursae; corpus bursae small to moderately large, membranous, with or without a signum.

KEY TO GENERA

BASED ON EXTERNAL MORPHOLOGY

1. Hind tibia with two pairs of spurs. *Betulodes*
Hind tibia with one pair of spurs 2
2. Abdomen with prominent dorsal tufts
 *Phaeoura*
Abdomen without prominent dorsal tufts. 3
3. Wings elongate, gray; forewings with t. p. line sharply angled opposite cell, then inwardly oblique to meet inner margin basad of center *Holochroa*
Wings broad, white or brown; forewings with t. p. line concave between veins, curved outward opposite cell and above inner margin, concave between, meeting inner margin at least two-thirds of distance from base.
 *Thyriniteina*

BASED ON MALE GENITALIA

1. Inner surface of valve with a raised, sclerotized, transverse structure 2
Inner surface of valve simple or with a single basal arm 3
2. Valves short, not extending beyond base of uncus; inner surface of valve with wide, toothed, transverse structure located crosswise in center of valve. *Phaeoura*
Valves elongate, extending at least one-half of length of uncus; inner surface of valve with low transverse structure extending much farther posteriad on outer margin of valve than on inner. *Betulodes*
3. Aedeagus with a single, prominent cornutus and an elongate uncus. *Holochroa*
Aedeagus with one or more small cornuti or a single, prominent cornutus and a greatly reduced uncus *Thyriniteina*

BASED ON FEMALE GENITALIA

1. Signum usually absent, when present round, weakly defined *Phaeoura*
Signum present, prominent, not round. 2
2. Sterigma weakly sclerotized, small; signum stellate *Holochroa*
Sterigma with large, well-sclerotized lamella postvaginalis and lamella antevaginalis; signum not stellate 3
3. Lamella postvaginalis and lamella antevaginalis in form of a single, large, sclerotized plate *Betulodes*
Lamella postvaginalis and lamella antevaginalis distinct, separated by membranous area *Thyriniteina*

SYSTEMATIC DESCRIPTIONS

GENUS BETULODES THIERRY-MIEG

Betulodes THIERRY-MIEG, 1904, Le Naturaliste, yr. 26, p. 183.

Head with palpi of male reaching above middle of eye, of female reduced, not reaching middle of eye; antennae of about 68 segments, basal segments shorter than terminal ones in male, pectinations of male extending to penultimate segment, the longest ones about 10 to 15 times as long as basal antennal segments, slightly swollen basally, and with a long, lateral seta adjacent to apical seta, of female simple. Thorax above with scattered, elongate, hair-like scales, and a small, paired metathoracic tuft, below with numerous hair-like scales; fore tibia with process of male arising near base, the process being as long as or longer than length of tibia, hind tibia with two pairs of spurs. Abdomen with moderate to small dorsal tufts. Forewings broad, concave between veins; hind wings strongly concave between veins, Sc approximate to R about one-fourth or one-third of length of cell; R and M₁ from before upper angle.

MALE GENITALIA: Uncus elongate; socius present, consisting of from about eight to 24 elongate setae; gnathos narrow, partially or completely sclerotized; valves elongate, broad, pointed apically, with a long, diagonal, sclerotized ridge, sacculus swollen, extending as far as diagonal ridge; anellus with paired lateral structures well developed, with two pairs of elongate, curved points; juxta with posterolateral and median areas slightly produced, concave between; saccus truncate anteriorly; aedeagus long and slender, vesica unarmed.

FEMALE GENITALIA: Sterigma with lamella postvaginalis and lamella antevaginalis fused to form a large, U-shaped plate surrounding ostial opening; ductus bursae short, sclerotized, thin; ductus seminalis arising dorsally or on right side; corpus bursae membranous, elongate, with a large, well-sclerotized signum.

EARLY STAGES: Unknown.

The species of this genus can be distinguished from the others in this tribe by the presence of two pairs of spurs on the hind

tibia, and by the fact that the wing margins are concave between the veins. The males of two of the species have very long antennal pectinations, while the other two have the pectinations of about average length. The male genitalia are characterized by having a diagonal or transverse sclerotized ridge across the inner face of the valves which terminates much farther posteriorly on the outer margin of the valve than at the base. The female genitalia, as far as they are known, have the lamella postvaginalis and the lamella antevaginalis fused together to form a large, U-shaped plate around the ostial opening.

This genus is represented by four species, consisting of two pairs of closely allied species. The males of three of these occur in two color forms, one a dark brown with more or less extensive white scaling along the front part of the upper surface of the forewings, and the second a unicolorous, paler brown. When additional material of the fourth species becomes available, it will be interesting to see if it also occurs in both color forms. The females, of which but two are known, are much larger and have whiter wings than the corresponding males.

KEY TO SPECIES

BASED ON EXTERNAL CHARACTERS

1. Males 2
- Females¹ 5
- 2(1). Longest pectinations of antennae about 10 times as long as basal segments, or approximately 1.5 mm. in length 3
- Longest pectinations of antennae about 15 times as long as basal segments, or approximately 3 mm. in length. 4
- 3(2). Extradiscal line of secondaries passing discal dot at distance of about 2 mm. . . *crebraria*
- Extradiscal line of secondaries passing discal dot at distance of about 3 mm. *matharma*
- 4(3). T. p. line of upper surface of forewings solid, not accentuated on the veins; length of forewing, 24 to 27 mm. . . *antennatissima*
- T. p. line of forewings consisting mainly of venular dots; length of forewing, 32 to 33 mm. *euriceraea*

¹ The females of *antennatissima* and *euriceraea* are unknown

- 5(1). Upper surface with t. p. line of forewings and extradiscal line of hind wings dark brown, stronger on veins than in cells, rather weakly dentate *crebraria*
 T. p. line of forewings and extradiscal line of hind wings black, strongly represented in cells between veins and strongly dentate *matharma*

BASED ON MALE GENITALIA

1. Diagonal sclerotized ridge on inner surface of valve extending to outer margin 2
 Diagonal sclerotized ridge on inner surface of valve subparalleling costa, not outwardly curved *matharma*
2. Diagonal sclerotized ridge with large, knobbed protuberance near middle of valve *crebraria*
 Diagonal sclerotized ridge without large protuberance 3
3. Posterior fork of paired structures of anellus three times as long as anterior fork
 *antennatissima*
 Length of posterior and anterior branches of paired structures of anellus equal
 *euriceraea*

BASED ON FEMALE GENITALIA¹

1. Lamella antevaginalis broadly fused with lamella postvaginalis, producing a very wide, flat, U-shaped plate around ostial opening; signum with single elongate ray from anterior side. *crebraria*
 Lamella antevaginalis narrowly fused with lamella postvaginalis, producing a narrow, U-shaped plate around ostial opening; signum with rays of same size
 *matharma*

Betulodes crebraria (Guenée)

Plate 18, figures 1, 4, 5; text figures 19, 30

Amphidasys crebraria GUENÉE, 1857, Histoire naturelle des insectes, vol. 9, p. 210; 1858, *op. cit.*, atlas, phalénites, pl. 10, fig. 3 (female). WALKER, 1860, List of the specimens of lepidopterous insects in the collection of the British Museum, pt. 21, p. 308. VIETTE, 1950, Bull. Mens. Soc. Linnéenne, Lyon, yr. 19, p. 202.

Amphidasys cebraia (sic), OBERTHÜR, 1913, Etudes de lépidoptérologie comparée, fasc. 7, p. 250.

Betulodes crebraria, THIERRY-MIEG, 1904, Le Naturaliste, yr. 26, p. 183.

A dimorphic species occurring in South America, the males being either a unicolorous

¹ The females of *antennatissima* and *euriceraea* are unknown.

brown or brownish gray or else a dark brown with more or less extensive white scaling parallel to the costa of the forewing, and the much larger females having a white or yellowish white ground color on the upper surfaces of the wings.

MALE: Head, vertex brownish black or grayish brown; front brownish black; palpi ascending to beyond middle of eyes, brownish black. Thorax above brownish black or grayish brown, with scattered white, gray, and brown scales, below brown or pale grayish brown, slightly darker anteriorly; legs brown or pale grayish brown, forelegs brownish black on outer surface, with ends of segments paler. Abdomen above with mixed white, gray, grayish brown, and brown scales, paler below.

UPPER SURFACE OF WINGS: Forewings with ground color dark brown or grayish brown, the latter heavily and evenly overlain with brown scales, in many specimens with anterior portion of wing, from base, through cell, as far as s. t. line, parallel with costa, broadly overlain with white scales; basal area varying from pure ground color to heavily overlain with white scales; t. a. line weakly indicated, often represented by brown costal spot about one-third of distance from base and by elongate brown spots on cubital vein and in fold; median area with lower portion suffused with brownish orange scales in some specimens, with a dark discal spot, and a narrow, brown, median shade line, stronger in lower portion of wing, slightly S-shaped; t. p. line represented by blackish brown venular spots, in some specimens connected by weak concave line, these in some specimens stronger in lower portion of wing, the line arising about two-thirds of distance from base as a costal spot, extending outward to vein M₃, then concave to anal vein; subterminal and terminal areas concolorous with remainder of wing or of ground color; s. t. line usually indicated by white dots or small, outwardly pointing V's; terminal line brownish black or black, some specimens with white scaling basally, broadly interrupted by veins; fringe concolorous with wing. Hind wings concolorous with forewings, tending to have basal area slightly brighter colored than outer part; median shade line present, extending across wing, passing basad of, or through, black discal

spot; extradiscal line black, usually complete, in some specimens pale and weak, concave between veins, the line with a longer tooth on vein M_3 , usually passing about 2 mm. from discal dot; subterminal area brownish black or of ground color, irrorate with white scales in some specimens; s. t. line represented by white cellular spots, strongest in lower portion of wing, marked basally in lower portion of wing by dark brown scales; terminal line and fringe like those on forewings.

UNDER SURFACE OF WINGS: All wings pale to dark yellowish brown, suffused with grayish brown or brown scales; costa of forewings brighter, interrupted by brownish black irrorations; discal spots present on all wings, otherwise without definite maculation, except for mirroring of cross lines from upper surface in most specimens.

LENGTH OF FOREWING: 26 to 30 mm.

FEMALE: Similar to male but much larger and much paler. Head as in male, but with reduced palpi, not reaching middle of eye.

UPPER SURFACE OF WINGS: Forewings with ground color white, with numerous brown strigations, and suffused with yellow in some specimens; costa broadly brown at base and between cross lines; median area more heavily suffused with brown than adjacent areas; subterminal area with brown scaling at costa and another above tornus. Hind wings concolorous with forewings, maculation like that of male.

UNDER SURFACE OF WINGS: Like that of male, but with white or pale yellow ground color, and with brown scaling more pronounced.

LENGTH OF FOREWING: 37 to 49 mm.

MALE GENITALIA: Uncus elongate, tapering; socius with approximately 24 setae; gnathos narrow, becoming membranous anteriorly; valves with outer margin rounded, bluntly pointed apically, extending posteriorly from between one-half to two-thirds of length of uncus; costa broadly sclerotized for less than one-half of its length; median portion of valve lightly sclerotized, with raised, semi-diagonal, sclerotized ridge extending distally from anterolateral margins of transtilla, curving laterally and terminating in a raised, knobbed protuberance near outer margin of valve; valves distad of ridge with elongate setae; sacculus swollen,

strongly curved ventrally and extending from base of valve to near end of sclerotized ridge, and having a few small, raised projections terminally; anellus with large, smooth, paired structures, the posterior pair very slightly curved at base and recurved terminally, the anterior pair of about equal size, extending anteriorly, then curved ventrally; juxta moderately large, with posterolateral areas extended posteriorly and connected with paired structures of anellus, and with a weak median projection; saccus broadly rounded or truncate anteriorly, with a slight median concavity; aedeagus moderately long and slender, about two-thirds of combined lengths of tegumen and saccus, with terminal one-third somewhat flattened dorsoventrally.

FEMALE GENITALIA: Sterigma with area of lamella postvaginalis raised, constricted posteriorly, then flared out, with posterior margin slightly concave medially, laterally and anteriorly the lamella antevaginalis continued as large, flat, very wide, U-shaped plate extending around ostial opening; ductus bursae short, sclerotized, tapering anteriorly, posteriorly with two small, inwardly directed folds near ostial opening, ductus seminalis arising dorsally from near anterior end of ductus bursae; corpus bursae elongate, membranous, ovate in outline, with a large, well-sclerotized signum, flattened, with a raised ventral rim laterally and anteriorly, laterally with several small teeth and anteriorly with a single, elongate, tooth-like projection.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: The type male and allotype female are in the collection of the Muséum National d'Histoire Naturelle, Paris (Viette, 1950).

TYPE LOCALITY: "Environs de Rio-Janeiro," Brazil.

DISTRIBUTION: South America and Panama. Specimens have been examined from Bolivia, Brazil, British Guiana, Panama, Paraguay, and Peru. On the wing in February, April through July, October, and December.

REMARKS: Thirty-two specimens and eight genitalic dissections were studied. The males of this species occur in two color forms, one a dark brown, with extensive white scaling along the front part of the upper surface of the forewing, and the other without the

white scaling, often being slightly lighter brown in color. This variation does not appear to be geographic nor does it seem to be seasonal, as far as can be told from the relatively small amount of material examined. Unfortunately most of the specimens examined do not have the date of capture on the labels, so not very much can be accurately determined as to their seasonal occurrence.

As the specimens with the extensive white suffusion are more numerous than the others, in the material studied for this revision, it is assumed that they are the dominant form and that the non-white specimens are a recessive.

The females do not show the same type of variation, although a few of the specimens studied were broadly suffused with yellow.

***Betulodes matharma* (Druce), new combination**

Plate 18, figures 2, 6, 7; text figures 20, 31

Amphidasys matharma DRUCE, 1892, *Biologia Centrali-Americana, Insecta, Lepidoptera-Heterocera*, vol. 2, p. 71; 1893, *op. cit.*, vol. 3, pl. 48, figs. 5, 6 (males).

A species extremely similar to *crebraria* and best separated from it by means of genitalic characters.

MALE: Head, vertex pale brown to dark brown; front brownish black; palpi ascending to middle of eyes, dark brown or brownish black. Thorax above with mixed white, dark brown, and grayish brown scales, the collar dark brown or grayish brown, below grayish brown, slightly darker anteriorly; legs gray on inner surfaces, dark brown or grayish brown on outer surfaces, with ends of segments paler. Abdomen above brown, with scattered black and white scales, the latter concentrated on first segment, and with conspicuous dorsal tufts; paler below.

UPPER SURFACE OF WINGS: Forewings with ground color dark brown or grayish brown, with scattered black and white scales, in some specimens with anterior portion of wing, from base, through cell, as far as s. t. line, parallel with costa, broadly overlain with white scales; t. a. line absent or very weakly indicated, apparently broadly bordered inwardly by white suffusion in some specimens; median area of ground color, or with a faint orange-brown suffusion; discal spot large, blackish brown; median shade

line absent; t. p. line weakly represented, indicated by dark markings on veins and by slightly browner coloration in lower portion of wing; subterminal and terminal areas concolorous with remainder of wing; s. t. line represented by two or three outwardly directed V-shaped marks at apex, and by a few white or dark brown scales above tornus; terminal line represented by dark, cellular spots, more prominent in upper part of wing; fringe dark brown, lighter opposite veins. Hind wings concolorous with forewings, or with basal area slightly brownish orange and irrorate with dark strigations; median shade line weakly represented, nebulous, extending across wing; discal spot black or blackish brown, prominent; extradiscal line black, deeply concave between veins, these concavities filled with brownish gray and scattered white scales, the line with a slightly longer tooth on vein M_3 , and usually passing about 3 mm. from discal dot; s. t. line represented by white cellular spots, variable in size and number; terminal line slightly darker than terminal area, interrupted by veins; fringe concolorous with wing.

UNDER SURFACE OF WINGS: All wings pale yellowish brown, heavily suffused with grayish brown scales; costa of forewings brighter, interrupted by dark brown irrorations; discal spots present on all wings, otherwise without much definite maculation, although extradiscal line of secondaries may be present in some specimens.

LENGTH OF FOREWING: 25 to 30 mm.

FEMALE: Similar to male, but much larger and much paler. Head as in male, but with reduced palpi, not reaching middle of eye.

UPPER SURFACE OF WINGS: Forewings with ground color white, heavily irrorate with numerous brown scales and strigations; median area browner than adjacent areas, with dark, circular, discal dots centered with white; t. p. line black, complete, but weakly represented in middle of wing; outer areas with brown scaling tending to be concentrated along outer margin of t. p. line in lower portion of wing, along course of s. t. line, and in terminal area opposite cell and above tornus. Hind wings concolorous with forewings, maculation like that of male but with extradiscal line sharply defined.

UNDER SURFACE OF WINGS: Like that in

male, but with white ground color, and with brown scaling more pronounced.

LENGTH OF FOREWING: 40 mm.

MALE GENITALIA: Uncus elongate, tapering; socius with from eight to 12 setae; gnathos narrow, somewhat widened anteriorly; valves with outer margin rounded, bluntly pointed apically, extending posteriorly from between one-half to two-thirds of length of uncus; costa broadly sclerotized for almost two-thirds of its length; median portion of valve with central one-third sclerotized transversely, with raised, semi-diagonal, sclerotized ridge extending distally from near anterolateral margins of transtilla, slightly curving laterally, terminating about in center of valve and at approximately two-thirds of length of valve, with several small protuberances from top of ridge; valve distad of ridge with rather extensive area of slender, elongate spines; sacculus swollen, curved ventrally and extending from base of valve to near end of sclerotized ridge, and having approximately one dozen small, sclerotized protuberances; anellus with large, smooth, paired structures, the posterior pair arising from subtriangular bases, straight, with their apices slightly angled, the anterior pair of about equal size, extending antero-ventrally from slightly widened bases, straight and tapering apically; juxta moderately large, with posterolateral areas extending posteriorly and connected with paired structures of anellus; saccus broadly rounded anteriorly, or with a slight median concavity; aedeagus long and very slender, in length slightly shorter than combined lengths of tegumen and saccus, slightly S-shaped in lateral view.

FEMALE GENITALIA: Sterigma with area of lamella postvaginalis raised, becoming less heavily sclerotized posteriorly and having several small transverse ridges, laterally and anteriorly the lamella antevaginalis continued as a narrowly U-shaped plate, extending around ostial opening, with a few small ridges laterad of the latter; ductus bursae short, sclerotized, tapering anteriorly, posterior lip concave; ductus seminalis arising from right side at junction with corpus bursae; corpus bursae elongate, membranous, forming an elongate ellipse in outline, with a well-sclerotized signum, flattened, laterally and

anteriorly stellate with short, broad rays, and with approximately 12 short, dorsal spines medially.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Druce described *matharma* from two specimens, a male and a female; both are in the collection of the British Museum (Natural History). The male is hereby designated as the lectotype.

TYPE LOCALITY: Bugaba, Panama.

DISTRIBUTION: Guatemala, Costa Rica, Panama, and Colombia. On the wing from January through May, July, and October through December.

REMARKS: Seventeen specimens and four genitalic dissections were studied. This species is extremely similar to *crebraria* in color, size, and maculation. Both species have the two male color forms, the commoner being dark brown, with extensive white scaling on the upper surface of the forewings, and a single, unicolorous brown example was also studied. One way to distinguish the males of the present species is by the location of the extradiscal line of the secondaries, as it is usually slightly farther from the discal dot than in *crebraria*. In the females, the present species can be distinguished by the heavier and more even brown strigations on the upper surface of the wings, and by the more sharply defined and more dentate t. p. and extradiscal lines.

The genitalia offer the surest way to identify this species correctly. In the male the pointed apical portion of the valves and the location of the sclerotized ridge on the inner face of the valves are diagnostic. In the female the smaller lamella postvaginalis and lamella antevaginalis, as well as the differently shaped signum, offer valid characters for the separation of this species from *crebraria*.

Betulodes antennatissima (Dyar),
new combination

Plate 18, figure 3; text figure 21

Amphidasys antennatissima DYAR, 1916, Proc. U. S. Natl. Mus., vol. 52, p. 29.

The males are of moderate size and have very long antennal pectinations. The species occurs in Mexico.

MALE: Head, vertex light grayish brown;

front dull black or blackish brown; palpi ascending to middle of eyes, grayish brown or blackish brown. Thorax above with mixed light gray and brown scales, below grayish brown or light gray, slightly darker anteriorly; legs light gray, with some grayish brown scaling, the tarsi brown, with ends of segments paler. Abdomen brown, with scattered gray and brownish black scales, above and below, and with inconspicuous dorsal tufts.

UPPER SURFACE OF WINGS: Forewings with ground color grayish brown, rather evenly overlain with brown and blackish brown scales; basal area concolorous with median area; t. a. line very weakly indicated in upper part of wing, outwardly curved in middle of wing and meeting inner margin about one-fourth of distance from base; median area with indistinct shade line, extending from costa to discal dot, and then represented in lower part of wing; discal dot small, round, pale; t. p. line dark, weakly represented in upper portion of wing, arising on costa almost nine-tenths of distance from base, concave opposite cell to vein M_3 , outwardly dentate on veins M_3 and Cu_1 , concave again to anal vein, thence inwardly oblique to inner margin at three-fifths of distance from base; subterminal area suffused with orange-brown scaling outside t. p. line, being wider and more prominent in lower portion of wing; s. t. line absent; terminal area concolorous with median area, some specimens with a patch of dark brown scales in cells M_1 and M_2 ; terminal line brownish black, thickened in cells, interrupted by veins; fringe concolorous with wing. Hind wings concolorous with forewings; base of wing brownish black, a continuation of t. a. line; median shade line black or brownish black, extending completely across wing; discal spot small, pale; extradiscal line black or brownish black, weakly represented in upper portion of wing, concave between veins M_1 and Cu_2 ; subterminal area tending to be filled with dark brownish gray scales, the central area filled with orange-brown; s. t. line incompletely represented, indicated mainly by paler color of terminal area; terminal line dark, narrow; fringe as on forewings.

UNDER SURFACE OF WINGS: All wings pale gray or pale grayish brown, more or less heavily suffused with brown scales, these

reflecting pattern from upper surface; terminal line and fringes as on upper surface.

LENGTH OF FOREWING: 24 to 27 mm.

FEMALE: Unknown.

MALE GENITALIA: Uncus elongate, tapering; socius with from 10 to 12 setae; gnathos narrow, complete; valves with outer margin angled, pointed apically; costa sclerotized for about five-sevenths of its length; median portion of valve with a raised, diagonal, sclerotized ridge, extending from near anterior margin of sclerotized costa at base and curving to outer margin just caudad of outer angle, slightly higher at both ends, with several small protuberances from top of ridge, the posterior surface and valve distad of ridge with numerous setae; sacculus swollen, curved ventrally and extending from base of valve to just before outer angle, this latter area with several small sclerotized protuberances; anellus with prominent, paired structures, the elongate posterior portion with the apices curving posteriorly, rough-surfaced except for apices, the shorter anterior points smooth, extending anteroventrally from shank of posterior processes; juxta large, with small median swelling and with posterolateral areas pointed outwardly; saccus truncate anteriorly, very slightly concave medially; aedeagus very long and very slender, in length slightly longer than combined lengths of tegumen and saccus, very slender, anterior portion of aedeagus slightly thicker than slender, tapering posterior end, with a small, laterally compressed extension on the anterior end.

FEMALE GENITALIA: Unknown.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPE: Dyar described this species from a single male specimen (U.S.N.M. No. 18890).

TYPE LOCALITY: Cuernavaca, Morelos, Mexico.

DISTRIBUTION: The Mexican states of Morelos, Guerrero, and Nayarit. On the wing in June and July.

REMARKS: Four specimens and three genitalic dissections were studied. This species can be recognized by the very long pectinations in the male antennae. The shape of the forewings seems to be slightly longer and not quite so broad as in the preceding two species. All four specimens examined are of the uni-

colorous brown form; no examples of the dark brown form with extensive white scaling on the wings is known as yet, although this coloration is present in every other species in the genus.

***Betulodes euriceraea*, new species**

Plate 19, figures 1, 2; text figure 22

The males are similar to those of the preceding species in having very long antennal pectinations but are larger. This species occurs in western South America.

MALE: Head, vertex brown or brownish gray; front blackish brown; palpi semiporrect or ascending to above middle of eyes, blackish brown. Thorax above with mixed brownish gray and white scales, the collar brown, below grayish brown, slightly darker anteriorly; legs grayish brown, the tarsi with ends of segments slightly paler. Abdomen above blackish brown, with scattered white scales, or with mixed gray, grayish brown, and dark brown scales, with white scales on basal segment; below grayish brown.

UPPER SURFACE OF WINGS: Forewings with ground color dark brown, broadly overlain with white scales in basal area, in cell, and extending to apex (holotype), or light brown, overlain with numerous dark brown scales and strigations and lacking the extensive white scalation; basal area of ground color, in some specimens heavily suffused with white below radial vein; t. a. line very weakly indicated or absent, in some individuals showing as spots on cubital and anal veins and in fold; median area concolorous with remainder of wing, overlain with white scales in cell (holotype); discal spot small, dark; median shade line extremely weak or absent; t. p. line represented by black venular spots, these in some specimens weakly connected in lower part of wing, arising about two-thirds of distance from base as a small costal spot, going very slightly concave to vein M_3 , concave again to anal vein, and obliquely into inner margin; subterminal area faintly suffused with pale brown scales in lower portion of wing; s. t. line indicated by white scales in upper part of wing, and by a dark, nebulous band below; terminal area concolorous with subterminal area, some specimens with a patch of white scales in cell M_3 ; terminal line

brownish black, broadly interrupted by veins; fringe concolorous with wing. Hind wings concolorous with forewings; basal area with a few white scales (holotype); median shade line dull black, very faint or weakly represented; discal spot black, prominent; extradiscal line black, complete, being emphasized by venular spots; subterminal and terminal areas broadly suffused with white scales or completely lacking these; s. t. line weak, indicated by white scaling in cells; terminal line and fringe as on forewings.

UNDER SURFACE OF WINGS: All wings yellowish brown, mottled with brown scales, and with pattern of upper surface weakly represented.

LENGTH OF FOREWING: 32 to 33 mm. (holotype).

FEMALE: Unknown.

MALE GENITALIA: Very similar to those of *antennatissima*; uncus elongate, with bluntly pointed apex; socius with from 12 to 18 setae; gnathos narrow, complete or partly membranous medially; valves with outer margin swollen, rounded apically; costa sclerotized for about three-fourths or four-fifths of its length; median portion of valve with a raised, diagonal, sclerotized ridge curving to outer margin just caudad of outer angle, becoming slightly thicker and higher distally, with a few small protuberances from near top of ridge; anellus with prominent, paired structures, the posterior portion angled inwardly and curving posteriorly near end, the latter area with numerous small setae, the anterior pair as long as posterior, extending at right angle to shank of posterior processes, the apices tapering and with a slight posterior curve; juxta broad, with small median swelling and with posterolateral areas produced outwardly; aedeagus slightly shorter than combined lengths of uncus and tegumen, slender, with slight swellings near middle and posteriorly, the latter with minute scobinations.

FEMALE GENITALIA: Unknown.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Holotype, male, Zamora, Ecuador, elevation 3000–4000 feet (O. T. Baron), and paratype, male, Charaplaya (latitude 65° W., longitude 16° S.), Bolivia, June, 1901, elevation 1300 meters (Simmons). Both

specimens are in the collection of the British Museum (Natural History).

DISTRIBUTION: Known only from the two type specimens from Ecuador and Bolivia.

REMARKS: Two specimens and two genitalic dissections were studied. This species is quite similar to *antennatissima* in the antennae, maculation, and male genitalia. It can be separated from the Mexican one by its larger size, and by its having the t. p. line represented by venular dots. In the male genitalia, *euriceraea* is distinguished by the much longer anterior members of the paired structures of the anellus, as compared with those of *antennatissima*.

This species also has the two color forms in the male similar to those found in *crebraria* and *matharma*. The dark specimen with extensive white scaling has been designated as the type, as it is in better condition than the second specimen. With but two specimens on hand, it is impossible to say just what this type of variation means in this species.

GENUS PHAEOURA HULST

Euboea GUMPPENBERG, 1887, Nova Acta Deutscher Akad. Naturf., Halle, vol. 49, pp. 333, 340, 344; 1893, *ibid.*, vol. 59, p. 407.¹

Phaeoura HULST, 1896, Trans. Amer. Ent. Soc., vol. 23, p. 359. DYAR, "1902" (1903), Bull. U. S. Natl. Mus., no. 52, p. 328. J. B. SMITH, 1903, Check list of the Lepidoptera of boreal America, p. 77. BARNES AND McDUNNOUGH, 1917, Check list of the Lepidoptera of boreal America, p. 119. McDUNNOUGH, 1938, Check list, pt. 1, p. 166.

Nacophora HULST, 1896, Trans. Amer. Ent. Soc., vol. 23, p. 360. DYAR, "1902" (1903), Bull. U. S. Natl. Mus., no. 52, p. 329. J. B. SMITH, 1903, Check list of the Lepidoptera of boreal America, p. 77. BARNES AND McDUNNOUGH, 1917, Check list of the Lepidoptera of boreal America, p. 119. McDUNNOUGH, 1938, Check list, pt. 1, p. 165. FORBES, 1948, Mem. Cornell Univ. Agr. Exp. Sta., no. 274, p. 84, fig. 42. New synonymy.

Head with short palpi; antennae with between 60 and 90 segments, basal segments shorter than terminal ones in male, pectinations of male extending to apex, the longest ones nine or 10 times as long as basal antennal

segments, slightly swollen basally, of female simple or shortly bipectinate. Thorax above and below with elongate, hair-like scales, and with paired metathoracic tuft; fore tibia with process of male arising in basal half of tibia, with long, hair-like scales from near its base, the process varying from shorter to longer than segment, of female very much reduced, between one-fifth and one-ninth of length of segment, hind tibia with terminal pair of spurs only. Abdomen with prominent dorsal tufts. Forewings broad and pointed; hind wings with Sc approximate to R about one-fourth of length of cell; R and M₁ from vicinity of upper angle.

MALE GENITALIA: Uncus elongate; socius present, consisting of approximately 18 to 24 elongate setae; gnathos narrow, sclerotized; valves short, broad, costa sclerotized, with a wide, dentate, heavily sclerotized, transverse structure, sacculus swollen, extending as far as transverse structure, swollen or with small teeth apically; anellus membranous, with lateral, paired structures well developed, having two pairs of elongate, curved points; juxta large, with posterolateral and median areas slightly produced, concave between; saccus broadly rounded or truncate anteriorly; aedeagus slender; vesica unarmed.

FEMALE GENITALIA: Sterigma with quadrate or elongate lamella postvaginalis, lamella antevaginalis a weakly sclerotized strip; ductus bursae a short, sclerotized, funnel-shaped structure; ductus seminalis arising dorsally or on right side; corpus bursae usually without signum, rarely present.

EARLY STAGES: The life histories of *quernaria* and *cristifera* have been published; these are the only descriptions of the early stages of this genus.

TYPE SPECIES: *Phalaena quernaria* J. E. Smith for *Euboea* and *Nacophora*; *Eubyja mexicanaria* Grote for *Phaeoura*. The two Hulst genera were by original designation; the Gumpfenberg genus had but a single included species.

RANGE: Eastern North America and the Rocky Mountain and Pacific coast states, extending south into Mexico and Guatemala.

Forbes (1948), in his discussion of *Nacophora*, states that "*Phaeoura* is not really a distinct genus." The present author agrees that these constitute a single genus and,

¹ *Euboea* Gumpfenberg is the oldest name available for this genus, but it is not being used, as it has not been published in the literature except for its original description and usage by Gumpfenberg more than 70 years ago. In conformity with the principle of conservation, this name is hereby dropped.

as first reviser, uses *Phaeoura* Hulst as the generic name for this group of species. The reasons are that *Phaeoura* has page priority over *Nacophora*, and six species were included in it as compared with two for *Nacophora* (only one of which is correctly placed here). *Phaeoura*, being older and containing more species than *Nacophora*, is the better known and more used name, so is retained.

This genus consists of 12 species. They are among the largest geometrid moths found in the United States and are usually rather poorly represented in collections. The adults resemble those of *Biston* Leach but can be distinguished by the fact that the male antennae are pectinate to the apex, by the elongate terminal seta at the end of each pectination, by the single pair of spurs on the hind tibia, and by the presence of the abdominal tufting. The genitalia are very different, with *Phaeoura* having the transverse sclerotized structure on the face of the valves, and the female being without a strongly developed signum and not having the very elongated apophyses posteriores that are to be found in *Biston*. In addition, good differences are to be found in the early stages, particularly in the egg and pupa, according to Forbes.

KEY TO SPECIES

BASED ON EXTERNAL MORPHOLOGY

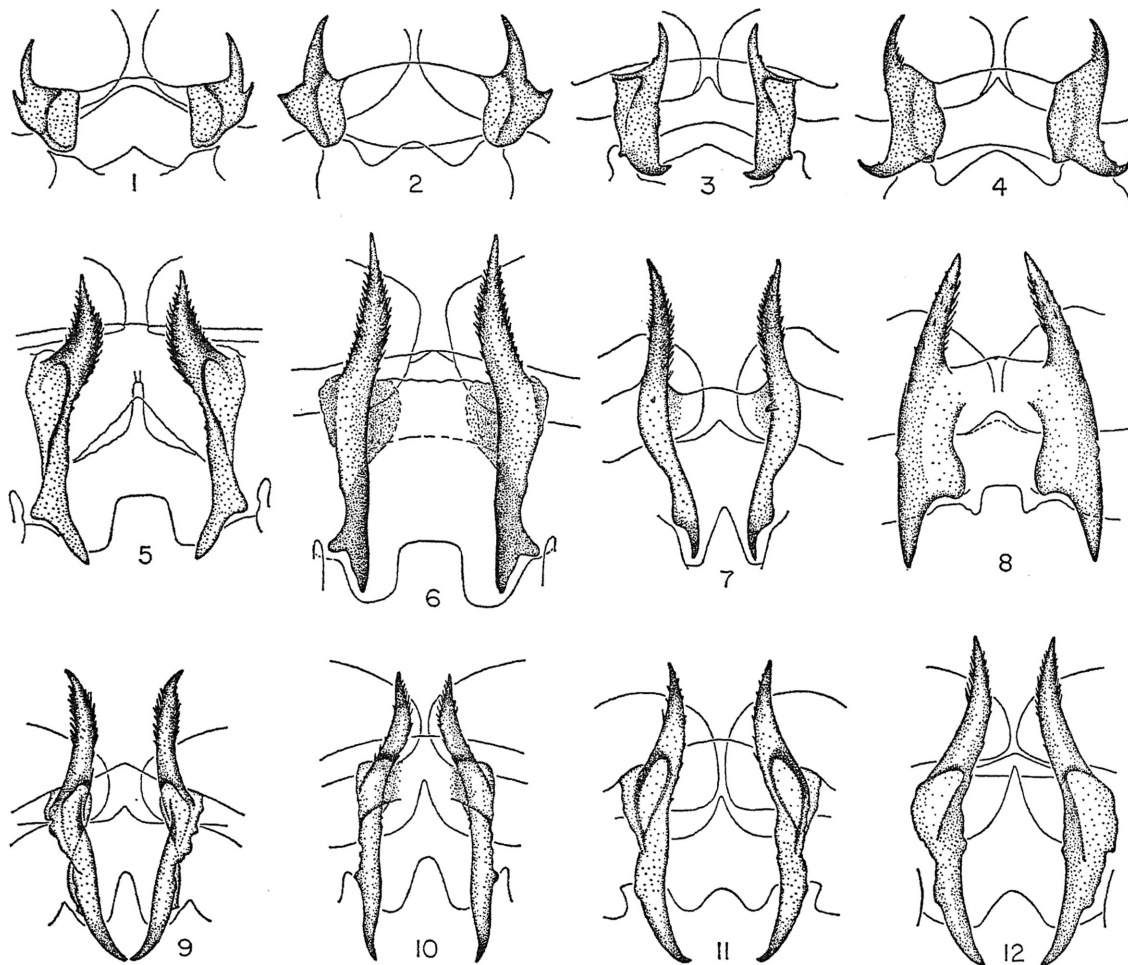
1. Females dimorphic in coloration, with the basal and subterminal areas of the upper surface of the forewings broadly suffused with white. 2
Females with coloration of males 5
- 2(1). Males with median area of forewing above darker than remainder of wing; females with simple antennae 3
Males with concolorous median area; females with dentate or very shortly bipectinate antennae 4
- 3(2). Males with some white scaling at origin of t. a. and t. p. lines on upper surface of forewings (except in melanic individuals); females light brown above, broadly suffused with white scaling (except for melanic individuals); eastern North America *quernaria*
Males without white scaling as described above; females brownish black, with less extensive white scaling; no melanic specimens known; southern Rocky

- Mountains *cristifera*
- 4(2). Median area as wide as subterminal and terminal areas; t. a. line produced into deep curve in cell *cladonia*
Median area much narrower than subterminal and terminal areas; t. a. line not extended out into cell *kirkwoodi*
 - 5(1). T. a. line sharply produced outward in cell, extending two-fifths to one-half of length of wing 6
T. a. line less sharply bent outward in cell, extending about one-third of length of wing 8
 - 6(5). Upper surface of wings dark gray, with large orange-brown areas outside of t. p. line above tornus and below costa *mexicanaria*
Upper surface of wings brownish violet or brownish orange, not as above 7
 - 7(6). Upper surface of wings brownish violet *ianthina*
Upper surface of wings brownish orange *spadix*
 - 8(5). Upper surface of wings dark brownish gray *belua*
Upper surface of wings lighter in color, gray or grayish white, overlain with darker scales. 9
 - 9(8). Ground color of upper surface of wings white, lightly overlain with dark gray and brown scales *utahensis*
Ground color light gray to gray, more heavily overlain with dark scales 10
 - 10(9). Males with median area of forewings above suffused with dark brownish gray scales, and with prominent areas of orange-brown scaling above tornus and below costa distad of t. p. line; wings of females lightly suffused with orange-brown scales, antennae with basal and terminal 10 or 15 segments simple, the remainder very shortly bipectinate *aetha*
Males with median area of forewings above more or less suffused with dark gray scales, and with a small amount of brown scaling above tornus and below costa distad of t. p. line; females not as above. 11
 - 11(10). Males with upper surface of forewings light gray, dusted with coarse dark scaling, the median area darker than basal and subterminal areas, being suffused with dark gray scales, and with very little brown shading distad of t. p. line; wings of females suffused with dark reddish brown, antennae with basal and terminal five or six segments sim-

ple, the remainder shortly bipectinate
 *perfidaria*
 Males with forewings above grayish
 brown, without prominent overlay, the
 median area only slightly darkened,
 and with a more or less complete band
 of brown scaling distad of t. p. line; fe-
 male unknown *cana*

BASED ON MALE GENITALIA

1. Paired, lateral structures of anellus with square or rectangular basal sections, the anterior curved projections directed ventrally 2
- Paired structures of anellus with elongate, very shallow basal sections, the anterior



FIGS. 1-12. Lateral structures of anellus of male genitalia. 1. *Phaeoura quernaria* (J. E. Smith), Florida (Mrs. A. T. Slosson; A.M.N.H.). 2. *P. cristifera* Hulst, lectotype, Colorado (Bruce; A.M.N.H.). 3. *P. cladonia* (C. Felder, R. Felder, and Rogenhofer), San Angel, Distrito Federal, Mexico, July 22, 1911 (C. C. Hoffmann; A.M.N.H.). 4. *P. kirkwoodi*, new species, holotype, Pinery Canyon, Arizona, July 8, 1956 (C. W. Kirkwood; A.M.N.H.). 5. *P. mexicanaria* (Grote), Spring Creek, Oregon, June 14, 1955 (J. H. Baker; A.M.N.H.). 6. *P. ianthina*, new species, holotype, La Polvosa, Chihuahua, Mexico, August 16, 1958 (L. R. Commissaris; A.M.N.H.). 7. *P. spadix*, new species, holotype, Acapulco, Mexico (U.S.N.M.). 8. *P. belua*, new species, paratype, Tonto Creek Fish Hatchery, Arizona, June 21, 1957 (Martin, Ford, Rees; A.M.N.H.). 9. *P. perfidaria* Barnes and McDunnough, Alamosa, Colorado (Osler; A.M.N.H.). 10. *P. aetha*, new species, holotype, Smoky Valley, California, June 23, 1947 (C. Ingham; A.M.N.H.). 11. *P. utahensis* Cassino and Swett, Paradise, Arizona, July (A.M.N.H.). 12. *P. cana*, new species, holotype, Camp Angelus, California, July 16, 1946 (N. Crickmer; A.M.N.H.).

- curved projections directed cephalad 5
- 2(1). Transverse structure on inner face of valves in form of raised ridge; aedeagus a simple tube with truncate posterior end. 3
- Transverse structure on inner face of valves in form of a swelling; aedeagus slightly swollen posteriorly, terminating in a sharp point. 4
- 3(2). Paired, lateral structures of anellus with anterior projections curved posteriorly *quernaria*
- Paired structures of anellus with anterior projections directed ventrally. *cristifera*
- 4(2). Posterior margin of paired anellus structures spinose *kirkwoodi*
- Posterior margin of paired anellus structures smooth *cladonia*
- 5(1). Sclerotized base of juxta with lateral, deeply invaginated circular areas occupying one-half of width of area between sides of vinculum. 6
- Sclerotized base of juxta without lateral circular invaginations. 8
- 6(5). Base of sacculus tapering, with basal constriction of juxta located at end thereof *mexicanaria*
- Sacculus widest at base, with basal constriction of juxta located near posterodorsal margin of same. 7
- 7(6). Anterior pair of anellus structures extending cephalad *ianthina*
- Anterior pair of anellus structures curving ventrally *spadix*
- 8(5). Ventral surface of paired anellus structures flat *belua*
- Ventral surface of paired anellus structures curved, slightly S-shaped. 9
- 9(8). Posterior end of aedeagus with lateral margins produced, concave medially *cana*
- Posterior end of aedeagus trifid, with prominent median projection 10
- 10(9). Posterior pair of anellus structures setose, the setae located on sides as well as ventrally 11
- Posterior pair of anellus structures very sparsely setose, the setae on ventral surface only *utahensis*
- 11(10). Anellus structures with posterior pair heavily setose, anterior pair evenly curving ventrally *perfidaria*
- Anellus structures with posterior pair lightly setose, anterior pair with ventral margin slightly concave. *aetha*

BASED ON FEMALE GENITALIA¹

1. Lamella postvaginalis more or less square in outline 2
- Lamella postvaginalis elongate, broadest posteriorly and with an anterior constriction, almost twice as long as maximum width 5
- 2(1). Sclerotized portion of ductus bursae about one and one-half times as long as wide, with ventral rim strongly convex. 3
- Sclerotized portion of ductus bursae with width and length equal, with ventral rim flat or slightly swollen. 4
- 3(2). Lamella postvaginalis with median constriction. *quernaria*
- Lamella postvaginalis without median constriction *cristifera*
- 4(2). Lamella postvaginalis a sclerotized square *cladonia*
- Lamella postvaginalis widest posteriorly, slightly constricted medially, with irregular edges *kirkwoodi*
- 5(1). Ventral lip of ductus bursae more or less truncate, with several small indentions, rather weakly sclerotized. *mexicanaria*
- Ventral lip of ductus bursae smoothly convex, well sclerotized 6
- 6(5). Lamella postvaginalis and lateral projections of sternum symmetrical 7
- These structures asymmetrical, projection and lamella postvaginalis on right side located slightly more posteriorly than those on left side *aetha*
- 7(6). Sclerotized portion of ductus bursae wider than long *perfidaria*
- Sclerotized portion of ductus bursae with length equal to, or greater than, width of posterior end 8
- 8(7). Sclerotized portion of ductus bursae with length equal to width of posterior end *belua*
- Sclerotized portion of ductus bursae with length twice that of width of posterior end *spadix*

Phaeoura quernaria (J. E. Smith),
new combination

Plate 19, figures 3-6; text figures 1, 13, 23, 32

Phalaena quernaria J. E. SMITH, 1797, The natural history of the rarer lepidopterous insects of Georgia . . . from observations by John Abbot, vol. 2, p. 205, pl. 103 (male and female, larva, pupa).

Amphidasys quernaria, GUENÉE, 1857, Histoire

¹ The female genitalia of *ianthina*, *utahensis*, and *cana* are not included.

naturelle des insectes, vol. 9, p. 207. WALKER, 1860, List of the specimens of lepidopterous insects in the collection of the British Museum, pt. 21, p. 307. ANON., 1882, Check list of Macrolepidoptera, Brooklyn Entomological Society, p. 24. OBERTHÜR, 1913, Études de lépidoptérologie comparée, fasc. 7, p. 250.

Amphidasys quernaria, PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, pl. 11, fig. 6 (female).

Eubyia quernaria, GROTE AND ROBINSON, 1868, List of the Lepidoptera of North America, p. 49. PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 411. GROTE, 1882, New check list of North American moths, p. 49. BEUTENMÜLLER, 1890, Ann. New York Acad. Sci., vol. 5, p. 222.

Eubyia quernaria, HULST, 1888, Ent. Amer., vol. 4, p. 50; 1895, Ent. News, vol. 6, p. 41. J. B. SMITH, 1891, List of the Lepidoptera of boreal America, p. 73.

Euboea quernaria, GUMPENBERG, 1893, Nova Acta Deutschen Akad. Naturf., Halle, vol. 59, p. 408.

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Amphidasys sperataria WALKER, 1860, List of the specimens of lepidopterous insects in the collection of the British Museum, pt. 21, p. 307. GUMPENBERG, 1893, Nova Acta Deutschen Akad. Naturf., Halle, vol. 59, p. 378. HULST, 1895, Ent. News, vol. 6, p. 41 (synonym of *cognataria* Guenée).

Eubyia sperataria, J. B. SMITH, 1891, List of the Lepidoptera of boreal America, p. 73.

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Nacophora sperataria, BARNES AND McDUNNOUGH, 1917, Check list of the Lepidoptera of boreal America, p. 119 (synonym of *quernaria*).

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Eubyia paenulataria, GROTE AND ROBINSON, 1868, List of the Lepidoptera of North America, p. 49. GROTE, 1876, Canadian Ent., vol. 8, p. 153; 1882, New check list of North American moths, p. 49. HULST, 1895, Ent. News, vol. 6, p. 41 (synonym of *phigaliaria*).

Eubyia quernaria paenulataria, J. B. SMITH, 1891, List of the Lepidoptera of boreal America, p. 73.

Nacophora paenulataria, DYAR, "1902" (1903), Bull. U. S. Natl. Mus., no. 52, p. 329. J. B. SMITH, 1903, Check list of the Lepidoptera of boreal America, p. 78. BARNES AND McDUNNOUGH, 1917, Check list of the Lepidoptera of boreal America, p. 119 (synonym of *quernaria*).

Amphidasys cupidaria GROTE, 1864, Proc. Ent. Soc. Philadelphia, vol. 3, p. 534, pl. 6, fig. 8 (male). ANON., 1882, Check list of Macrolepidoptera, Brooklyn Entomological Society, p. 24.

Amphidasys cupidaria, PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 412, pl. 11, fig. 5 (male).

Eubyia cupidaria, GROTE AND ROBINSON, 1868, List of the Lepidoptera of North America, p. 49. PACKARD, 1876, A monograph of the geometrid moths . . . of the United States, p. 411. GROTE, 1882, New check list of North American moths, p. 49. GUMPENBERG, 1887, Nova Acta Deutschen Akad. Naturf., Halle, vol. 49, p. 338. BEUTENMÜLLER, 1890, Ann. New York Acad. Sci., vol. 5, p. 222. HULST, 1895, Ent. News, vol. 6, p. 41.

Eubyia cupidaria, J. B. SMITH, 1891, List of the Lepidoptera of boreal America, p. 73.

Nacophora cupidaria, HULST, 1896, Trans. Amer. Ent. Soc., vol. 23, p. 360. GROSSBECK, 1910, Ann. Rept. New Jersey State Mus., for 1909, p. 504. BARNES AND McDUNNOUGH, 1917, Check list of the Lepidoptera of boreal America, p. 119 (synonym of *quernaria*).

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Nacophora quernaria var. *atrescens* HULST, 1898, Canadian Ent., vol. 30, p. 162. SHOEMAKER AND DAVIS, 1922, Ent. News, vol. 33, p. 310 (illustration of female). RINDGE, 1955, Bull. Amer. Mus. Nat. Hist., vol. 106, p. 137.

Nacophora quernaria atrescens, DYAR, "1902" (1903), Bull. U. S. Natl. Mus., no. 52, p. 329. J. B. SMITH, 1903, Check list of the Lepidoptera of boreal America, p. 78.

Nacophora quernaria form *atrescens*, BARNES AND McDUNNOUGH, 1917, Check list of the Lepidoptera of boreal America, p. 119.

A moderate-sized species, with the median area of the forewings slightly darkened and with white scaling along the cross lines, found in eastern North America. The females are larger and whiter than the males. Melanic and semi-melanic specimens occur in this species.

MALE: Normal form: Head, vertex white, brown, or a combination of the two; front brown or dark brown; palpi dark brown, slightly paler below and on inner surfaces; antennae with from 61 to 69 segments. Thorax above with a mixture of white, gray, brown, and dark brown scales, tegulae white in some specimens, usually brownish; below grayish brown or brown; legs dark brown or blackish brown, the ends of tibia and tarsal segments white; process of fore tibia about one and one-fourth times longer than tibia, arising near upper end, extending well beyond end of segment. Abdomen above brown, with blackish brown, gray, and white scales, forming weak segmental borders, basal segment white in some specimens; below paler.

UPPER SURFACE OF WINGS: Forewings with ground color light brown, with variable amounts of dark brown scaling, and with considerable, although variable, areas of pure white scales located basad of t. a. line and distad of t. p. line, thus emphasizing the cross lines; t. a. line blackish brown, arising on costa about one-third of distance from base, in some specimens represented by dots

on veins only, more or less broadly shaded basally by white, with slight outward bend in cell, then curving basally to meet inner margin one-fourth of distance from base, in many specimens with small, inwardly directed teeth on veins; median area concolorous with basal area, or slightly darker, in many with white scaling in cell; discal spot elliptical, weakly represented; t. p. line arising on costa about seven-tenths of distance from base, blackish brown, complete, more or less broadly shaded distally by white, proceeding straight or with slight concavity to a prominent, outwardly directed tooth on vein M_2 and a slightly smaller one on vein Cu_1 , concave below this, with another outward angle on anal vein, then basad to inner margin; subterminal area mostly white basally, especially near costa, light brown distally; s. t. line white, narrow, interrupted by veins; terminal area white at apex of wing and in cell M_3 , otherwise of ground color, cell Cu_2 with scattered white scales in some specimens; terminal line dark, narrow, broadly interrupted by veins; fringe concolorous with wing, in some slightly lighter opposite veins. Hind wings concolorous with forewings; basal and median areas suffused with white scales in some specimens; dark median shade line often present, enclosing elongate, weak discal spot; extradiscal line blackish brown, extending completely across wing as a more or less straight line, with small, outwardly directed projections on veins R and M_3 , and slightly concave elsewhere; the line usually shaded distally by white; outer portion of wing similar to same area on forewing.

UNDER SURFACE OF WINGS: All wings white overlain with pale brown, and with scattered dark brown and blackish brown scales, with maculation of upper surface present; forewings with median area darkened, with median shade line present in some specimens; fringes concolorous with wings, becoming darker distally.

Melanic form: Head, thorax and abdomen black or blackish brown; thorax slightly paler below; legs as in normal form but white bands narrower.

UPPER SURFACE OF WINGS: Ground color of all wings unicolorous black or blackish brown; forewings with t. a. and t. p. lines, and hind wings with extradiscal line, varying

from clearly defined to absent, grayish black when present; otherwise without maculation.

UNDER SURFACE OF WINGS: Ground color of all wings unicolorous black; maculation varying from presence of outer cross lines to complete absence.

LENGTH OF FOREWING: 19 to 22 mm.

FEMALE: Normal form: Head like that in normal male, vertex white; antennae simple. Thorax with anterior portion mainly white, dark brown posteriorly; below, and legs, similar to those of normal male. Abdomen mainly white, especially posteriorly, with brown and blackish brown scaling.

UPPER SURFACE OF WINGS: Like that of normal male, but with a greater amount of white scaling, in some specimens becoming the principal color; median area of forewings and basal area of hind wings dark brown, darker than in most males.

UNDER SURFACE OF WINGS: Like that of normal male, but with a tendency for more white scaling.

Melanic form: Similar to melanic male; wings with a tendency to have cross lines white, at least in part, instead of grayish black.

LENGTH OF FOREWING: 22 to 30 mm.

MALE GENITALIA: Uncus long and slender, with numerous setae, apex with an elongate, sclerotized point; socius with approximately 18 setae; gnathos narrow, sclerotized; valves extending slightly beyond posterior margin of tegumen, costa broadly sclerotized for about one-half of length, cucullus evenly rounded, transverse structure in middle of inner surface of valve connecting base of costa and end of sacculus, in form of heavily sclerotized, laterally compressed, raised ridge, extending two-thirds to three-fourths of distance to sacculus, terminating in long, recurved, multispinose apex, the latter with variable number of spines, sacculus broadly swollen and raised, tapering distally, terminating with several small, thick, variable spines at end, outer margin of valve in some specimens swollen at this location; transtilla a broad band, narrowed medially; anellus with paired lateral structures attached to anterior margin of transtilla, arising from square or rectangular bases, terminating in an elongate, posteriorly curving caudal spine and a smaller, anterior spine directed postero-

ventrally; juxta broadly connecting well-separated sacculi, sclerotized, posterolateral areas narrowly extended caudad to connect with paired structures anterior of transtilla, and with median area slightly produced, rounded; saccus broadly U-shaped; aedeagus slender, posterior end truncate, with slight constriction just distad of center, the posteroventral portion usually with small area of fine spicules, in length equal to about three-fourths to four-fifths of combined lengths of tegumen and saccus.

FEMALE GENITALIA: Sterigma with lamella postvaginalis constricted medially, widening anteriorly, the lateral edges swollen ventrally; ductus bursae with ventral rim extended posteriorly on midline, tapering anteriorly and becoming membranous, with ductus seminalis arising from this area; corpus bursae pear-shaped, signum absent or weakly represented, when present, small and inconspicuous.

EARLY STAGES: The caterpillar and pupa were illustrated by J. E. Smith (1797). Guenée (1857) described the larva from the illustrations in Smith. Packard (1876) quoted Guenée's description, then gave a short additional description based on an unpublished drawing of Abbot. Engel (1908) gave a complete description of all stages of the life cycle. Forbes (1948) briefly summarized the important characters of the egg, caterpillar, and pupa.

FOOD PLANTS: Oak appears to be the preferred host. Packard (1876) based his additional larval description on examples of *Crataegus*, which should be verified. Both Engel (1908) and Shoemaker and Davis (1922) reported wild cherry as a host; the former stated that, of the two, oak seemed to be preferred. Tietz (1952) stated that the larva is a general feeder on trees, in addition to the above food plants, which also should be verified. Ferguson (1954) stated that birch is a reported food plant.

TYPES: The location of the types of *quernaria* and *phigaliaria* is unknown. The types of *sperataria* Walker, *paenulataria* Grote, and *cupidaria* Grote are in the British Museum (Natural History). The unique type of *atrescens* is in the collection of the American Museum of Natural History.

TYPE LOCALITIES: Georgia (*quernaria*);

"Amérique septentrionale" (*phigaliaria*); the United States (*sperataria*); "Middle States" (*paenulataria* and *cupidaria*); London, Ontario (*atrescens*).

DISTRIBUTION: From Florida, Arkansas, and Texas in the southern United States, north to Nova Scotia, and east to Ontario and Wisconsin. (See fig. 13.) On the wing in April through August in the north, appearing as early as January in Florida.

REMARKS: Two hundred and seventy-five specimens and 17 genitalic dissections were studied. This species is quite variable, as a glance at the synonymy indicates; the status of all the various names was not settled until

1917. A close study of this species shows that virtually no two examples have the same maculation and color. Variability is a feature of the species in both sexes, with the female being larger and having whiter wings than the male. Males from Texas and Florida usually have very little or no white scaling on the upper surface of the wings. Specimens from these states may form a valid subspecies, but until much more material is available from the Deep South and bordering states it is thought advisable not to apply a name to these moths.

This variability is further complicated by the presence of melanic specimens, and others



FIG. 13. Distribution of *Phaeoura quernaria* (J. E. Smith). In addition to the plotted localities, this species is also known from Arkansas and Virginia.

that appear to be intermediate between the normal and the black forms. The description of the melanic form (*atrescens* Hulst) was based on a somewhat intermediate specimen, and was published in 1898. More recently the melanic specimens have been taken in New Jersey, New York, and Pennsylvania, mainly within the past 10 to 15 years.

There is considerable individual variability in the male genitalia of this species and others, particularly in the shape and extent of the armament of the valves. The apices of the transverse process may be symmetrical or asymmetrical, with a tendency for the right side to have more points than the left; the right side often has two or three apical spines, while the left usually has one or two. It is difficult to find two specimens that are identical in this respect. Further variability is noted in the nature of the spining of the terminal portion of the sacculus.

Phaeoura cristifera Hulst

Plate 19, figures 7,8; text figures 2, 14, 33

Phaeoura cristifera HULST, 1896, Trans. Amer. Ent. Soc., vol. 23, p. 360. DYAR, "1902" (1903), Bull. U. S. Natl. Mus., no. 52, p. 328. J. B. SMITH, 1903, Check list of the Lepidoptera of boreal America, p. 77. BARNES AND McDUNNOUGH, 1912, Contributions to the natural history of the Lepidoptera of North America, vol. 1, no. 4, p. 35, pl. 16, fig. 8 (male); 1917, Check list of the Lepidoptera of boreal America, p. 77. McDUNNOUGH, 1938, Check list, pt. 1, p. 166. RINDGE, 1955, Bull. Amer. Mus. Nat. Hist., vol. 106, p. 140. J. A. COMSTOCK, 1959, Bull. Southern California Acad. Sci., vol. 58, p. 101, pls. 32-34 (early stages).

Phaeoura mexicanaria, W. S. WRIGHT (nec Grote), 1920, Bull. Amer. Mus. Nat. Hist., vol. 42, p. 489.

Nacophora guernaria, FORBES (nec J. E. Smith), 1948, Mem. Cornell Univ. Agr. Exp. Sta., no. 274, p. 84 (*partim*).

A moderate-sized species, with the median area of the forewings slightly darkened and without white scaling along the cross lines. The females have extensive white scaling, and no melanic specimens are known of this species of the southwestern United States.

MALE: Head, vertex with mixed pale gray and brown scales; front grayish brown, becoming dark brown laterally and dorsally; palpi dark brown laterally, grayish brown

below and on inner surfaces; antennae with from 68 to 73 segments. Thorax above with a mixture of pale gray, brown, and brownish black scales, collar brownish, pale basally and black distally, tegulae tending to be pale gray, with scattered brown scales and hair-like scales; below heavily clothed with hair-like scales, pale gray or pale grayish brown, prothorax darker; legs grayish brown to brownish black, the ends of tibia and of tarsal segments whitish gray; process of fore tibia shorter than tibia, arising about two-sevenths of distance from base, extending well beyond end of segment. Abdomen above with mixed pale gray and brown scales, the ends of segments narrowly marked with black scales, basal segment pale gray; below pale gray, with scattered light brown scales.

UPPER SURFACE OF WINGS: Forewings with ground color pale grayish brown, with variable amounts of dark brown and dull orange-brown scaling; t. a. line black, arising on costa one-third of distance from base, crossing costa at right angle, curving outward in cell, then swinging basally to meet inner margin about one-fifth of distance from base, with small inwardly pointing tooth on cubital vein, the line bordered basally by ground color; median area heavily suffused with dark brown and black scales, with a dark, nebulous shade line in many specimens; discal spot elliptical, not very prominent; t. p. line black, arising on costa about seven-tenths of distance from base, proceeding as a concave loop, with a minute tooth on vein M_1 , to a prominent, outwardly directed tooth on vein M_3 , sharply angled posteriorly, with a smaller tooth on vein Cu_1 , broadly concave below this tooth, with a minute tooth on vein Cu_2 and a prominent tooth on anal vein, then sharply angled to meet inner margin just distad of middle; subterminal area of ground color basally, thus emphasizing t. p. line by contrast of colors, many specimens having lower part of t. p. line shaded by dark grayish brown, cell R_5 tending to have a pale gray or white spot, outer portion of subterminal area suffused with a dull orange-brown band, becoming brownish black in cells M_1 and M_2 ; s. t. line grayish white, very narrow, often poorly defined; terminal area brownish black in cells R_5 , M_1 , and M_2 , interrupted by paler veins; terminal line

black, narrowly interrupted by veins; fringe concolorous with terminal area, interrupted by veins. Hind wings concolorous with forewings; basal and median areas irrorate with brown and blackish brown scales; dark median shade line present, often enclosing small discal spot; extradiscal line black, extending completely across wing, with small, outwardly directed projections on veins R and M_3 , and slightly concave elsewhere; outer portion of wing similar to same area on forewing.

UNDER SURFACE OF WINGS: All wings pale gray, overlain with dull black scales, especially in median area and in outer portion of wings, the veins tending to be pale brown; maculation of upper surface present, with discal spots more prominent.

LENGTH OF FOREWING: 17 to 21 mm.

FEMALE: Head, vertex white or brownish gray; front blackish brown; palpi blackish brown laterally, paler below and on inner surfaces; antennae simple. Thorax above with white, grayish black, and black scales, the first the dominant color; below grayish black or grayish brown; legs brown or blackish brown, with white on ends of tibia and of tarsal segments. Abdomen above covered with white, dark brown, and black scales, dark basally, tending to become largely white posteriorly.

UPPER SURFACE OF WINGS: Pattern like that of male, but forewings with areas basad of t. a. line and distad of t. p. line broadly suffused with white, with scattered white scaling in cell in median area, and in many specimens extending to wing margin at apex and in cell M_3 ; median area and terminal areas brownish black. Hind wings with scattered white scaling in basal and median areas; area distad of extradiscal line broadly suffused with white; terminal area with white scaling at apex and in cell M_3 ; remainder of wing brownish black.

UNDER SURFACE OF WINGS: Like that of male, but with ground color white.

LENGTH OF FOREWING: 23 to 29 mm.

MALE GENITALIA: Very similar to those of *quernaria*; valves with costal sclerotization extending for about three-fourths of length, transverse structure on inner face of valve extending about seven-eighths of distance to sacculus, tending to be angled outward or

curved in middle of valve, rather wide, in many specimens with a few small teeth medially and terminating in spinose apices; anellus with lateral structures arising from square or rectangular bases, terminating in an elongate, posteriorly curving, caudal spine and a smaller anterior spine directed ventrally; juxta with posterolateral areas tending to be rather broad, subtriangular in some specimens, and with median area broadly triangular, extending as far as, or beyond, ends of posterolateral areas; saccus broadly U-shaped, the anterior margin slightly concave in some specimens.

FEMALE GENITALIA: Very similar to those of *quernaria*; sterigma with lamella post-vaginalis poorly defined, slightly tapered and bluntly rounded posteriorly; ductus bursae with ventral rim broadly extended posteriorly on midline; corpus bursae with signum absent or weakly represented.

EARLY STAGES: Described and illustrated by J. A. Comstock (1959).

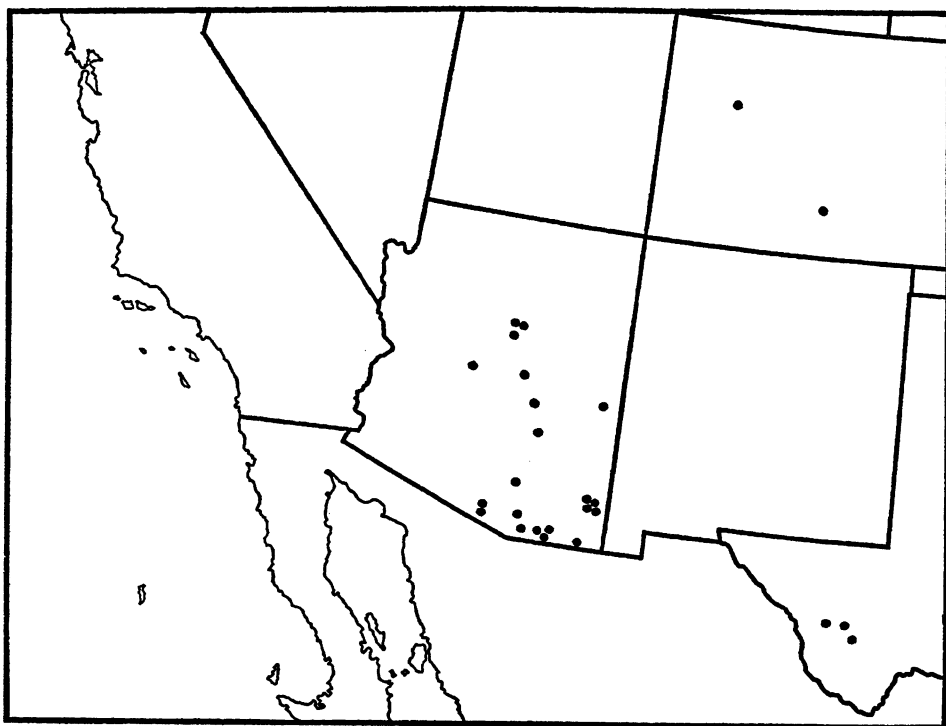
FOOD PLANT: Willow.

TYPE: In the original description of this species, Hulst gave no indication of the number of specimens on which the description was based. At least two male specimens labeled "type" are in existence, one being in the collection of the United States National Museum and the other in the American Museum of Natural History, *ex* Hulst collection at Rutgers University. The former specimen has highly contrasting colors, while the latter is a much plainer specimen. As the original description does not mention the contrasting nature of the pattern, it is assumed that the description was not based on the former specimen. Accordingly, the male in the collection of the American Museum of Natural History is hereby designated the lectotype.

TYPE LOCALITY: Colorado (Bruce).

DISTRIBUTION: Colorado, Arizona, and western Texas. (See fig. 14.) The reference to *quernaria* from Arizona in Forbes is to this species. On the wing in late March, April, May, June, July, and August.

REMARKS: One hundred and eighty specimens and nine genitalic dissections were studied. This species is very similar to *quernaria*. As compared with the latter, *cristifera* has the cross lines of the upper surface of

FIG. 14. Distribution of *Phaeoura cristifera* Hulst.

the wings more clearly defined, the wings darker brown, and both sexes slightly smaller. Only rarely do the males of *cristifera* have any white scales on either the upper or lower surfaces of the wings. The females can be recognized by the darker coloration of the wings above, and they have, in general, less extensive areas of white scaling than is to be found in *quernaria*. Melanic specimens of *cristifera* are not known, as melanism is known to occur in *quernaria* only.

In recent years this species has been collected in Arizona fairly often, although the females apparently do not readily come to light. Males from the population in the mountains of southern Arizona are consistent in having the upper surface of the wings rather dark, finely speckled with dark scales, a dull orange-brown band on the subterminal areas of the wings, and the terminal area usually a darker brown. Specimens from Colorado, the type locality, are very poorly represented in collections; those few moths from that state that are available are usually quite old and perhaps faded. These specimens

appear to be somewhat lighter in color than those of the Arizona population, they have fewer dark scales and speckling, and the subterminal and terminal areas of the wings are only slightly darkened. Fresh material from Colorado is badly needed to demonstrate whether or not these differences are constant; if they are, it may be necessary to restrict the name to the population from this state.

The male genitalia of this species are very similar to those of *quernaria* and show the same type of variability. The present species tends to have a wider and broader transverse process on the valve and to have simpler apices than does *quernaria*. In *cristifera* both processes usually terminate in a single spine, although the right side may have two or three, and the left two, apical projections. Additional differences are to be found in the extent of the costal sclerotization of the valve and in the paired structures of the anellus, particularly in the anterior spine.

The female genitalia are also very much like those of *quernaria*. In *cristifera*, the

lamella postvaginalis is not so well defined as in the preceding species, and it is tapered and bluntly rounded posteriorly.

Phaeoura cladonia (C. Felder, R. Felder, and Rogenhofer), new combination

Plate 19, figures 9, 10; text figures 3, 34

Amphidasys cladonia C. FELDER, R. FELDER, AND ROGENHOFER, "1864-1867" (1875), Reise der Österreichischen Fregatte "Novara" um die Erde, vol. 2, atlas, p. 2, pl. 125, fig. 13 (female).

Amphidasys charon DRUCE, 1898, Biologia Centrali-Americana, Lepidoptera-Heterocera, suppl., vol. 2, p. 533; 1898, *op. cit.*, vol. 3, pl. 98, fig. 24 (male; not fig. 23, female). New synonymy.

Amphidasys exotica DYAR, 1907, Jour. New York Ent. Soc., vol. 15, p. 233. New synonymy.

A species from Mexico that is larger and more unicolorous than *Phaeoura cristifera*. The males have virtually no white scaling, while the females are broadly shaded with this color.

MALE: Head covered mainly with hair-like scales; vertex dark brown; front dark brown or blackish brown; palpi extending beyond front and above lower margin of eyes, grayish brown, paler below and on inner surfaces; antennae with from 68 to 71 segments. Thorax above dark brown, with numerous hair-like scales, with scattered dark gray scales in tegulae and blackish brown scales on posterior tuft; below heavily clothed with hair-like scales, grayish brown, prothorax darker; legs grayish brown or brown, the ends of tibia and of tarsal segments whitish gray; process of fore tibia longer than tibia, arising near base, extending well beyond end of segment. Abdomen dark brown, the ends of segments narrowly blackish brown; below with some grayish brown scales and hair-like scales.

UPPER SURFACE OF WINGS: Forewings with ground color dark brown, with a few scattered black and blackish brown scales; basal area concolorous with median area; t. a. line black, arising on costa one-third of distance from base, sharply angled outward in cell, then swinging sharply basally, with inwardly pointing teeth on cubital and anal veins, to meet inner margin about one-fifth of distance from base; median area with scattered brown scales along costa and below cell, with a weak, dark, nebulous, shade line in lower

portion of wing; discal spot very weakly indicated; t. p. line black, arising on costa about seven-tenths of distance from base, with strong, outwardly directed teeth on veins, proceeding straight or slightly concave to the most prominent tooth, on vein M_3 , with a slightly smaller tooth on vein Cu_1 , then broadly concave, produced prominently outward again on anal vein, then sharply angled to meet inner margin about three-fourths of distance from base; subterminal area concolorous with median area; s. t. line represented by a small white spot in cell R_5 , in some specimens also in cell R_4 , and with a faint, dark line above tornus; terminal area concolorous with subterminal area in upper part of wing, interrupted by lighter-colored veins, with a pure white spot in cell M_3 , brownish yellow from cell M_3 to anal angle, extending into outer portion of subterminal area in lower part of wing; terminal line absent; fringe brown, interrupted at vein endings. Hind wings concolorous with forewings; basal and median areas more or less irrorate, with brownish yellow scales; dark median shade line and discal spot weakly represented or absent; extradiscal line black, extending completely across wing, with outward projection on vein M_3 , in some specimens with small teeth on other veins, concave between, particularly in lower part of wing; outer portion of wing similar to same area on forewing, with small white spot in cell M_3 .

UNDER SURFACE OF WINGS: All wings dark brown; forewings with grayish white spots along costa, without cross lines, with outer portion of wing reflecting lighter color and white spot from upper surface; hind wings irrorate with light brown or brownish gray, extradiscal line faintly represented, outer portion of wing reflecting lighter color and white spot from upper surface.

LENGTH OF FOREWING: 22 to 24 mm.

FEMALE: Head, vertex white, mixed with brown scales in some specimens; front and palpi like those of males; antennae simple basally, becoming dentate or very shortly bipectinate about one-third of distance from base and with apex simple. Thorax above white, with brown scales on collar and on posterior portion of thorax; below grayish brown or brown; legs brown or dark brown,

with white on ends of tibiae and of tarsal segments. Abdomen brown basally, with scattered dark brown scales, and with some white scales on basal segment, becoming white posteriorly.

UPPER SURFACE OF WINGS: Pattern like that of male, but with cross lines more strongly concave between veins and tending to be more produced on veins; basal area largely pure white, with variable amounts of ground color along costa and extending posteriorly across base of wing; median area with nebulous shade line, a small white discal spot encircled by black, and with some white scaling often present beyond cell; subterminal area pure white, with variable number of scattered brown scales, and with a brown patch on costa occupying central one-third of area between t. p. line and apex of wing; terminal area white below apex and in cell M_3 , overflowing into adjacent cells, and above tornus, with remaining areas brown or brownish yellow, extending into outer portion of subterminal area in lower part of wing; terminal line absent; fringe brown. Hind wings brown as far as extradiscal line, sometimes overlain with white irrorations, with dark median shade line and small discal spot; area distad of black extradiscal line pure white, with variable number of scattered brown scales; terminal area with broad white patch in cells M_3 and in part of M_4 , usually with white patches of scales at apex and near anal angle.

UNDER SURFACE OF WINGS: Similar to upper surface but with duller colors.

LENGTH OF FOREWING: 29 to 35 mm.

MALE GENITALIA: Similar to those of *quernaria*; sides of uncus tapering; valves with costal sclerotization extending about two-fifths of length, cucullus tapering, evenly rounded, transverse structure on inner face of valve extending almost to sacculus, basal portion diagonal, curving distally, in form of low ridge, terminating in a recurved spinose apex, the right side broader than left, terminating in three spines, left side terminating in two or three narrower protuberances; transtilla with broad anterior margin, from which rectangular bases of paired lateral structures of anellus arise, their posterior margins smooth, terminating in an elongate, posteriorly curving, caudal spine and a

smaller, anterior spine directed ventrally; juxta very wide, occupying most of area between sides of vinculum, with small, partly membranous areas laterally at posterodorsal margins of sacculi, posterolateral areas short and broad, median area broadly triangular, subequal in length to lengths of posterolateral areas; aedeagus slender, slightly swollen posteriorly, with a small, sclerotized swelling, then tapering to a point, in length about four-fifths to nine-tenths of combined lengths of tegumen and sacculus.

FEMALE GENITALIA: Very similar to those of *quernaria*; sterigma with large, rectangular lamella postvaginalis; ductus bursae short, the sclerotized portion less than one-half of length of lamella postvaginalis, the length subequal to the width, and with the ventral rim very slightly convex; ductus seminalis arising dorsally; corpus bursae ovate, signum absent.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: The female type of *cladonia* is in the collection of the British Museum (Natural History). Druce described *charon* from two specimens, a male and a female, both of which are at present in the British Museum (Natural History); these are not conspecific, so the male is hereby designated as the lectotype. The unique type female of *exoticaria* is U.S.N.M. No. 10456.

TYPE LOCALITIES: "Silhet" (*cladonia*); it seems highly unlikely that this locality in northern India is the true type locality of this species. Jalapa, Mexico (*charon*). Mexico City, Mexico (*exoticaria*).

DISTRIBUTION: This species is known from Guerrero, the Distrito Federal, and from Veracruz, Mexico. On the wing in March, June, July, and August.

REMARKS: Eleven specimens and four genitalic dissections were studied. A diagnostic feature of this species is the sexual dimorphism in the color of the wings, as the males have virtually no white scales on the upper surface of the wings, while this color is very prominent in the females. The males can be recognized by the virtually unicolorous tone of the upper surface of the wings and by the lack of the cross lines on the lower surface of the forewings. The females resemble the females of *cristifera*, but those of *cladonia* are

larger and have more complex antennae, the brown scaling is more of a reddish brown color, and the areas of white scaling on both the upper and under surfaces tends to be more extensive.

The male genitalia of this species can be distinguished from those of the preceding species by the low, transverse ridge on the inner face of the valves, by the broader anterior margin of the transtilla, by the wider juxta, and by the pointed aedeagus, with its small sclerotized swelling.

The female genitalia of *cladonia* are larger than those of the preceding species. The large lamella postvaginalis and the smaller ductus bursae are characteristic of this species.

Phaeoura kirkwoodi, new species

Plate 19, figure 11, plate 20, figure 1;
text figures 4, 35

Eubyja mexicanaria, GROTE, 1883, Trans. Kansas Acad. Sci., for 1881-1882, vol. 8, p. 51 (female, not male).

This species is similar to *exoticaria*, but it has the cross lines of the forewings closer together. It occurs in the southwestern United States.

MALE: Head covered mainly with hair-like scales; vertex brownish gray, with scattered dark brown scales; front brownish black; palpi extending beyond front and above lower margin of eyes, pale grayish brown, with scattered brown scales terminally in some specimens; antennae with from 67 to 73 segments. Thorax above pale brownish gray or grayish brown, with numerous hair-like scales, with scattered pale gray scales in tegulae and dull black scales on posterior tuft; below heavily clothed with hair-like scales, grayish white, prothorax darker; legs grayish white, darker on outer surfaces, the ends of tibia and of tarsal segments white; process of fore tibia slightly shorter than tibia, arising one-fourth of distance from base, extending well beyond end of segment. Abdomen above grayish brown, with posterior portions of segments suffused with brown, and with a narrow, black band at end of each segment; below whitish gray, with scattered brown scales.

UPPER SURFACE OF WINGS: Forewings with ground color ochraceous brown, with scat-

tered ocher and dark gray scales and with black striations; basal area concolorous with, or faintly lighter than, median area, with a few white or grayish white scales in cubital cell; t. a. line black, arising on costa one-third of distance from base, gently angled outward into cell, swinging posteriorly to middle of cubital cell, then angled basally to meet inner margin one-fourth of distance from base; median area with cell usually suffused with grayish brown scales, in some specimens with a faint, dark, nebulous, shade line in lower portion of wing; discal spot absent; t. p. line black, arising on costa about two-thirds of distance from base, with minute, outwardly pointing swellings on veins, proceeding straight to a small to moderate-sized tooth on vein M_3 , strongly concave below this, approaching to between 1.5 and 3.0 mm. of t. a. line below cubital vein, swinging outward to anal vein, then angled basad to meet inner margin two-thirds of distance from base; subterminal area broad, suffused with ochraceous scales in lower portion of wing; s. t. line represented by scattered white scales in cell R_5 , in some specimens also in cell R_4 , and with a faint, dark line above tornus; terminal area concolorous with subterminal area, in some specimens interrupted by lighter-colored veins, with a large, nebulous, ochraceous spot in cell M_3 ; terminal line absent; fringe concolorous with wing, often narrowly interrupted at vein endings. Hind wings concolorous with forewings, having numerous thin, black striations; dark median shade line weakly represented or absent; discal spot absent; extradiscal line black, extending completely across wing, with outward projection on vein M_3 ; outer portion of wing with dark, nebulous s. t. line extending from anal angle to radial cell.

UNDER SURFACE OF WINGS: Forewings dark brown, with grayish brown scaling below costa; costa with several whitish gray spots, outer one-third of wing with mixed brown and grayish white striations anteriorly, becoming grayish white posteriorly with t. a. and t. p. lines of upper surface weakly indicated, and with dark, nebulous patch in terminal area in cells M_1 and M_2 ; hind wings concolorous with upper surface of hind wings, or slightly paler, with extradiscal and nebulous s. t. lines weakly represented.

LENGTH OF FOREWING: 20 to 23 mm.; holotype, 21 mm.

FEMALE: Head, vertex white, mixed with brown scales in some specimens; front and palpi like those in males; antennae simple basally, becoming dentate or very shortly bipectinate about three-sevenths of distance from base, and with apex simple. Thorax above white anteriorly, with brown scales on collar, dark brown posteriorly; below brown; legs brown or dark brown, narrowly white on ends of tibiae and of tarsal segments. Abdomen brownish gray, with white scaling at base and on terminal segments.

UPPER SURFACE OF WINGS: Pattern like that in male, with cross lines tending to be slightly more dentate on veins and with ground color a deeper brown; basal area largely white or white overlain with golden yellow, with variable amounts of ground color along costa and extending posteriorly across wing; median area often with nebulous shade line, a small discal spot, and with some white scales often present beyond cell; subterminal area pure white or white overlain with golden yellow, with scattered brown scales, and with brown patch on costa occupying slightly more than central one-third of area between t. p. line and apex of wing; terminal area white at apex, and with scattered white scales in cell M_3 and at tornus, with remaining areas brown; terminal line absent; fringe brown, becoming white at apex and, in some specimens, at vein endings. Hind wings brown as far as extradiscal line, overlain with white irrorations, with faint, nebulous median shade line; discal spot absent; area distad of black extradiscal line pure white, in some specimens weakly tinted with golden yellow, with variable number of scattered brown scales; terminal area concolorous with basal part of wing, some specimens with white patches in cell M_3 , at apex and at anal angle.

UNDER SURFACE OF WINGS: Similar to upper surface but with duller colors.

LENGTH OF FOREWING: 28 to 29 mm.; allotype, 28 mm.

MALE GENITALIA: Very similar to those of *cladonia*; valves rather short, their apices not extending as far as posterior margin of tegumen, cucullus subtriangular, the transverse structure terminating in two spines on

right side and three on left; paired structures of anellus with spinose posterior margin, an elongate caudal spine and a smaller, curved anterior spine; juxta with posterolateral and median areas triangular, of about the same length; aedeagus about four-fifths of combined lengths of tegumen and saccus.

FEMALE GENITALIA: Very similar to those of *cladonia*; sterigma with lamella postvaginalis widest posteriorly, slightly constricted medially, with small, rectangular projections laterally at anterior end; ductus bursae slightly wider than long; corpus bursae without signum.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Holotype, male, Pinery Canyon, Chiricahua Mountains, Cochise County, Arizona, July 8, 1956 (C. W. Kirkwood); allotype, female, upper camp, Pinery Canyon, Chiricahua Mountains, Cochise County, Arizona, July 8, 1956 (L. M. Martin, J. A. Comstock, W. A. Rees). Paratypes, two males and one female, same data as holotype, June 23, 1958 (C. W. Kirkwood), July 7, 11, 1956 (R. H. Reid); two females, same data as allotype, July 5, 7, 1956; one male, Big Thompson Canyon, Larimer County, Colorado, July 9, 1955, elevation 6500 feet (R. H. Leuschner); one male, Platte Canyon, Colorado, June 30, 1907; one male and one female, near Hot Springs, Las Vegas, New Mexico, 7000 feet, August, 1882 (F. H. Snow), the female being the specimen described by Grote as the doubtful female of *mexicanaria*. Holotype in the collection of the American Museum of Natural History, allotype in the collection of the Los Angeles County Museum; paratypes in the collections of both institutions, the Museum of Comparative Zoölogy, Harvard College, the Snow collection of the University of Kansas (on indefinite loan to the American Museum of Natural History), of C. W. Kirkwood, and of R. H. Leuschner.

DISTRIBUTION: Arizona, New Mexico, and Colorado. The specimens examined were captured in June, July, and August.

REMARKS: Eleven specimens and two genitalic preparations were examined. This is a rather small species, closely allied to *cladonia*. These two species have a number of characters in common, such as the strong

sexual dimorphism in the coloration of the wings, the more or less unicolorous wings of the male, and the complex antennae of the females. The present species can be separated from *cladonia* by the cross lines on the forewings, as they are closer together in *kirkwoodi*, thus leaving a much larger distal area of the wing and a narrower median area. The cross lines are thicker and more prominent, are less dentate, and lack the deep sinus of the t. a. line in the cell that is to be found in the Mexican species. The secondaries of the males have a prominent subterminal band, a feature that is but weakly indicated in *cladonia*. Differences are also present on the under surface, as *kirkwoodi* is more bicolored and has the cross lines represented. The females of the two species are similar, but the character and location of the cross lines distinguish them.

The genitalia are very similar to those of *cladonia*. The male can be distinguished by the slightly shorter, more pointed valves, and by the spinose posterior margins of the lateral anellus structures. The female can be separated from that of the preceding species by the differently shaped lamella postvaginalis and by the very short ductus bursae.

This species is named in honor of my friend, Carl W. Kirkwood, who collected part of the type series. He has done much excellent moth collecting in the Southwest in recent years, which has resulted in a sizable advance in our knowledge of this group of insects from this area.

Phaeoura mexicanaria (Grote)

Plate 20, figures 2, 3; text figures 5, 15, 24, 36

Eubyja mexicanaria GROTE, 1883, Trans. Kansas Acad. Sci., for 1881-1882, vol. 8, p. 51 (male, not female). HULST, 1895, Ent. News, vol. 6, p. 41.

Eubyja mexicanaria, J. B. SMITH, 1891, List of the Lepidoptera of boreal America, p. 73.

Phaeoura mexicanaria, HULST, 1896, Trans. Amer. Ent. Soc., vol. 23, p. 359. DYAR, "1902" (1903), Bull. U. S. Natl. Mus., no. 52, p. 328. J. B. SMITH, 1903, Check list of the Lepidoptera of boreal America, p. 77. HUNTER, 1914, Kansas Univ. Sci. Bull., vol. 8, p. 29. BARNES AND McDUNNOUGH, February, 1917, Check list of the Lepidoptera of boreal America, p. 119; March, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 3, p. 246, pl.

26, fig. 1. McDUNNOUGH, 1938, Check list, pt. 1, p. 166.

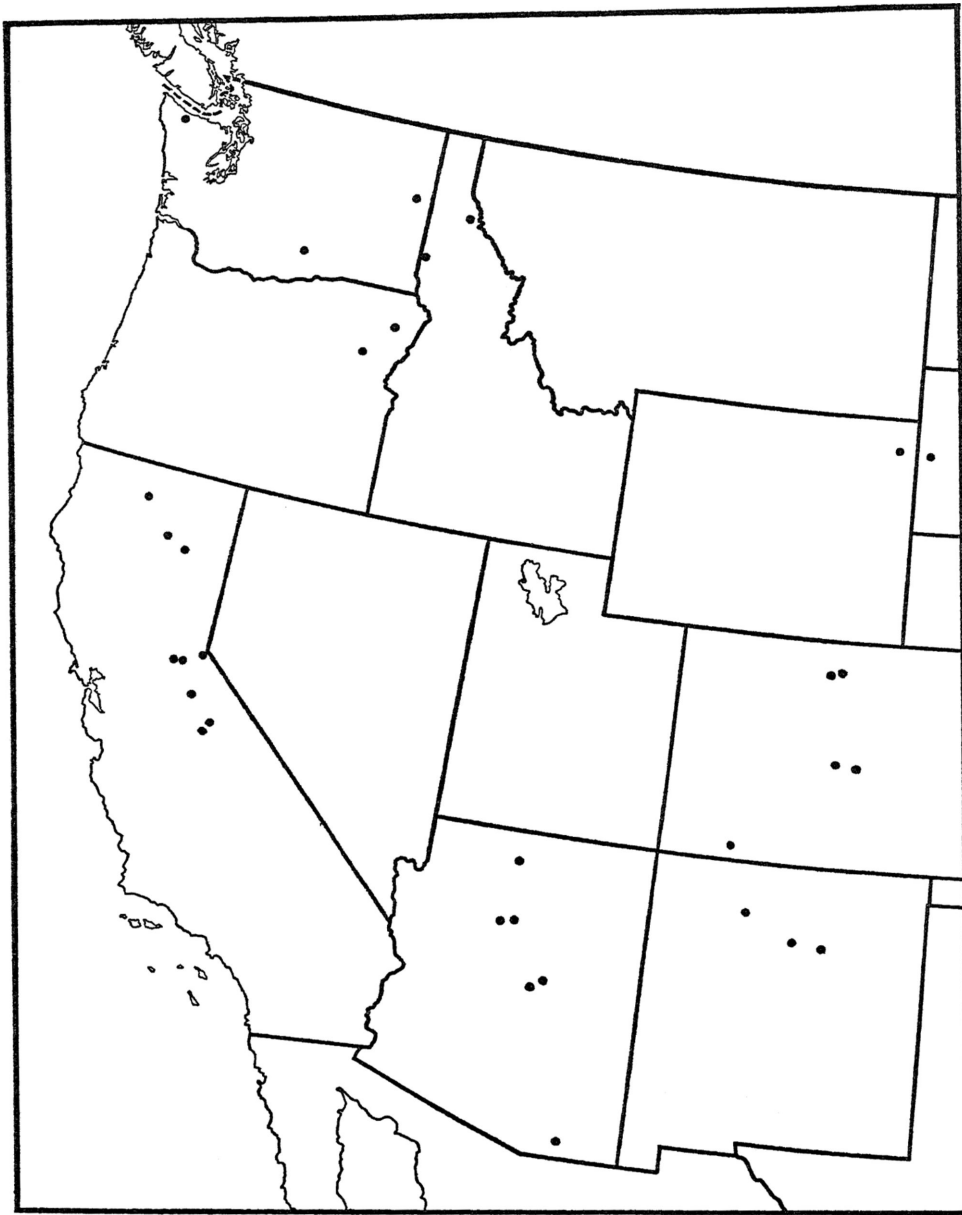
Phaeoura triaria BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 3, p. 247, pl. 26, fig. 3 (holotype male). McDUNNOUGH, 1938, Check list, pt. 1, p. 166. New synonymy.

Phaeoura magnificans DYAR, 1923, Insec. Inscit. Menstr., vol. 11, p. 166. New synonymy.

A very large, dark gray species, with a large, orange-brown patch above the tornus and with a very deep bend into the cell by the t. a. line. The sexes of this species, which is found in the western United States, are not dimorphic in color.

MALE: Head covered mainly with hair-like scales; vertex grayish brown or grayish black, with light gray scales at antennal bases; front blackish brown; palpi extending beyond front and above lower margin of eyes, brownish black or concolorous with front; antennae with from 66 to 80 segments. Thorax above grayish brown or dark gray, in some specimens with scattered pale gray scales, with numerous hair-like scales, the collar and posterior tuft black; below heavily clothed with hair-like scales, light to dark grayish brown, prothorax tending to be slightly darker in some specimens; legs varying from grayish white to grayish black, the ends of tibia and of tarsal segments very slightly lighter in color; process of fore tibia shorter than tibia, arising one-third of distance from base, extending to end of segment. Abdomen above with a mixture of light gray, brown, orange-brown, and black scales, with posterior portions of segments in some specimens narrowly marked with brownish black, the tufts and basal segment with some grayish white scales; below light to dark gray.

UPPER SURFACE OF WINGS: Forewings elongate, with ground color gray, variably overlain with orange-brown, grayish white, and blackish brown scales; basal area suffused with orange-brown, with ground color at base of wing and along basal side of t. a. line; t. a. line black, prominent, arising on costa approximately one-fourth of distance from base, going sharply outward into cell, extending almost one-half of length of wing, then strongly curved or angled basad in middle of cell, proceeding to inner margin at

FIG. 15. Distribution of *Phaeoura mexicanaria* (Grote).

one-fourth of distance from base, with basal projection on cubital vein; median area contrasting in color, more or less suffused with black scales, in some specimens with orange-brown scalation above round or ovate discal spot, and along cubital and anal veins; t. p. line black, prominent, arising on costa about seven-tenths of distance from base, proceeding in a slightly concave course to a

prominent, outwardly pointing projection on vein M_3 , with small teeth on veins M_1 and M_2 , running slightly basad to a less prominent projection on vein Cu_1 , then broadly concave to anal vein, with a small tooth on vein Cu_2 and a larger one on anal vein, thence sharply basad to meet inner margin about one-half of distance from base; subterminal area with orange-brown suffusion in upper

and lower portions, usually separated from t. p. line by narrow strip of ground color; terminal area of ground color, cell M_2 suffused with grayish black scales, this suffusion reaching t. p. line in some specimens, and with occasional dark shading along outer margin in cells M_1 and Cu_1 ; terminal line blackish brown, interrupted by veins; fringe concolorous with wing. Hind wings concolorous with forewings, having variable amounts of black scaling basad of extradiscal line, and with veins tending to be orange-brown; dark median shade line weakly represented, in some specimens absent; discal spot oval, whitish gray; extradiscal line black, prominent, extending completely across wing, with outward projections on veins, those on M_3 , Cu_1 , and anal veins being strongest; outer portion of wing with broad dark band in center; terminal line and fringe as on primaries.

UNDER SURFACE OF WINGS: Wings light gray or grayish white, with scattered darker gray scales, the costal margin of forewing and all veins tending to be brown or grayish brown; pattern of upper surface indicated in dark gray, with t. a. line and discal spot of forewing rather weakly represented.

LENGTH OF FOREWING: 23 to 28 mm.

FEMALE: Head like that of male; antennae simple basally, becoming shortly bipectinate about one-third of distance from base and extending almost to apex. Thorax and abdomen like those of male.

UPPER SURFACE OF WINGS: Like that of male.

UNDER SURFACE OF WINGS: Like that of male.

LENGTH OF FOREWING: 27 to 30 mm.

MALE GENITALIA: Similar to those of *quernaria*, but almost twice as large; uncus wide, the posteroventral portion slightly keeled; valves slightly shorter than, or as long as, posterior margin of tegumen, costal sclerotization rather short, then cucullus outwardly oblique to outer margin, transverse structure on inner face of valve with curved posterior margin, extending about two-thirds of distance to sacculus, terminating in an elongate, sclerotized spinose or tooth-like projection, the inner margin of the structure variously dentate, sacculus bluntly pointed at base, terminating in a variably

toothed swelling on outer margin of valve; anellus with lateral structures connected posteriorly by sclerotized area, anterior of transtilla, in length equal to length of uncus, sharply attenuated along the body axis, with basal portion very long and low, the posterior spines curved caudally, finely setose except for apices, the anterior spines directed anteroventrally; juxta with partly membranous areas laterally at bases of sacculi, posterolateral areas with small, vertical areas distad of anterior portion of anellus processes, median area extended ventrally, with truncate posterior margin; saccus broadly U-shaped, slightly concave medially; aedeagus slender, anterior end tapering and slightly curved ventrally, posterior end slightly swollen, laterally with a few spicules, terminally pointed, in length about four-fifths of combined length of tegumen and saccus.

FEMALE GENITALIA: Similar to those of *quernaria*, but about twice as large; sterigma with very large lamella postvaginalis, maximum width almost three times as wide as mouth of ductus bursae, widest posteriorly, flat, tapering anteriorly to narrow neck, with several setae on each side, then swollen again before meeting ductus bursae; ductus bursae lightly sclerotized, the sclerotized portion about twice as long as wide, gently tapering, the ventral lip truncate, with several indentations; corpus bursae ovate, without signum.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Lectotype, male, of *mexicanaria*, from the Snow collection at the University of Kansas, Lawrence, now on indefinite loan to the American Museum of Natural History; designated by Barnes and McDunnough (1917b). The unique female type of *magnificans* (U.S.N.M. No. 25816) is in the United States National Museum collection, as is the unique male type of *triaria*.

TYPE LOCALITIES: New Mexico, according to the original description (*mexicanaria*). Barnes and McDunnough (1917b) state that the type locality is Gallinas Canyon, Las Vegas, New Mexico, while the type is labeled "near Hot Springs, Las Vegas, N. M., 7000 ft., Aug. '82, F. H. Snow." Hunter (1914, p. 15), in summarizing the scientific expeditions of the entomological museum of the University of Kansas, states

that the 1883 expedition was in Gallinas Canyon, while in 1882 the locality was Las Vegas Hot Springs. The latter is assumed to be the correct locality.

For *magnificans*, Moscow, Latah County, Idaho. For *triaria*, Redington, Pima County, Arizona.

DISTRIBUTION: Western United States. (See fig. 15.) On the wing in June, July, and August.

REMARKS: One hundred and seventy-four specimens and eight genitalic dissections were studied. Barnes and McDunnough (1917b) were correct in their assumption that the female mentioned in the original description is not conspecific, as it belongs to the preceding species. The correctly associated female was described as *magnificans* by Dyar.

The type of *triaria* is a very large specimen, somewhat worn, and without abdomen. The course of the t. a. line, as far as can be determined, takes a very deep bend into the cell. This character, plus the large size, indicates that this name should be placed as a synonym of *mexicanaria*. However, the coloration is not that of a typical specimen of this species. Possibly this is an aberrant specimen and, until additional material comes to hand, should be so considered.

The genitalia of this species are about twice the size of those of the preceding species. In the male, the nature of the paired structures of the anellus is greatly changed from that in the previous species, too, as in *mexicanaria* these structures are very long and low. There is a considerable amount of individual variation in the shape of the sclerotized structures on the inner face of the valves; no two dissections show the same shape and configuration of this structure.

The female genitalia can be distinguished from those of the preceding species by the very large lamella postvaginalis, being about three times wider than the ductus bursae. The latter structure is less heavily sclerotized, and it is longer and thinner than in the preceding species.

Phaeoura ianthina, new species

Plate 20, figure 4; text figure 6

A brownish violet species from northern Mexico, slightly smaller than the preceding species and with the pale basal area of the

secondaries contrasting with the darker outer area.

MALE: Head covered mainly with hair-like scales; vertex pale gray; front blackish brown; palpi extending beyond front and above lower margin of eyes, slightly paler than front; antennae with about 88 segments. Thorax above dark brownish violet, with mostly hair-like scales, the collar black, with a narrow posterior margin of grayish white, posterior tuft slightly darker than remainder of thorax, narrowly yellow-brown basally; below densely covered with hair-like scales, paler brownish violet, prothorax darker; legs grayish brown, the ends of tibia and of tarsal segments very slightly lighter in color; process of fore tibia shorter than tibia, arising about one-third of distance from base, extending a short distance beyond end of segment. Abdomen above with a mixture of dark gray, grayish brown, and brownish violet scales, with posterior portions of segments in some specimens narrowly marked with gray, and with basal segment having grayish white scales; below gray.

UPPER SURFACE OF WINGS: Forewings elongate, with ground color gray, heavily overlain with brown, brownish violet, and scattered black scales; basal area suffused with dark scales in upper portion and with dark brown scales between radial and cubital veins; t. a. line blackish gray, fairly prominent, arising on costa approximately one-fourth of distance from base, going sharply outward into cell about two-fifths of length of wing, strongly bent basad in middle of cell, thickened on cubital vein, angled outward to fold, then running straight to inner margin at one-fifth of distance from base; median area contrasting in color, more or less suffused with brown and brownish violet scales; median shade line present, more prominent in lower portion of wing, wide, black or blackish gray, broadly concave, in anterior portion of wing largely replaced by large, narrowly D-shaped discal spot; t. p. line black, tending to be grayish black in cells in lower portion of wing, arising on costa two-thirds of distance from base, proceeding as in *mexicanaria*, meeting inner margin with median shade in a black spot; subterminal area with brown scaling in upper and lower portions, apparently separated from t. p. line by band of

ground color; terminal area broad, heavily suffused with dark brownish violet scales; terminal line dark, interrupted by veins; fringe concolorous with wing. Hind wings concolorous with forewings, only very lightly marked with dark scales basad of extradiscal line, veins dark brown; median shade line rather weak, broad, somewhat nebulous; discal spot oval, with white center; extradiscal line black, prominent, as in *mexicanaria*; outer portion of wing heavily suffused basally with dark brown scales and distally by brownish violet scales, with band of ground color outside extradiscal line, the s. t. line indicated by change in color of scaling plus a few light gray scales; terminal line weakly indicated; fringe as on forewings.

UNDER SURFACE OF WINGS: Wings light gray, with scattered dark gray scales, the costal margin of forewing and all veins tending to be yellowish brown; pattern of upper surface indicated in dark gray.

LENGTH OF FOREWING: Holotype, 24 mm.

FEMALE: Unknown.

MALE GENITALIA: Very similar to those of *mexicanaria*; valves with triangular cucullus, transverse structure on inner face of valves extending about three-fifths of distance to sacculus, terminating in slender, curved apices, the right apex with two short teeth and one long central tooth, the left apex with one outer, short tooth and a long apical tooth, sacculus with truncate base; anellus with paired structures not connected posteriorly by sclerotized area, in length one and one-half times as long as length of uncus; juxta with well-defined, deeply invaginated, membranous areas near posterodorsal margins of sacculus, posterolateral areas elongate, outer margins curved vertically, median area rectangular in outline; saccus broadly U-shaped, broadly concave medially; aedeagus with spicules inconspicuous.

FEMALE GENITALIA: Unknown.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPE: Holotype, male, La Polvosa (latitude 108° 39' W., longitude 28° 09' N.), Chihuahua, Mexico, August 16, 1958 (L. R. Commissaris); in the collection of the American Museum of Natural History.

DISTRIBUTION: Known only from the type locality in western Chihuahua.

REMARKS: One specimen and one genitalic dissection were studied. Unfortunately the unique type is somewhat rubbed and worn, and it may be necessary to give additional descriptive notes on this species when more material becomes available.

This species is related to *mexicanaria*. It can be separated from that moth by its slightly smaller size and by its brownish violet coloration, lacking the areas of orange-brown suffusion that are to be found in Grote's species. In addition, *ianthina* has more segments in its antennae, has a light gray vertex contrasting with a blackish front, and has a broader terminal area of the primaries, than does *mexicanaria*. The basal area of the secondaries of the present species is sharply contrasting in color with the area distad of the extradiscal line, a condition not present in related species.

The male genitalia can be distinguished from those of *mexicanaria* by the fact that the paired structures of the anellus are one and one-half times as long as the uncus, by the truncate bases of the sacculi, and by the deep lateral invaginations of the juxta.

Phaeoura spadix, new species

Plate 20, figures 5, 6; text figures 7, 37

A species similar to *ianthina*, but with the upper surface of the wings predominantly brownish orange. It also occurs in Mexico.

MALE: Head like that of *ianthina*; vertex brownish orange; front dark brown; palpi extending beyond front and above lower margin of eyes, slightly paler than front; antennae with from 75 to 88 segments. Thorax above brownish orange, with a few light gray scales; below densely covered with hair-like scales, brownish gray, prothorax slightly darker; legs grayish brown basally, tibiae and tarsi brown, with ends of the segments paler.

UPPER SURFACE OF WINGS: Forewings with ground color brownish orange, with scattered gray, brown, and brownish black scales, and with cross lines like those of *ianthina*; basal area with gray scales along inner margin of t. a. line, and with a few scattered dark scales; t. a. and t. p. lines dull black, complete, arising from costal spots, t. p. line evenly concave in lower part of wing; median area concolorous with basal and terminal areas;

median shade line broad, dark brown, broadly convex in cell, passing around or including large, elongate, discal spot, becoming concave in lower portion of wing and terminating on or near t. p. line below anal vein; subterminal area of ground color, unicolorous, with a few scattered dark scales; terminal area slightly darkened in upper portion of wing distad of faint, pale, incomplete s. t. line; terminal line weakly represented in upper portion of wing, interrupted by veins; fringe concolorous with wing. Hind wings concolorous with forewings, pale gray along costal margin and basally, becoming overlain with brownish orange scales; maculation like that of *ianthina*; outer portion of wing evenly colored, without indications of s. t. line; terminal line weakly indicated; fringe concolorous with wing.

UNDER SURFACE OF WINGS: Wings light gray, with scattered brown and grayish brown scales reflecting cross lines and discal spots from upper surface; base of cell of primary with elongate, hair-like scales, grayish brown in color.

LENGTH OF FOREWING: 24 to 26 mm. (holotype).

FEMALE: Like male.

LENGTH OF FOREWING: 26 mm. (allotype).

MALE GENITALIA: Very similar to those of *ianthina*; valves with transverse structure on inner face extending about four-sevenths of distance to sacculus, both sides terminating in a large, recurved spine, the inner margin on right side with three teeth, the left side with two, sacculus with truncate base; anellus with paired structures connected medially by sclerotized bar, the posterior arms with setose surface, the anterior arms with ends curving ventrally; juxta with well-defined, deeply invaginated areas near posterodorsal margins of sacculus, posterolateral areas elongate, widened apically, median area elongate; saccus broadly U-shaped; aedeagus with or without minute spicules.

FEMALE GENITALIA: Similar to those of *mexicanaria*; sterigma with very large lamella postvaginalis, rounded, with width about equal to length, having a raised median anterior section; ductus bursae well sclerotized, tapering, slightly longer than wide, the ventral lip slightly convex; corpus bursae ovate, without signum.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Holotype, male, presumably from Acapulco, Mexico; the locality label has been cut, so that the first two letters are completely missing, as well as the upper half of the letters, and part of the last letter of the locality. Allotype, female, Guatemala City, Guatemala (Rodriguez). Paratype, male, Cuernavaca, Morelos, Mexico, September, 1904 (Gadow). Holotype in the collection of the United States National Museum; allotype and paratype in the collection of the British Museum (Natural History).

DISTRIBUTION: This species is known from Guerrero and Morelos, Mexico, south to the capital of Guatemala. The only date of capture is September.

REMARKS: Three specimens and three genitalic dissections were studied. This species is allied to the preceding one but can be separated from *ianthina* by its brownish orange coloration. The male genitalia are distinguished by upcurved apices as compared with the slightly smaller male genitalia of *ianthina*, while the female genitalia can be separated from those of *mexicanaria* by the rounded lamella postvaginalis.

Phaeoura belua, new species

Plate 20, figures 7, 8; text figures 8, 16, 38

A large, dark brownish gray species from Arizona and California, with an indentation of the t. a. line into the cell that is shorter than the same line in the preceding species.

MALE: Head with both normal and hair-like scales; vertex with short, grayish white scales and longer, brownish gray, hair-like scales, with white or light gray scales at antennal bases; front black or blackish gray; palpi extending beyond front and above lower margin of eye; antennae with from 69 to 75 segments. Thorax above grayish brown, with scattered gray scales and with numerous brown, hair-like scales, the collar and posterior tuft dull black; below heavily clothed with hair-like scales, gray to grayish brown, prothorax tending to be slightly darker; legs varying from grayish white to grayish brown, the ends of tibia and tarsal segments lighter in color; process of fore tibia shorter than tibia, arising one-third of distance from base, extending a short

distance beyond end of segment. Abdomen above with a mixture of gray, brown, and black scales, with posterior portions of segments in some specimens narrowly marked with black, basal segment with some grayish white scales; below light to dark gray.

UPPER SURFACE OF WINGS: Forewings somewhat short and broad, with ground color gray, more or less heavily overlain with dark reddish brown, dark gray, and black scales, and with the median, cubital, and anal veins narrowly marked with reddish brown; basal area variably suffused with dark reddish brown in upper portion, and with black scales on veins at base of cell; t. a. line black, prominent, arising on costa approximately one-fourth of distance from base, curving outward into cell, extending less than three-eighths of length of wing, then broadly curved basad to cubital vein, slightly convex below this, meeting inner margin about one-fifth of distance from base; median area contrasting in color, more or less suffused with dark gray and black scales, and with some reddish brown scales present in lower portion of wing in some specimens; median shade line black, usually indicated, at least in lower part of wing, rather nebulous, angled outward from costa to black, ovate, discal spot, the latter with gray or brown scales in middle, the median shade line then running in a generally concave arc to inner margin; t. p. line black, prominent, arising on costa about three-fourths of distance from base, proceeding in a straight or slightly concave course to a prominent, outwardly pointing projection on vein M_3 , the line thickened on veins M_1 and M_2 in some specimens, running slightly basad to a less prominent projection on vein Cu_1 , then broadly concave to anal angle, with a slight tooth or thickening of the line on vein Cu_2 , forming an angle of approximately 90 degrees on anal vein, thence to inner margin about two-thirds of distance from base; subterminal area mostly dark reddish brown, interrupted in cell M_3 and separated from t. p. line by a band of ground color; terminal area of ground color, cells M_1 and M_2 suffused with dark gray and black scales, this suffusion reaching t. p. line in some specimens, and with lower portion also tending to be suffused with dark scales; terminal line blackish brown, interrupted by

veins; fringe concolorous with wing. Hind wings concolorous with forewings, with veins tending to be narrowly reddish brown; dark median shade line weakly represented, in some specimens absent; discal spot oval, black, with a grayish white center; extradiscal line black, prominent, extending completely across wing, with very small, outwardly projecting teeth or a thickening of the line on veins, the line running straight or slightly concave from costa to an outward projection on vein M_3 , then concave to anal margin; outer portion of wing with a light gray subterminal line, shaded basally by a broad band of dark scales; terminal line and fringe as on primaries.

UNDER SURFACE OF WINGS: Wings light gray or grayish white, with scattered darker gray scales, the costal margin of forewing and all veins tending to be slightly ochreous; pattern of upper side indicated in dark gray.

LENGTH OF FOREWING: 21 to 27 mm.; holotype, 24 mm.

FEMALE: Head like that of male; antennae simple basally, becoming shortly bipectinate about one-fourth of distance from base and with terminal one-fourth simple. Thorax and abdomen like those of male, or tending to have slightly less light gray scaling.

UPPER SURFACE OF WINGS: Like that of male, but tending to be more heavily and more coarsely suffused with dark scales.

UNDER SURFACE OF WINGS: Like that of male, but tending to be slightly more suffused with dark scales.

LENGTH OF FOREWING: 26 to 30 mm.; allotype, 26 mm.

MALE GENITALIA: Very similar to those of *mexicanaria*; uncus rather short and thick, with tapering sides; valves with transverse structure extending about three-fifths of distance to cucullus, the width equal to about two-thirds of length of the structure, sacculus wide at base, tapering distally, produced as a small, variably spinose, truncate protuberance on outer margin of valve; anellus with paired structures connected medially by well-sclerotized area situated ventrad to transtilla, the paired structures about one and one-quarter times as long as uncus, the finely setose, slender, posterior spines relatively short and tending to converge apically, the slightly heavier caudal spines elongate;

juxta very broad, curved dorsally opposite posterodorsal margins of sacculi, posterior margin with three subequal protuberances; aedeagus slender, in length about two-thirds of combined length of tegumen and saccus, tubular, posterior end with small, median, rounded protuberance, and with some small, inconspicuous spicules near apex.

FEMALE GENITALIA: Very similar to those of *mexicanaria*; sterigma with very large lamella postvaginalis, maximum width about two and one-half times as wide as mouth of ductus bursae, constricted medially; ductus bursae well sclerotized, the sclerotized portion as long as wide, ventral rim convex, smoothly rounded; corpus bursae somewhat pear-shaped, with a round, dorsal signum.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Holotype, male, Southwestern Research Station of the American Museum of Natural History, 5 miles west of Portal, Cochise County, Arizona, elevation 5400 feet, May 5, 1956 (M. Statham); allotype, female, 6 miles east of Prescott, Yavapai County, Arizona, May 28, 1949 (Crickmer). Paratypes, six males and one female, same data as holotype, June 22, 1957 (M. Statham), July 16, 1955 (W. J. Gertsch), July 14, 1958 (M. A. Cazier), August 14, 1957 (C. W. Kirkwood), May 16-31, 1960 (C. W. Kirkwood); 19 males, Sunnyside, west side of Huachuca Mountains, Cochise County, Arizona, July 7-17, 1958 (T. W. Davies, L. M. Martin); two males, upper camp, Pinery Canyon, Chiricahua Mountains, Cochise County, Arizona, July 3-9, 1956 (L. M. Martin, J. A. Comstock, W. A. Rees); 24 males and one female, Christopher Creek, Mogollon Rim, Gila County, Arizona, elevation 5800 feet, June 16-22, 1957 (L. M. Martin, R. J. Ford, W. A. Rees); 10 males, Tonto Creek State Fish Hatchery, Mogollon Rim, Gila County, Arizona, elevation 6400 feet, June 21, 1957 (L. M. Martin, R. J. Ford, W. A. Rees); three males, Kohl's Ranch, Mogollon Rim, Gila County, Arizona, elevation 5400 feet, June 23, 1957 (L. M. Martin, R. J. Ford, W. A. Rees). Holotype and allotype in the collection of the American Museum of Natural History; paratypes in the collections of that institution, of the

Los Angeles County Museum, and of C. W. Kirkwood.

DISTRIBUTION: The mountains of central and southeastern Arizona, and the San Jacinto Mountains of southern California. (See fig. 16.) On the wing in May, June, July, and August.

REMARKS: Seventy-nine specimens and five genitalic dissections were studied. This species is similar to *mexicanaria*, but it is smaller, as the average length of the primaries in *belua* males is about 3.5 mm. less than that of the Arizona population of *mexicanaria*. The shape of the forewings is different, as *mexicanaria* has more elongate wings. In pattern, *belua* tends to have a more prominent median shade line on the upper surface of the forewings, a much shorter indentation in the t. a. line in the cell, and the t. p. line and extradiscal line straighter and less dentate, than in *mexicanaria*. In color *belua* tends to be somewhat duller and less contrasting, as the brown suffusion tends to be on the darker red side as compared with the more orange tint of *mexicanaria*.

Not much can be said about the females of this species, as only three specimens have been examined of this sex.

In the male genitalia, the short, thickset uncus and the sclerotized, connecting bar of the paired structures of the anellus are diagnostic.

In the single female genitalia dissected and studied, the presence of a definite signum is a most interesting feature. This character is rather variable in this genus, and it will be interesting to see if it is present when more dissections are made. In general the female genitalia are very similar to those of *mexicanaria*. In *belua* the ductus bursae is more heavily sclerotized, is shorter, and has a smoothly rounded, convex ventral lip.

Phaeoura perfidaria Barnes and McDunnough

Plate 21, figures 1, 2; text figures 9, 16, 39

Phaeoura perfidaria BARNES AND McDUNNOUGH, 1917, Contributions to the natural history of the Lepidoptera of North America, vol. 3, p. 247, pl. 26, figs. 4, 5 (holotype male, paratype female). McDUNNOUGH, 1938, Check list, pt. 1, p. 166.

A species from the southwestern United



FIG. 16. Distribution of *Phaeoura belua*, new species, and *P. perfidaria* Barnes and McDunnough.

States that is smaller and paler gray than the preceding species. The males have a darker and more contrasting median area, while the females are suffused with dark brown and orange-brown scales above.

MALE: Head like that of *belua*; palpi extending up to middle of eye; antennae with from 68 to 75 segments. Thorax above gray, with scattered gray-brown scales and hair-like scales, the collar and posterior tuft grayish black; below, and legs, as in *belua*; process of fore tibia shorter than tibia, arising just basad of middle of segment, extending beyond end of segment. Abdomen above gray, with numerous grayish brown and grayish black scales, with posterior portions of segments in some specimens narrowly marked with black, basal segment with light gray scales; below pale gray.

UPPER SURFACE OF WINGS: Forewings rather short and broad, with maculation like that of *belua*; ground color pale gray, overlain with dark gray, dark brown, and black

scales; basal area somewhat suffused with dark gray or brown in lower portion, with black scales on veins and in fold of most specimens; t. a. line black, prominent, with outward curve in cell extending to about one-third of length of wing and tending to be angled in fold; median area contrasting in color, more or less suffused with dark gray, brown, and black scales, these tending to be slightly heavier in lower part of wing in some specimens; median shade line usually indicated, often appearing in lower part of wing and as an elongate spot on costa; discal spot oval, black, with light gray scales in center; t. p. line black, prominent, concave to prominent projection on vein M_3 , deeply concave between projections on Cu_1 and anal vein, forming an angle of approximately 90 degrees or less on anal vein, thence to inner margin just beyond one-half of distance from base; subterminal area pale gray next to t. p. line in upper and lower portions of wing, suffused with dark brown and dark gray

scales at costa and above inner margin; s. t. line light gray, incompletely represented in a few specimens, often absent; terminal area suffused with dark gray and scattered black scales, these tending to be concentrated in cells M_1 and M_2 ; terminal line grayish black, interrupted by veins; fringe concolorous with wing. Hind wings concolorous with forewings; maculation like that of *belua*; extradiscal line with small outward tooth on vein R_1 , concave to vein M_3 , a smaller, outward projection on vein Cu_1 , thence concave to anal margin.

UNDER SURFACE OF WINGS: Like that of *belua*.

LENGTH OF FOREWING: 21 to 24 mm.

FEMALE: Head like that of male but darker; antennae with basal five or six segments simple, becoming shortly bipectinate, with pectinations extending almost to apex. Thorax and abdomen dark brown above, with scattered gray scales; below, pale gray.

UPPER SURFACE OF WINGS: Similar to that of male, but more heavily overlain with dark brown and orange-brown scales, usually more or less obscuring the ground color in most specimens, although the gray tends to show along inner edge of t. a. line and in the two concave areas of t. p. line of forewings; hind wings with some gray scaling in basal portion of wing and along outer edge of extradiscal line.

UNDER SURFACE OF WINGS: Similar to that of male, but more heavily suffused with grayish brown scaling.

LENGTH OF FOREWING: 25 to 27 mm.

MALE GENITALIA: Very similar to those of *belua*; valves with cucullus rounded; anellus with paired structures having posterior members rather coarsely setose, except for naked apices, which are slightly C-shaped, the caudal spines slender, elongate, curving dorsally at apex, thus each structure being slightly S-shaped; juxta with slight dorsal curvature opposite posterodorsal margins of sacculi, posterolateral areas with small vertical area distally, the median area lobate.

FEMALE GENITALIA: Very similar to those of *belua*; sterigma with very large lamella postvaginalis, maximum width about twice that of mouth of ductus bursae, sharply constricted medially, the lateral edges pro-

duced dorsally, without setae on constricted area; ductus bursae slightly wider than constricted area of lamella postvaginalis, the sclerotized area shorter than wide, ventral rim slightly convex, smoothly rounded; corpus bursae rounded, with small, weak signum.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: This species was described from six male and six female types from material in the Barnes collection. One specimen was labeled by Barnes and McDunnough as "type ♂," another as "type ♀," and the remainder as paratypes. The specimen labeled as the type male is hereby designated as the lectotype, and it is the specimen figured on plate 26, figure 4, accompanying the original description. The female on the same plate, figure 5, bears a paratype label, and is not the type female as captioned. The lectotype, type female, and four paratypes of each sex are in the collection of the United States National Museum.

TYPE LOCALITY: Glenwood Springs, Garfield County, Colorado.

DISTRIBUTION: Colorado, Utah, Arizona, and southeastern California. (See fig. 16.) On the wing in April, May, June, July, and August.

REMARKS: Fifty-six specimens and 12 genitalic dissections were studied. This species is closely allied to *belua*. The two might be considered as subspecies of a single species except for certain consistent differences, one of the most noticeable being the structure of the female antennae. Approximately the middle one-half of the antennae is bipectinate in *belua*, while in *perfidaria* there are only five or six simple segments at both the base and apex. This type of difference is known to be of specific value in other species of this genus, so it is assumed to be of equal importance here.

Other differences that will help to distinguish *perfidaria* from *belua* are to be found in the slightly smaller size and paler gray coloration of the present species, as the males have relatively little brown and black suffusion on the wings; the result is a cleaner, more clearly defined type of maculation. The t. a. line of *perfidaria* has a slightly shorter dip in the cell, and it tends to be angled in the

fold; the t. p. line of this species tends to meet the inner margin nearer the center of the wing, and to form an angle of 90 degrees or less on the anal vein. The females tend to be more dimorphic in coloration in *perfidaria* than in *belua*. In the present species they are quite heavily suffused with dark brown and orange-brown scales, and the ground color is usually obscured by these scales. In *belua*, on the other hand, there is some heavier suffusion in the females, but it is not of the magnitude found in this species.

The male genitalia are very similar to those of the preceding species. Differences are to be found in the shape of the lateral structures of the anellus, as they are slightly S-shaped in *perfidaria*, compared with the flat, straight structures in *belua*. Small differences are also found in the juxta, as outlined in the description.

The female genitalia are also very much like those of *belua*. In *perfidaria*, the lamella postvaginalis is slightly smaller than in the preceding species, and the median constriction is nearer the middle and has steeper sides, without any setae. The ductus bursae is shorter than in *belua*.

From the mountain areas of eastern San Bernardino County, California, four specimens have been examined. They are very similar in maculation and color to typical examples of *perfidaria*, although they are a bit smaller and tend to be slightly less marked with dark scales, producing a more even color on the forewings. The single female ("Colorado desert," *ex* collection Henry Edwards) is rather worn and does not appear to be so heavily suffused with reddish brown scales as is that of typical *perfidaria*; the antennae are apparently the same in the two. Until additional material is captured, these few specimens are tentatively placed under this name.

Phaeoura utahensis Cassino and Swett

Plate 21, figure 3; text figures 11, 17

Phaeoura (sic!) utahensis CASSINO AND SWETT, 1923, *Lepidopterist*, vol. 4, p. 14.

Phaeoura utahensis, McDUNNOUGH, 1938, Check list, pt. 1, p. 166.

A pale gray species from the southwestern United States, lacking the dark overlay of scales found in other species, while the

females are suffused with brown and orange-brown scales above.

MALE: Head like that of *perfidaria*; palpi extending to just above middle of eye; antennae with from 67 to 77 segments. Thorax above grayish white, with collar, narrow transverse stripe in patagia, and posterior tuft grayish brown or grayish black; below, and legs, like those of *perfidaria*. Abdomen above grayish white, with scattered grayish brown and grayish black scales, with posterior portions of segments in some specimens narrowly marked with dark, basal segment with white scales; below pale gray.

UPPER SURFACE OF WINGS: Forewings somewhat short and broad, with maculation like that in *perfidaria*; ground color white, overlain with dark gray, brown, and a few blackish brown scales; basal area somewhat suffused with dark scaling in lower portion, with dark gray and blackish brown scales on veins and in fold; t. a. line black, prominent, with outward curve in cell extending to about one-third of length of wing, and tending to be angled in fold; median area contrasting in color, lightly suffused with dark gray and blackish brown scales, these tending to be slightly heavier in lower part of wing; median shade line weakly indicated in lower part of wing; discal spot oval, black, with white scales in center; t. p. line black, prominent, concave to prominent projection on vein M_3 , concave to an almost equally prominent tooth on vein Cu_1 , then deeply concave to another strong outward projection on anal vein, forming an angle of approximately 90 degrees and proceeding to inner margin just beyond one-half of distance from base; subterminal area of ground color next to t. p. line, suffused with pale brownish gray scales below costa and above inner margin; s. t. line light gray, incompletely represented; terminal area suffused with dark gray and with scattered blackish brown scales, the latter tending to be slightly more concentrated in cells M_1 and M_2 ; terminal line dull blackish gray, broadly interrupted by veins; fringe concolorous with wings, faintly checkered with pale scales at vein endings. Hind wings concolorous with forewings, with basal area only slightly suffused with darker scaling; maculation like that of *perfidaria*;

median shade line usually absent, and discal spot rather weakly represented in most specimens.

UNDER SURFACE OF WINGS: Like that of *perfidaria*.

LENGTH OF FOREWING: 22 to 24 mm.

FEMALE: Head like that of male but slightly darker; antennae with basal 10 to 12 segments simple, becoming shortly bipectinate, with pectinations extending almost to apex. Thorax and abdomen dark brown or brownish black above, the former with numerous gray scales.

UPPER SURFACE OF WINGS: Similar to that of male, but more heavily overlain with dark brown and orange-brown scales, usually more or less obscuring the ground color in most specimens, although the gray tends to show along inner edge of t. a. line and in the two concave areas of t. p. line of forewings; hind wings with basal portion of wing and outer edge of extradiscal line gray, with sparse, brownish black irrorations.

UNDER SURFACE OF WINGS: Similar to that of male, but more heavily suffused with grayish brown scaling.

LENGTH OF FOREWING: 27 mm.

MALE GENITALIA: Very similar to those of *perfidaria*; valves with costal sclerotization tapering terminally, cucullus rounded; anellus with posterior of paired structures very sparsely setose, the setae situated mainly on ventral ridge of structure, the anterior spines evenly curving ventrally; juxta with posterolateral areas well defined, directed slightly outward, slightly shorter than rounded median lobe.

FEMALE GENITALIA: Not examined.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Holotype, male, and allotype, female, in the Museum of Comparative Zoölogy, Harvard College (M.C.Z. No. 16560).

DISTRIBUTION: Utah. There are single specimens from the Cassino collection, labeled Paradise, Arizona, July, and Glenwood Springs, Colorado, June 24-30; these records should be verified. (See fig. 17.) On the wing in June and July.

REMARKS: Seven specimens and two genitalic dissections were studied. This species is closely related to *perfidaria*. In *utahensis*, the

wings are paler than in any other known species in the genus, and they have neither so heavy nor so dark an overlying suffusion.

The male genitalia are very similar to those of *perfidaria*. Differences can be found in the nature and shape of the paired structures of the anellus and the juxta. In the former, the posterior pair of spines are very sparsely setose, with the setae on the ventral ridges of the structure in *utahensis*. The posterolateral lobes on the posterior margin of the juxta are more clearly defined and more rectangular in this species than in *perfidaria*.

***Phaeoura aetha*, new species**

Plate 21, figures 4, 5; text figures 10, 17, 40

A contrastingly colored species from the western portion of the Great Basin. The males have a blackish median area and an orange-brown subterminal area, while the females are suffused with orange-brown scales above.

MALE: Head like that of *perfidaria*; antennae with from 71 to 79 segments. Thorax above light gray, with scattered grayish brown and black scales and hair-like scales, in some specimens completely brownish black, the collar dark brown anteriorly, becoming black posteriorly, posterior tuft blackish brown, light brown anteriorly and often grayish brown posteriorly; below, and legs, like those in *perfidaria*; process of fore tibia shorter than tibia, arising about one-third of distance from base, extending a short distance beyond end of segment. Abdomen above with mixture of light gray, blackish brown, and light orange-brown scales, the last being concentrated on anterior part of abdomen, with posterior portions of segments narrowly marked with black, basal segment with grayish white scales; below grayish white, with scattered grayish black scales.

UPPER SURFACE OF WINGS: Forewings rather short and broad, with maculation like that of *perfidaria*; ground color white or grayish white, overlain with grayish brown, black, and orange-brown scales; basal area suffused with dark scales basally, leaving a more or less clear band of ground color next to t. a. line; t. a. line black, prominent, with outward curve in cell extending slightly less than three-eighths of length of wing, convex

in fold; median area contrasting in color, more or less heavily suffused with dark scales, with dark brown or dark orange scales concentrated along costa and anal vein; median shade line present, weakly represented in upper portion of wing, in form of gentle curve below discal spot; discal spot oval or in some specimens somewhat rounded, black, with white or grayish white scales in center; t. p. line black, prominent, slightly concave to prominent projection on vein M_3 , inwardly oblique to vein Cu_1 , then deeply concave to anal vein, thence sharply inward to meet inner margin just beyond one-half of distance from base; subterminal area of ground color next to t. p. line in upper and lower portions of wing, in some specimens overlain with dark gray scales, and broadly suffused with light orange-brown in upper and lower portions of wing; s. t. line light gray, narrow, in some specimens partially absent; terminal area suffused with dark grayish brown and black scales, becoming darker in some specimens in cells M_1 and M_2 ; terminal line black, broadly interrupted by veins; fringe checkered, grayish black, whitish opposite vein endings. Hind wings concolorous with forewings; maculation like that of *perfidaria*; extradiscal line running straight to small tooth on vein M_3 , then slightly concave to anal margin.

UNDER SURFACE OF WINGS: Like that of *perfidaria*, but with slightly darker terminal line and fringe, both tending to be interrupted by veins.

LENGTH OF FOREWING: 21 to 25 mm.; holotype, 23 mm.

FEMALE: Head like that of male; antennae with basal 10 or 15 segments simple, becoming very shortly bipectinate, with pectinations terminating about 10 or 15 segments before apex. Thorax above with mixed light gray, blackish gray, and orange-brown scales, the patagia with a narrow, transverse band of blackish gray; below like male. Abdomen broadly suffused above with orange-brown, with posterior portions of segments narrowly marked with black.

UPPER SURFACE OF WINGS: Similar to that of male, but more heavily overlain with orange-brown scales, particularly in basal and median areas of forewings; fringe dull black, interrupted with ground color opposite veins;

hind wings with orange-brown scaling along cubital vein and basad of faint subterminal line.

UNDER SURFACE OF WINGS: Similar to that of male.

LENGTH OF FOREWING: 25 to 27 mm.; allotype, 26 mm.

MALE GENITALIA: Very similar to those of *perfidaria*; anellus with posterior of paired structures slender, finely setose, the anterior pair with ventral side slightly concave; juxta with posterolateral areas well defined, directed posteriorly, the median lobe rounded, with a small terminal indentation in some specimens.

FEMALE GENITALIA: Very similar to those of *perfidaria*; sterigma with large lamella postvaginalis, slightly asymmetrical, median constriction extending farther posteriorly on right side, lateral edges slightly produced dorsally, right side deeper than left; ductus bursae slightly wider than constricted area of lamella postvaginalis, length of sclerotized area subequal to width, ventral rim slightly convex; corpus bursae apparently without signum.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Holotype, male, Smoky Valley, Tulare County, California, June 23, 1947 (Charles Ingham); allotype, female, same data, June 17, 1945, elevation 6300 feet (C. Henne). Paratypes, 60 males and one female, same data as types, May 28, 1943, and various dates in June, 1943 to 1954 inclusive; four males and one female, Coleville, Mono County, California, July 2-9, 1948 (R. Coleman); July 23, 1952; one male, Barton Flats, San Bernardino County, California, June 28, 1946 (G. H. and J. L. Sperry); one male, Doble, near Baldwin Lake, San Bernardino County, elevation 7400 feet, April 28, 1959 (C. Henne); one male, Split Rock Tank, Riverside County, California, May 21, 1938 (G. H. and J. L. Sperry); four males, Ichthyosaur State Park, Nye County, Nevada, June 21-24, 1960 (R. L. Westcott). Holotype in the collection of the American Museum of Natural History; allotype in the Los Angeles County Museum; paratypes in these two institutions, in the collection of J. H. Baker, and in that of the author.

DISTRIBUTION: Nevada and California, extending down the eastern side of the Sierra Nevada Mountains and south into the San Bernardino Mountains and adjacent desert areas to the east. (See fig. 17.) On the wing in late April, May, June, and July.

REMARKS: Seventy-two specimens and seven genitalic dissections were studied. This species is similar to *perfidaria* but can be distinguished by the whiter ground color and the more contrasting nature of the coloration of the upper surface. One of the most prominent diagnostic features of the coloring is the two broad patches of orange-brown scaling outside the t. p. line on the primaries. This same coloring, somewhat darkened, is also present in the median area of the forewings, along the costa, and in the lower portion of the wing. The females can be separated from those of *perfidaria* by the antennal pectinations, as those of *aetha* are much shorter in length and begin farther from the base than those of *perfidaria*. The present species has a lighter ground color than does *perfidaria*, and the females of *aetha* are not so heavily suffused with dark scales as is the Colorado species.

The genitalia show a very close similarity

to those of *perfidaria*. Once again a careful study of the lateral structures of the anellus of the male show certain differences. In *aetha*, the posterior pair of spines are thinner and less heavily setose, and the ventral margin of the anterior pair is concave, rather than strongly curved ventrally as in *perfidaria*. In the female the slightly asymmetrical lamella postvaginalis is unique in the genus. There are some differences between the two female dissections in the extent of the asymmetrical nature of the lamella postvaginalis. In the one paratopotype studied the asymmetrical nature is quite evident, and the median constriction extends farther posteriorly on the right side than on the left; in a paratype from Coleville, the right side is scarcely longer than the left, but the dorsal extension of the lateral edge is more prominent on this side. In both cases the lateral extensions of the dorsum of the eighth abdominal segment have the right side terminating farther to the rear than the left side.

***Phaeoura cana*, new species**

Plate 21, figure 7; text figures 12, 17

A pale grayish brown species from southern

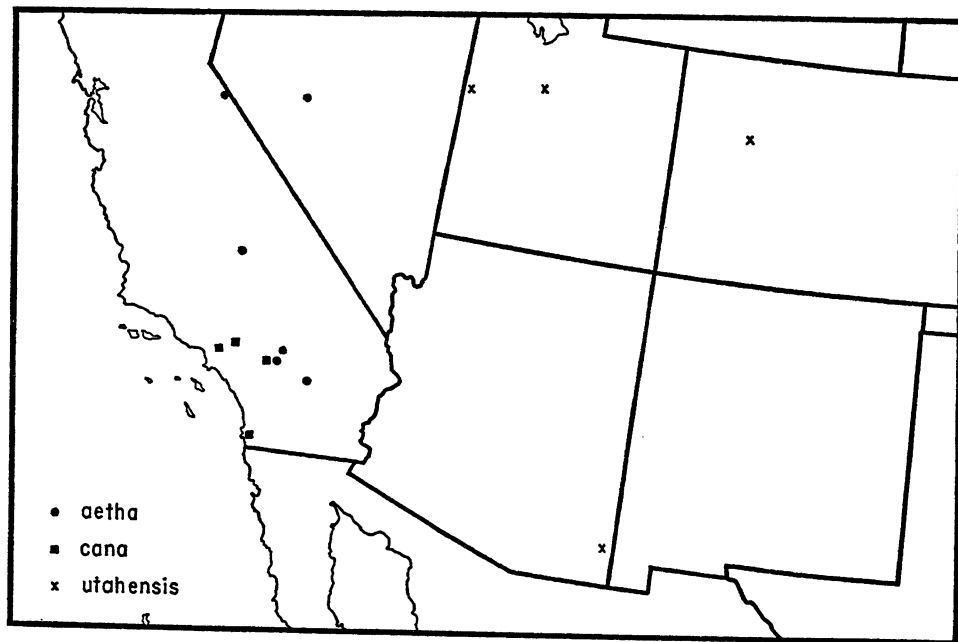


FIG. 17. Distribution of *Phaeoura utahensis* Cassino and Swett, *P. aetha*, new species, and *P. cana*, new species.

California, with a dark brown subterminal area in the male.

MALE: Head like that of *perfidaria*; antennae with from 70 to 74 segments. Thorax above light gray, with a few grayish brown scales and hair-like scales, the collar and posterior tuft grayish black; below, and legs, like those of *perfidaria*; process of fore tibia shorter than tibia, arising near base and extending a short distance beyond end of segment. Abdomen above light gray, with scattered dark gray and brownish gray scales, the latter concentrated on anterior part of abdomen, with posterior portions of segments weakly marked with dark in some specimens; below grayish white, with scattered dark scales.

UPPER SURFACE OF WINGS: Forewings rather short and broad, with maculation of the same type as that of *perfidaria*; ground color pale gray, overlain with grayish brown and with a few scattered, blackish brown scales; basal area with blackish brown scales along radial vein and as a dash in cubital cell; t. a. line black, prominent, with outward curve in cell extending about one-third of length of wing, with a generally convex course, having a small basal tooth on the cubital vein; median area slightly darker than basal and subterminal areas; median shade line weak, present in lower portion of wing only; discal spot elliptical, black, with pale gray or grayish brown scales in center; t. p. line black, prominent, like that in *aetha* but with a stronger tooth on anal vein; subterminal area of ground color next to t. p. line in upper and lower portions of wing, and suffused with dull dark brown distally; s. t. line very weak or absent; terminal area of ground color, sprinkled with scattered dark scales, more noticeable in cells M_1 and M_2 ; terminal line brownish black, broadly interrupted by veins, narrow and rather weak; fringe grayish brown, lighter opposite vein endings. Hind wings concolorous with forewings; maculation like that of *aetha*, but with weak terminal line.

UNDER SURFACE OF WINGS: Like that of *aetha* but with a glossier surface and with less dark scaling.

LENGTH OF FOREWING: 23 to 24 mm.; holotype, 24 mm.

FEMALE: Unknown.

MALE GENITALIA: Very similar to those of *perfidaria*; anellus with posterior of paired structures tapering, lightly setose, anterior pair with ventral side concave; juxta with posterolateral areas well defined, directed posteriorly, median lobe rounded; aedeagus with posterior end bifid, having the lateral margins extended posteriorly, concave between.

FEMALE GENITALIA: Unknown.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Holotype, male, Camp Angelus, San Bernardino County, California, July 16, 1946 (Noel Crickmer). Paratypes, one male, north fork, San Gabriel Canyon, Los Angeles County, California, July 29, 1945 (Don Meadows); one male, Mt. Lowe, Los Angeles County, California, June 7; one male, San Diego, San Diego County, California, September 22. Holotype in the collection of the American Museum of Natural History; paratypes in the collection of the United States National Museum and of the Museum of Comparative Zoölogy, Harvard College.

DISTRIBUTION: The San Gabriel and San Bernardino Mountains of southern California, with a single specimen from San Diego in the Cassino collection. (See fig. 17.) On the wing in June, July, and September.

REMARKS: Four specimens and two genitalic dissections were studied. This species is one of the palest to be found in this genus. In this respect it is somewhat similar to *utahensis*, but *cana* is a slightly darker gray, and the brown subterminal area is more pronounced. Another diagnostic feature is the more evenly curved t. a. line, as it does not have a strong basal tooth on the cubital vein.

In the male genitalia the bifid apex to the aedeagus is characteristic of this species. The lateral structures of the anellus are more curved than those of *perfidaria* and *aetha*.

GENUS *THYRINTEINA* MÖSCHLER

Thyriniteina MÖSCHLER, 1890, Abhandl. Senckenbergischen Naturf. Gesell., vol. 16, p. 268. SCHAUS, 1940, in Scientific survey of Porto Rico and the Virgin Islands, New York Academy of Sciences, vol. 12, p. 323.

Head with short palpi; antennae with from 35 to 45 segments, terminal eight or 10

segments much shorter than basal ones, pectinations of male extending up to reduced terminal segments, the longest ones about seven times as long as basal antennal segments, of even width or slightly swollen basally, of female simple or shortly serrate, apparently the result of coalescence of short pectinations to segments. Thorax dorsally with hair-like scales restricted to tegulae, without posterior tuft, ventrally with relatively few hair-like scales; fore tibia with process of male arising near base from a swelling, in width equal to width of tibia, and with an elongate hair pencil from outer surface, as long as tibia, and with process extending shortly beyond end of segment, of female without basal swelling, arising just beyond middle of segment, and not reaching end of segment, hind tibia with terminal pair of spurs only. Abdomen with small, inconspicuous, middorsal tufts, often absent in worn specimens. Forewings of male short, broad, and triangular, of female much larger and somewhat more pointed; hind wings with Sc approximate to R near base, with a weak cross vein; R and M_1 from before upper angle.

MALE GENITALIA: Uncus elongate, or greatly reduced; socius weakly represented; gnathos membranous; valves elongate, unornamented, with very wide base, tapering distally, bluntly rounded or pointed apically, with sclerotized costa; anellus with paired lateral structures usually well developed, with one or two pairs of elongate, curved points, in some species reduced to a rod-like structure; juxta very large, sclerotized, with median area extended posteriorly as paired, median, and lateral points, or with a single, elongate, median point only; saccus broad, concave medially; aedeagus moderately slender, swollen basally, pointed distally; vesica with several small cornuti or a single, large, thorn-like cornutus.

FEMALE GENITALIA: Sterigma with elongate, slender lamella postvaginalis, with or without a raised, sclerotized structure, lamella antevaginalis in form of a slender, sclerotized rod, U-shaped, extending anteriorly to encircle ostium, complete or partially obsolescent medially; ductus bursae short, well sclerotized posteriorly, becoming more membranous anteriorly; ductus seminalis arising dorsally or on right side; corpus bursae large,

membranous, with elliptical signum, usually with both ends extended as small, inwardly directed points.

EARLY STAGES: Unknown.

TYPE SPECIES: *Boarmia quadricostaria* Herrich-Schäffer, by original designation (= *Thyrinteina arnobia quadricostaria*).

RANGE: Widespread in the American tropics, from southern Texas to the Argentine, and in the Greater Antilles.

This genus is represented by four species. One is widespread on both the mainland and in the Greater Antilles, being divisible into several subspecies; the second, an insular one in the Caribbean; and the other two are found in southern South America. All have the females larger than the males, with white or brownish wings. The male genitalia have simple valves and one or more small cornuti in the vesica. The female genitalia have an elliptical signum, usually with an inwardly pointing tooth near each end.

KEY TO SPECIES¹

BASED ON MACULATION

1. Males 2
Females 6
2. Forewings broadly shaded with tan or pale brown, with occasional specimens white (usually not exceeding 12% of the population); South America and part of Central America *arnobia arnobia*
Forewings white, or white lightly dusted with brown 3
3. All wings below with discal spots black. *schadeana*
Discal dots below white, inconspicuous 4
4. Forewings white, rarely completely shaded with dark brown (usually not exceeding 6% of the population); Mexico *arnobia phala*
Forewings white, dusted with brown; Antilles 5
5. Wings slightly more heavily dusted with brown; Cuba, Hispaniola, Puerto Rico. *arnobia quadricostaria*
Wings slightly less dusted with brown; Jamaica *unicornis*
6. All wings below with discal dots black. *schadeana*
Discal dots of under side white 7
7. Antennae black *arnobia, unicornis*
Antennae white *leucoceraea*

¹ The males of *leucoceraea* are unknown.

BASED ON MALE GENITALIA

1. Uncus long and slender, approximately twice as long as width of aedeagus *arnobia*
Uncus reduced, shorter than width of aedeagus 2
2. Vesica armed with two to four small cornuti *unicornis*
Vesica armed with a single, large, thorn-like cornutus *schadeana*

BASED ON FEMALE GENITALIA

1. Lamella antevaginalis a very slender, U-shaped rod, in length equal to length of apophyses anteriores *arnobia*
Lamella antevaginalis shorter than apophyses anteriores 2
2. Posterior margin of ductus bursae simple, truncate 3
Posterior margin of ductus bursae extended as an elongate, capitate, sclerotized projection *schadeana*
3. Sclerotized portion of ductus bursae slightly wider than long *leucoceraea*
Sclerotized portion of ductus bursae about twice as long as width *unicornis*

Thyrintina arnobia arnobia (Stoll)

Plate 21, figure 6, plate 22, figure 1;
text figures 25, 41

Phalaena Geometra arnobia STOLL, 1782, *Papillons exotiques des tres parties du monde*, vol. 4, p. 188, pl. 383, fig. 1.

Amphidasys arnobiaria (*sic!*), GUENÉE, 1857, *Histoire naturelle des insectes*, vol. 9, p. 211. OBERTHÜR, 1913, *Etudes de lépidoptérologie comparée*, fasc. 7, p. 251.

Amphidasys arnobia, WALKER, 1860, List of the specimens of lepidopterous insects in the collection of the British Museum, pt. 21, p. 308 (*partim*).

Amphidasys arnobia, DRUCE, 1892, *Biologia Centrali-Americana, Insecta, Lepidoptera-Heterocera*, vol. 2, p. 71 (*partim*).

Thyrintina arnobia, PROUT, 1910, *Trans. Ent. Soc. London*, p. 343 (*partim*). BEEBE AND FLEMING, 1951, *Zoologica*, vol. 36, p. 250.

Boarmia oppositaria WALKER, 1860, List of the specimens of lepidopterous insects in the collection of the British Museum, pt. 21, p. 361. PROUT, 1910, *Trans. Ent. Soc. London*, p. 343 (*synonymy*).

Thyrentina (*sic!*) *oppositaria*, KAYE AND LAMONT, 1927, *Mem. Dept. Agr. Trinidad and Tobago*, no. 3, p. 99.

Biston immissus C. FELDER, R. FELDER, AND ROGENHOFER, "1864-1867" (1875), *Reise der Österreichischen Fregatte "Novara" um die Erde*, vol. 2, atlas, p. 3, pl. 133, fig. 24. PROUT, 1910, *Trans. Ent. Soc. London*, p. 343 (*synonymy*).

A species in which the males are of moderate size, with the forewings suffused with brown. It occurs in South and Central America.

MALE: Head, vertex white, long-scaled; front, upper one-half black or brownish black, lower portion white; palpi white, laterally marked with black or brownish black; antennae with about 44 or 45 segments. Thorax above white, long-scaled, some specimens with a few black scales posteriorly; below white or whitish gray; legs white or light gray basally, tibia and tarsus mostly blackish brown, lighter at ends of segments. Abdomen white or grayish white, above and below, with a few scattered black scales.

UPPER SURFACE OF WINGS: Forewings with ground color white, variably suffused with brown scales beyond t. a. line, usually covering ground color completely; basal area sparsely dusted with scattered dark scales; t. a. line brown or blackish brown, varying from being completely represented to obsolescent, arising on costa about one-fourth of distance from base as large, dark brown, costal spot, outwardly curved in cell, with slight thickening or basal tooth on cubital vein, with bluntly rounded basal projection in cubital cell, a sharp, outwardly directed tooth on anal vein, then inwardly oblique to inner margin; median area usually more or less solidly suffused with brown; median shade line arising about middle of costa as large, dark brown spot, the line often obsolescent in upper portion of wing, more prominent in lower portion, appearing as broad shade line; discal spot of slightly raised scales, white, gray, or brown in color; t. p. line blackish brown, complete, arising on costa about two-thirds of distance from base as large, dark brown spot, outwardly dentate on veins, extending outward to vein M₃, subparalleling wing margin to vein Cu₁, then concave, swinging outward on anal vein, then obliquely inward to inner margin at about seven-tenths of distance from base; subterminal and terminal areas usually concolorous, with a large brown subapical spot, in some specimens a dark, broad, subterminal band may be present, shaded distally with lighter scales; terminal line dark, interrupted by veins; fringe brown or blackish brown,

narrowly interrupted at vein endings. Hind wings white, shaded with brown scaling at apex; basal and median areas lightly dusted with black or brown scales; median shade line weakly represented; discal spot white, encircled by narrow dark line; extradiscal line blackish brown, complete, concave between veins, with outward projections thereon, running more or less straight to vein M_3 , parallel with outer margin to vein Cu_1 , then concave to anal vein; subterminal line more or less completely represented, often obsolete in middle of wing; terminal line complete or interrupted by veins, blackish brown; fringe white or concolorous with wing, interrupted by white at vein endings.

UNDER SURFACE OF WINGS: Forewings brown or white, depending on color of upper surface; without maculation, the costal margin pale brown, with large black spots; fringe concolorous with wing, in some specimens very narrowly pale at vein endings. Hind wings brown and white, or white; discal spot weakly indicated, and start of extradiscal line at costa marked with a dark spot; fringe as on forewings.

LENGTH OF FOREWING: 16 to 20 mm.

FEMALE: Similar to male, but much larger; antennae black.

UPPER SURFACE OF WINGS: White, without brown suffusion, the wings lightly dusted with scattered blackish brown scales; discal spot of primaries absent, subterminal line of both sets of wings only very weakly represented, otherwise like that of male.

UNDER SURFACE OF WINGS: White, lightly dusted with brown scales. Primaries with t. a. line showing through from upper surface; t. p. line originating at large black spot on costa and indicated by elongate spots on veins. Hind wings with more or less complete extradiscal line, beginning as large costal spot.

LENGTH OF FOREWING: 25 to 32 mm.

MALE GENITALIA: Uncus elongate, parallel-sided, apex bluntly rounded, with a slight ventral ridge; valves with very wide base, outer margin angled or curved posteriorly, tapered distally, apex bluntly rounded; costa smoothly sclerotized for about three-fourths of length of valve, broadest in middle of sclerotized area; cucullus with numerous setae; anellus with paired lateral structures

curving posteriorly, arising from narrow, elongate base with slender sclerotized strips along anterior and posterior margins; juxta with median area extended posteriorly as two small median projections and a pair of longer, lateral teeth, the edges between them slightly swollen or virtually straight, and with anterolateral areas deeply invaginated dorsally; saccus broad, U-shaped, concave medially; aedeagus with broadly swollen anterior end and elongate, pointed posterior end, in length equal to combined lengths of tegumen and saccus; vesica armed with from one to three small cornuti.

FEMALE GENITALIA: Sterigma with lamella postvaginalis elongate, slightly concave, the lateral margins irregular, lamella antevaginalis a very slender, elongate, U-shaped, sclerotized rod extending anteriorly to beyond ostium, completely or slightly broken on midline, in length equal to length of apophyses anteriores; ductus bursae a short, rectangular, sclerotized structure, posterolaterally extended to unite with lamella postvaginalis, anteriorly becoming narrowed, more membranous, and with longitudinal striations; corpus bursae elongate, membranous, ovate in outline, with a rather poorly defined, laterally elliptical signum, both ends of which extend inward as small, sclerotized points.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Of *arnobia*, location unknown. The types of *oppositaria* and *immissus* are in the British Museum (Natural History).

TYPE LOCALITIES: Surinam (*arnobia*); Venezuela (*oppositaria*); Amazonas, Brazil (*immissus*).

DISTRIBUTION: The nominate subspecies occurs in South America and part of Central America. Specimens have been examined from Bolivia, Brazil, British Guiana, Colombia, Costa Rica, French Guiana, Panama and the Canal Zone, Paraguay, Peru, El Salvador, Surinam, Trinidad, and Venezuela. It has also been reported from Uruguay (Guenée, 1857). On the wing in every month of the year.

This species is known to occur in Guatemala, Honduras, and Nicaragua, as females have been examined from these three countries. At this time it is not possible to place

them in this subspecies or the following one. More material is needed, particularly males, before their status can be determined.

REMARKS: One hundred and fifty-seven specimens and 11 genitalic dissections were studied. This population is characterized by the fact that the upper surface of the forewings of the males is largely suffused with a pale brown or tan beyond the t. a. line and, in many specimens, that the brown is also found on the apical portion of the secondaries. On the under side the brown is repeated, usually extending over the entire forewing and on the anterior portion of the hind wing. Occasional males are not suffused with brown, and this would appear to be the recessive character for wing color in the population. In a series of 58 males from Brazil, eight specimens fall into such a category, and one or two other specimens are but lightly suffused with brown. The non-brown males occurred in approximately one-eighth of this population as represented in the samples studied.

***Thyriniteina arnobia phala*, new subspecies**

Plate 22, figures 2, 3

Amphidasys arnobia, DRUCE, 1892, *Biologia Centrali-Americana, Insecta, Lepidoptera-Heterocera*, vol. 2, p. 71 (*partim*); 1893, *op. cit.*, vol. 3, pl. 48, fig. 4; 1898, *op. cit.*, suppl., vol. 2, p. 533.

Amphidasys arnobia, DYAR, 1914, *Proc. U. S. Natl. Mus.*, vol. 47, p. 242.

This subspecies occurs in Mexico and the adjacent mainland areas and is characterized by the white forewings of the males.

MALE: Head, thorax and abdomen like those of nominate subspecies.

UPPER SURFACE OF WINGS: Forewings, ground color white, lightly dusted with scattered brown or blackish brown scales, rarely completely suffused with dark brown scales; maculation like that of nominate subspecies. Hind wings concolorous with forewings; maculation like that of nominate subspecies.

UNDER SURFACE OF WINGS: Forewings, ground color white, rarely completely suffused with dark brown scales, costal margin pale brown, with brownish black spots and markings, apical portion suffused with brown scaling. Hind wings white, without suffusion

or maculation except for small dark spot marking inception of extradiscal line.

LENGTH OF FOREWING: 15 to 20 mm.; holotype, 17 mm.

FEMALE: Head, thorax and abdomen like those of male.

UPPER SURFACE OF WINGS: Similar to those of male, but slightly more heavily dusted with dark brown scales, and with discal spots more prominent.

UNDER SURFACE OF WINGS: White, similar to that of nominate subspecies.

LENGTH OF FOREWING: 25 to 32 mm.; allotype, 29 mm.

MALE GENITALIA: Like those of nominate subspecies but differing as follows: uncus slightly thinner; paired processes of anellus appearing to be slightly thicker; median projections of juxta slightly heavier and more widely separated, lateral projections of same organ slightly longer; aedeagus slightly longer.

FEMALE GENITALIA: Like those of the nominate subspecies, but differing in that the lamella postvaginalis is slightly larger, and that the lamella antevaginalis is not interrupted in the middle.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Holotype, male, Chichen Itza, Yucatan, Mexico, September 12, 1952 (J. and D. Pallister); allotype, female, Colonia Yucatan, Yucatan, Mexico, August 22, 1952 (J. and D. Pallister). Paratypes, one male from Del Rio, Val Verde County, Texas, May 25, 1952 (Cazier, Gertsch, and Schrammel). The remaining paratypes are from Mexico, listed by states: *Veracruz*: Thirteen males and seven females, Jalapa (W. Schaus), "6-10-1948" (Wegener), December, 1948; one male, Minatitlan, August 20, 1926 (C. C. Hoffmann); one female, "Cerro Azul," July 3, 1924 (C. C. Hoffmann); one female, Orizaba, August, 1907 (C. C. Hoffmann); one male, Jicaltepec, April 4 (Townsend); one male, Teocelo, September; one male, Presidio, July, 1951; one male, La Gloria, Cardal, January, 1938 (J. Camolo G.); one male, Cordoba (R. Muller); one male and one female, Coatepec; three females, Motzorongo, June, 1906 (R. Muller); one female, Palo Gaucho, August, 1941 (J. Camolo G.). *Yucatan*: Thirty-three males

and seven females, Chichen Itza, various dates in May, June, July, August, and September, 1952, 1954 (J. and D. Pallister, E. C. Welling); three males, Colonia Yucatan, August 18, 19, 1952 (J. and D. Pallister); one male, Chuminopolis, August 6, 1952 (J. and D. Pallister); one male, Pisté, June 9, 1959 (C. and P. Vaurie); one male, Xtohil, May 13, 1954 (E. C. Welling). *San Luis Potosi*: One male, Valles (Mrs. R. H. Steude); six females, Tamazunchale, May 20, 1952 (Cazier, Gertsch, and Schrammel). *Guerrero*: Two males, Agua del Obispo, July, 1932 (C. C. Hoffmann). *Chiapas*: One male, "La Granja," July, 1930 (C. C. Hoffmann). *Tabasco*: One male, Teapa, January 14 (R. Muller); one female, Frontera, October 18 (R. Muller). Holotype and allotype in the collection of the American Museum of Natural History; paratypes in the collections of that institution, of the United States National Museum, and of the Carnegie Museum.

DISTRIBUTION: Southern Texas (Del Rio), Mexico, and British Honduras. On the wing from April through September, and December.

REMARKS: One hundred specimens and five genitalic dissections were studied. In this population white is the dominant color for the upper surface of the forewings of the males. In a series of 66 males from Mexico four brown specimens have been examined; this recessive coloration occurs in about 6 per cent of the population as represented by the samples studied. In these examples the brown is evenly spread over all four wings, above and below, thus differing from the South American specimens. The white males from South America have the apices of the forewings below white; the Mexican white males have the apices shaded with pale brown.

Thyriniteina arnobia quadricostaria
(Herrich-Schäffer), new
combination

Plate 22, figures 4, 5

Boarmia quadricostaria HERRICH-SCHÄFFER, 1870, Corresp.-Blatt Zool.-Min. Ver. Regensburg, vol. 24, p. 188. GUNDLACH, 1881, Contrib. Ent. Cubana, p. 404. PROUT, 1910, Trans. Ent. Soc. London, p. 343 (synonym of *arnobia*).

Thyriniteina quadricostaria, MÖSCHLER, 1890, Abhandl. Senckenbergischen Naturf. Gesell., vol. 16, p. 268. GUNDLACH, 1891, An. Soc. Española Hist. Nat., vol. 20, p. 337.

Amphidasys arnobia, WALKER, 1860, List of the specimens of lepidopterous insects in the collection of the British Museum, pt. 21, p. 308 (*partim*). WOLCOTT, 1923, Jour. Dept. Agr. Porto Rico, vol. 7, p. 182.

Amphidasys arnobia, DRUCE, 1892, Biologia Centrali-Americana, Insecta, Lepidoptera-Heterocera, vol. 2, p. 71 (*partim*).

Thyriniteina arnobia, PROUT, 1910, Trans. Ent. Soc. London, p. 343 (*partim*). SCHAUS, 1940, in Scientific survey of Porto Rico and the Virgin Islands, New York Academy of Sciences, vol. 12, pt. 3, p. 324. WOLCOTT, 1948, Jour. Agr. Univ. Porto Rico, vol. 32, p. 645.

A population with white forewings, dusted with brown scales, in the males, that occurs in the Greater Antilles.

MALE: Head, thorax and abdomen like those of nominate subspecies, some specimens with brown scales scattered on thorax and abdomen.

UPPER SURFACE OF WINGS: Forewings with ground color white, overlain with pale brownish gray and brown scales and irroration; maculation like that in nominate subspecies, with costal spots tending to be somewhat larger and subterminal band more prominent. Hind wings concolorous with forewings, with basal portion of wing irrorated with dark scales.

UNDER SURFACE OF WINGS: Ground color white; forewings with costa cream-colored, with dark brown spots, apical area suffused with pale grayish brown; all wings without maculation except for traces of discal dots and a small blackish brown spot on costa of hind wings at beginning of extradiscal line.

MALE GENITALIA: Like those of nominate subspecies but differing as follows: uncus slightly thinner; paired processes of anellus appearing to be slightly thicker, with a small, shoulder-like protuberance on dorsal surface of posteriorly curving processes; median projections of juxta slightly heavier and more elongate, lateral projections of same organ longer; aedeagus longer than combined lengths of tegumen and saccus, having a more elongate, pointed, posterior end.

FEMALE GENITALIA: Like those of the nominate subspecies, but differing in that the

lamella postvaginalis is more extensively sclerotized and the lamella antevaginalis is slightly broader, with the sclerotized portion at the midline very slender.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPE: Location unknown.

TYPE LOCALITY: Cuba.

DISTRIBUTION: Cuba, Hispaniola, and Puerto Rico. Both Möschler (1890) and Gundlach (1891) reported it as occurring in Puerto Rico, but no specimens were seen from that island by Schaus (1940). A recently collected specimen has been examined by the author, so the record is verified. On the wing in January, March, May, June, July, September, and October.

REMARKS: Twenty-four specimens and seven genitalic dissections were studied. The Antillean population, as far as is known, consists of white males only. They can be distinguished from males of the other populations by the heavier suffusion of dark scales on the upper surface of the wings. In this respect they are darker than males of the preceding subspecies but much lighter in color than the normal South American males.

Several differences are found in the genitalia. Possibly they reflect a degree of variation that is of specific rank. Until more is known about the various populations, particularly about the early stages, it is thought best to place this population as a subspecies of *arnobia*.

Thyrinitea unicornis, new species

Plate 22, figures 6, 7; text figures 26, 42

Amphidasys arnobia, GOWDEY, 1926, Dept. Agr. Jamaica, Ent. Bull., no. 4, pt. 1, p. 61.

Very similar to *quadricostaria* in size, color, and maculation in both sexes.

MALE: Upper surface of forewings tending to be slightly less heavily dusted with brown scales than in the preceding population, and with the costal spots tending to be slightly more diffuse. Under surface of all wings white, very sparsely dusted with brown scales, the costa of forewings with several small, brownish black spots and of the hind wings with a dark spot at beginning of extradiscal line.

LENGTH OF FOREWING: 15 to 20 mm.; holotype, 18 mm.

FEMALE: Upper surface of all wings white, with a few scattered brownish black scales; cross lines narrow, brownish black, as are the few small costal spots, and the terminal line. Under surface white, with very few dark scales; cross lines of forewings faintly indicated from upper surface; extradiscal line of hind wings complete, very fine except for thicker costal spot.

LENGTH OF FOREWING: 26 to 28 mm.; allotype, 26 mm.

MALE GENITALIA: Uncus short, the apex bifurcate; valves with very wide base, outer margin angled or curved posteriorly, tapered distally, apex bluntly pointed; costa sclerotized for about two-thirds of length of valve, widest at base; cucullus with numerous setae; anellus with thick, paired, lateral structures roughly H-shaped, wider at base than posteriorly, projecting caudad as far as base of uncus, connected medially by a long, sclerotized area, extending anteriorly to posterolateral margins of juxta, and having a ventrally directed, spine-like projection on each side near anterior ends; juxta with median area extended as a very long, thin projection, extending posteriorly as far as posterior margin of valves, anterior portion with distal areas curved posteriorly; saccus very broad, rectangular, anterior margin concave medially; aedeagus with moderately swollen anterior end and an elongate, pointed posterior end, in length subequal to combined lengths of uncus, tegumen, and saccus; vesica armed with two to four small cornuti at the end of a small, weakly sclerotized plate.

FEMALE GENITALIA: Sterigma with lamella postvaginalis about twice as long as wide, narrowed distally, with rough surface and edges, lamella antevaginalis square in outline, slightly narrowed posteriorly, and with a broad, rather flat protuberance on anterior side; ductus bursae slightly enlarged anteriorly, with a lightly sclerotized area extending a short distance on right side of corpus bursae, from which ductus seminalis arises; corpus bursae elongate, membranous, ovate in outline, with small, well-defined, laterally elliptical signum, both ends thickened.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Holotype, male, Phoenix Park, Moneague, St. Ann Parish, Jamaica, Febru-

ary 26, 1957 (B. Heineman); allotype, female, Flamstead, St. James Parish, Jamaica, March, 1927 (C. K. Russel). Paratypes, all from Jamaica and listed by parishes: *Manchester Parish*: Seven males, Mandeville, November 16, 1919, December 20, 1919, January 13-15, 1920, elevation 2131-2250 feet, July 17, 1960, elevation 2000 feet (P. and C. Vaurie); one male, near Troy, June 14-15, 1909; one male, Balaclava, April 15-20, 1909; three males, Christiana, July 31, 1931, July 27, 1933 (Avinoff and Shoumatoff), "8-7-23." *Clarendon Parish*: Two males, Clarendon, Cumberland District, December 15-18, 1919, elevation about 3000 feet. *St. Andrew Parish*: Four males, Constant Spring, April 12, 1931, elevation 600 feet, June 25, 26, August 7, 1936 (Avinoff and Shoumatoff); one male, Hermitage Reservoir, July 24, 1960 (P. and C. Vaurie). *Trelawny Parish*: Three males, Baron Hill, March 16, 1931, elevation 1150 feet, October, 1931 (Lily Perkins); two males, Falmouth, July 19, 1960 (C. and P. Vaurie). *St. Ann Parish*: One male, Shaw Park, Ocho Rios, February 24, 1947 (B. Heineman); one male, Discovery Bay, March 9, 1952 (B. Heineman); 14 males, Moneague (also spelled Monique), various dates in May, June, July, 1895-1933; seven males, Claremont, March, 1931, March, 1933, May 15, 1936, June 2, 1936 (Lily Perkins). *Portland Parish*: Three males, Greenhills, Hardwar Gap, June 4, 13, 26, 1936 (E. Paine); two males, Hardwar Gap, July 13-15, 1960, elevation 4800 feet (P. and C. Vaurie); three males, Green Hills, April, 1940; one male, Mt. Pleasant, July 28, 1936 (Avinoff and Shoumatoff); three males, Port Antonio, February 15, 1955 (B. Heineman). *St. Thomas Parish*: Three males, Morant Bay, July 12, 1933, July 15, 1936 (Avinoff and Shoumatoff); one male, Bath, March, 1937. *St. James Parish*: Three males, Montpelier, August, 1895. Twelve males and one female, "Jamaica" (Baker; F. Klages), 1927 (C. K. Russel), January-April, 1927 (C. K. Russel). The holotype is in the collection of the American Museum of Natural History; the allotype, in the collection of the Carnegie Museum. Paratypes are deposited in both these institutions and in the United States National Museum.

DISTRIBUTION: Jamaica. On the wing in

January through August, November, and December.

REMARKS: Eighty-one specimens and four genitalic dissections were studied. In size, pattern, and color, this species is almost indistinguishable from *arnobia quadricostaria*. This population tends to have the upper and under surfaces of the wings slightly lighter in color than does the preceding subspecies, as the wings have less dark scaling.

The best way to differentiate this species is by the genitalia. In the male, the very short uncus, with its bifurcate apex, the large, H-shaped, paired structures of the anellus, and the very long median process of the juxta are characteristic of *unicornis*. In the female, the quadrate outline of the lamella antevaginalis and the larger ductus bursae are diagnostic.

Thyrinteina leucoceraea, new species

Plate 22, figure 8; text figure 43

A relatively small species, the female having white antennae.

MALE: Unknown.

FEMALE: Head, vertex white; front, upper two-thirds with mixed black and dark brown scales, lower portion white; palpi white; antennae white, with about 42 to 44 segments. Thorax above white, long-scaled, with scattered brownish black scales; below whitish gray; legs whitish gray basally, forelegs with tibia and tarsus blackish brown. Abdomen white or grayish white, above and below with a few scattered black scales.

UPPER SURFACE OF WINGS: Forewings with ground color white, evenly sprinkled with brown scales; cross lines like those in *arnobia*; discal spot of slightly raised white scales; subterminal line very weakly indicated or absent, arising from a rather nebulous brown spot on costa midway between origin of t. p. line and wing apex; terminal line weakly present or absent; fringe concolorous with wing. Hind wings concolorous with forewings, evenly dusted with brown scales; maculation like that of *arnobia*; subterminal line present, interrupted by veins; fringe of ground color.

UNDER SURFACE OF WINGS: All wings white, lightly dusted with brown scales terminally, without maculation except for dark brown venular dots representing t. p.

and extradiscal lines, and for elongate, white discal dots on all wings.

LENGTH OF FOREWING: 22 to 24 mm.; holotype, 24 mm.

MALE GENITALIA: Unknown.

FEMALE GENITALIA: Sterigma with lamella postvaginalis concave dorsally, membranous, ventrally with a raised, subrectangular protuberance, with spiculate surface, the two anterior corners extending shortly cephalad, lamella antevaginalis a narrow, U-shaped rod extending anteriorly beyond ostium; ductus bursae a very short, sclerotized tube, slightly wider than long, truncate posteriorly, narrowing anteriorly; ductus seminalis arising on right side; corpus bursae an elongate, large, membranous structure, elliptical in outline, with a very small, rather weakly defined signum.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Holotype, female, Hansa Humboldt, Santa Catherina, Brazil. Paratypes, two females, same data as holotype, and two females, Tapera, Pernambuco, Brazil (Pickel). Holotype and three paratypes in the collection of the United States National Museum; one paratype in the American Museum of Natural History.

DISTRIBUTION: Known only from the type series from Brazil.

REMARKS: Five specimens and two genitalic dissections were studied. The females of this species resemble small females of *arnobia* but can be distinguished by the fact that the wings are slightly more heavily dusted with brown scales, producing a slightly grayish appearance, the small size, and the white antennae. The genitalia are also distinctive and can be identified by the small lamella antevaginalis, the raised, spiculate lamella postvaginalis, and the very small signum.

Thyriniteina schadeana Schaus

Plate 23, figures 1, 2; text figures 27, 44

Thyriniteina schadeana SCHAUS, 1927, Proc. Ent. Soc. Washington, vol. 29, p. 80.

This species resembles a small, white *arnobia*, with slightly more elongate and narrower wings.

MALE: Head, thorax and abdomen like those of *arnobia*; antennae with from 35 to 37 segments.

UPPER SURFACE OF WINGS: Forewings with ground color white, lightly sprinkled with dark brown scales and more or less suffused with pale brownish gray terminally; cross lines like those in *arnobia*; discal spot of slightly raised white scales, narrowly outlined in brownish black; median area concolorous with basal area and basal portion of subterminal area; subterminal line absent; fringe concolorous with terminal area, faintly interrupted at vein endings. Hind wings concolorous with forewings, lightly dusted with black or dark brown scales; maculation like that of *arnobia*; subterminal line weakly indicated; fringe of ground color.

UNDER SURFACE OF WINGS: All wings white, without maculation except for prominent dark discal dots; forewings slightly suffused with very pale brownish gray terminally, with pale brownish gray costa having some dark brown spots, in some specimens with very faint reflection of t. p. line indicated; hind wings with start of extradiscal line at costa marked with a small dark spot.

LENGTH OF FOREWING: 12 to 15 mm.

FEMALE: Similar to male, but much larger; antennae black.

UPPER SURFACE OF WINGS: White or whitish gray, dusted with dark brown scales; discal spot of forewings outlined by darker scales; terminal line of both wings present.

UNDER SURFACE OF WINGS: White, lightly dusted with brown scales. Forewings with costa concolorous with remainder of wing; all wings with discal spots dark brown, t. p. and extradiscal lines represented by larger costal and smaller venular dots.

LENGTH OF FOREWING: 20 to 21 mm.

MALE GENITALIA: Uncus short, shorter than length of cornutus in aedeagus, with a slight ventral ridge, terminating in a single point; valves with very wide base, tapering distally, apex bluntly pointed; costa sclerotized and heavily setose for one-half to two-thirds of length of valve; cucullus with a moderate number of short setae; anellus with paired lateral structures reduced to a single, diagonal, rod-like structure on each side, slightly enlarged and pointed apically; juxta with median area extended posteriorly as two median projections and a pair of smaller, lateral teeth, the edges between them with

one or two small teeth irregularly placed in some specimens, and with anterolateral areas deeply invaginated dorsally; saccus broad, U-shaped, slightly concave medially; aedeagus slightly constricted before anterior end, broadly swollen posteriorly and terminating in a sclerotized point; vesica armed with a single large, thorn-like cornutus.

FEMALE GENITALIA: Sterigma with lamella postvaginalis concave, membranous, lamella antevaginalis sclerotized posteriorly, then narrowed to a slender, U-shaped rod extending anteriorly to beyond ostium, becoming partly membranous when transverse; ductus bursae a short, sclerotized tube medially, broader than long, extending posteriorly as an elongate, digitate projection, slightly enlarged terminally, its surface rugose, the ductus extending anteriorly as a swollen, more lightly sclerotized area, with an irregular anterior margin; corpus bursae elongate, membranous, ovate in outline, with a well-defined, rounded signum, with two inwardly projecting points.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPE: Schaus described this species from a single female type (U.S.N.M. No. 33207).

TYPE LOCALITY: According to the original description, the type locality was San Bernardino, Paraguay. The specimen bearing the type label is labeled as coming from Trinidad, Paraguay. There is a town with the name of Trinidad on the western outskirts of Asuncion, while San Bernardino is about 20 miles to the east. It is assumed that the correct type locality is the town of Trinidad.

DISTRIBUTION: Specimens have been examined from the type locality in Paraguay and from the provinces of Jujuy and Tucuman in Argentina. The single specimen with a date of capture was labeled April.

REMARKS: Six specimens and five genitalic dissections were studied. This species resembles a small, narrow-winged, white *arnobia*. It can be distinguished from nominate *arnobia* by these characters and by having fewer segments in the antennae. The male genitalia are distinguished by the large, thorn-like cornutus in the vesica and by the elongate, rod-like processes of the anellus. The prominent posterior process of the

ductus bursae of the female genitalia is diagnostic for *schadeana*.

GENUS HOLOCHROA HULST

Holochroa HULST, 1896, Trans. Amer. Ent. Soc., vol. 23, p. 352. DYAR, "1902" (1903), Bull. U. S. Natl. Mus., no. 52, p. 323. J. B. SMITH, 1903, Check list of the Lepidoptera of boreal America, p. 76. GROSSBECK, 1912, Bull. Amer. Mus. Nat. Hist., vol. 31, p. 406. BARNES AND McDUNNOUGH, 1917, Check list of the Lepidoptera of boreal America, p. 117. McDUNNOUGH, 1938, Check list, pt. 1, p. 162.

Gloduria DYAR, 1924, Insec. Inscit. Menstr., vol. 12, p. 18. New synonymy.

Head with short palpi; antennae with about 52 to 57 segments, pectinations of male extending to apex, the longest ones from six to eight times as long as basal antennal segments, of even width or slightly swollen basally, of female simple. Thorax dorsally with numerous hair-like scales, and with a paired posterior tuft, ventrally moderately heavily clothed with hair-like scales; fore tibia with process of male arising just basad of middle of segment, of female just beyond middle, hind tibia with terminal pair of spurs only. Abdomen with small, often inconspicuous, middorsal tufts. Forewings elongate; hind wings with Sc approximate to R slightly basad of middle of cell; R and M₁ from before, at, or stalked beyond, upper angle.

MALE GENITALIA: Uncus elongate; socius weakly represented; gnathos weakly sclerotized, complete or partially obsolescent; valves unornamented or with a single sclerotized arm at base; anellus with paired lateral structures having two elongate, curved points, well separated, one directed posteriorly, the other ventrally; juxta with sclerotized median area extended as a point or rounded lobe; saccus truncate anteriorly; aedeagus slender; vesica with a single heavy cornutus.

FEMALE GENITALIA: Sterigma rather weakly sclerotized; ductus bursae small; corpus bursae moderately large, with stellate signum.

EARLY STAGES: Unknown.

TYPE SPECIES: *Tornos dissociarius* Hulst for *Holochroa*, by original designation. As *dyslogista* Dyar was the only included

species in *Gloduria*, it automatically becomes the type, even though it was not so specified by Dyar.

RANGE: The southwestern United States and northwestern Mexico, extending south in Mexico as far as Guerrero.

This genus is represented by two species, both of which are smaller and have narrower wings than any of the other species in this tribe. Both species are gray or brownish gray in color, with the t. p. line having a characteristic course, as it is concave in the upper part of the wing, sharply angled opposite the cell, and strongly inwardly oblique below this point. The male genitalia have simple valves, a median projection from the anellus, and a single large cornutus in the vesica. The stellate signum and the weakly sclerotized sterigma are diagnostic features of the female genitalia.

KEY TO SPECIES

BASED ON MACULATION

1. Forewings above grayish brown, suffused with brown in basal and subterminal areas, and with prominent t. a. and t. p. lines; hind wings above paler than forewings 2
Forewings above an even, pale brownish gray, with weakly defined cross lines; hind wings above concolorous with forewings . . . *unicolor*
2. Upper surface of forewings a more or less unicolorous grayish brown, the secondaries slightly paler . . . *dissociaria dissociaria*
Upper surface of forewings contrastingly colored, with white basal and subterminal areas separated by grayish black median area, the secondaries contrastingly white
. *dissociaria varia*

BASED ON MALE GENITALIA

- Valve simple. *dissociaria*
Valve with a sclerotized arm at base . . . *unicolor*

BASED ON FEMALE GENITALIA

- Signum extended transversely . . . *dissociaria*
Signum extended longitudinally . . . *unicolor*

Holochroa dissociaria dissociaria (Hulst)

Plate 23, figures 4, 5; text figures 18, 28, 45

Tornos dissociarius HULST, 1887, Ent. Amer., vol. 2, p. 192. PEARSALL, 1908, Canadian Ent., vol. 40, p. 133. RINDGE, 1955, Bull. Amer. Mus. Nat. Hist., vol. 106, p. 141.

Lepiodes dissociaria, J. B. SMITH, 1891, List of the Lepidoptera of Boreal America, p. 71.

Holochroa dissociaria, HULST, 1896, Trans. Amer. Ent. Soc., vol. 23, p. 352. DYAR, "1902" (1903), Bull. U. S. Natl. Mus., no. 52, p. 323 (*partim*). J. B. SMITH, 1903, List of the Lepidoptera of Boreal America, p. 76.

Holochroa dissociarius, GROSSBECK, 1912, Bull. Amer. Mus. Nat. Hist., vol. 31, p. 407. BARNES AND McDUNNOUGH, 1917, Check list of the Lepidoptera of Boreal America, p. 117. McDUNNOUGH, 1938, Check list, pt. 1, p. 162.

A rather evenly colored population, occurring in Arizona and Colorado.

MALE: Head, vertex pale gray or white; front flat, blackish brown; palpi very small, grayish basally, becoming blackish brown terminally; antennae with about 52 segments, the pectinations of the male between six and seven times as long as basal antennal segments. Thorax above pale gray, with scattered dark gray scales, and with black scales between back of head and thorax, below gray, slightly darker anteriorly; legs gray, the tarsi blackish brown, with ends of segments white. Abdomen gray, the second segment black or brownish black dorsally; paler below.

UPPER SURFACE OF WINGS: Forewings with ground color gray, more or less evenly overlain with pale gray and dark gray scales, and with basal and subterminal areas often lightly shaded with brown; t. a. line either absent or weakly represented anteriorly, when present arising on costa about one-third of distance from base, going sharply outward into cell, curving posteriorly, becoming prominent below cell, black, proceeding with slight curve to inner margin about one-fifth of distance from base; discal spot small, white, in some specimens absent; t. p. line very weakly represented anteriorly, arising on costa almost four-fifths of distance from base, making a concave loop to vein M_3 , coming nearer to wing margin than origin of line, sharply angled basally, becoming prominent, black, proceeding to inner margin about one-half of distance from base, usually with slight concavity near vein Cu_2 and with slight convexity at anal vein; subterminal and terminal areas often suffused with brown below angle of t. p. line, and with nebulous gray spotting in cells opposite cell and above

anal angle; terminal line narrow, black, often interrupted by veins, with intravenular spots in upper part of wing; fringe concolorous with wing. Hind wings pale gray, with scattered dark gray and blackish brown scales, these becoming more numerous towards anal margin; discal spot weakly represented or absent; extradiscal line black or blackish brown, becoming faint in upper part of wing, paralleling outer margin, tending to have a small, outwardly directed bend on vein M_3 ; subterminal and terminal areas slightly suffused with gray scales, with faint trace of s. t. line present in some specimens; terminal line and fringe as on primaries.

UNDER SURFACE OF WINGS: All wings pale gray, rather silky in nature, without maculation, although pattern from upper side weakly reflected in some specimens; costa of forewings with gray and grayish black scales; terminal line absent; fringe concolorous with wing.

LENGTH OF FOREWING: 15 to 18 mm., with one specimen measuring 20 mm.

FEMALE: Similar to male, with forewings tending to be slightly less suffused with dark scales, to have discal spot and cross lines slightly more clearly defined; hind wings tending to be darker than in male and less contrasting with primaries.

LENGTH OF FOREWING: 18 to 21 mm.

MALE GENITALIA: Uncus tapering, slightly curved ventrally, terminating in a blunt point; gnathos complete; valves simple, rounded apically, with sclerotized costa extending about three-fifths or four-fifths of length of valve, sacculus with a weak ridge and slightly more sclerotized than remainder of valve; anellus with strongly developed, well-separated, paired structures, posterior prong curved, elongate, longer than anterior one, the latter extending anteriorly well beyond transtilla and terminating in prong; juxta with small lateral lobes, with median area produced posteriorly as a sharply pointed, sclerotized projection with a ventral ridge; aedeagus equal in length to combined lengths of tegumen and sacculus, posterior end bluntly pointed, indented near middle; vesica with a single, heavy, recurved spine, arising from a broad base, with a sclerotized strip anterior thereto.

FEMALE GENITALIA: Sterigma with a

weakly defined elliptical or subrectangular lamella postvaginalis and with small, raised lamella antevaginalis; ductus bursae small, posterolateral margins extending farther caudad than median area; corpus bursae elongate, roughly tear-shaped, with large, stellate signum, situated transversely, with rays more strongly developed on anterior side than on other margins.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPE: In the American Museum of Natural History, the species having been described from a single male.

TYPE LOCALITY: No locality was given in the original description. The type bears a "Cal." label, but California is a doubtful locality, as the species is not known to occur in that state.

DISTRIBUTION: Arizona, Colorado, and Durango. (See fig. 18.) On the wing in April, May, June, July, and August.

REMARKS: One hundred and sixty-five specimens and 16 genitalic dissections were studied. There is some variation in the color and maculation of the upper surface of the forewings, as the amount of dark gray and brown suffusion tends to be somewhat variable; there are also minor differences in the strength and course of the t. a. and t. p. lines. The females are larger and not quite so dark as the males, but have similar maculation. In one example the t. a. and t. p. lines are broken below the cell and have become connected with each other, leaving a brief area without cross lines.

The single Durango male (Palos Colorados, August 4, 1947, 8000 feet elevation; W. J. Gertsch and M. A. Cazier) is the largest known example of this sex, as the primary measures 20 mm. Whether the slightly darker and more brownish forewings and hind wings represent an individual variation or a good population difference will not be known until more material from this area is available.

Holochroa dissociaria varia, new subspecies

Plate 23, figures 6, 7; text figure 18

Holochroa dissociaria, DYAR, "1902" (1903), Bull. U. S. Natl. Mus., no. 52, p. 323 (*partim*).

A more contrastingly marked subspecies, occurring in New Mexico and Texas.

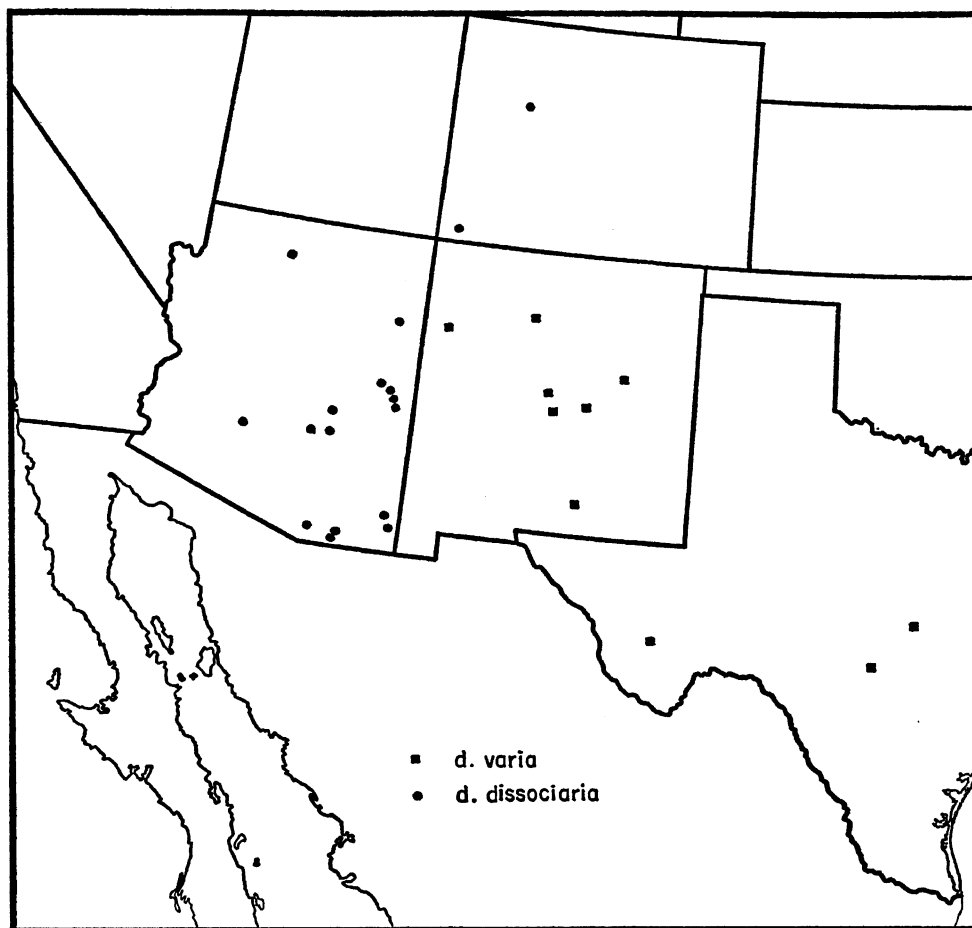


FIG. 18. Distribution of *Holochroa dissociaria* (Hulst). The species is also known from the state of Durango.

MALE: Head, thorax and abdomen like those in nominate subspecies.

UPPER SURFACE OF WINGS: Forewings contrastingly colored, with basal and subterminal areas white, lightly overlain with pale gray scales in some specimens, the median area gray and blackish gray; cross lines like those in nominate *dissociaria*; median area lighter gray parallel with costa, a blackish gray shade line along t. p. line in lower portion of wing; discal spot white or grayish white, narrowly outlined in black; a small, grayish white area of variable size below apex and in cell R_4 , extending across upper part of t. p. line; subterminal area with pale brown below angle of t. p. line; s. t. line light gray, present in upper and lower

parts of wing. Hind wings white, with scattered brown and grayish brown scales along anal angle and terminally; maculation like that of nominate *dissociaria*.

UNDER SURFACE OF WINGS: All wings white, the dark scales of upper surface of forewings faintly reflected below, otherwise like those of typical *dissociaria*, but with discal spots more strongly indicated.

LENGTH OF FOREWING: 16 to 18 mm.; holotype, 17 mm.

FEMALE: Similar to male, the forewings tending to be less contrasting in color, with the white areas completely overlain with gray on both forewings and hind wings, the latter not sharply contrasting in color with the primaries as a result.

LENGTH OF FOREWING: 20 (allotype) to 21 mm.

MALE GENITALIA: Like those of the nominate subspecies.

FEMALE GENITALIA: Like those of the nominate subspecies.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Holotype, male, Gran Quivira National Monument, Socorro County, New Mexico, July 18, 1957 (S. F. Wood), and allotype, female, same data, but collected July 14, 1958. Paratypes: Sixteen males and one female, same data as types, July 18, 22, 1957, July 14, 15, 17, 1958; one male, Mountainair, Torrance County, New Mexico, July 7, 1940, elevation 5800 feet; one male, Santa Rosa, Guadalupe County, New Mexico, July 5, 1951 (A. K. Wyatt). Holotype and allotype in the collection of the Los Angeles County Museum; paratypes in the collection of that institution, of the American Museum of Natural History, and of C. W. Kirkwood.

DISTRIBUTION: New Mexico and the western part of Texas. (See fig. 18.) On the wing from March through July and again in September and October.

REMARKS: Thirty-three specimens and five genitalic dissections were studied. This population is slightly larger and more brightly and contrastingly colored than the nominate subspecies, particularly in the males. The white secondaries, the white basal and subterminal areas, and the very dark median area of the forewings form a marked contrast in color. The females are also lighter in color and have their forewings more contrastingly marked than do the members of this sex of typical *dissociaria*.

Holochroa unicolor (Druce), new combination

Plate 23, figures 3, 8; text figures 29, 46

Lepiodes (?) *unicolor* DRUCE, 1899, *Biologia Centrali-Americana*, Insecta, Lepidoptera-Heterocera, vol. 2, p. 542, vol. 3, pl. 99, fig. 22. RINDGE, 1954, *Bull. Amer. Mus. Nat. Hist.*, vol. 104, p. 181.

Gloduria dyslogista DYAR, 1924, *Insec. Inscit. Menstr.*, vol. 12, p. 18. New synonymy.

A gray, unicolorous species from Mexico, with weakly defined cross lines.

MALE: Head, vertex pale grayish brown; front raised, extending well beyond eyes, grayish brown, slightly darker above; palpi extending beyond front of eyes, appressed, pale grayish brown basally, becoming brown terminally; antennae with about 57 segments, the pectinations of the male between seven and eight times as long as basal antennal segments. Thorax above pale gray, with scattered brown scales, below pale gray; legs gray, the tarsi brown, with ends of segments narrowly gray. Abdomen grayish brown above and below, with small, black, lateral patches on A_2 .

UPPER SURFACE OF WINGS: Ground color of all wings pale gray, evenly overlain with pale brown and darker brown scales, producing a uniformly grayish brown color; forewings with faint maculation, the cross lines usually weakly represented; t. a. line represented by small brown spot on costa about one-fourth of distance from base, broadly convex in middle of wing, swinging back to inner margin; discal spot brown, large; t. p. line arising about four-fifths of distance from base, making a concave loop to vein M_3 , coming nearer to wing margin than origin of line, sharply angled basally, subparalleling outer margin to inner margin about two-thirds of distance from base, tending to be concave between veins; subterminal and terminal line narrow, brown, interrupted by veins; fringe concolorous with wings. Hind wings concolorous with forewings; discal spot large, grayish black; extradiscal line complete or fading out in anterior part of wing, paralleling outer margin, concave between veins; terminal line and fringe as on primaries.

UNDER SURFACE OF WINGS: All wings pale grayish brown; forewings, costa with brown scaling; discal dot large, dull black; t. p. line arising three-fourths of distance from base, evenly curved around cell, then paralleling outer margin, becoming faint in lower part of wing; terminal line and fringe as above. Hind wings with very large, black, discal spot, and with extradiscal line well-marked, fading out posteriorly; terminal line and fringe as above.

LENGTH OF FOREWING: 17 mm.

FEMALE: Similar to male but much larger.

LENGTH OF FOREWING: 23 to 25 mm.

MALE GENITALIA: Uncus with basal con-

striction, curving ventrally, terminating in an elongate, spine-like point; gnathos with lateral sections only; valves truncate apically, with sclerotized costa extending to beginning of truncation, base of valves with twisted, sclerotized arm, in length longer than maximum width of aedeagus, sacculus with several small, longitudinal ridges and a small tooth; anellus with strongly developed, well-separated, paired structures, posterior prong curved, anterior one arising medially from structure, the latter continuing anteriorly as far as juxta; juxta with median area broadly produced posteriorly, bluntly pointed, with small, shoulder-like projections at base of projecting area; aedeagus subequal in length to combined lengths of tegumen and saccus, pointed apically, posterior end slightly swollen, right side with sclerotized band, the surface minutely serrate in part, anterior portion of aedeagus slightly tapering; vesica with a single, heavy, straight spine, arising from a swollen base, and with a broad, flat, sclerotized band anterior thereto.

FEMALE GENITALIA: Sterigma with elongate lamella postvaginalis, bluntly rounded at both ends, posteriorly continued as a series of small, transverse ridges, the lamella antevaginalis an irregular, semicircular patch on each side at junction with ductus bursae; ductus bursae short, with sclerotized area broader than long, widening posteriorly; corpus bursae extending dorsally from ductus bursae, then posteriorly to form an elongate

ellipse, signum longitudinally stellate, with the anterior side produced cephalad in a form of a long projection, the posterior side concave, with a small pair of rays.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPES: Druce described this species from one pair, both specimens being in the collection of the British Museum (Natural History); the male is hereby designated as the lectotype. Dyar also described this species from one pair, and the male of *dyslogista* is hereby designated as the lectotype; both specimens are in the collection of the United States National Museum.

TYPE LOCALITIES: Presidio de Mazatlan, Sinaloa, Mexico (*unicolor*); Colima, Mexico (*dyslogista*).

DISTRIBUTION: West central Mexico, known from Sinaloa, Colima, Guerrero, and Morelos. The only known date of capture is June.

REMARKS: Five specimens and four genital preparations were studied. Unfortunately this species is very poorly represented in collections, so that virtually nothing can be said about the variation within the species. The species is, however, quite distinct from *dissociaria*. It can be recognized by the even, grayish brown coloration of the wings, with poorly defined cross lines and with prominent discal spots. The male genitalia are distinctive in having the arm at the base of the valves, while the shape of the signum is diagnostic in the female.

LIST OF SPECIES OF NACOPHORINI, WITH THEIR KNOWN DISTRIBUTION

GENUS *Betulodes* THIERRY-MIEG

- | | |
|------------------------------------|---|
| 1. <i>crebraria</i> (Guenée) | Bolivia, Brazil, British Guiana, Panama, Paraguay, Peru |
| 2. <i>matharma</i> (Druce) | Costa Rica, Panama, Colombia |
| 3. <i>antennatissima</i> (Dyar) | Mexico |
| 4. <i>euriceraea</i> , new species | Bolivia, Ecuador |

GENUS *Phaeoura* HULST

- | | |
|---|-------------------------------------|
| 1. <i>quernaria</i> (J. E. Smith) | Eastern North America |
| 2. <i>cristifera</i> Hulst | Arizona, Colorado, western Texas |
| 3. <i>cladonia</i> (C. Felder, R. Felder, and Rogenhofer) | Mexico |
| 4. <i>kirkwoodi</i> , new species | Arizona, Colorado, New Mexico |
| 5. <i>mexicanaria</i> (Grote) | Western United States |
| 6. <i>ianthina</i> , new species | Mexico |
| 7. <i>spadix</i> , new species | Mexico, Guatemala |
| 8. <i>belua</i> , new species | Arizona, California |
| 9. <i>perfidaria</i> Barnes and McDunnough | Arizona, California, Colorado, Utah |

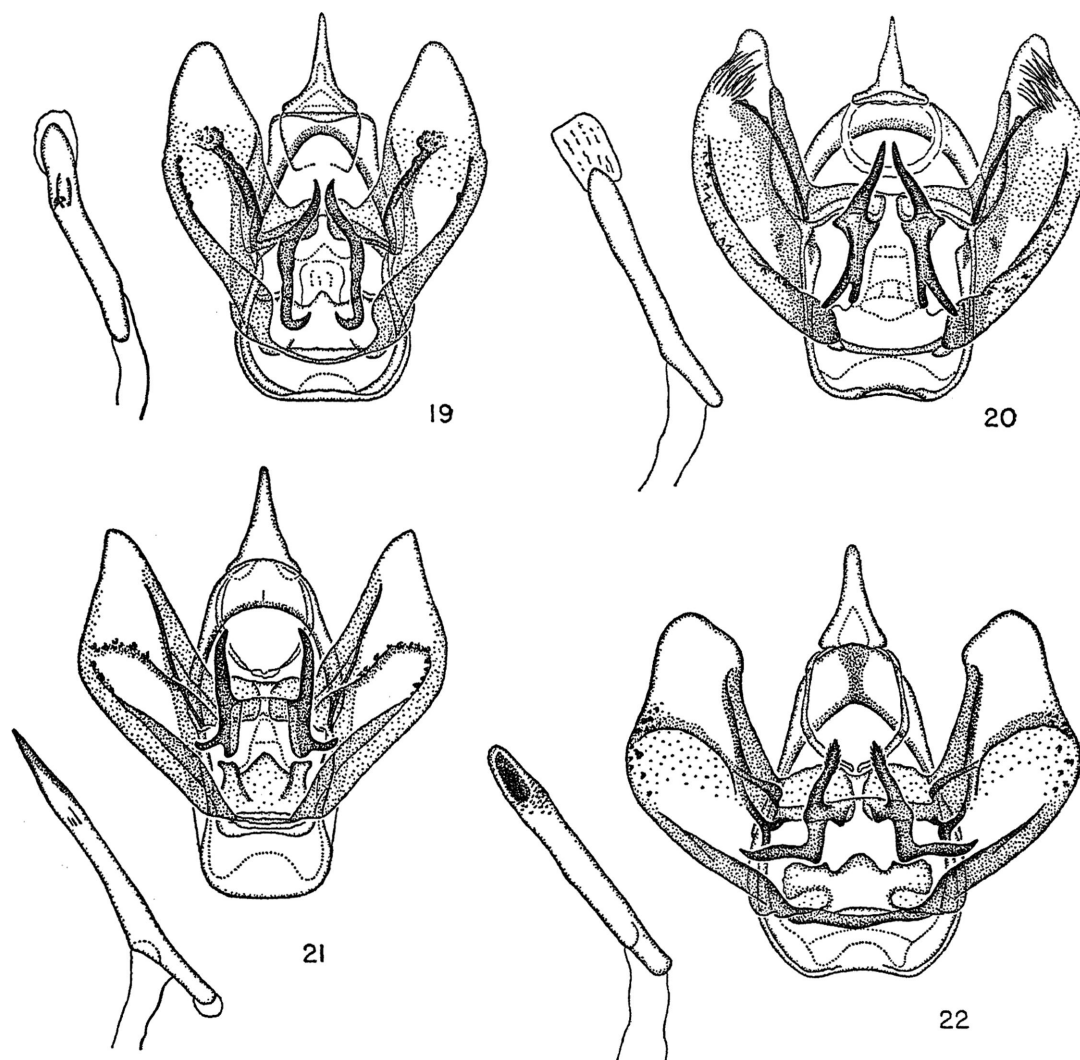
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| 10. <i>utahensis</i> Cassino and Swett | Utah, ?Colorado, ?Arizona |
| 11. <i>aetha</i> , new species | California, Nevada |
| 12. <i>cana</i> , new species | California |

GENUS *Thyrintina* MÖSCHLER

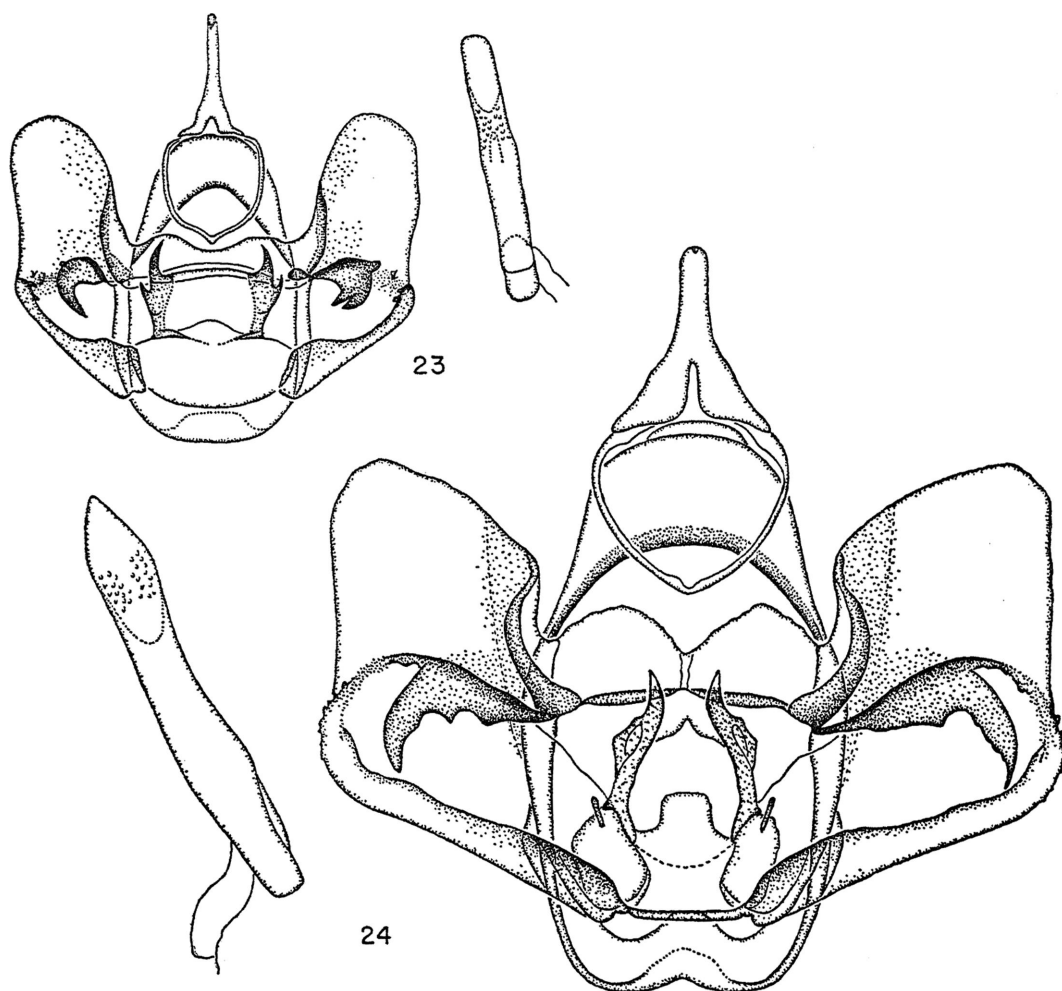
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|---|--|
| 1a. <i>arnobia arnobia</i> (Stoll) | Bolivia, Brazil, British Guiana, Colombia,
Costa Rica, French Guiana, Panama and
the Canal Zone, Paraguay, El Salvador,
Surinam, Trinidad, Uruguay, Venezuela |
| b. <i>arnobia phala</i> , new subspecies | British Honduras, Mexico, Texas |
| c. <i>arnobia quadricostaria</i> (Herrich-Schäffer) | Cuba, Hispaniola, Puerto Rico |
| 2. <i>unicornis</i> , new species | Jamaica |
| 3. <i>leucoceraea</i> , new species | Brazil |
| 4. <i>schadeana</i> Schaus | Argentina, Paraguay |

GENUS *Holochroa* HULST

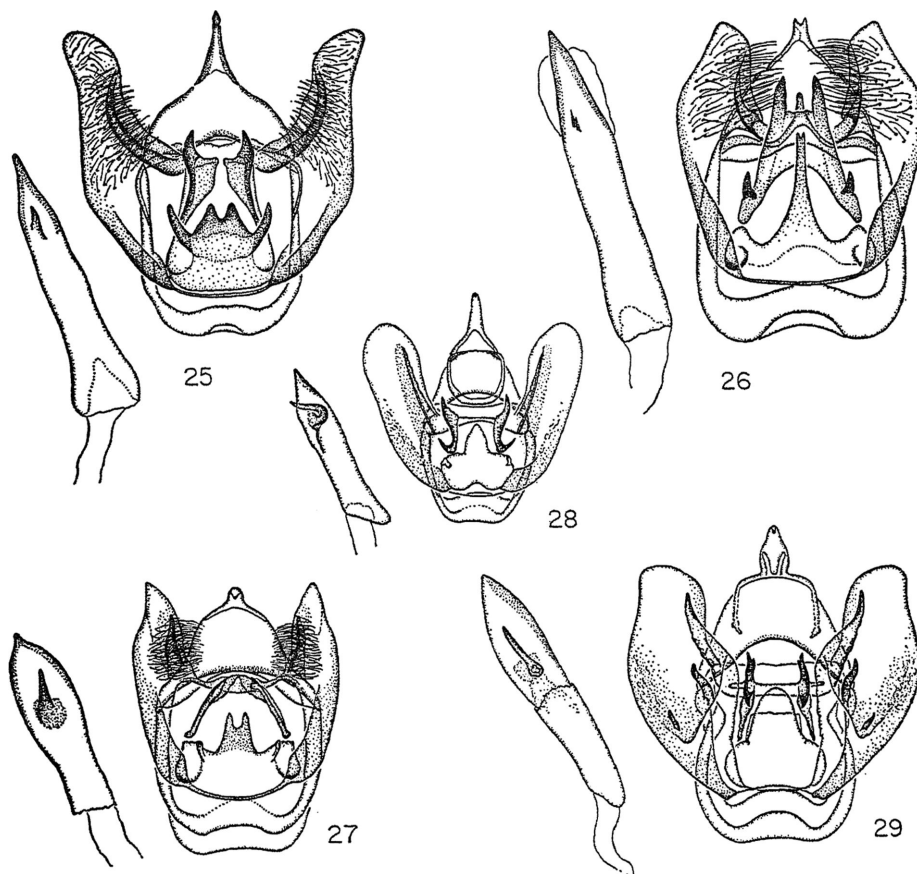
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|--|----------------------------|
| 1a. <i>dissociaria dissociaria</i> (Hulst) | Arizona, Colorado, Durango |
| b. <i>dissociaria varia</i> , new subspecies | New Mexico, Texas |
| 2. <i>unicolor</i> (Druce) | Mexico |



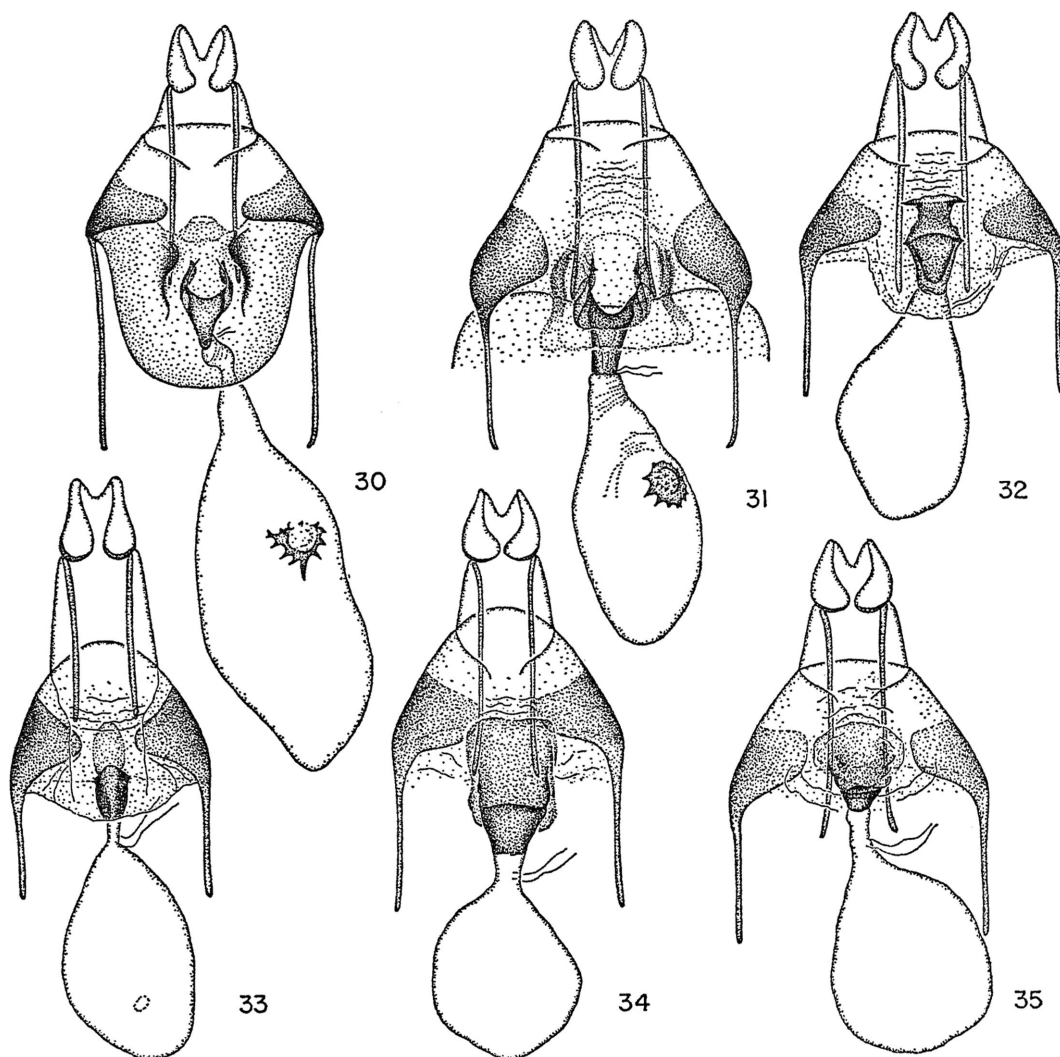
FIGS. 19-22. Male genitalia. 19. *Betulodes crebraria* (Guenée), Panama (A.M.N.H.). 20. *B. matharma* (Druce), Barro Colorado Island, Canal Zone, July 19-22, 1951 (R. M. Laughlin; A.M.N.H.). 21. *B. antennatissima* (Dyar). Tepic, Nayarit, Mexico, June, 1938 (C. C. Hoffman; A.M.N.H.). 22. *B. euriceraea*, new species, holotype, Zamora, Ecuador (O. T. Baron; B.M.N.H.).



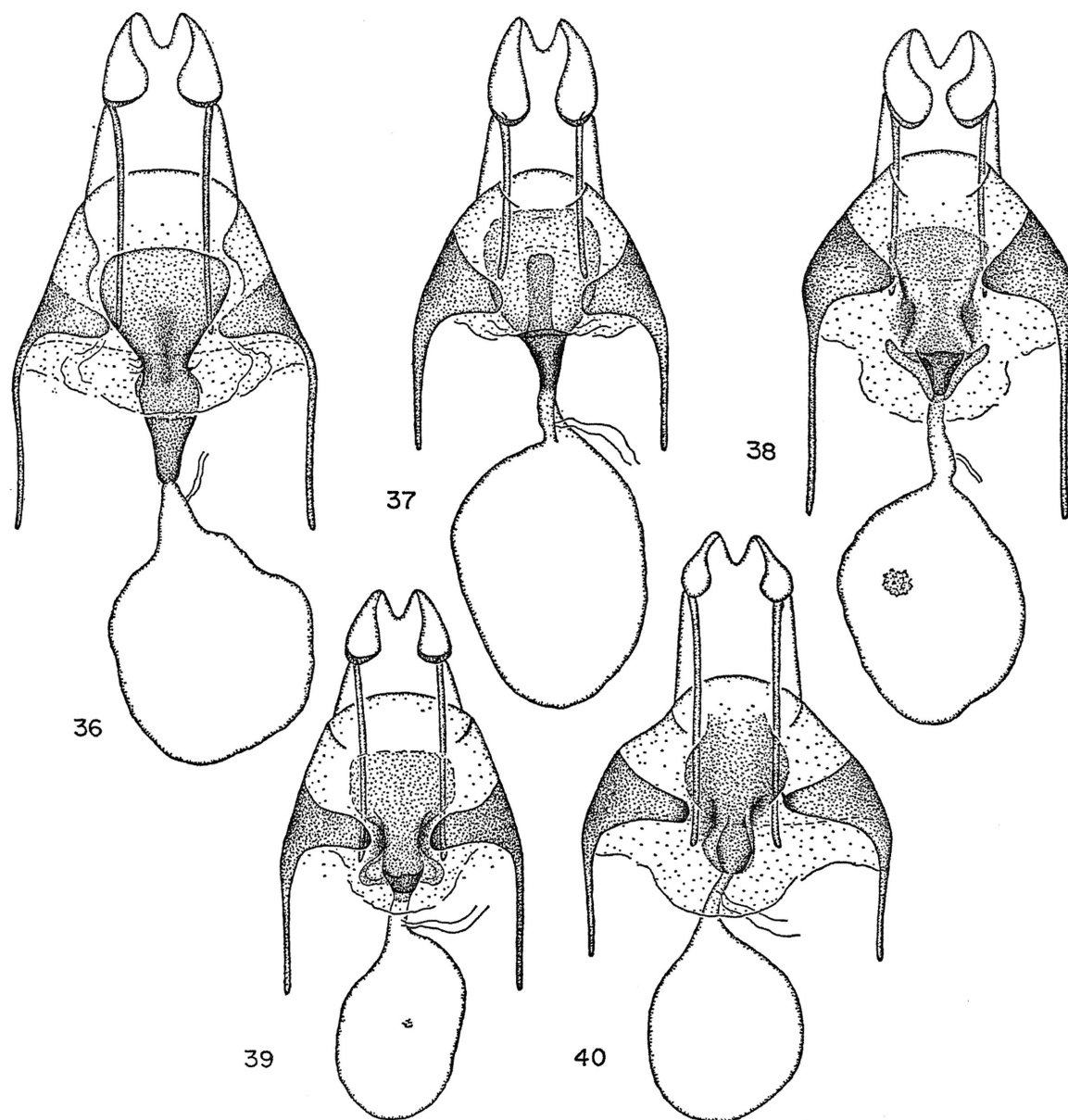
FIGS. 23, 24. Male genitalia. 23. *Phaeoura quernaria* (J. E. Smith), Siesta Key, Sarasota County, Florida, February 13, 1951 (C. P. Kimball; A.M.N.H.). 24. *P. mexicanaria* (Grote), Spring Creek, near Baker, Baker County, Oregon, June 14, 1955 (J. H. Baker; A.M.N.H.).



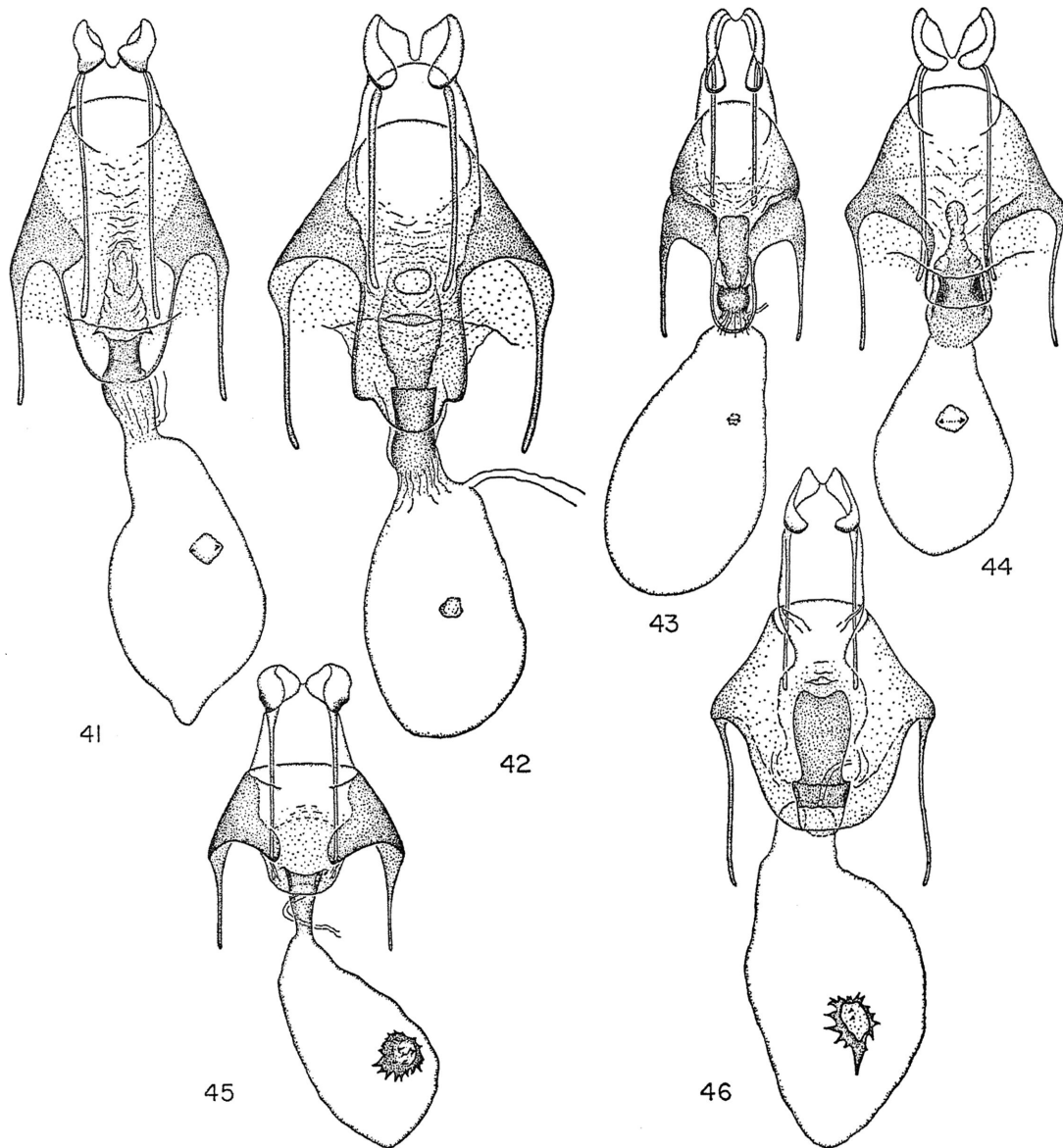
FIGS. 25-29. Male genitalia. 25. *Thyriniteina arnobia arnobia* (Stoll), Blumenau, Brazil, January (Pohl; A.M.N.H.). 26. *T. unicornis*, new species, paratype, Baron Hill, Jamaica, March 16, 1931 (A.M.N.H.). 27. *T. schadeana* Schaus, Tucuman, Argentina (U.S.N.M.). 28. *Holochroa dissociaria dissociaria* (Hulst), Garden Canyon, Arizona, July 30, 1949 (W. J. and J. W. Gertsch; A.M.N.H.). 29. *H. unicolor* (Druce), no data (A.M.N.H.).



FIGS. 30-35. Female genitalia. 30. *Betulodes crebraria* (Guenée), Castro, Parana, Brazil (U.S.N.M.). 31. *B. matharma* (Druce), Juan Vinas, Costa Rica, February (Schaus and Barnes; U.S.N.M.). 32. *Phaeoura quernaria* (J. E. Smith), Sharon, Massachusetts, May 11, 1909 (A. C. Sampson; A.M.N.H.). 33. *P. cristifera* Hulst, Browns Canyon, Arizona, June 8, 1952 (Cazier, Gertsch, Schrammel; A.M.N.H.). 34. *P. cladonia* (C. Felder, R. Felder, and Rogenhofer), San Angel, Distrito Federal, Mexico, July 26, 1911 (C. C. Hoffmann; A.M.N.H.). 35. *P. kirkwoodi*, new species, allotype, upper camp, Pinery Canyon, Arizona, July 8, 1956 (Martin, Comstock, Rees; L.A.M.).



FIGS. 36-40. Female genitalia. 36. *Phaeoura mexicanaria* (Grote), Reuter Canyon Camp, Wyoming, July 13, 1959 (F., P., and B. Rindge; A.M.N.H.). 37. *P. spadix*, new species, allotype, Ciudad de Guatemala (Rodriguez; B.M.N.H.). 38. *P. belua*, new species, paratype, Christopher Creek, Arizona, June 17, 1957 (Martin, Ford, Rees; L.A.M.). 39. *P. perfidaria* Barnes and McDunnough, Glenwood Springs, Colorado, June 28, 1894 (W. Barnes; A.M.N.H.). 40. *P. aetha*, new species, paratype, Smoky Valley, California, June 11, 1945 (C. Henne; L.A.M.).

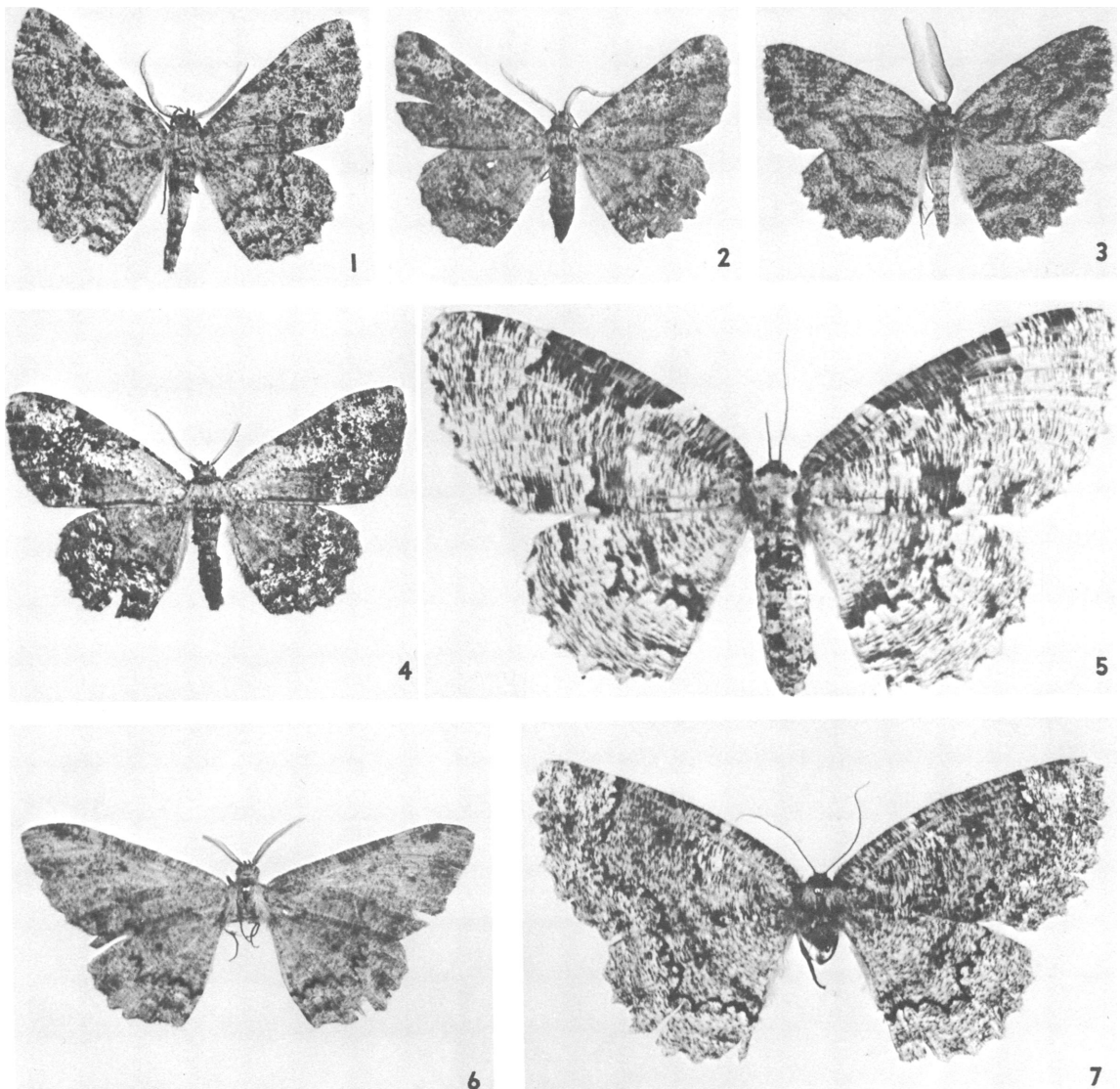


FIGS. 41-46. Female genitalia. 41. *Thyriniteina arnobia arnobia* (Stoll), Nuevo Teutonia, Brazil, July 23, 1948 (Plaumann; A.M.N.H.). 42. *T. unicornis*, new species, paratype, Jamaica, January-April, 1927 (C. K. Russel; C.M.). 43. *T. leucoceraea*, new species, holotype, Hansa Humboldt, Brazil (U.S.N.M.). 44. *T. schadeana* Schaus, Tucuman, Argentina (U.S.N.M.). 45. *Holochroa dissociaria* (Hulst), Southwestern Research Station of the American Museum of Natural History, Arizona, June 25, 1957 (M. Statham; A.M.N.H.). 46. *H. unicolor* (Druce), Colima, Mexico (allotype of *Gloduria dyslogista* Dyar; U.S.N.M.).

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PLATES 18-23



1. *Betulodes crebraria* (Guenée), male, Region Chapare, Bolivia, August, 1950, elevation 400 meters (A.M.N.H.)

2. *Betulodes matharma* (Druce), male, Barro Colorado, Canal Zone, February 3 (M. Bates; M.C.Z.)

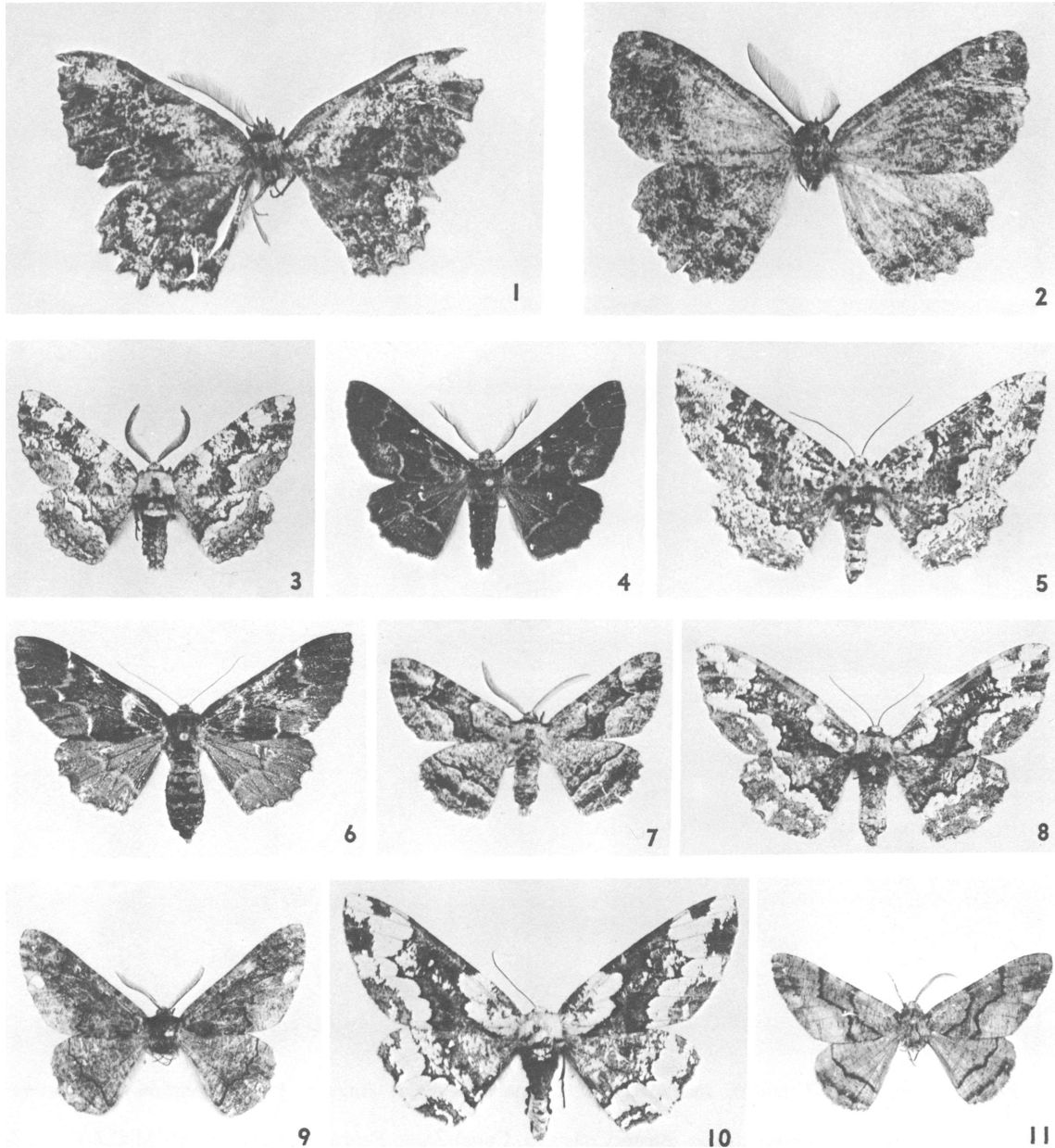
3. *Betulodes antennatissima* (Dyar), male, Cuernavaca, Mexico, June, 1906 (U.S.N.M.)

4, 5. *Betulodes crebraria* (Guenée). 4. Male, Yahuar Mayo, Peru, April, 1912, elevation 1200 feet (B.M.N.H.). 5. Female, Colombia (U.S.N.M.)

6, 7. *Betulodes matharma* (Druce). 6. Male, Bonda, Colombia, elevation 150 feet (H. H. Smith; B.M.N.H.).

7. Female, Juan Vinas, Costa Rica, February (Schaus and Barnes; U.S.N.M.)

All figures natural size



1, 2. *Betulodes euriceraea*, new species. 1. Holotype, male, Zamora, Ecuador, elevation 3000–4000 feet (O. T. Baron; B.M.N.H.). 2. Paratype, male, Charaplaya, Bolivia, June, 1901, elevation 1300 meters (Simmons; B.M.N.H.).

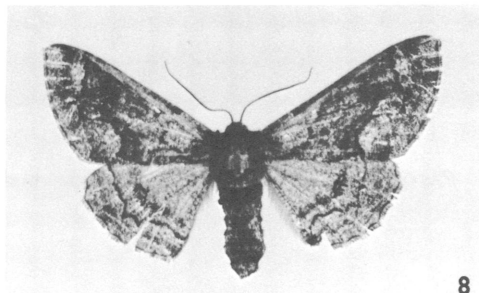
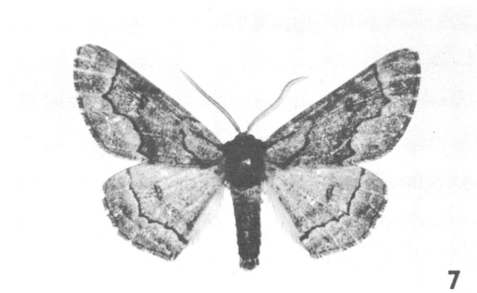
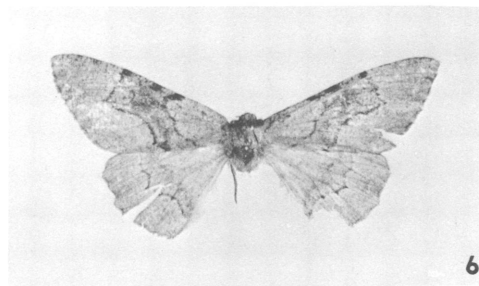
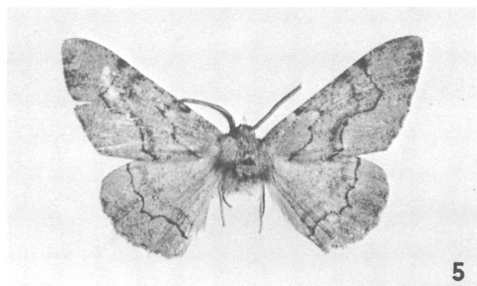
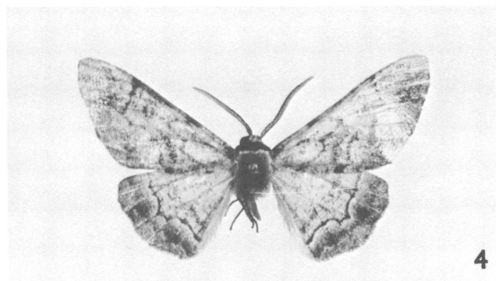
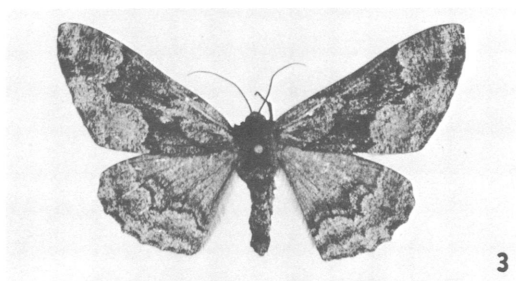
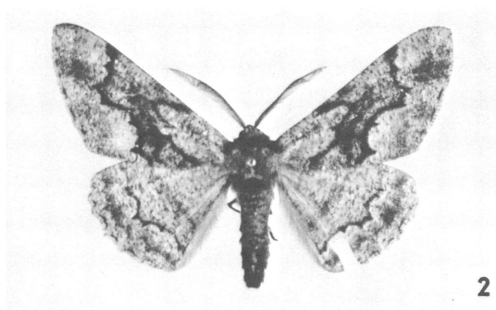
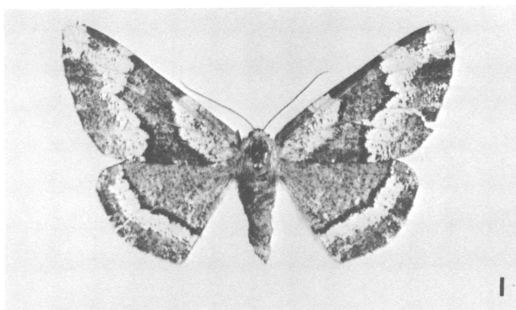
3–6. *Phaeoura quernaria* (J. E. Smith). 3. Normal male, Orange Mountains, New Jersey, June 17 (F. Lemmer; A.M.N.H.). 4. Melanic male, Ocean County, New Jersey, June 15, 1952 (O. Buchholz; A.M.N.H.). 5. Normal female, Scotch Plains, New Jersey, June 17 (F. Lemmer; A.M.N.H.). 6. Melanic female, Ocean County, New Jersey, June 12, 1952 (O. Buchholz; A.M.N.H.).

7, 8. *Phaeoura cristifera* Hulst, Southwestern Research Station, Cochise County, Arizona, elevation 5400 feet (M. Statham; A.M.N.H.). 7. Male, July 26, 1957. 8. Female, July 21, 1957.

9, 10. *Phaeoura claudonia* (C. Felder, R. Felder, and Rogenhofer), San Angel, Distrito Federal, Mexico (C. C. Hoffmann; A.M.N.H.). 9. Male, July 22, 1911. 10. Female, August 8, 1912.

11. *Phaeoura kirkwoodi*, new species, holotype, male, Pinery Canyon, Chiricahua Mountains, Cochise County, Arizona, July 8, 1956 (C. W. Kirkwood; A.M.N.H.).

All figures natural size



1. *Phaeoura kirkwoodi*, new species, paratype, female, upper camp, Pinery Canyon, Chiricahua Mountains, Cochise County, Arizona, July 5, 1956 (L. M. Martin, J. A. Comstock, W. A. Rees; A.M.N.H.)

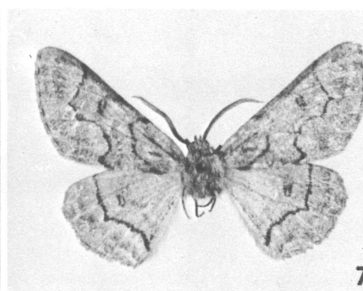
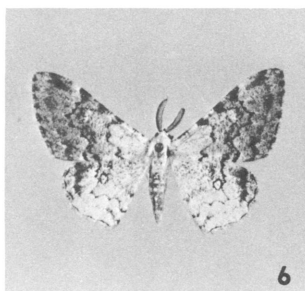
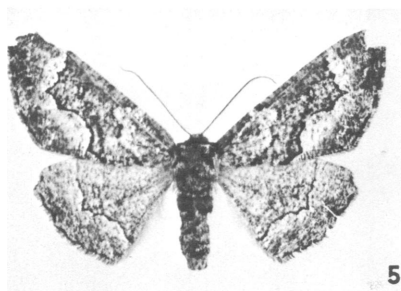
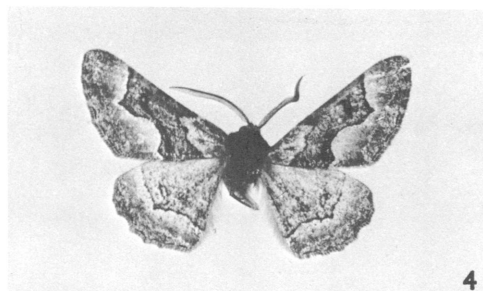
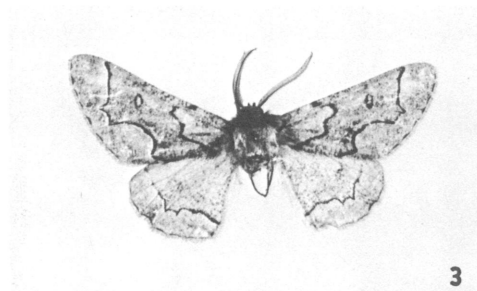
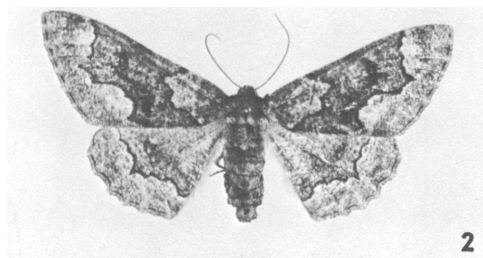
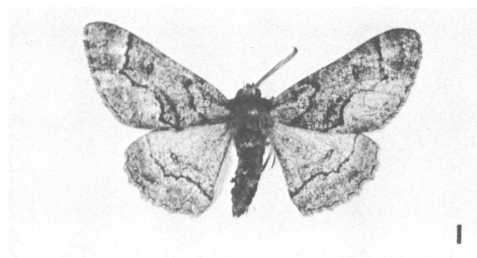
2, 3. *Phaeoura mexicanaria* (Grote). 2. Male, Parks, Coconino County, Arizona, June 27, 1957 (L. M. Martin, R. J. Ford, W. A. Rees; A.M.N.H.). 3. Female, Reuter Canyon Camp, Crook County, Wyoming, July 13, 1959, elevation 6100 feet (F., P., and B. Rindge; A.M.N.H.)

4. *Phaeoura ianthina*, new species, holotype, male, La Polvosa, Chihuahua, Mexico, August 16, 1958, elevation 6400 feet (L. R. Commissaris; A.M.N.H.)

5, 6. *Phaeoura spadix*, new species. 5. Holotype, male, Acapulco, Mexico (U.S.N.M.). 6. Allotype, female, Ciudad de Guatemala (Rodriguez; B.M.N.H.)

7, 8. *Phaeoura belua*, new species. 7. Holotype, male, Southwestern Research Station, Cochise County, Arizona, May 5, 1956, elevation 5400 feet (M. Statham; A.M.N.H.). 8. Allotype, female, 6 miles east of Prescott, Arizona, May 28, 1949 (Crickmer; A.M.N.H.)

All figures natural size



1, 2. *Phaeoura perfidaria* Barnes and McDunnough. 1. Male, Rock Creek Park, El Paso County, Colorado, June 3, 1955 (J. F. May; A.M.N.H.). 2. Female, Glenwood Springs, Colorado, June 24-30 (A.M.N.H.)

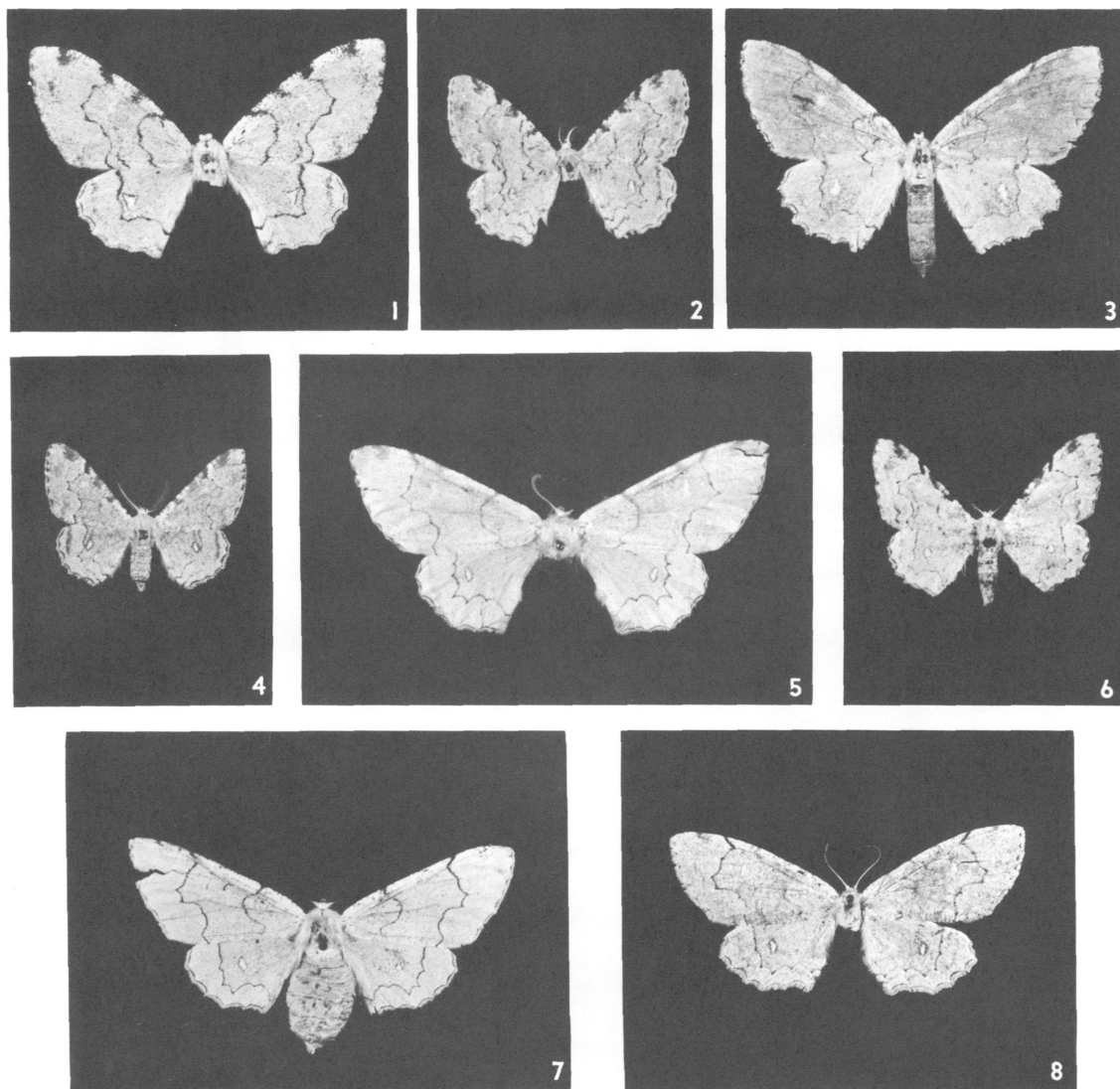
3. *Phaeoura utahensis* Cassino and Swett (?), male, Paradise, Arizona, July (A.M.N.H.)

4, 5. *Phaeoura aetha*, new species. 4. Holotype, male, Smoky Valley, Tulare County, California, June 23, 1947 (C. Ingham; A.M.N.H.). 5. Allotype, female, Smoky Valley, Tulare County, California, June 17, 1945, elevation 6300 feet (C. Henne; L.A.M.)

6. *Thyrinteina arnobia arnobia* (Stoll), male, Nuevo Teutonia, Brazil, April, 1953 (F. Plaumann; A.M.N.H.)

7. *Phaeoura cana*, new species, holotype, male, Camp Angelus, California, July 16, 1946 (N. Crickmer; A.M.N.H.)

All figures natural size



1. *Thyrinteina arnobia arnobia* (Stoll), female, Nuevo Teutonia, Brazil, July 23, 1949 (F. Plaumann; A.M.N.H.)

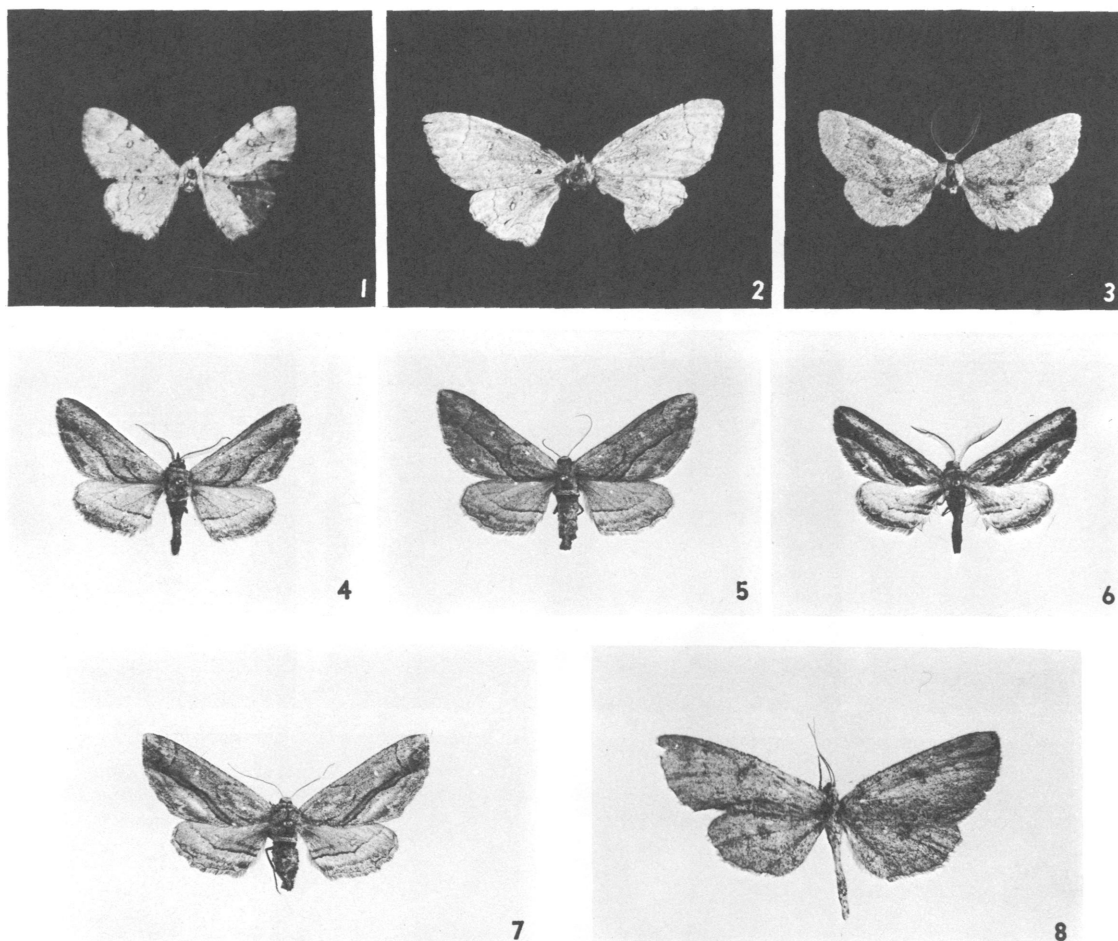
2, 3. *Thyrinteina arnobia phala*, new subspecies. 2. Holotype, male, Chichen Itza, Yucatan, Mexico, September 12, 1952 (J. and D. Pallister; A.M.N.H.). 3. Paratype, female, Colonia Yucatan, Yucatan, Mexico, August 14, 1952 (J. and D. Pallister; A.M.N.H.)

4, 5. *Thyrinteina arnobia quadricostaria* (Herrich-Schäffer). 4. Male, Sierra Maestra, eastern Cuba, January 30, 1930, elevation 1000 feet (O. Querci; A.M.N.H.). 5. Female, Guantanamo, Cuba, July 24, 1909 (A.M.N.H.)

6, 7. *Thyrinteina unicornis*, new species. 6. Holotype, male, Phoenix Park, Moneague, Jamaica, February 26, 1957 (B. Heineman; A.M.N.H.). 7. Allotype, female, Flamstead, Jamaica, March, 1927 (C. K. Russel; C.M.)

8. *Thyrinteina leucoceraea*, new species, holotype, female, Hansa Humboldt, Santa Catherina, Brazil (U.S.N.M.)

All figures natural size



1, 2. *Thyrinteina schadeana* Schaus. 1. Male, Jujuy, Jujuy Province, Argentina, April, 1949 (A.M.N.H.). The dark area on the right wings is a grease spot. 2. Female, Tucuman, Argentina (R. Schreiter; U.S.N.M.)
 3, 8. *Holochroa unicolor* (Druce). 3. Male, no data (A.M.N.H.). 8. Female, Morelos, Mexico (Kruger; U.S.N.M.)

4, 5. *Holochroa dissociaria dissociaria* (Hulst), Southwestern Research Station, Cochise County, Arizona, elevation 5400 feet. 4. Male, August 9, 1956 (E. Ordway; A.M.N.H.). 5. Female, June 19, 1957 (M. Statham; A.M.N.H.)

6, 7. *Holochroa dissociaria varia*, new subspecies, Gran Quivira National Monument, Socorro County, New Mexico, July 14, 1958 (S. F. Wood; L.A.M.). 6. Paratype, male. 7. Allotype, female

All figures natural size