A REVISION OF THE MELANOLOPHIINI (LEPIDOPTERA, GEOMETRIDAE)

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ABSTRACT

The present work is the first attempt to unite all the genera of the Melanolophiini in one paper, and to give a revision of the tribe. The males can be recognized by the following group of characters: antennae pectinate, with the pectinations arising basally on their segments; abdomens are variously modified, usually having the intersegmental membrane between A3 and A4 ventrolaterally with either an invagination on each side, some with a small projecting setal tuft, or a large, very prominent double setal tuft, plus a prominent comblike paired structure of elongate, apically flattened scales on the intersegmental membrane between A7 and A8 (although this may be reduced to a flattened sclerotized band and a few setae); the inner face of the valves is never simple, having a variably developed sacculus, often in the form of a spinose process or an elongate free arm, and/or a swollen, sclerotized, spinose harpe. The females have the signum reduced or absent; otherwise they have to be associated with their males for tribal placement. The early stages of only a very few species are known; these are characterized in the mature larva by having seta SDX2 in the subdorsal region of the anterior abdominal segments, and with all the crochets of the prolegs being in one group.

The Melanolophiini are restricted to the New World, where the species range from southern Alaska to southern South America. A few are known from both the Greater and Lesser Antilles, but the group is not known from Chile.

Fifteen genera are recognized; *Antiphoides*, *Arilophia*, *Minyolophia*, *Segalenara*, and *Tesiophora* are described as new. All genera are completely described, with the adults and the genitalia of both sexes illustrated; a key to the males is provided. For some genera only brief references are made to the included species, while in others complete generic revisions are presented, with diagnoses of the previously described species and descriptions of new taxa. Included in the latter category are *Anavinemina* Rindge, *Galenara* McDunnough, and *Vinemina* McDunnough, as well as the newly described genera.

Fifty-two new species are described. These include *Anavinemina acomos*, *A. brachiata*, *A. evexa*, *A. lunaris*, *A. semicircula*, *A. striola*, *A. wellingi*, *Arilophia rawlinsi*, *Astalotesia hollandi*, *Carphoides durango*, *C. oaxaca*, *Galenara antilectos*, *G. bispicula*, *G. carina*, *G. engonios*, *G. ferrugina*, *G. leberasae*, *G. phoxe*, *G. tlaxcala*, *G. vernonae*, *Melanolophia anchicaya*, *M. calimae*, *M. mima*, *M. muriensis*, *M. necopina*, *M. orthogonia*, *M. ovata*, *M. peridoxa*, *M. plecte*, *M. pseudoxa*, *M. sullivani*, *Pherotesia dystactos*, *P. garka*, *P. inhamata*, *P. obunca*, *P. pedaria*, *P. quadra*, *P. ralla*, *Minyolophia distincta*, *M. hadra*, *M. inermis*, *M. parilis*, *M. prolixa*, *M. yanayacu*, *Tesiophora aquila*, *T. cerezal*, *T. entephros*, *T. exallos*, *T. orthe*, *T. pulla*, *Vinemina digita*, and *V. olivaria*. These 52 new species bring the number in this tribe to just under 200; almost one-half are placed in *Melanolophia*.

Six new combinations are proposed: *Anavinemina rindgei* (Beutelspacher), *Antiphoides errantaria* (McDunnough), *A. dentata* (Dyar), *Minyolophia azenioides* (Herbulot), *Segalenara phyararia* (Dyar), and *Tesiophora humidaria* (Schaus). There is one new status, as *Pherotesia minuisca* Rindge is raised to species rank.

INTRODUCTION

In 1964 I published three revisionary papers on the genera and species that constitute a large portion of the Melanolophiini. The included genera were *Melanolophia*, *Pherotesia*, and *Melanotesia* (1964a), *Anavinemina* and *Vinemina* (1964b), and *Carphoides*, *Paraphoides*, and *Galenara* (1964c). These were more or less considered separate entities at the time, as I made little effort to show the generic relationships, much less to treat them as component parts of a single tribe, even though they were recognized as being closely related. Not unexpectedly, this has resulted in some confusion and a lack of understanding of both the generic and tribal limits. As more specimens became available, and as I continued my research on the New World Ennominae, it became obvious to me that a revisionary paper on the tribal level would be most helpful. The present revision is the result.

This paper differs somewhat from my revisions of the New World Bistonini (1975, 1985), Nacophorini (1983), and Lithinini (1986) in that I am including descriptions of new species in addition to the work at the generic level. In my 1964 revisions, complete species descriptions were given; therefore, in the present paper, practically all the taxa in the tribe will have been previously defined

by me. On the generic level, my treatment in the present paper varies from presenting references to or a listing of the included species; the other extreme is a complete generic revision, with new keys to the species and with all the included taxa being defined. *Anavinemina*, *Galenara*, and *Vinemina* received the latter treatment, for example; the remaining genera fall between these two extremes.

Insofar as I know, the Melanolophiini are found only in the New World. The included species are found from southern Alaska to southern South America, but they are not known from Chile. A few species of the widespread genus *Melanolophia* occur in the Greater and Lesser Antilles, plus the sole species of *Arilophia* that is endemic to the Dominican Republic.

Nearly all the figures in the present paper are of specimens and dissections in the AMNH; when this is not so, it is indicated in the appropriate caption.

ACKNOWLEDGMENTS AND ABBREVIATIONS

The following abbreviations have been used in this paper: AMNH, American Museum of Natural History, New York; BMNH, British Museum (Natural History), London; CAS, California Academy of Sciences, San Francisco; CNC, Canadian National Collection, Ottawa; LAM, Natural History Museum of Los Angeles County, Los Angeles; UNAM, Colección Entomológica del Instituto de Biología, Universidad Nacional Autónoma de México, Mexico City; USNM, United States National Museum of Natural History, Smithsonian Institution, Washington (Dr. Douglas C. Ferguson).

Much of the new material that has been studied for this paper was collected by the following gentlemen; I am most grateful for their efforts and generosity: Claude Herbulot, Paris; Richard Holland, Albuquerque, New Mexico; J. Bolling Sullivan, Beaufort, North Carolina; and Eduardo C. Welling, Merida, Yucatán.

Helpful comments on the manuscript were received from W. C. McGuffin and R. S. Peigler.

MATERIALS AND METHODS

Much of the information in this revision is based on my three 1964 papers in which data were based on specimens from a number of museums and private collections. Additional data have been obtained from a new and intensive study of the moths in the collection of the American Museum of Natural History, aided by a limited number of specimens from other museums and collectors. The collection of Melanolophiini in my charge has shown appreciable growth in the past 25 years; these additional specimens have given me a much larger sample to analyze and, as it turned out, a number of species that were heretofore undescribed. But a number of the previously described taxa have not been augmented by new material; much more collecting is necessary before both sexes of certain species are known, much less their complete geographical and temporal ranges.

The major differences in my dissecting techniques between the 1964 papers and the present one is that whenever possible I try to evert the vesica from the aedeagus of every male whenever possible, and to clear and mount (in Canadian balsam) at least one antenna and a complete set of legs of both sexes for many species in all genera. This technique has made available a considerable amount of information that was not included in the earlier revisions.

This is the fourth paper in which I have made a very detailed set of observations and analyses; the previous ones were my generic revisions of the New World Nacophorini (1983), Bistonini (1985, based largely on Rindge, 1975), and Lithinini (1986). Basically the same characters and methodology were utilized in all four studies; these were detailed for the Nacophorini (1983) and so are not repeated here. In the following section many characters are discussed as they pertain to the members of this tribe. Whenever possible I have tried to denote whether a given character is plesiomorphic or apomorphic. My usage of these terms is based on some 40 years of research on the New World Ennominae and the resulting revisionary and descriptive publications on this subfamily. The polarities are based on the distribution of

character states throughout the Ennominae, as exemplified by the three papers cited above.

It should be noted that I make no outgroup comparisons when discussing plesiomorphic and apomorphic characters. The sister group of the Melanolophiini is believed to be the Boarmiini (McGuffin, 1987). The latter, as now understood, is a large group that is world wide in distribution; it is poorly known systematically, especially in the tropical regions of the world, where most of the genera have not received either a tribal placement or a recent description and revision in the literature. There appears to be considerable diversity in the adults, and the immature stages are virtually unknown; until this assemblage is revised and analyzed, it will not be known if the present concept of the Boarmiini forms a monophyletic group or not. An excellent example of the work that is badly needed is the paper by Sato (1984). He gave a detailed analysis and the phylogenetic relationships of the *Hypomecis* (= *Boarmia*) complex in Japan; adult, larval, and pupal characters for all known genera were included in his analysis.

The males of the Melanolophiini have the inner surface of each valve variously modified; this is characteristic of the group but is not restricted to it. Some genera in the Boarmiini also have this structure modified; some examples include *Glena* (Rindge, 1965, 1967a), *Hulstina* and *Pterotaea* (Rindge, 1970), *Mericisca* (Rindge, 1972), *Nepterotaea* and *Chesiadodes* (Rindge, 1973), and *Hesperumia* (Rindge, 1974).

The following is the terminology I use in describing the inner surface of the valves; the naming of the parts and the origin of musculature are based on Sibatani et al. (1954), but I am not certain that our terminologies are exactly the same. All descriptions are based on genitalia that are slide mounted under a cover glass, with the valves spread. The *costa* is the sclerotized area along the posteromedial margin of the valve; it may or may not extend to the apex of the valve. The margin facing the medial area of the genitalia may be straight, curved, or have a swelling, ranging in size from a small hump to an elongate lobe, often with a prominent group of very long setae apically. The *ampulla* is a raised ridge, almost always bearing numerous setae, that extends along the inner margin of the costa from near the apex of the valve for a variable distance. The *sacculus* is the anterodistal margin of the valve, extending from the base of the latter partway up the outer margin; it is often lightly sclerotized and swollen. Its inner margin may be unmodified and become membranous as part of the central area of the valve, the *anellifer*. Or the inner margin may be variously modified, with some of the possibilities being an extended sclerotized area on the inner face of the valve, a structure that more or less parallels the outer margin and looks like a rounded area that is often partially spined, a tubelike structure, or something similar to the last but in the form of a free arm, which may be symmetrical or asymmetrical on the two valves. Connecting the ampulla and sacculus across the anellifer is a lightly sclerotized band, the *harpe*, which serves as an area of muscle attachment. The harpe itself is usually not prominent and, in fact, may be somewhat difficult to locate; on the other hand it may have a prominent globular, semicircular, or similarly shaped projection that is heavily sclerotized and has several thick spines on its outer surface. This projection of the harpe is, in many cases, one of the most obvious parts of the ornamentation on the inner surface of the valve.

CHARACTERS

The following is a discussion of some of the characters that have been studied for this paper. When a given character is preceded by a number, it has been used in the accompanying tables, which give the plesiomorphic and apomorphic states for each genus. In observations not included in the tables, it is sometimes possible to indicate or describe the plesiomorphic (P) or apomorphic (A) conditions; in other cases this was not fea-

sible, or the character proved to be of little or no taxonomic value. Some of this information is summarized in tables 1 and 2.

External Characters: Tongue. (1) Fully developed and presumably functional (P) or reduced and presumably nonfunctional (A).

Palpi. (a) The average height in relation to eye varied from being about even with the lower margin of the eye to about one-half its height. (b) The combined length of the second and third segments was from about 0.4 to 0.8 mm, rarely 1.2 mm. (c) The ratio of the length of the third segment to the second varied from about 20 to 60 percent. (d) Nature of scaling on third segment, whether loosely or tightly scaled. (e) Position of third segment, whether extending above the horizontal plane or decumbent. (f) The relative size of the male and female palpi showed that in most cases they are about equal. The palpi have not been found to possess tribal characters; in a few cases they are consistent within a genus but generally any useful information is to be found at the specific level.

Front. In many species the front is flat, whereas in others it may be slightly raised to extend beyond the eyes. Some species have a low ridge across the top, while others have small dorsolateral swellings.

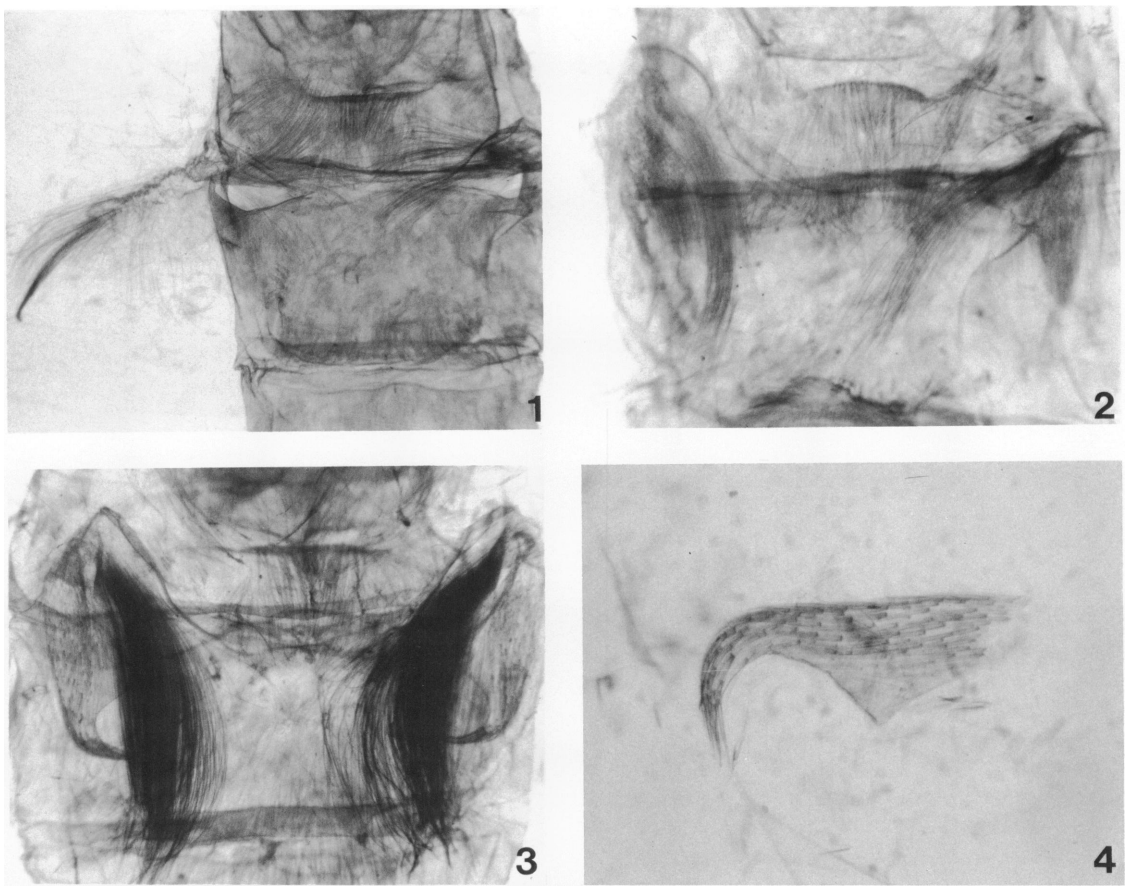
Antennae. (a) The number of segments is usually between about 40 and 73; in general, the more plesiomorphic genera have fewer segments than do the more apotypic genera. (b) All males have pectinate antennae. (c) Nearly all females have simple antennae; in a few species of *Melanolophia* and *Pherotesia* they are shortly pectinate. (d) The pectinations of the male antennae arise basally on their originating segments. (e) The length of the longest male pectinations range from about 0.50 to 1.35 mm. (f) The ratio of the length of the longest male pectinations to the length of their basal segments ranges from 2.5:1 to 7:1. (g) The number of simple segments at the end of the male antennae varies from about two to one-third the length of the antennae. Distally, the length of the pectinations gradually decreases so that it is difficult to classify the terminal segments as either purely simple or pectinate. (h) The male antennae have a terminal seta at the end of each pectination; the females have either a pair of setae distally on each segment or several minute setae ventrally. The last may be difficult to find due to their size and the dense scaling of the antennae.

Thorax. (a) The patagia are a mixture of spatulate or flattened scales and hairlike scales. (b) A small metathoracic tuft is usually present.

Forelegs. (a) Both sexes of all species possess an epiphysis. (b) The point of origin of this structure in the males is about at the middle of the tarsus; it varies from about 40 to 55 percent of the length. (c) In the females, the point of origin is more distal than in the males, and is between 55 and 65 percent of the length. (d) The length of the male epiphysis ranges between 50 and 70 percent of the length of the tibia. (e) The female epiphysis is always shorter than that of the male of the same sex; it varies from 35 to 50 percent of the length of the tibia. The positions and length of the epiphysis are not known to be of importance in defining the genera.

Hind legs. (a) All species have two pairs of tarsal spurs. (b; 2) Presence (A) or absence (P) of a hair pencil on the hind tarsus of the males; this may be either a generic or a specific character.

Forewings. (a) Number of veins; all genera have 12. (b) The accessory cell may be absent or there are one or two cells. The number may differ within a genus, within a given species, or rarely, from one forewing to the other in a single individual. (c) Vein R_1 may originate from Sc, from the top of the accessory cell, or it may be stalked to form R_{1+2}. (d) Vein R_2 is variable, either free, arising from the end of the accessory cell, or stalked with R_1 or R_{3+5}. (e) Veins R_{3+4} either arise from the end of the cell, or are stalked with R_5. (f) Vein R_5 arises from the end or the bottom of the accessory cell when the latter is present, or from R_{3+4}. (g) Vein udc usually arises at an angle of about 60° to the radial vein. (h) Veins mdc and ldc may be biconvex, curved, or angled. (i) The length of the forewings of both sexes varies from about 10 to 25 mm; sexual dimorphism in wing length is not obvious. (j) All females are fully winged. (k) The outer margin is either smoothly rounded or is weakly concave between the veins. (l) The wings are without a basal fovea. Note: Wing venation characters should be used with considerable caution due to intra-

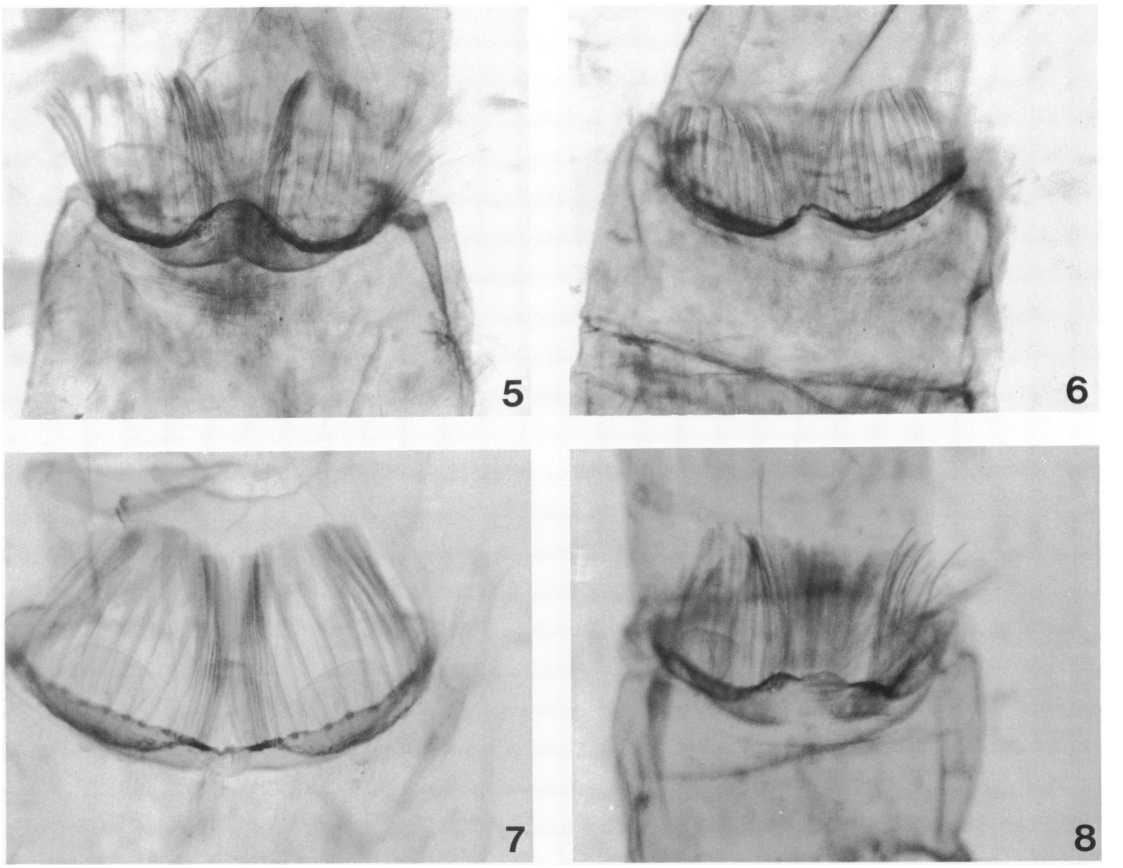


Figs. 1–4. Male abdomens, showing secondary sexual modifications of segments A3 and A4. **1.** *Melanolophia orthotis* Prout, with exserted tuft. **2.** *M. orthogonia*, new species, holotype, with double setal tuft. **3.** *M. muriensis*, new species, holotype, double setal tufts, with outer ones fused together. **4.** *M. sullivani*, new species, holotype, fused outer setal tuft.

specific variation. Craw (1987: 270) has discussed wing venation and the difficulties of its usage, not only in the Geometridae but in citations pertaining to members of the Arctiidae and Satyridae.

Hindwings. (a) The number of veins is either seven, eight, or (rarely) nine. Some genera tend to have seven veins (*Astalotesia*, *Carphoides*, *Eufidonia*, *Minyolophia*, *Paraphoides*, *Segalenara*, *Tesiophora*, and *Vinemina*), while others have eight (*Anavinemina*, *Melanolophia*, and *Melanotesia*), with the remainder being variable in number. It is very probable that individuals in any of the above-listed genera will be found that are at variance with the number given. (b) The number of veins may be sexually dimorphic; in *Pherotesia* the males often have nine veins, and the females seven or eight. (c) The ratio of vein Sc to the cell ranges from about 40 to 60 percent, with most species being about half the length. (d) Veins mdc and ldc may be curved, angled, have a deep angle (*Anavinemina*), or be vestigial. (e) The hindwings are either very similar to the forewings in pattern and color, or contrast in one or both elements. (f) The color may be white, grayish brown, brown (P), or white with a broad black border (A).

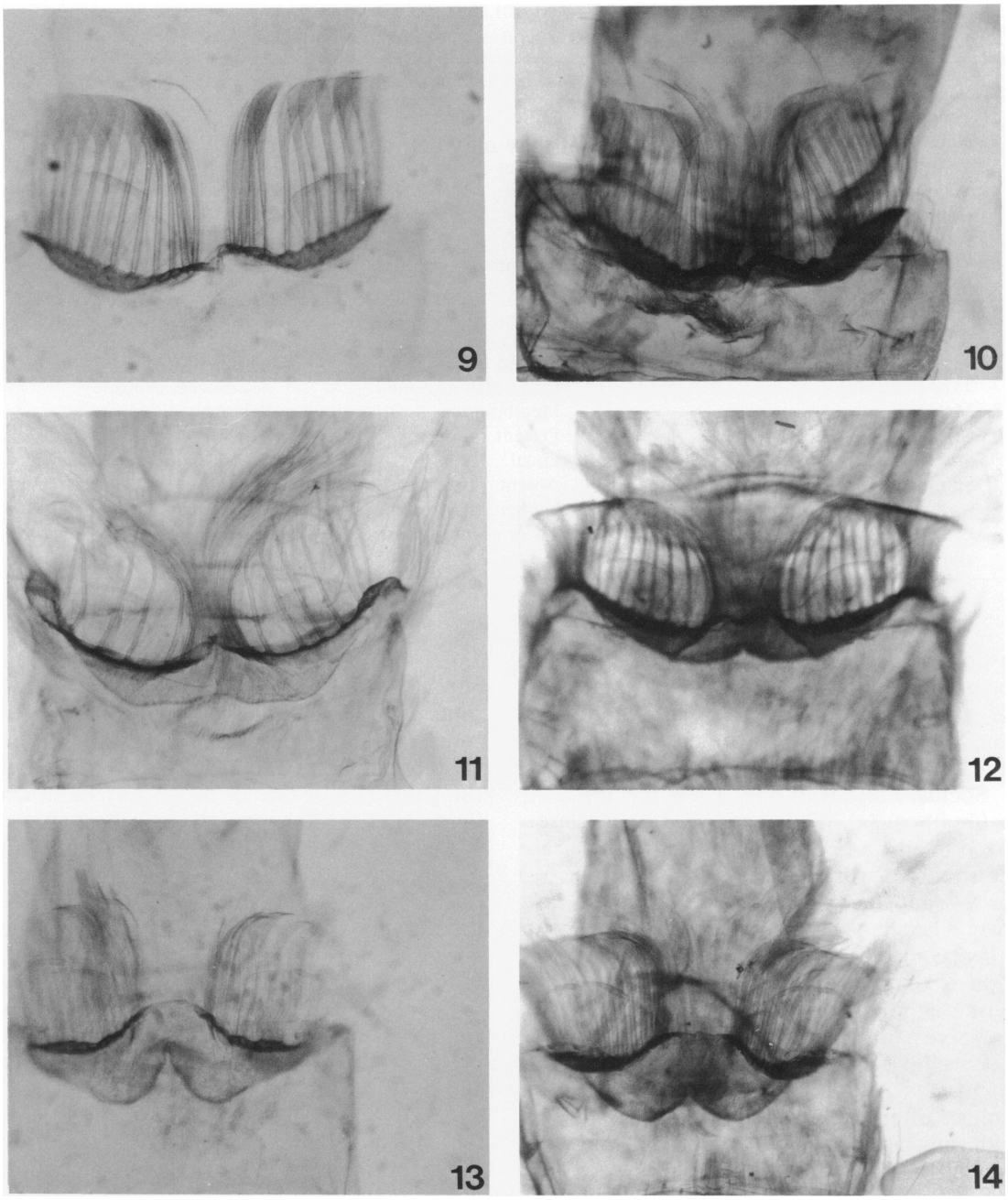
Abdomen. (a) No dorsal tufts are present. (b; 3) Presence (A) (figs. 1–3) or absence (P) of a median row of setae ventrally on the third segment of the males. There is a close correlation between the presence of this setae



Figs. 5–8. Male abdomens, showing secondary sexual modifications between segments A7 and A8. **5**. *Astalotesia hollandi*, new species, holotype. **6**. *Anavinemina indistincta* (Warren). **7**. *Galenara lixaria* (Grote). **8**. *G. bispicula*, new species, holotype.

row and the presence of the tibial hair pencil; it appears as if it might be a sex-linked character. (c; 4) Males with intersegmental membrane between A3 and A4 laterally unmodified (P) or with each side having an invagination, from which, at one extreme, a small tuft of setae project, or at the other extreme with a large, very prominent double setal tuft (A) (figs. 1–4). There appears to be a transformation series from the small simple setal tuft, to a larger double tuft, to the condition where part of the double tuft becomes fused together to form a solid, curved projection, while the other part remains as separate setae. (d; 5) Males with intersegmental membrane between A7 and A8 ventrally unmodified (P), or with prominent comblike paired structures of elongate, tapering, or apically flattened scales and a few large, flat scales immediately anteriad (figs. 5–14), or with all of these vestigial, being represented by a basal sclerotized band and some setae (A). It is not certain whether the vestigial band is an intermediate step between being unmodified and having the comblike scales, or a reduction state of the latter. (e) Males with the membrane connecting the end of the abdomen and male genitalia without setae (P) or with numerous elongate setae (A).

Male Genitalia: Uncus. (a; 6) The general shape is a simple, straight, tapering shaft (P), with some species of *Melanolophia* having a variously swollen apex (A). (b) In lateral view, the shaft, may be almost straight (P) to curved, C-shaped, or angled (A). (c) The length of the uncus varies from 0.3 to 0.7 mm, and the



Figs. 9–14. Male abdomens, showing secondary sexual modifications between segments A7 and A8. **9**. *Tesiophora humidaria* (Schaus), holotype (USNM). **10**. *T. entephros*, new species, holotype. **11**. *Minyolophia parilis*, new species, holotype. **12**. *Melanolophia bugnathos* Rindge. **13**. *Pherotesia garka*, new species, holotype. **14**. *P. obunca*, new species, paratype.

width of the base from 0.3 to 0.7 mm. The length is normally about equal to the width of the base. (d) The apex of the shaft is variable, having a single point, two points either close together or widely separated, three points, a rounded apex, or a transverse ridge;

TABLE 1
Nature of Character States in the Melanolophiini

Characters	Plesiomorphic	Apomorphic
1. Tongue	Fully developed	Reduced
2. Hair pencil on male hind tibia	Absent	Present
3. Ventral row of setae on A3 of males	Absent	Present
4. Males with intersegmental membrane laterally between A3 and A4 invaginated, with single or double setal tuft	Absent	Present
5. Males with intersegmental membrane ventrally between A7 and A8 with prominent comblike paired structures of elongate scales	Absent	Present
6. Type of uncus	Simple, tapering	Apex swollen
7. Type of anellus	Inconspicuous, small	Sclerotized, elongate
8. Manica	Membranous	Spinose
9. Cristae	Present	Absent
10. Size of cristae when present	Equal	One or more much enlarged
11. Spining in vesica	Absent	Present
12. Nature of spining in vesica when present	Numerous or a spined strip	Single large
13. Length of corpus bursae compared with apophyses posteriores	Twice as long or less	spine More than twice as long

a dorsal keel-like swelling may or may not be present. The variation of the apex may be of specific or generic nature. (e) The dorsal and lateral surfaces of the uncus may be bare or have numerous slender setae.

Socius. Present in only a few species.

Gnathos. (a) Well developed and sclerotized in all species. (b) The general shape can be square or rounded, but is liable to be V- or W-shaped, or some variation of the last two. The shape can be of generic value, or it may be specific character. (c) The apical portion is often attenuate and recurved and is without spines.

Valves. (a) Never simple, often with a costal swelling, usually having a group of prominent setae, with a variably developed sacculus, often as a spinose process or an elongate, usually asymmetrical, arm, and with a swollen, sclerotized, spinose harpe. (b) Terminal region tapering or bluntly rounded, rarely truncate or weakly swollen.

Anellus. (a; 7) Enlarged anteriorly, more or less straplike posteriorly, membranous or weakly sclerotized (P), to a very prominent, heavily sclerotized, elongate, apically bifurcate process (A). (b; 8) The manica may be entirely membranous (P) or strongly developed, in the form of lateral spinose areas (A).

Cristae. (a; 9) These may be present (P) or absent (A); both conditions may occur in the same genus. I am considering the absence to be a loss of an existing condition. (b; 10) The cristae may be of about the same length and thickness (P), or one or more may be much longer and thicker than all the others (A).

Aedeagus. (a) The length ranges from 1.3 to 3.6 mm. (b) The width varies from 0.20 to 0.65 mm. (c) The general shape is a simple tube; it may be straight or curved. (d) The apex may be rounded or pointed; if the latter, it may be bluntly pointed or attenuate, lightly to heavily sclerotized. (e) The anterior end is rounded; it may be unmodified or attenuate.

Vesica. (a; 11) The vesica may be without spines (P), being either smooth or with longitudinal striations, or else have spines (A). (b; 12) When spines are present, they are either short and in a row (P), or they are a spinose bar or a single large spine, sometimes with some small spines on its base (A). (c) When the vesica is exserted, it may be a simple tube, a rounded swelling, or a tube with several caeca.

Female Genitalia: The apophyses. (a) The length of the apophyses posteriores varies from 1.4 to 3.7 mm. (b) The length of the apophyses anteriores varies from 0.7 to 1.6

TABLE 2
Presence or Absence of Characters
(Numbers at tops of columns are those of table 1)

	1	2	3	4	5	6	7	8	9	10	11	12	13
Antiphodes	−	+	+	+	±	−	−	+	−	+	±	−	+
Arilophia	−	+	+	−	+	−	−	−	+	−	−	0	−
Astalotesia	−	±	±	−	+	−	−	+	−	−	+	−	−
Anavinemina	−	±	±	+	+	−	−	−	−	±	+	−	+
Carphoides	±	−	−	−	±	−	−	−	±	−	+	−	+
Eufidonia	−	+	+	−	+	−	−	−	−	−	±	−	−
Galenara	−	±	±	±	+	−	−	−	−	−	+	±	±
Melanolophia	−	+	+	+	+	±	+	−	±	−	−	0	±
Melanotesia	−	+	+	+	+	−	+	−	+	0	+	+	−
Minyolophia	−	+	+	+	+	−	+	−	±	−	±	−	−
Paraphoides	−	+	+	+	+	−	−	−	+	0	−	0	+
Pherotesia	−	+	+	+	+	−	±	−	±	±	±	±	±
Segalenara	−	−	−	−	−	−	−	+	−	−	−	0	?
Tesiophora	−	+	+	+	+	−	+	−	+	0	+	−	+
Vinemina	−	+	+	+	±	−	−	−	−	−	+	±	+

Symbols: +, apomorphic state; −, plesiomorphic state; ±, both found in same taxon; 0, not applicable; ?, data not available.

mm. Both sets are normally thin but in some species of *Anavinemina* they are quite thick. (c) The point of attachment of the apophyses posteriores to the papillae anales is usually anteriad, but it may become median.

The sterigma. All species have a more or less clearly defined sinus vaginalis, delimited ventrally by a membranous lip to form a bowl shaped or cuplike receptacle; the anterior part of the membranous lip may be variably crenulate. The lamella antevaginalis is usually absent, but may be strongly developed in certain species within a genus (as in *Melanolophia*). The lamella postvaginalis varies from being a weakly sclerotized and poorly defined area to an elongate and prominent structure.

The ductus bursae. A relatively short structure, membranous or sclerotized, varying in length from being slightly shorter than wide to about three times as long as wide.

The corpus bursae. (a; 13) The length (assuming it is fully inflated) compared to the length of the apophyses posteriores; an arbitrary division is twice as long or less (P) compared with more than twice as long (A). The range of variation is from about equal to about four times as long. (b) The general shape is a simple tube; it may be straight or slightly curved or somewhat modified. (c) The posterior portion may be simple and rounded, or it may be swollen and asymmetrical; the texture varies from membranous to variably sclerotized; longitudinal striations may be absent or present. (d) The posterior end varies from being simple and rounded to being enlarged on one side, appearing somewhat "shoe shaped."

The signum. A discrete, well-defined signum may be present or absent; when present, it is usually small, curved, or triangular in shape. Other types are a pair of lightly sclerotized areas with rows of small spinelike projections (*Paraphoides*), or several circles of minute spines near the anterior end of the corpus bursae.

Early Stages: Since I have not worked with them, all that can be done is to report the observations of other workers. The only recent comparative work has been done by Salkeld (1983) on eggs, and by McGuffin (1977) on the early stages; both worked primarily with the limited Canadian fauna.

Eggs. Oblong-elliptical, with rows of polygonal cells with broadly rounded, elevated walls. They are a pale to muddy green, becoming rusty or red at the anterior pole. (Salkeld, 1983: 59, figs. 25–27).

Larvae. The first instar larva is yellow to

green or gray-green, with or without fine gray lines; setae pointed; crochets in two groups of 3 or 4 each, joined by a band of very short crochets. The mature larva is greenish with pale lines, having seta SDX2 in the subdorsal region of the anterior abdominal segments, and with the crochets of the prolegs in one group. The caterpillar stretches out along the foliage when at rest. (McGuffin, 1977: 99).

Pupa. Brown, fusiform, with a slender bifurcate cremaster, without any visible prothoracic femora, and with the prespiracular groove on A5 pointed at both ends, toothed on the anterior edge, and curved away from the spiracle. Pupation occurs in the soil or in litter, and the pupa overwinters (in Canada). (McGuffin, 1977: 99; 1987: 102).

Food Plants: The known North American groups feed on a wide variety of conifers, broad leaved trees, and shrubs. Practically nothing is known about the food plants of all the species that occur south of the United States, although two species of *Melanolophia* in South America are defoliators of introduced *Pinus*, *Cupressus*, and *Eucalyptus*.

Dimorphism: (a) Venation. Most species have similar venation in the two sexes (P). In *Pherotesia* the hind wings of the males usually have nine veins and the females seven or eight (A). (b) Color and maculation. The great majority of species show little or no differences in maculation or color between males and females of the same taxa (P). The females of some species in some genera tend to have slightly paler forewings (e.g., *Eufidonia*) or to have slightly darker hindwings (e.g., *Carphoides*) than do the males on the upper surface. In some species of *Pherotesia* there are noticeable differences in the color and pattern on the upper surface of the forewings (see figs. 238, 239, 242–247)(A); this does not occur in every species of the genus. (c) Seasonal. Seasonal variation is usually not present (P). The most commonly collected members of the tribe are those from North America, north of Mexico; nearly all of these are single brooded and so the point is moot. In the tropics some of the moths may fly during most or all of the year at a given locality, but there usually isn't enough adequately dated material to decide the point. One exception is recent collecting by J. B. Sullivan in Valle, Colombia, where he was in the field in both January and February and again in June. In two species of *Melanolophia*, being described in this paper, there appears to be seasonal dimorphism (A), being shown by lighter or darker wing colors at the different times of the year. Longer series and more study is needed to show if this is really so, and if so, just how widespread is this condition.

SYSTEMATIC DESCRIPTIONS

The Melanolophiini have been characterized in the section on Characters. The majority of the males have the autapomorphic character of the double comb on the underside of the abdomen in the membrane between segments A7 and A8. All known males have pectinate antennae, with the pectinations arising at or near the base of each segment. A number of males have a paired, lateral organ between segments A3 and A4, but this may be reduced to an invagination on each side. The inner surface of each valve is variously ornamented, with the harpe often having a variably shaped and setose projection, and with the sacculus swollen, with a tubelike structure, or with symmetrical or asymmetrical arms.

KEY TO GENERA
BASED ON MALE CHARACTERS

1. Abdomen between segments A7 and A8 on ventral surface with either comblike paired structure of elongate scales (figs.5–14), or with these vestigial, represented by basal sclerotized band and some setae 4
   Abdomen between A7 and A8 unmodified 2

2(1). Gnathos with median swelling U- or V-shaped; each valve with small, curved harpe 3
   Gnathos with median swelling rounded, knoblike; each valve with long slender harpe, extending parallel to long axis of valve, with outer edge thickly spined . ..... *Segalenara*

3(2). Vesica with one large spine; manica simple ..... *Vinemina*
Vesica without spines; manica with numerous prominent spines ..... *Antiphodes* (in part)
4(1). Abdomen with intersegmental membrane ventrolaterally between A3 and A4 invaginated, varying from small pocket-like indentation with or without a few elongate setae to having very prominent setal tufts on an exsertable sac 5
Abdomen unmodified ventrolaterally between A3 and A4 10
5(4). Gnathos in form of an elongate W ..... *Paraphoides*
Gnathos not as above 6
6(5). Each valve with a prominent median swelling on costa 7
Valves without prominent costal setose swellings 9
7(6). Vesica with broad spine; anellus bifurcate, each apex having numerous spines extending posteriorly to about middle of uncus ..... *Melanotesia*
Vesica unarmed; anellus with posterior end rounded or bilobed, short, not as above 8
8(7). Hind wings with both upper and lower surfaces yellowish orange, contrasting with darker forewings; cristae prominent ..... *Arilophia*
Hind wings concolorous with forewings; cristae absent ..... *Melanolophia*
9(6). Aedeagus or manica with thick spines at posterior end .... *Antiphodes* (in part)
Aedeagus or manica without apical spining ..... *Pherotesia*
10(4). Hind wings with veins udc and ldc deeply and sharply angled ..... *Anavinemina*
Hind wings with veins udc and ldc curved or weakly angled 11
11(10). Antennae with longest pectinations 0.95 to 1.25 mm in length .... *Astalotesia*
Antennae with longest pectinations 0.5 to 1.0 mm in length 12
12(11). Gnathos V-shaped medially 13
Gnathos U-shaped medially 14
13(12). Hind tibia with hair pencil 15
Hind tibia without hair pencil ..... *Carphoides*
14(12). Valves symmetrical 16
Valves asymmetrical, with left valve having long slender process ..... *Minyolophia* (in part)
15(13). Male genitalia with costa extended distally as free arm, being attached anteriorly; distal end of sacculus with prominent semicircular setose process .... *Tesiophora*
Costa an integral part of inner face of valve; sacculus without prominent semicircular setose process ..... *Eufidonia*
16(14). Aedeagus with large spine ... *Galenara*
Aedeagus unarmed ..... *Minyolophia* (in part)

Segalenara, new genus
Figures 15, 23

Galenara McDunnough (in part): Rindge, 1964c: 30–33, figs. 16, 26, 31.

DIAGNOSIS: The male abdomen is without any obvious modifications; the gnathos has a median, rounded, ball-like ventral process; each valve has its harpe with an elongate, slender, sclerotized process, its outer margin being thickly setose; the manica has short spines on both sides of the aedeagus; the lamella antevaginalis and lamella postvaginalis are strongly developed; the signum is small, circular, and with an interiorly directed point; and the hind wings have seven veins.

DESCRIPTION: *Adults*: Head with antennae of approximately 47 segments; males with terminal 3 segments simple; longest pectinations about 0.7 mm, being 5 times as long as their basal segments. Palpi rising to just above lower edge of eyes, extending in males 60 percent length of eye in front of eyes.

Forelegs of males with epiphysis arising at 45 percent length of segment and being 55 percent its length, distally flattened. Hind legs of males without tibial hair pencil.

Forewings with one accessory cell; R_1 free; mdc and ldc angled; outer margin of wing weakly concave between veins. Hindwings with seven veins; Sc extending 50 percent of cell; udc and ldc angled. Upper surface of forewings various shades of brown, with indistinct, mottled pattern; of hind wings gray, with numerous brown scales, and partial extradiscal line. Under surface of all wings grayish brown, with indistinct, obsolescent pattern. Length of forewings, 16 to 18 mm.

Abdomen of males simple, without any obvious secondary sexual modifications; however, a microscopic medioventral thickening, without setae, present on underside of A3. Many scales on dorsal surface modified, being broad and flat, with either a median ridge or

with several longitudinal ridges, the apices fluted; scales on ventral surface tending to be setose; both types arising from rounded depressions concentrated near ends of segments.

Male Genitalia (fig. 23): Uncus 5.0 mm long; sides tapered; apex strongly curved ventrally, slightly bulbous, rounded, having a few very short setae. Socius absent. Gnathos wide dorsolaterally, decreasing in width by one-half ventromedially; with large median, rounded, ball-like to ovate ventral process. Each valve with S-shaped, sclerotized costa, bearing numerous, elongate setae on outer surface; ampulla thickly setose; harpe with elongate, slender, sclerotized process weakly constricted medially, its anterodistal margin thickly set with anteriorly directed spines; anellifer with small sclerotized area between anterior portion of process and costal swelling bearing several long, slender setae; sacculus narrowly sclerotized anteriorly, broadly increased in width medially, with posteromedial extension under process of harpe. Cristae small, inconspicuous. Anellus weakly sclerotized, more membranous medially, posterior end truncate. Manica in form of elongate posterolateral areas of numerous short spines. Aedeagus 1.3 mm long, 0.2 mm wide, slightly swollen medially; anterior end narrowed, posterior end rounded. Vesica unarmed.

Female Genitalia: Sterigma with prominent, sclerotized lamellae; lamella antevaginalis with two, lateral, widely separated, digitate lobes; lamella postvaginalis large, extended well posteriad of lamella antevaginalis, broad anteriorly, tapered posteriorly, with median apical cleft. Ductus bursae weakly sclerotized, tapered anteriorly, with width about equal to length. Corpus bursae membranous, elongate, slender; anterior end rounded; posteriorly enlarged on right side. Ductus seminalis arising ventrally from posterior swelling of corpus bursae. Signum small, circular, smoothly sclerotized, anteriorly with raised rim and anteriorly directed point.

EARLY STAGES: Unknown.

FOOD PLANT: Unknown.

TYPE SPECIES: *Melanolophia phyararia* Dyar, 1926.

DISTRIBUTION: The mountains of central Mexico (the state of Mexico and the Distrito Federal), at elevations of about 2225 to 2450 m.

TIME OF FLIGHT: June and July.

REMARKS: The autapomorphic characters for this genus are the ball-shaped or ovate median process of the gnathos and the circular signum. This is the only genus in the tribe that has a rounded signum, although this general shape is found in other tribes of the Ennominae. However, the signum of *phyararia* is considerably reduced and has an anteriorly directed point, which distinguishes it from most other ennomine signa.

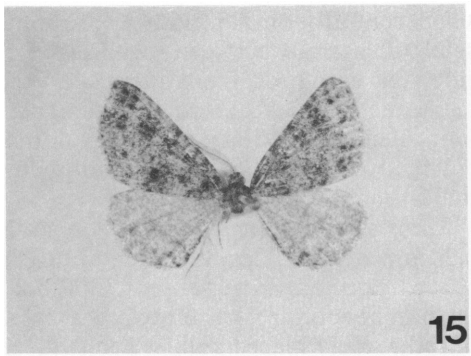
The type species is the only included species. No freshly caught material of *phyararia* is known to me, so nothing can be added to the section on Range in my 1964 paper. It should be reiterated here that the adults of this species (fig. 15) might be mistaken for some species of *Anavinemina*. The member of this genus can be separated from the latter by the number of veins in the hind wings, by the angulate nature of vein ldc, and by the genitalia.

In my earlier paper, I expressed some doubts as to the generic placement of *phyararia*, as it really did not fit into *Galenara*; now that it has been removed, the latter genus appears to be monophyletic.

ETYMOLOGY: The Latin prefix *se-* has been added to *Galenara*, to indicate the separation of the two. The generic name is considered to be feminine.

→

Figs. 15–22. Adults. **15**. *Segalenara phyararia* (Dyar), male; Distrito Federal, Mexico. **16**. *Paraphoides largifera* Rindge, holotype, female. **17**. *P. stulta* Rindge, holotype, male. **18**. *P. bura* (Druce), male; Chimaltenango, Guatemala. **19**. *Antiphoides errantaria* (McDunnough), male; Durango, Mexico. **20**. *A. dentata* (Dyar), male; Guerrero, Mexico. **21**. *Astalotesia bucurvata* Blanchard and Knudson, male; Brewster Co., Texas. **22**. *A. hollandi*, new species, holotype, male. X 1.2.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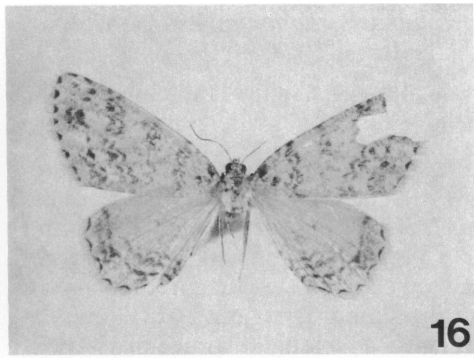
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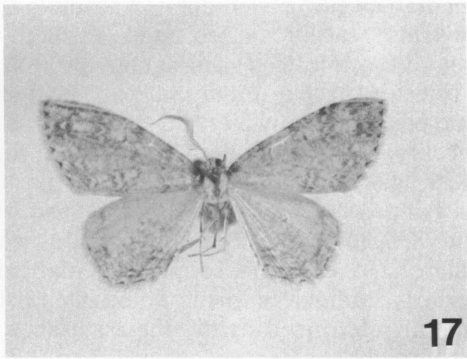
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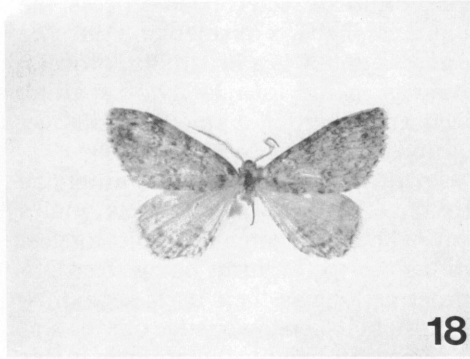
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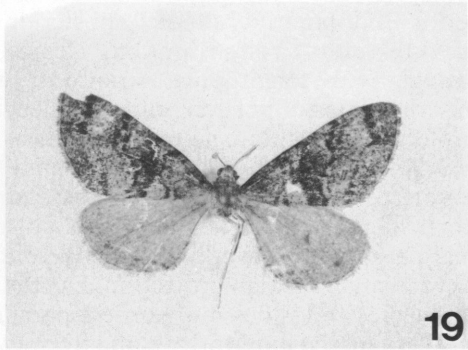
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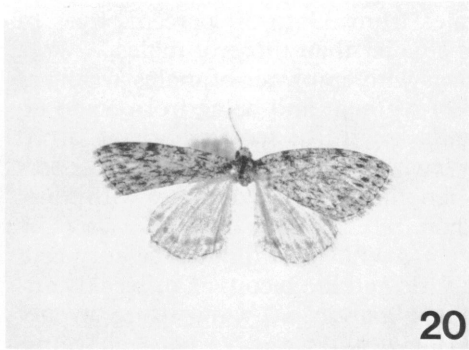
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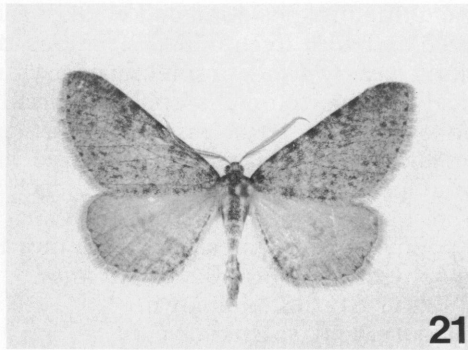
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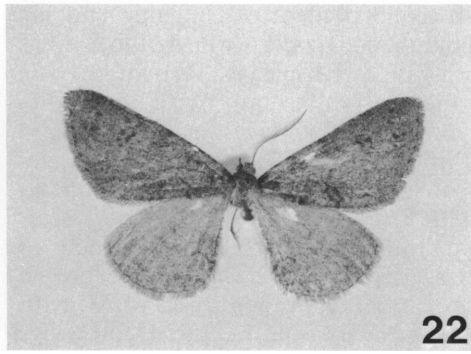
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Genus *Paraphoides* Rindge

Figures 16–18, 27, 28, 70

Paraphoides Rindge, 1964c: 11–22 (not 23–28), figs. 7–12.

DIAGNOSIS: The male abdomen has a median row of setae ventrally on A3, a double setal tuft laterally between segments A3 and A4, and a prominent comblike paired structure between A7 and A8; the gnathos has an elongate bipointed apex; each valve has its sacculus with an elongate process, its posteromedian margin being thickly setose; the manica is a bifurcate, sclerotized process; the lamella antevaginalis is obsolescent, and the lamella postvaginalis is a broad, flat process; the signum is in the form of two separate, sclerotized areas having a spiculate surface; and the hind wings have seven veins.

DESCRIPTION: *Adults*: Head with antennae of approximately 46 to 55 segments; males with terminal 6 to 9 segments simple; longest pectinations 0.6 to 0.9 mm, being from 3.5 to 5.0 times as long as their basal segments. Palpi rising to between lower edge of eyes and up to 33 percent its height, extending in males 25 percent length of eyes in front of eye, and in females from 33 to 50 percent. Eyes of females smaller than those of males.

Forelegs with epiphysis of males arising at middle of segment and being from 55 to 60 percent its length, of females arising at 60 percent length of segment and being 45 percent its length. Hind legs of males with tibial hair pencil.

Forewings with or without accessory cell; R_1 free; mdc and ldc biconvex or weakly angled; outer margin of wing either evenly rounded or weakly concave between veins. Hind wings with seven veins; Sc extending from 40 to 50 percent of cell; udc and ldc curved or angled. Upper surface of forewings grayish white, with grayish brown to pale brown maculation, usually with fairly distinct t. p. line and row of dark spots basad of s. t. line being the most prominent elements; of hind wings more or less concolorous with forewings, but with less dark scaling and maculation. Under surface of forewings grayish brown, with large brown apical area; of hind wings grayish white, with obsolescent maculation. Length of forewings 13 to 17 mm.

Abdomen of males with median row of setae ventrally on A3, with setose lobe and setal tuft laterally between A3 and A4 on each side, and with prominent comblike structure between A7 and A8, consisting of many, very long, slender, modified setae not noticeably enlarged distally. Scaling of abdomen normal.

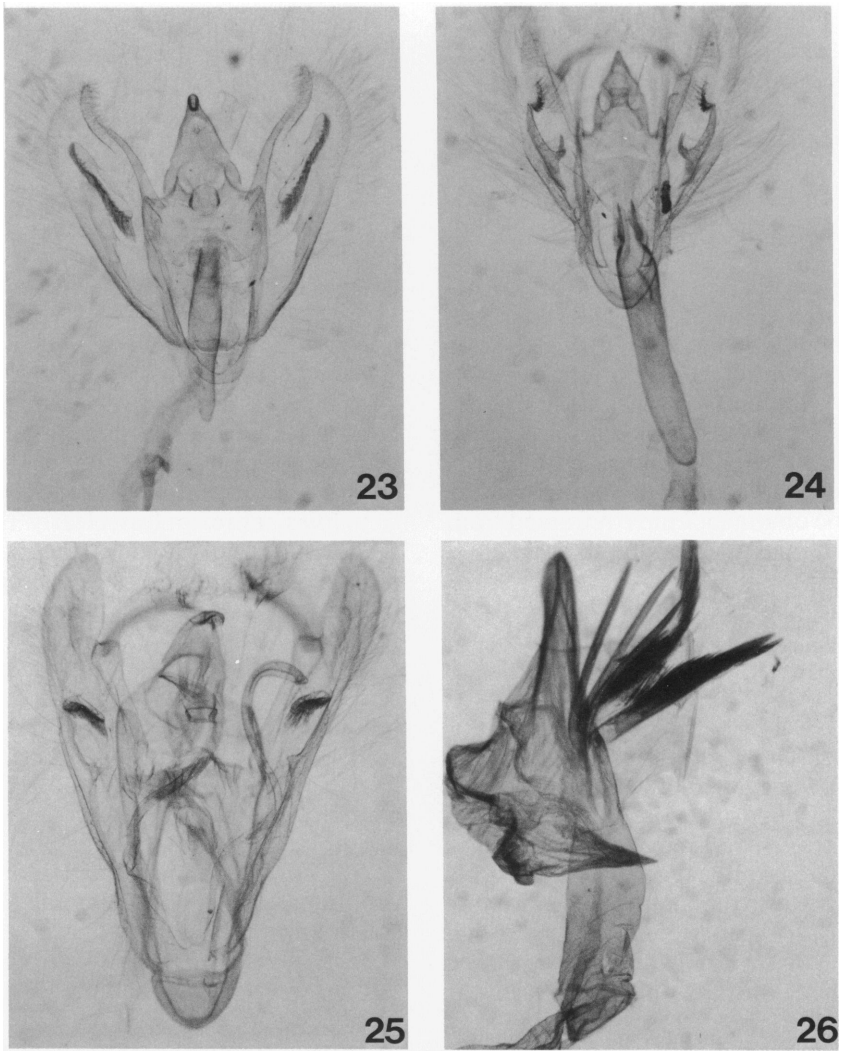
Male Genitalia (figs. 27, 28): Uncus 0.4 to 0.5 mm long; sides tapered; apex slighly curved, pointed. Socius absent. Gnathos with median portion in form of two heavily sclerotized, widely spaced points. Each valve with sclerotized costa having prominent, setose median swelling; well defined ampulla thickly setose; sacculus sclerotized, swollen, with heavily sclerotized, triangular process, its posterior margin thickly set with posteriorly and posterodistally directed spines; harpe with weakly sclerotized area or small tubercle bearing several setae, located near posterior end of process. Cristae numbering from about 2 to 8, 0.30 to 0.65 mm long. Anellus weakly sclerotized, elongate, somewhat enlarged anteriorly. Manica in form of elongate posterolateral sclerotized arms, their surfaces longitudinally striate. Aedeagus 1.5 to 2.2 mm long, 0.3 mm wide, with parallel sides; anterior end bluntly rounded, posterior end weakly sclerotized, rounded. Vesica unarmed, with longitudinal striations; when exserted anterior portion gently swollen, then projecting to right angle to aedeagus.

Female Genitalia (fig. 70): Sterigma with obsolescent lamella antevaginalis; lamella postvaginalis broad, flat or with posterior margin slightly curved, posteriorly rounded or with small median projection. Ductus bursae sclerotized, sides more or less parallel or weakly tapered anteriorly, being from two to three times as long as wide. Corpus bursae membranous, posterior end weakly sclerotized and with longitudinal striations, anteriorly weakly swollen, sometimes asymmetrical. Ductus seminalis arising ventrally or on left side, posteriorly or medially. Signum in form of two, separate sclerotized areas, more or less rectangular in shape, each with a spiculate surface and a few longitudinal ribs. Apophyses posteriores 1.6 to 1.9 mm long; apophyses anteriores 0.8 to 1.0 mm.

EARLY STAGES: Unknown.

FOOD PLANTS: Unknown.

TYPE SPECIES: *Tephrosia bura* Druce, 1892; by original designation.



Figs. 23–26. Male genitalia. **23.** *Segalenara phyararia* (Dyar); Distrito Federal, Mexico. **24.** *Antiphoides dentata* (Dyar); Guerrero, Mexico. 25, 26. *A. errantaria* (McDunnough); Durango, Mexico. **25.** Genitalia. **26.** Aedeagus (not to same scale).

DISTRIBUTION: Mexico (Veracruz, Oaxaca, and Chiapas), Guatemala (Alta Verapaz, Totonicapán, Quezaltenango, and Chimaltenango), and Costa Rica (Cartago). The moths have been collected at elevations between 1200 and 3200 m.

TIME OF FLIGHT: Throughout most of the year, although I have not seen specimens caught in February, March, or December.

REMARKS: The included males can nearly always be recognized by the prominent W- or M-shaped gnathos, and all females by the two rectangular sclerotized areas that correspond to the signum; all included species are very similar to each other in the color and pattern of the upper surface of the wings. Some species of *Melanolophia* have a gnathos that is somewhat similar in shape to those of the present genus, but are completely different in pattern and color, being various shades of brown on the upper surface of all wings, with the pattern of the forewings continued onto the hindwings.

As presently defined, *Paraphoides* includes *foeda* Rindge, *bura* (Druce) (fig. 18), *vafra* Rindge, *largifica* Rindge (fig. 16), and *stulta*

Rindge (fig. 17); there are keys to these species in my 1964 revision (pp. 13, 14). These keys also include *dentata* Dyar and *errantaria* McDunnough, which have been removed from *Paraphoides* in the present paper and placed in *Antiphoides*; the presence of these two species in the keys does not affect their usefulness in separating the presently included species.

I have before me considerably more material from Mexico and Guatemala than was available when the genus was proposed. Even with a larger number of genitalic dissections available, it is difficult to separate the species. More fieldwork and a knowledge of the early stages probably will be necessary before a thorough and satisfactory definition of the species can be obtained; I have refrained from naming additional species due to this.

Antiphoides, new genus

Figures 19, 20, 24–26, 71

Paraphoides Rindge (in part): Rindge, 1964c: 23–28, figs. 13–15.

DIAGNOSIS: The male abdomen has a median row of setae on the ventral surface of A3, a double setal tuft laterally between segments A3 and A4, and may or may not have a prominent comblike paired structure between A7 and A8; the gnathos has an elongate, apically truncate apex; each valve has its sacculus with an elongate, slender process with a median, apically spinose projection, and a prominent, curved, spinose process of the harpe at the distal end of the process; the manica has several to many elongate, thick spines on both sides of the aedeagus; the lamella antevaginalis forms the anterior portion of the sinus vaginalis, and the strongly developed lamella postvaginalis is in the form of a wide sclerotized piece; the signum is a small, angled process or is absent; and the hind wings may have either seven or eight veins.

DESCRIPTION: *Adults*: Head with antennae of about 47 to 54 segments; males with terminal 10 to 12 segments simple; longest pectinations 0.6 to 0.7 mm, being between 3.5 to 4.0 times as long as their basal segments. Palpi rising to lower edge of eyes, extending in males 30 percent length of eyes in front of eye, and in females 33 percent. Eyes of females smaller than those of males.

Forelegs with epiphysis of males arising at middle of segment and being from 50 to 55 percent its length, of females arising at 55 percent length of segment and being 45 percent its length. Hind legs of males with tibial hair pencil.

Forewings with or without accessory cell; R_1 free; mdc and ldc weakly angled or curved; outer margin of wing weakly concave between veins. Hind wings with seven or eight veins; Sc extending 45 to 50 percent of cell; udc and ldc curved or weakly angled. Upper surface of forewings various shades of gray, grayish black, and faintly brownish gray, with cross lines and discal dots present; of hind wings gray, with darker gray or grayish black scaling, and with discal spot, extradiscal and s. t. lines more or less clearly represented. Under surface of all wings gray, with varying amounts of grayish brown scaling, and with indistinct, obsolescent pattern. Length of forewings, 14 to 19 mm.

Abdomen of males with median row of setae ventrally on A3, with setose lobe and setal tuft laterally between A3 and A4 on each side, and with or without prominent comblike structure between A7 and A8, consisting of many, very long, slender, modified setae not noticeably enlarged distally. Scaling of dorsal surface of abdomen elongate, with prominent median and lateral ribs; ventral surface normal.

Male Genitalia (figs. 24–26): Uncus 0.35 to 0.40 mm long; sides tapered; apex curved or angled ventrally, varying from blunt point to broad, rounded scoop-shaped structure. Socius absent. Gnathos wide dorsolaterally, decreasing in width by half ventromedially; median portion truncate apically. Each valve with sclerotized costa having prominent, setose median swelling; ampulla moderate, thickly setose; sacculus sclerotized, swollen, with sclerotized process, striplike, with median projection bearing short setae or several thick spines; harpe with prominent process, semicircular, with one margin thickly covered with short, thick setae; anellifer with weakly sclerotized setose area between harpe and costa. Tegumen with posterolateral margins sclerotized, knoblike or extending posteriorly to middle of lateral margins of gnathos. Cristae numbering from about 3 to 13, with one very thick, S-shaped, elongate, extending posteriorly to harpe, being from 0.85

to 1.30 mm long. Anellus weakly sclerotized, elongate, slender. Manica with from two to three thick, elongate spines posterolaterally, with or without adjacent row of many shorter, closely set spines on each side. Aedeagus 2.3 to 3.1 mm long, 0.3 to 0.4 mm wide, with parallel sides; anterior end either rounded or constricted and lightly sclerotized, posterior end rounded or bluntly pointed. Vesica either unarmed or with slender, curved rod having rough surface; when exserted, bulging out on dorsal side, with large posterior lobe and smaller lateral lobes, almost entire surface striate.

Female Genitalia (fig. 71): Sterigma with lamella antevaginalis forming anterior surface of sinus vaginalis; lamella postvaginalis a broad, sclerotized piece, with or without an elongate, median, fingerlike process extending posteriorly. Ductus bursae sclerotized, with sides more or less parallel, dorsad of posterior end of corpus bursae, being as long as wide. Corpus bursae elongate, weakly curved or swollen, posterior portion sclerotized, finely punctate, and with or without very many longitudinal striations, and with membranous anterior end. Ductus seminalis arising dorsally or laterally near anterior end of ductus bursae on right side. Signum either absent or a small, sclerotized, angled process near anterior end of corpus bursae. Apophyses posteriores 1.4 mm long; apophyses anteriores 1.0 mm.

EARLY STAGES: Unknown.

FOOD PLANTS: Unknown.

TYPE SPECIES: *Galenara errantaria* McDunnough, 1940.

DISTRIBUTION: Southern Arizona and Durango, to the mountains of central Mexico (Morelos and Guerrero).

TIME OF FLIGHT: May and June.

REMARKS: The two included species are *errantaria* McDunnough (fig. 19) and *dentata* (Dyar) (fig. 20); both were formerly included in *Paraphoides*, and are in the keys to that genus, and are described, with their genitalia being illustrated, as cited for *Antiphoides*. The males of both species can be recognized by the very prominently spined manica of each, and the females by the shape of the lamellae.

The female genitalia of *errantaria* (fig. 71) have not previously been described. The lamella postvaginalis has an elongate, median, fingerlike process extending posteriorly; the corpus bursae is elongate (4.7 mm), relatively and evenly wide (1.3 mm), slightly curved, with the posterior 40 percent sclerotized and with numerous, deep longitudinal striations; the ductus seminalis arises from the dorsal surface of the posterior end of the corpus bursae near the junction with the ductus bursae; the signum is a small, sclerotized, angled process near the anterior end of the corpus bursae.

There are a number of differences between *errantaria* and *dentata*; their similarities are thought to be sufficient to place them in the same genus, although future work, including life histories, may make it necessary to separate them into two genera.

ETYMOLOGY: The generic name is formed from the Greek prefix *anti-* plus the stem *-phoides*, meaning against or opposite to those generic names terminating with *-phoides*. The generic name is considered to be feminine.

Genus *Astalotesia* Ferguson

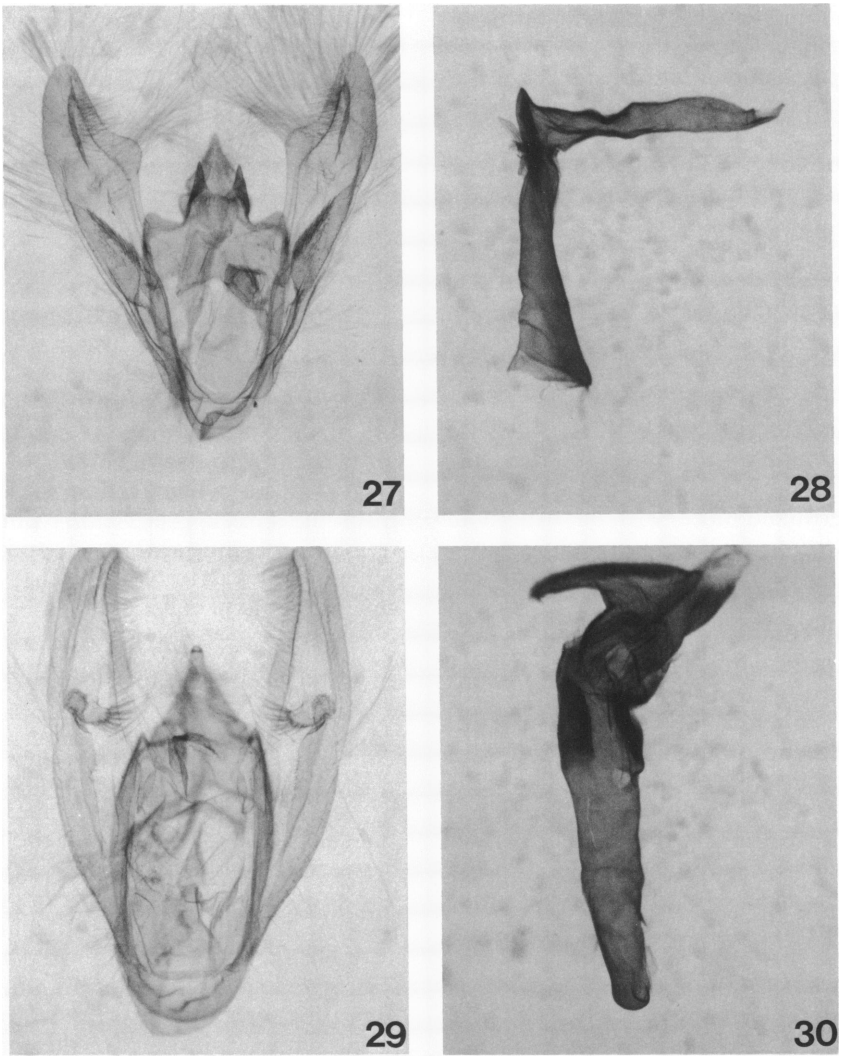
Figures 5, 21, 22, 29, 30, 72

Astalotesia Ferguson, *in* Ferguson et al., 1983: 553.

DIAGNOSIS: The male abdomen is with or without the median row of setae on the ventral surface of A3, is without the lateral tufts between A3 and A4, but has the large comblike process ventrally between A7 and A8; the gnathos has a V-shaped median area; each valve has a wide sacculus with an elongate, sclerotized ridge, its outer margin being dentate, plus a prominent raised process of the harpe with a spinose rim; the manica has a large area of short spines on both sides of the aedeagus; the lamella antevaginalis is absent, while the lamella postvaginalis is an irregular sclerotized transverse band; the signum is absent; and the hind wings have seven or eight veins.

DESCRIPTION: *Adults*: Head with antennae of approximately 52 to 55 segments; males with terminal 2 to 5 segments simple; longest pectinations 0.95 to 1.25 mm, being 5 to 7 times as long as their basal segments. Palpi rising to 10 (males) or 15 percent (females) of height of eye, extending in males 50 to 66 percent length of eyes in front of eye, and 66 percent in females. Eyes of females smaller than those of males.

Forelegs of males with epiphysis arising between 45 and 50 percent length of segment



Figs. 27–30. Male genitalia and aedeagi (not to same scale). **27, 28.** *Paraphoides stulta* Rindge; Oaxaca, Mexico. **29, 30.** *Astalotesia hollandi*, new species, holotype.

and being 60 to 65 percent its length, of females at 55 percent length of segment and 50 percent its length. Hind legs of males with or without tibial hair pencil.

Forewings without accessory cell, or with one weakly defined; R_1 either free or united to form R_{1+2}; mdc and ldc angled or bicurved; outer margin of wing smoothly rounded. Hindwings with either seven or eight veins; Sc extending 50 percent of cell; udc and ldc angled. Upper surface of forewings gray, with indistinct maculation; of hind wings a paler gray, with partial extradiscal line. Under surface of all wings grayish white, with forewings slightly darker than hind wings, without maculation except for small discal dots and partial extradiscal line on hind wings. Length of forewings, 18 to 20 mm.

Abdomen of males with or without median row of setae on ventral surface of A3, without lateral tufts between A3 and A4, with large comblike process ventrally between A7 and A8 consisting of elongate scales flattened distally and being about twice width of their stems (fig. 5). Scaling normal.

Male Genitalia: Uncus 0.4 mm long; sides

tapered; apical region with parallel sides, curved ventrally, terminating in transverse ridge or bilobed apex. Socius absent. Gnathos with lateral portions of equal width; medially V-shaped. Each valve with sclerotized costa, scarcely swollen medially and lacking group of elongate setae; ampulla narrow, with dense row of elongate setae; sacculus broad, sclerotized, swollen, extended to posterior end of its flange and harpe, having median, elongate, raised flange with partially dentate margin; harpe with prominent process, flattened, raised, its distal margin rounded or flattened, and bearing six to eight large spines in single row; anellifer weakly sclerotized, extended on inner face from sacculus to apex of valve. Cristae small, inconspicuous, 4 to 8 in number. Anellus either membranous or lightly sclerotized, broad anteriorly, becoming curved posteriorly, distal end membranous, with numerous short spines. Manica in form of large area of very many, closely set, short spines posterolaterally around aedeagus. Aedeagus 2.10 to 2.35 mm long, 0.3 mm wide; weakly tapered anteriorly, and with bluntly pointed, slightly sclerotized posterior end. Vesica with slender sclerotized strip having finely spinose or dentate surface, 0.5 to 0.8 mm long; when exserted, vesica continuing distally but at angle to aedeagus, with weak longitudinal striations, and with sclerotized strip projecting at angle to left side.

Female Genitalia (fig. 72): Sterigma without lamella antevaginalis; lamella postvaginalis an irregular transverse band, with rounded median swelling and smaller lateral projections. Ductus bursae, or combined ostial cavity plus ductus bursae, elongate, twice as long as wide, posterolateral margins thickened, sclerotized. Corpus bursae elongate, slender, membranous. Ductus seminalis arising ventrally from posterior end of corpus bursae. Signum absent. Apophyses posteriores very long, 3.25 mm in length; apophyses anteriores 1.10 mm long.

EARLY STAGES: Unknown.

FOOD PLANTS: Unknown.

TYPE SPECIES: *Astalotesia bucurvata* Blanchard and Knudson, 1983 (fig. 21); by original designation.

DISTRIBUTION: Western Texas and Sonora.

TIME OF FLIGHT: March and April.

REMARKS: This genus contains the type species from western Texas and the following new species from Sonora.

My description of the genus varies in a few details from Ferguson's original description; part of the differences are due to having two species with which to work, and partly because Ferguson's observations and mine do not agree. Attention is called to the dual condition of vein R_1 of the forewing; the different number of veins in the hind wings (the specimens I examined had seven veins, but fig. 8a in the original description shows eight veins); Ferguson's statement that the pectinations of the male antennae are "probably longer than those of any other genus in the tribe" (pectinations as long or longer are found in *Carphoides*, *Melanolophia*, and *Pherotesia*); "aedeagus without cornuti" is not true even for the type species; the sclerotized strip is more strongly developed in the Sonoran species than in the type species, but it is nearly always present in *bucurvata*.

Astalotesia hollandi, new species

Figures 5, 22, 29, 30

DIAGNOSIS: Male with longest antennal pectinations 0.95 mm in length; hind legs of males with tibial hair pencil, and lower surface of abdominal segment A3 with median row of setae; forewings with cell defined by weak cross vein, and with veins R_{1+2} stalked; male genitalia with elongate process of harpe, sacculus with inner margin narrow and with few spines; vesica with elongate spinose strip. (The females have not been examined.)

DESCRIPTION: *Adults*: Similar to *bucurvata*, differing mainly as follows (comparative figures for *bucurvata* given in parentheses): Antennal pectinations shorter, longest ones 0.95 mm in length (1.25 mm) with 4 or 5 simple segments distally; forelegs of males with epiphysis arising at 45 percent length of segment (50 percent) and being 65 percent its length (60 percent); hind legs of males with hair pencil (absent); segment A3 with median row of bristles (absent). Forewings with accessory cell defined by weak cross vein (absent); veins R_{1+2} stalked (both free).

Upper surface of forewings a dark, smooth gray, with obsolescent maculation, represented primarily by faint t. a. line, dark divided t. p. line present near end of cell, and

with two or three dark spots in s. t. line distad from t. p. line; hind wings an even gray, with obsolescent extradiscal line. Under surface unicolorous gray, hind wings slightly paler than forewings.

Length of Forewing: 20 mm (holotype).

Male Genitalia (figs. 29, 30): Similar to those of *bucurvata*, differing mainly as follows: Uncus with apical portion more slender, with parallel sides. Valves with ridge of sacculus near middle of inner face of valve not as high (not subtriangular) and having far fewer and shorter spines; harpe with elongate process (not semicircular), with 7 or 8 slender spines apically (6 thicker ones). Anellus membranous, with posterior end smooth (lightly sclerotized, with numerous short spines). Manica short and broad, with appressed short spines on each side (longer, narrower, and with longer spines). Aedeagus 2.1 mm long (2.25 mm). Vesica with prominent spinose strip, 0.8 mm long (smaller, 0.5 mm); when exserted, angled to right, with spinose strip extending to left at right angle to aedeagus.

TYPE: Holotype, male, 23.4 mi NE of Rancho Tres Ríos, on Río Bavispe, and 6.5 mi SW of Rancho Gavilan, 5600 ft, Sonora, Mexico, Apr. 12, 1978 (R. Holland; at UV light) (fig. 22). The genitalia of the holotype are mounted on slide FHR 18,871A and one antenna and a set of legs is on slide 18,871B.

The holotype is in the collection of the AMNH.

DISTRIBUTION: Known only from the type locality.

REMARKS: One specimen, one genitalic dissection, and one slide mount of an antenna and legs have been studied. The differences between *hollandi* and *bucurvata* have been outlined above.

ETYMOLOGY: This species is named after Richard Holland, of Albuquerque, New Mexico, who caught the specimen.

Genus *Eufidonia* Packard

Figures 31, 39, 40, 75

Eufidonia Packard, 1876: 225. Gumppenberg, 1887: 397. Hulst, 1896: 324. Forbes, 1948: 63. McGuffin, 1977: 106.

DIAGNOSIS: The male abdomen has both the median row of setae on the ventral surface of A3 and the prominent comblike paired structure between A7 and A8, but is without the lateral tufts between segments A3 and A4; the gnathos has a very long and heavily sclerotized V-shaped median portion; each valve has its sacculus as an elongate, slender, sclerotized process, its inner margin being thickly setose at its distal end or for most of its length; the manica is membranous; the lamella antevaginalis is not differentiated, although the bowl-shaped sinus vaginalis is more or less deeply rugose; the lamella postvaginalis appears as the posterodorsal sclerotized rim of the ductus bursae; the signum is absent; and the hind wings have seven veins.

DESCRIPTION: *Adults*: Head with antennae with from 39 to 45 segments; males with terminal 8 segments simple; longest pectinations 0.5 to 0.6 mm, being 3 to 5 times as long as their basal segments. Palpi rising to lower edge of eyes, extending in males between front of eyes and 75 percent its length, in females between 25 to 50 percent. Eyes of females smaller than those of males.

Forelegs of males with epiphysis arising at about 50 percent length of segment and being 55 to 60 percent its length, of females at 55 to 60 percent length of segment and 40 to 50 percent its length. Hind legs of males with tibial hair pencil.

Forewings usually with accessory cell, sometimes without; R_1 free; mdc and ldc rounded or angled; outer margin of wing smoothly rounded. Hindwings with seven veins; Sc extending 40 percent of cell; udc and ldc angled or curved. Upper surface of forewings pale grayish white with heavy grayish brown or dark brown scaling except in paler median and s. t. areas; of hind wings without the heavy dark scaling, with obsolescent maculation (fig. 31). Under surface similar to upper surface but with less dark scaling. Length of forewings, 10 to 15 mm.

Abdomen of males with median row of setae on ventral surface of A3, without lateral tufts between A3 and A4, and with large comblike paired process ventrally between A7 and A8 consisting of elongate scales flattened distally and being slightly wider than their stems. Scaling normal.

Male Genitalia (figs. 39, 40): Uncus 0.35 to 0.40 mm long; sides tapered; apex bluntly rounded. Socius absent. Gnathos very large,

heavily sclerotized, wide and convex dorsolaterally, narrowed ventrolaterally, median portion large, heavily sclerotized, posterior surface finely shagreened, apex bluntly pointed or truncate. Each valve with sclerotized costa having moderate to large medial swelling with group of elongate setae; ampulla broad, setose; sacculus broad anteromedially, giving rise to long slender arm spined on either part of inner margin or apically; harpe moderate, with small spinose area. Cristae small, inconspicuous, 3 to 8 in number, 0.5 to 1.0 mm long. Anellus constricted anteriorly, rounded posteriorly. Manica membranous. Aedeagus 1.5 mm long, 0.30 to 0.35 mm wide; anterior portion narrowed, widest medially, posterior end rounded. Vesica with small, weakly scobinate or striate area; when exserted, vesica projecting at right angle to aedeagus.

Female Genitalia (fig. 75): Sinus vaginalis bowl-shaped, more or less deeply rugose. Sterigma without definable lamella antevaginalis; lamella postvaginalis appearing as posterodorsal sclerotized rim of ductus bursae. Ductus bursae short, square, rectangular or slightly tapered, lateral margins appearing thickened. Corpus bursae short, membranous, pear-shaped, anterior end rounded, posteriorly sclerotized and striate. Ductus seminalis arising ventrally from posterior portion of corpus bursae. Signum absent. Apophyses posteriores 1.5 to 1.8 mm in length; apophyses anteriores 0.7 to 0.8 mm long.

EARLY STAGES: Described and illustrated by McGuffin (1977: 106, 107, figs. 203 d–h, 205 a–d), and the eggs were illustrated by Salkeld (1983: 58, 59, figs. 27 a–e). The eggs are laid singly on the host plant; the larvae feed on the foliage, and have five or six instars. Pupation takes place at or near the surface of the soil, without a cocoon; hibernation takes place in this stage.

FOOD PLANTS: A variety of broad-leaved shrubs and trees, as well as a number of conifers (McGuffin, 1977: 109, 112).

TYPE SPECIES: *Tephrosia notataria* Walker, 1860; by monotypy.

DISTRIBUTION: Transcontinental across southern Canada (McGuffin, 1977: 81, 110, 111, figs. 21, 28, 29) extending south in the United States to North Carolina in the east, and to Ohio, Wisconsin, and South Dakota in the midwest; apparently absent from the western United States.

TIME OF FLIGHT: May, June, July, and early August. The adults are often diurnal flyers, but they may be nocturnal too.

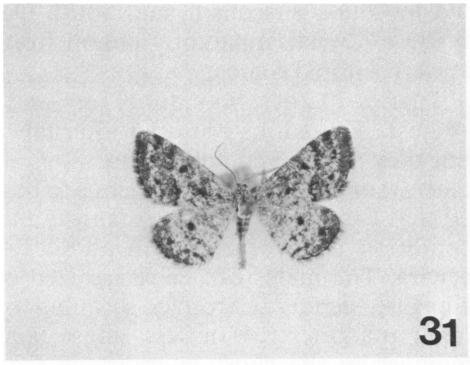
REMARKS: This is the first genus to be treated that has a membranous manica, and this condition is to be found in all succeeding genera. The males can be recognized by the elongate, slender sclerotized sacculus with its inner margin more or less setose, and the females by the short, membranous corpus bursae.

The three species that are included are *convergaria* (Walker), *discospilata* (Walker) (fig. 31), and *notataria* (Walker); keys to the adults and mature larvae are to be found in McGuffin (1977: 107, 108). The adults of all the species are quite similar to one another in color and pattern, but the genitalia and larvae have good characters that can be used to recognize each species.

Arilophia, new genus
Figures 32, 41, 42, 73

DIAGNOSIS: The moths are distinguished by the yellowish orange hind wings on both the upper and lower surfaces, and by the forewings above having a mixture of black, white and yellowish orange scales. The male abdomen has a median row of setae on the ventral surface of A3, a small pocketlike indentation on each side between segments A3 and A4, and a prominent comblike paired structure between A7 and A8; the uncus is tapered; the gnathos is broadly U-shaped, truncate distally; the valves have symmetrical arms on each sacculus, terminating in a large spinose lobe, and with a short projection from the harpe having a terminal spine at right angles to each arm; the cristae are numerous and elongate; the lamella antevaginalis is very slender, the lamella postvaginalis is a small sclerotized area having posterolateral setae, and the sinus vaginalis forms a large area on each side with numerous concentric rings; the corpus bursae is short and broad, and lacks a signum; and the hind wings have 8 veins.

DESCRIPTION: *Adults*: Head with antennae having about 63 segments; males with terminal 6 segments simple; longest pectina-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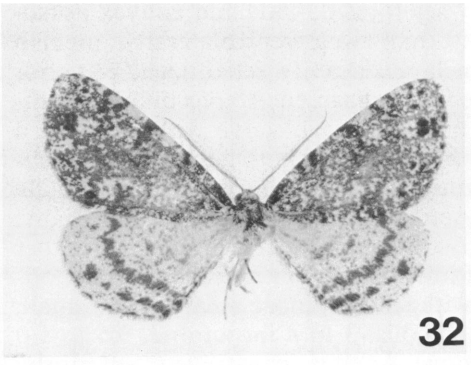
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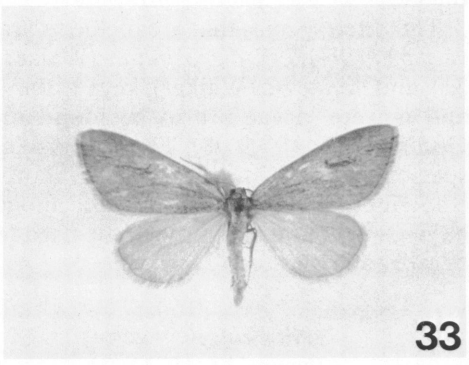
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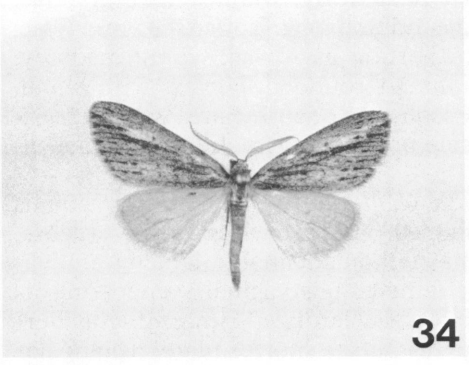
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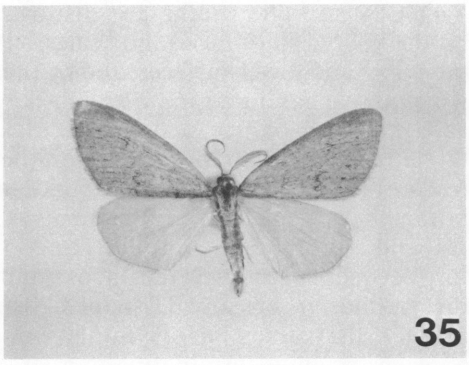
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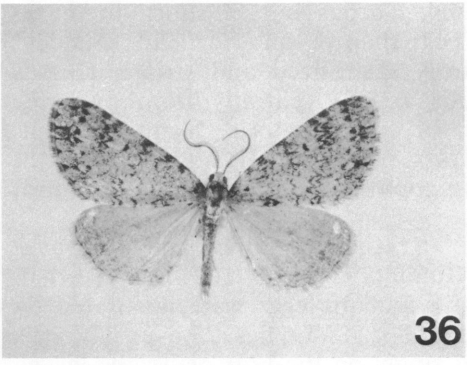
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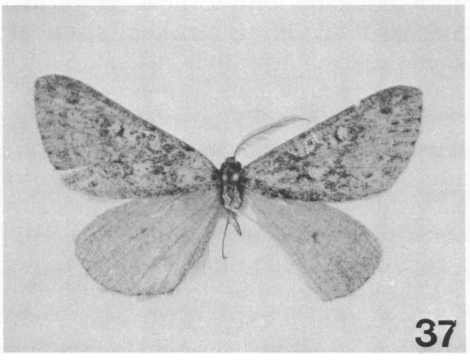
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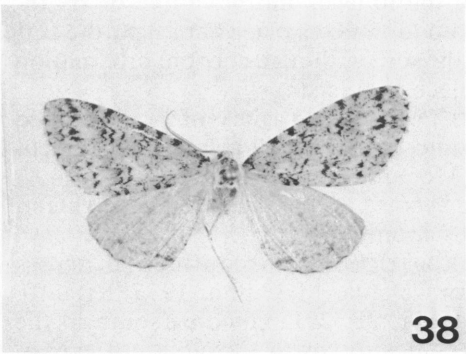

38

tions 0.9 mm, being 5.5 times as long as their basal segments. Palpi rising to one-third height of eyes, extending in males 55 percent length of eyes in front of eye, and in females 60 percent. Eyes of females smaller than those of males.

Forelegs of males with epiphysis arising at about 45 percent length of segment and being 65 percent its length, of females at 55 percent length of segment and 50 percent its length. Hind legs of males with tibial hair pencil.

Forewings with accessory cell; R_1 free; mdc and ldc curved; outer margin of wings smoothly rounded. Hindwings with 8 veins, Sc being terminally bifurcate and extending 50 percent length of cell; udc and ldc angled. Upper surface of forewings with mixture of black, white and yellowish orange scales, the last usually indicating cross lines; of hind wings yellowish orange, with dull black extradiscal line (fig. 32). Under surface similar to upper surface but with more black scaling. Length of forewings, 20 to 27 mm.

Abdomen of males with median row of setae on ventral surface of A3, with intersegmental membrane between A3 and A4 weakly invaginated laterally, and with large comblike paired process ventrally between A7 and A8 arising in deep basal indentation on each side and consisting of elongate curved scales of equal width for their entire length. Scaling normal.

Male Genitalia (figs. 41, 42): Uncus 0.6 to 0.7 mm long; sides tapered; apex with single, slightly curved point. Socius absent. Gnathos very large, broadly U-shaped, truncate terminally, with short median ridge, posterodistal surface finely denticulate. Each valve with sclerotized costa having moderate swelling but lacking setae; ampulla broad, raised, thickly setose; sacculus with anterolateral margin sclerotized, giving rise to prominent arm, symmetrical on both sides, terminating in bulbous swelling having very many curved setae on dorsal surface (when valves are spread); harpe moderate, having transverse sclerotized band giving rise to triangular process at right angles to arm, with each process having long terminal spine. Cristae very prominent, about 50 on each side, with longest 0.6 mm. Anellus with broad base, narrowed posteriorly. Manica membranous. Aedeagus 2.3 mm long, 0.4 mm wide; anterior end rounded, posteriorly tapered to narrow point and having one side sclerotized. Vesica unarmed; when exserted, projecting at about right angle to aedeagus, with basal swelling.

Female Genitalia (fig. 73): Sinus vaginalis bowl shaped, with lateral areas deeply rugose. Sterigma with finely crenulate, membranous lamella antevaginalis; lamella postvaginalis in form of median sclerotized area having posterolateral sclerotized areas on each side thickly covered with short setae. Ductus bursae tubular, twice as long as wide, weakly sclerotized. Corpus bursae membranous, short, broad, almost square but with posterior portion on left extending dorsad of ductus bursae. Ductus seminalis arising ventrally from near left margin of posterior projection. Signum absent. Apophyses posteriores 2.4 to 2.5 mm in length; apophyses anteriores 1.3 to 1.6 mm long.

EARLY STAGES: Unknown.

FOOD PLANTS: Unknown.

TYPE SPECIES: *Arilophia rawlinsi*, new species.

DISTRIBUTION: Known from a single mountain range in the Dominican Republic.

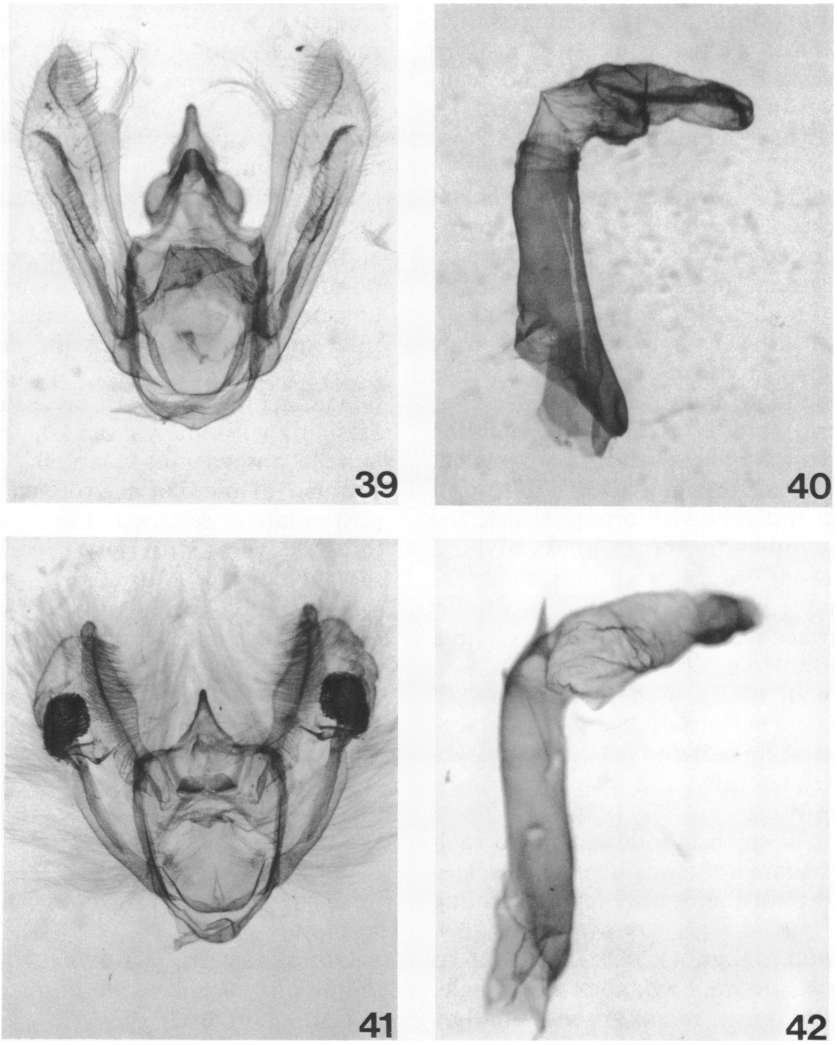
TIME OF FLIGHT: July.

REMARKS: The single included species is extremely similar in color and maculation to the Palearctic *Arichanna melanaria* (Linnaeus), resembling that species much more than any New World geometrid known to me. The two species belong in different tribes, as the Old World genus is placed in the Boarmiini.

Arilophia shows certain similarities to *Eufidonia*, as in the general type of maculation

←

Figs. 31–38. Adult males. **31**. *Eufidonia discospilata* (Walker); Laurentides Park, Quebec. **32**. *Arilophia rawlinsi*, new species, holotype. 33, 34. *Carphoides incopriaria* (Hulst). **33**. Yavapai Co., Arizona. **34**. Bernalillo Co., New Mexico. **35**. *Carphoides inconspicuaria* (Barnes and McDunnough); Cochise Co., Arizona. **36**. *C. setigera* Rindge, paratype; Cochise Co., Arizona. **37**. *C. oaxaca*, new species, holotype. **38**. *C. durango*, new species, holotype. X 1.2.



Figs. 39–42. Male genitalia and aedeagi (not to same scale). **39**, **40**. *Eufidonia notataria* (Walker); Ontario. **41**, **42**. *Arilophia rawlinsi*, new species, holotype (CMNH).

on the upper surface of the wings, with contrastingly colored hindwings, in lacking the lateral hair pencils between A3 and A4, in the configuration of the sinus vaginalis and lamellae, in the short corpus bursae, and in the lack of a signum.

ETYMOLOGY: The generic name is formed from the Greek prefix *ari-* and the suffix *-lophia*, to indicate the similarity in color and maculation between *Arichanna* and the placement of this new genus in the Melanolophiini. The generic name is considered to be feminine.

Arilophia rawlinsi, new species
Figures 32, 41, 42, 73

DIAGNOSIS: The adults are recognized by the yellowish orange hind wings on both the upper and lower surfaces, contrasting with the black, white and yellowish orange scaled forewings.

DESCRIPTION: *Adults*: For head, thoracic appendages, and abdomen see generic description.

Upper surface of forewings with mottled grayish black and white scaling, having yel-

lowish orange scales along part of costa, forming cross lines, and rather diffused in terminal area; t. a. line angulate, with broad black blotch on costa distad of line; median cross line with black costal blotch near small black discal spot, line itself tending to be diffuse or reduced, not reaching inner margin; t. p. line weakly S-shaped, outlined distally by black cellular spots; subterminal area white, variable in width and intensity; s. t. line of black centered, grayish black spots, variable in size and number; terminal line of black cellular spots; fringe yellow-orange, with black spots opposite those of terminal line. Hind wings an even yellowish orange, with scattered black scaling; black discal spot present; extradiscal line varying from a few black scales to complete black band; subterminal band black, represented in lower portion of wing only; terminal line and fringe similar to those of forewing.

Under surface of forewings mottled grayish black and yellowish orange, without definite pattern except for mostly orange costa and black discal spot; hind wings similar to upper surface.

Length of Forewings: Holotype, 24 mm; paratypes, males, 20 to 25 mm, females, 22 to 27 mm.

Male Genitalia: As described for the genus.

Female Genitalia: As described for the genus.

TYPES: Holotype, male, La Abeja, 1250 m, 38 km NNW Cabo Rojo (18°09′N, 71°38′W), Pedernales, Dominican Republic, July 15, 1987 (John E. Rawlins and Robert L. Davidson) (fig. 32). The genitalia of the holotype are mounted on slide FHR 20,250. Paratypes, all from Pedernales, Dominican Republic, and caught by Rawlins and Davidson: 37 km N Cabo Rojo (18°09′N, 71°35′W), 1500 m, July 11, 1987, 2 males, 1 female; 37 km N Cabo Rojo, 4 km E La Abeja (18°10′N, 71°37′W), 1440 m, July 12, 1987, 19 males, 7 females ; same data as holotype but 1160 m, July 13, 1987, 3 males; same data as preceding, July 14, 1987, 3 males, 1 female; same data as holotype, 6 males, 2 females.

The holotype is in the collection of the CMNH; paratypes are in the collections of that institution and of the AMNH.

DISTRIBUTION: Known only from the La Abeja (Las Abejas) area of the Sierra de Baoruco in the Dominican Republic. This is near the border with Haiti, and is in the south central portion of Hispaniola (see Schwartz, 1989: 4, map 1).

Note that the specimen labels bear the singular name for the locality (La Abeja), as this is used by the natives of the area (Rawlins, personal commun.); the plural (Las Abejas) has been used by Schwartz (1989: 498).

The moths were taken only at ultraviolet light. They were most abundant in open pine woodlands from 1160 to 1500 m, and were not caught at lower elevations, in the more xeric habitats of the southern foothills of the Sierra de Baoruco, or at higher elevations near the crest of the range (Rawlins, personal commun.).

For a description of the Sierra de Baoruco area, see Schwartz (1989: 498–500). Seven species of butterflies are known only from this area; *Arilophia rawlinsi* is the first endemic moth to be named from there.

REMARKS: Forty-five specimens (34 males, 11 females), six genitalic dissections (four males, two females), and two slide mounts (one male, one female) of antennae and legs have been studied.

ETYMOLOGY: I take pleasure in naming this species after John E. Rawlins, who caught many of the specimens in the type series, and then called my attention to them.

Genus *Carphoides* McDunnough
Figures 33–38, 43–45

Carphoides McDunnough, 1920: 15. Rindge, 1964c: 3–11, figs. 1–6.

DIAGNOSIS: The male abdomen is without modifications on the ventral surface of A3 and between A3 and A4, and the comblike paired structure between A7 and A8 may be present or represented by a basal sclerotized band; the gnathos is heavily sclerotized, slender, and has an attenuated, V-shaped median area; each valve has its sacculus with an elongate, slender, apical setose area, plus an anterior, raised, rounded or curved, spinose process of the harpe; the manica is membranous; the sinus vaginalis has deep, lateral troughs, while the lamella antevaginalis is absent and the lamella postvaginalis is a small, median, subtriangular area; the signum is absent but there is a narrow band of minute

spines encircling the anterior end of the corpus bursae; and the hind wings usually have 7 veins.

DESCRIPTION: *Adults*: Head with antennae of approximately 47 to 62 segments; males with terminal 4 or 5 segments simple; longest pectinations 0.5 to 1.2 mm, being from 3 to 6 times as long as their basal segments. Palpi rising to between lower edge of eyes up to 10 percent its height, extending in males from 50 to 67 percent length of eyes in front of eye, and in females 67 percent. Eyes of females either equal in size to those of males or smaller.

Forelegs with epiphysis of males arising between 45 and 50 percent length of segment and being 60 to 67 percent its length, of females arising between 55 and 65 percent length of segment and being 35 to 40 percent its length. Hind legs of males without tibial hair pencil.

Forewings with or without one accessory cell; R_1 free, rarely from top of cell; mdc and ldc curved; outer margin of wing evenly rounded. Hind wings with seven veins, rarely eight; Sc extending 50 to 60 percent of cell; udc and ldc curved or angled. Wing shape and coloration of two types, either with elongate, slender wings, forewings with upper surface gray with weakly defined longitudinal markings or with faint t. p. line, hind wings white and without maculation, or wings shorter and broader, forewings with upper surface greenish gray, with dark, slender, transverse cross lines, hind wings pale gray, with more or less complete s. t. line. Under surface of narrow winged species with grayish white forewings, white hind wings, and no maculation, of broad winged species with all wings grayer, forewings with obsolescent markings of upper surface of wings weakly repeated. Length of forewings, 13 to 20 mm.

Abdomen of males without median row of setae ventrally on A3, without lateral setae between A3 and A4, and either with or without (possibly deciduous?) comblike paired structure between A7 and A8, when present consisting of many, very long, slender, modified setae not enlarged distally. Scaling of abdomen normal.

Male Genitalia: Uncus 0.35 to 0.50 mm long; sides tapered, apical region parallel-sided or with slight swelling posteriorly; apex bilobed, straight or curved. Socius absent. Gnathos heavily sclerotized, slender, with large, V-shaped median area angled posteriorly. Each valve with sclerotized costa, either with or without median setose swelling; ampulla appearing as raised setose ridge between costa and harpe; sacculus slender, sclerotized, either having long slender arm extending about 90 percent length of valve, apically swollen, or with lateral projection, both types densely setose apically; harpe moderately broad, with large, raised, lobate or curved process thickly setose on ventral surface (when valves are spread). Cristae either absent or 5 to 15 in number, 0.1 to 0.4 mm long. Anellus widened anteriorly with median depression, narrowed posteriorly. Manica membranous. Aedeagus 1.3 to 1.8 mm long, 0.2 to 0.4 mm wide; dorsal surface with posterior portion sclerotized, tapered to anteriorly curved point. Vesica with small, slender rod or with larger, swollen, spinose process, their lengths 0.3 to 0.6 mm.

Female Genitalia: Sinus vaginalis with deep, lateral troughs, rugose and weakly sclerotized dorsally. Sterigma without definable lamella antevaginalis; lamella postvaginalis appearing as small, median, subtriangular area near posterior end of ductus bursae. Ductus bursae sclerotized, twice as long as wide, lateral margins appearing thickened. Corpus bursae elongate, 3.5 to 4.5 mm long, slender, straight, membranous, anterior end rounded, posteriorly asymmetrical, larger to left of junction with ductus bursae than on right side, weakly sclerotized and punctate. Ductus seminalis arising ventrally from posterior portion of corpus bursae. Signum absent; corpus bursae with encircling narrow band of minute spines near anterior end. Apophyses posteriores 1.65 to 1.80 mm long; apophyses anteriores 0.8 mm.

EARLY STAGES: Unknown.

FOOD PLANTS: Unknown.

TYPE SPECIES: *Aethyctera lineata* Hulst, 1892; by original designation. *A. lineata* is a junior subjective synonym of *Tornos incopriarius* Hulst, 1887.

DISTRIBUTION: Southwestern United States (Colorado, Utah, Nevada, Arizona, New Mexico, and western Texas) and Mexico (Durango, Oaxaca).

TIME OF FLIGHT: From March into September, and November.

REMARKS: The members of this small ge-

nus can be divided into two groups. The type species, *incopriaria*, plus *inconspicuaria* (Barnes and McDunnough) have elongate, slender forewings that have the upper surface gray with indistinct maculation, either as a longitudinal black line above the cubital vein or as weakly indicated t. a. and t. p. lines (figs. 33–35), the uncus is enlarged posteriorly, the inner surface of the curve in the sacculus arm is setose, the process of the harpe is lobate, and the cristae are absent. In comparison, *setigera* Rindge and the two new species described below have broad forewings that have the upper surface greenish gray or gray with many, more or less distinct, slender cross lines (figs. 36–38), the apical portion of the uncus has parallel sides, the inner surface of the curve in the sacculus arm does not have a group of setae, the process of the harpe is a large, curved or semicircular process, and cristae are present. The adults of the last three species appear much more similar in appearance to some species of *Vinemina*, *Paraphoides*, or even *Astolotesia* rather than their congeners; an examination of the genitalia will determine the genus and species.

Because of the two new species described below, my keys to the species (1964c: 4, 5) are no longer adequate to separate the adults by maculation and male genitalia, so new keys are provided. Both the new species are known only from males, and so an enlarged key to the female genitalia is not provided.

KEY TO SPECIES

Based on Wings and Antennae

1. Upper surface of forewings with dentate cross lines (figs. 36–38) 2
   Upper surface of forewings with cross lines indistinct or absent (figs. 33–35) 4
2. Upper surface of forewings dark gray; male antennae with pectinations 1.2 mm .. *oaxaca*
   Upper surface of forewings greenish gray; male antennae with longest pectinations 0.5 to 0.6 mm 3
3. Forewings with accessory cell; length of forewings 11 to 13 mm ..... *setigera*
   Forewings without accessory cell; length of forewings 17 to 19 mm ..... *durango*
4. Upper surface of forewings with prominent longitudinal black marking above cubital vein in lower part of cell and in cell M2 (figs. 33, 34) ..... *incopriaria*
   Upper surface of forewings without longitudinal maculation; some specimens with t. a. and t. p. lines weakly indicated (fig. 35) ... . *inconspicuaria*

Based on Male Genitalia

1. Vesica with elongate, apically curved, prominent row of spines 2
   Vesica with inconspicuous, short, sclerotized band 4
2. Harpe with small ovate process, separate from swelling at end of sacculus 3
   Processes of harpe and sacculus apparently combined, producing large setose swelling half width of valve and being constricted medially (fig. 45) ..... *oaxaca*
3. Uncus with cleft at apex at least as deep as width of its lateral lobes ... *inconspicuaria*
   Uncus with very shallow cleft ... *incopriaria*
4. Valve with posterior end truncate, and with spined process of sacculus extending to within 0.2 mm of end (fig. 43) ..... *durango*
   Valve with posterior end rounded, and with spined process of sacculus being 0.5 mm from apex ..... *setigera*

Carphoides oaxaca, new species

Figures 37, 45

DIAGNOSIS: The largest species in the genus, with a forewing length of 20 mm; the male antennae with their longest pectinations 1.2 mm (compared with 0.5 to 0.7 mm for all other species); the male genitalia have a median setose costal swelling on the costa, and the process of the harpe enlarged to occupy at least half the width of the valve. (The females have not been examined.)

DESCRIPTION: *Adults*: Head with longest antennal pectinations 1.2 mm, being 6 times as long as their basal segments. Palpi with elongate (0.4 mm long) decumbent third segment; rising to lower edge of eyes, and extending 50 percent length of eyes in front of eyes.

Forelegs with epiphysis of male arising at 50 percent length of segment and being 60 percent its length.

Forewings with accessory cell; cross veins mdc curved, ldc straight. Hind wings with seven veins; Sc extending 50 percent length of cell; cross veins udc curved, ldc straight. Wing broad. Forewings with upper surface gray, with a few small whitish areas; maculation indistinct, weakly indicated by darker scales, with obsolescent t. a. and t. p. lines; discal spot black, with white scaling distad; s. t. line white, incomplete. Hind wings with upper surface unicolorous grayish white,

without maculation except for small gray discal spot. Under surface of forewings a mottled dark gray, with indication of pattern from upper surface; hind wings paler, similar to upper surface.

Length of Forewing: 20 mm (holotype).

Male Genitalia (fig. 45): Uncus with broad apex curved ventrally. Valves with costa having median setose costal swelling; sacculus becoming wider toward middle of valve, occupying one-half width of valve; harpe broad, with very large swelling at right angles to costa, possibly fused with process at end of sacculus, constricted medially, and having thick spines. Cristae numbering about 15, longest ones 0.4 mm. Aedeagus 1.60 mm long, 0.25 mm wide. Vesica with spinose process, spines being on left side and curving at end, 0.4 mm long.

TYPE: Holotype, male, La Cabaña, 2800 m, Municipio San Juan Atepec, Oaxaca, Mexico, Nov. 6, 1980 (E. C. Welling) (fig. 37). The genitalia of the holotype are mounted on slide FHR 19,358A, and an antenna and set of legs on FHR 19,358B.

The holotype has been deposited in the collection of the AMNH.

DISTRIBUTION: Known only from the type locality in the mountains of northern Oaxaca.

REMARKS: One specimen, one genitalic dissection, and one slide mount of an antenna and legs have been studied.

This species has a number of characters that distinguish it. The color and maculation of the upper surface of the wings fit in with *setigera* and the following species, but the moth has the appearance of some members of *Astalotesia* and *Vinemina*. The pectinations of the male antennae are much longer than any other known member of *Carphoides*; they are more like those of *Astalotesia*. But the male genitalia and secondary sexual characters indicate that the placement should be in *Carphoides*; a comparison of the spining of the vesica shows the considerable similarity to *inconspicuaria* and *incopriaria*. Within the genus, *oaxaca* is the only known species to have the setose costal swelling, the short, broad sacculus, and the very large, medially constricted process of the harpe.

ETYMOLOGY: The specific name is a noun in apposition based on the type locality.

Carphoides durango, new species
Figures 38, 43, 44

DIAGNOSIS: Upper surface of broad forewings greenish gray, with black, zigzag crosslines; the male genitalia have the distal end of the valves truncate, with the spine process of the sacculus extending to within 0.2 mm of the end, and the spinose process of the harpe is very slender and curved; the vesica has a slender strip that is 0.3 mm long. (The females have not been examined.)

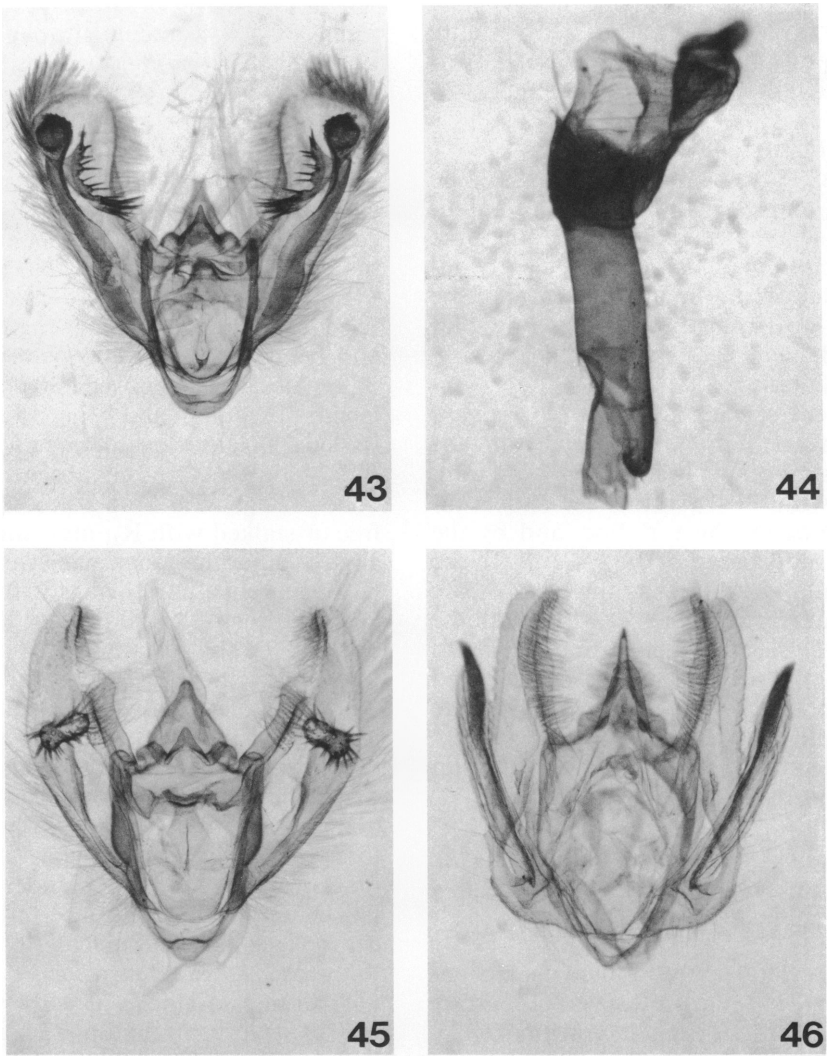
DESCRIPTION: *Adults*: Head with longest antennal pectinations 0.6 mm, being 3.6 times as long as their basal segments. Palpi with third segment short, 0.2 mm, and erect; rising to lower edge of eyes or just above, and extending 33 percent length of eyes in front of eyes.

Forelegs with epiphysis of males arising at 50 percent length of segment and being 60 percent its length.

Forewings without accessory cell; mdc and ldc curved. Hind wings with 7 veins; Sc extending 50 percent length of cell; udc and ldc curved. Wings broad. Forewings with upper surface grayish green, with elongate white spots more or less distinct basad of s. t. line; maculation of slender, black, zigzag lines, originating as black spots on costa; t. a. line obsolescent in middle of wing; discal dash small to obsolescent; t. p. line usually complete, often double; s. t. line varying from prominent, black, inwardly pointing dashes to obsolescent, dashes more or less outlined on both sides by white areas; terminal line of intravenular black dashes. Hind wings grayish white, with obsolescent discal dot and incomplete s. t. line; terminal line slender, grayish black, narrowly interrupted by veins. Under surface of forewings a mottled gray, with obsolescent maculation; hind wings paler, similar to upper surface.

Length of Forewings: Holotype, 19 mm; paratypes, 17 to 18 mm.

Male Genitalia (figs. 43, 44): Uncus with flat, bilobed apex. Valves without costal swelling; apex truncate; ampulla an elongate, thickly setose, S-shaped ridge; sacculus sclerotized, raised above face of valve, of equal width up to rounded, spinose, terminal swelling, reaching to within 0.2 mm of truncate



Figs. 43–46. Male genitalia. 43, 44. *Carphoides durango*, new species, paratype. **43**. Genitalia. **44**. Aedeagus (not to same scale). **45**. *C. oaxaca*, new species, holotype. **46**. *Anavinemina brachiata*, new species, holotype.

apex; harpe with slender, erect process, apically setose. Cristae 5 or 6, longest ones 0.3 mm. Aedeagus 1.8 mm long, 0.3 mm wide. Vesica with slender, lightly sclerotized, minutely setose strip, 0.3 mm long; when exserted, vesica with narrowed portion extending posterodorsally and to right, with sclerotized strip directed towards posterior end of aedeagus, and at right angles to that structure.

TYPES: Holotype, male, road to Topia, 38 mi W paved road (highway 39) Durango to Tepehuanes, 7700 ft, Durango, Mexico, July 12, 1981 (R. Holland; at UV light) (fig. 38). The genitalia of the holotype are mounted on slide FHR 19,111A, and an antenna and set of legs on FHR 19,111B. Paratypes: same data as holotype, one male; La Ciudad, Municipio Pueblo Nuevo, 2475 m, Durango, Mexico, Aug. 15, 1984 (E. C. Welling), one male.

The holotype and both paratypes are in the collection of the AMNH.

DISTRIBUTION: The Western Sierra Madre in the state of Durango; the type series was caught at elevations between 2350 and 2475 m.

TIME OF FLIGHT: July and August.

REMARKS: Three specimens, two genitalic dissections, and two slide mounts of antennae and legs have been studied. Of the three adults, the holotype has the most clearly defined maculation on the upper surface of the forewings; both paratypes are somewhat rubbed and have as a result rather poorly defined maculation.

The present species is similar to *setigera* from Arizona. It may be separated from the latter by its longer wing length (17–19 mm, compared with 11–18 mm), the more undulating course of the t. p. line, and by the large white spots basad of the s. t. line. In the male genitalia, *durango* has the apex of the valve truncate (rounded in *setigera*), with the process of the sacculus being much closer to the apex, by the more erect, less curved, and more slender process of the harpe, and by the longer strip in the vesica.

ETYMOLOGY: The specific name is a noun in apposition based on the type locality.

Genus *Anavinemina* Rindge

Figures 6, 46–59, 74, 76–81

Anavinemina Rindge, 1964b: 3–23, figs. 1–14.

DIAGNOSIS: The male abdomen usually has a median row of setae on the ventral surface of A3 (rarely absent), has lateral pocketlike depressions with a few setae between segments A3 and A4, and has a prominent comblike paired structure between A7 and A8; the gnathos has an elongate median section with either a U- or V-shaped apex; each valve has a sclerotized sacculus that may or may not have an elongate arm, and the harpe may be unmodified or have a large, raised, apically setose projection; the manica is membranous; the lamella antevaginalis is not sclerotized, and the lamella postvaginalis is a weakly sclerotized, rugose area; the signum is absent, but some species may have an area or band of minute spines near the anterior end of the corpus bursae; and the hind wings have eight veins.

DESCRIPTION: *Adults*: Head with antennae of about 48 to 59 segments; males with terminal 4 to 8 segments simple; longest pectinations 0.50 to 0.85 mm, being between 3 and 6 times as long as their basal segments. Palpi rising to between 10 and 33 percent height of eyes, extending in males between 33 and 67 percent length of eyes in front of eye, and in females between 40 and 80 percent. Eyes of females smaller than those of males.

Forelegs with epiphysis of males arising between 40 and 55 percent length of segment and being from 50 to 65 percent its length, of females arising between 50 and 66 percent length of segment and being 35 to 50 percent its length. Hind legs of males usually with tibial hair pencil, rarely absent.

Forewings with 1 or 2 accessory cells; R_1 free or stalked with R_2; mdc and ldc sharply angled; outer margin of wing weakly concave between veins. Hind wings with eight veins; Sc extending 45 to 50 percent length of cell; udc and ldc sharply angled. Upper surface of forewings either olivaceous and dark brown with orange or yellow scaling and with grayish median and s. t. areas, or an even dark brown with obsolescent maculation; of hind wings gray, with olivaceous brown scaling and extradiscal and s. t. lines with first type of forewings, or grayish brown with obsolescent markings in second type. Under surface similar to that of upper surface but with muted colors and reduced maculation. Length of forewings, 15 to 20 mm.

Abdomen of males usually with median row of setae ventrally on A3 (rarely absent), with lateral pocketlike depressions with a few setae between A3 and A4 (rarely with prominent tufts), and with prominent comblike paired structure between A7 and A8, consisting of many, very long, slender, modified setae either not enlarged distally (fig. 6) or enlarged twice as wide as stem of setae. Scaling of abdomen normal.

Male Genitalia: Uncus 0.3 to 0.5 mm long; sides tapered or concave; apex either a single point, or truncate, bilobed or scoop-shaped, flat or sharply curved ventrally; thickly covered with setae dorsally. Socius absent. Gnathos well sclerotized, laterally slender, convex at junction with tegumen; median portion large, curved ventroposteriorly, U- or V-shaped, posterior surface rugose. Each valve with sclerotized costa, with or without

setose median swelling; ampulla varying from moderate ridge to large distal enlargement of costa, thickly setose; sacculus sclerotized, varying from simple swelling to elongate, inwardly shortly setose, free arm; harpe reduced or well developed, with or without large, circular or semicircular setose process. Cristae numbering from 1 to about 12, either of approximately same length (0.1 to 0.3 mm) or with one or more much longer and thicker (0.6 to 0.8 mm) than others. Anellus lightly sclerotized, straplike or constricted medially, posterior end shortly Y-shaped. Manica membranous. Aedeagus 1.5 to 1.8 mm long, 0.20 to 0.35 mm wide; posterior end lightly sclerotized. Vesica either unarmed, with from 4 to 12 thick spines or with spinose strip; when exserted, extended posteriorly and then curved.

Female Genitalia: Sterigma with lamella antevaginalis membranous; lamella postvaginalis weakly sclerotized, rugose. Ductus bursae membranous or with stipplelike sclerotization, small, longer than wide. Corpus bursae elongate, straight or weakly curved; anterior end membranous, either rounded or asymmetrical, somewhat footlike; posterior end asymmetrical, with swelling on either left or right side of junction with ductus bursae, membranous or weakly sclerotized, smooth or with a few short longitudinal striations. Ductus seminalis arising ventrally from corpus bursae near ductus bursae, either on left or right side. Signum absent; anterior portion of corpus bursae either membranous, weakly punctate, or with partial band of inwardly projecting minute denticulations. Apophyses slender or thick; apophyses posteriores 1.5 to 2.5 mm long; apophyses anteriores 0.7 to 1.2 mm. Papillae anales varying from normal shape to elongate, heavily sclerotized and curved.

EARLY STAGES: Unknown.

FOOD PLANTS: Unknown.

TYPE SPECIES: *Tephrosia muraena* Druce, 1892; by original designation.

DISTRIBUTION: Southern Arizona, southern Mexico (Veracruz, Mexico, Distrito Federal, Guerrero, Oaxaca, and Chiapas), and Guatemala.

TIME OF FLIGHT: March, June through January.

REMARKS: When I described the genus and its included species, I placed *aequilibera* Prout in *Anavinemina*, but remarked that "the male genitalia are very different" from the other species of the genus. Prout described his species from Jaragua do Sul, Santa Catarina, Brazil. Based on my brief remarks and illustrations of the holotype and its genitalia (Rindge, 1964b: 23, figs. 13, 14), it is necessary to remove this species from *Anavinemina*. Until additional specimens of this moth come to hand and are studied, it will have to be placed as a species of uncertain status.

In recent years considerably more material has come to hand in *Anavinemina*, and this has enabled me to expand my studies within the genus. Several species have not been collected since my 1964 paper, while other specimens represent both previously described and undescribed species. The last, described below, plus the removal of *aequilibera*, make my previous keys inadequate; new keys to the genitalia of both sexes have been made. Due to the close similarity in color, maculation, and size of the included species, no key has been provided based on external characters; as dissections are strongly recommended for determinations, genitalic characters have to be used to separate the species in the keys.

KEY TO SPECIES

BASED ON MALE GENITALIA[1]

1. Uncus elongate, curving and tapering to a slender, single point 2
   Uncus broad, truncate apically, and terminating in two widely separated points 8
2(1). Each sacculus with an elongate, slender arm attached basally; vesica unarmed 3
   Each sacculus without arm; vesica with spines or sclerotized strip 4
3(2). Sacculus arm arising near anterior base of valve (fig. 46) ..... *brachiata*
   Sacculus arm arising near middle of valve (fig. 47) ..... *indistincta*
4(2). All cristae short, inconspicuous ..... *promuraena*

[1] The males of *molybra*, *rindgei*, and *striola* are not included.

One to three cristae on each side very long (0.6–1.0 mm) 5

5(4). Harpe with large semicircular projection distally, having numerous spines along outer edge directed anteriorly 6
Harpe with small, raised projection distally, having a few inwardly pointing spines 7

6(5). Large semicircular projection located near middle of valve, and having spinose area next to outer edge of valve (fig. 51) .. .. *orphne*
Large semicircular projection located near end of valve, and having spinose area next to apex of valve (fig. 53) .. *evexa*

7(5). Vesica with from four to six thick spines in one group (fig. 57) ..... *muraena*
Vesica with single longitudinal spinose patch ..... *axica*

8(1). Harpe with small globose projection distally 9
Harpe with larger flattened projection distally 10

9(8). Cristae with one very long, S-shaped seta extending posteriorly to about middle of uncus on each side ..... *axicata*
Cristae with one seta longer than others, weakly curved, not extending beyond end of anellus (fig. 55) ..... *acomos*

10(8). Vesica with slender, longitudinal sclerotized strip (fig. 49) ..... *wellingi*
Vesica without sclerotized strip 11

11(10). Harpe with sides of process straight; one or two cristae on each side elongate (0.8 mm) (fig. 48) ..... *semicircula*
Harpe with sides of process C-shaped; one or two cristae on each side shorter (0.6 mm) (fig. 52) ..... *lunaris*

Based on Female Genitalia[2]

1. Ovipositor lobes membranous, straight, and short (0.6–0.8 mm); apophyses thin and long, with apophyses posteriores 1.9–2.5 mm, apophyses anteriores 0.7–1.2 mm 2
Ovipositor lobes heavily sclerotized, curved, and long (0.9–1.1 mm) (fig. 76); apophyses thick and short, with apophyses posteriores 1.5–1.7 mm, apophyses anteriores 0.7 mm 8

2(1). Ductus seminalis arising posteriorly on left side of corpus bursae ..... *muraena*
Ductus seminalis arising ventrally or on right side of corpus bursae 3

3(2). Corpus bursae with anterior portion swollen, somewhat footlike in outline 4
Corpus bursae with anterior portion not swollen 5

4(3). Corpus bursae with posterior 15 to 20 percent heavily sclerotized ..... *axicata*
Corpus bursae with posterior end not sclerotized (fig. 81) ..... *molybra*

5(3). Ductus bursae joining corpus bursae dorsally on left side ..... *promureana*
Ductus bursae joining corpus bursae posteriorly 6

6(5). Corpus bursae straight 7
Corpus bursae with anterior one-half curved ..... *acomos*

7(6). Ostium bursae posteriad of ductus bursae extended ventrally; corpus bursae with minimum width of 0.5 mm (fig. 80) ... . *orphne*
Ostium bursae posteriad of ductus bursae extended dorsally; corpus bursae with minimum width of 0.6 mm (fig. 79) ... . *striola*

8(1). Ovipositor lobes 0.9 mm to 1.0 mm long 9
Ovipositor lobes 1.1 mm long (fig. 78) ... . *wellingi*

9(8). Ductus seminalis arising from rounded shoulder of corpus bursae (fig. 74) .... *indistincta*
Ductus seminalis arising from swelling anteriad of rounded shoulder of corpus bursae (fig. 77) ..... *brachiata*

Based largely on the genitalic configurations of related genera, I am arranging the species in a different order than in my 1964 paper. Although I am not certain of the polarities of the characters, I am assuming that males with a saccular arm and with little or no armament in the vesica and females with a straight tubelike corpus bursae represent species with the more plesiomorphic characters. When the species are arranged in this order, the upper surface of the forewings is an almost unicolorous dark brown, without noticeable maculation, and change to grayish brown with some of the cross lines becoming visible, to forewings that have white and yellow scaling and tend to have relatively prominent maculation. These last species have male genitalia with a raised, rounded process of the harpe and either spines or a spinose process in the vesica, and the females possess

[2] The females of *axica*, *evexa*, *lunaris*, *rindgei*, and *semicircula* are not included.

a footlike anterior portion of the corpus bursae.

Anavinemina brachiata, new species
Figures 46, 59, 76, 77

DIAGNOSIS: The upper surface of the forewings is dark brown with indistinct maculation, consisting primarily of a pale, incomplete s. t. line. The male genitalia have a very long saccular arm attached near the anterior end of each valve. The female genitalia have the corpus bursae in the form of an elongate, straight tube, with the ductus seminalis arising from a swelling anteriad of the rounded shoulder on the right side of the posterior end of the corpus bursae; the apophyses are thick, and the papillae anales are sclerotized.

DESCRIPTION: *Adults*: Head with longest antennal pectinations of males 0.6 mm, being 3.2 times as long as their basal segments, and with terminal 6 segments simple. Palpi rising to 33 percent height of eyes, and extending between 33 (males) and 40 percent (females) length of eyes in front of eyes.

Hind legs of males with hair pencil, and male abdomen with ventral row of setae on A3.

Forewings with upper surface dark brown, becoming reddish brown along veins in outer portion of wing; maculation obsolescent, with t. a. and t. p. lines only weakly indicated at best; s. t. line whitish, represented below costa, broadly interrupted by veins; discal spot black, angular, not prominent. Hind wings with upper surface brownish gray, either without maculation or with obsolescent discal spot and partial extradiscal line. Under surface of forewings dark gray or brownish gray, of hind wings pale gray, evenly covered with brownish gray scaling; maculation obsolescent or absent on all wings.

Length of Forewings: Holotype, 17 mm; paratypes, 16 to 17 mm.

Male Genitalia (fig. 46): Uncus elongate, sides concave, apically curved ventrally, terminating in very short, curved, transverse ridge. Gnathos with elongate median portion broadly wedge-shaped. Valves with small costal swelling; ampulla prominent, extending slightly beyond apex of valve; sacculus with very long arm attached near anterior end of valve, with remainder free, of equal width, extending about 80 percent length of valve, with terminal third of arm having median, thickly setose area; harpe extended across face of valve, fusing with curved portion of sacculus, and having raised, apically serrate, erect flange in center of valve. Cristae not prominent, 2 or 3 in number, about 0.1 mm long. Anellus constricted anteriomedially, broadly Y-shaped posteriorly. Aedeagus 1.6 mm long, 0.25 wide; posterior end pointed, lightly sclerotized; vesica unarmed.

Female Genitalia (figs. 76, 77): Sterigma with lamella postvaginalis membranous to weakly sclerotized, rugose laterally. Ductus bursae membranous, tapered, widened anteriorly. Corpus bursae an elongate, straight tube; posterior end curved and with small area of weakly stipplelike sclerotization near junction with ductus bursae; medially with faint traces of longitudinal striations; anterior end rounded, with rows of minute denticulations. Ductus seminalis arising from swelling anteriad of rounded shoulder on right side of corpus bursae. Segment 8 with dense clump of elongate scales ventromedially. Apophyses thick; apophyses posteriores 1.5 mm long; apophyses anteriores 0.7 mm. Papillae anales sclerotized, curved, 1.0 mm long.

TYPES: Holotype, male, Zapotitlán, 2650 m, Municipio Río Honda, Oaxaca, Mexico, Nov. 12, 1980 (E. C. Welling) (fig. 59). The genitalia of the holotype are mounted on slide FHR 19,350A, and one antenna and set of legs on slide FHR 19,350B. Paratypes, all from Oaxaca, Mexico, and collected by E. C. Welling: Same data as holotype, 1 male; Río Guajolote, 2000 m, Mpio. Suchixtepec, Nov. 9, 1980, 1 female; La Soledad, 1400 m, Mpio. Candelaria Loxicha, Nov. 10, 1980, 1 female.

All the type specimens have been deposited in the collection of the AMNH.

DISTRIBUTION: The mountains of Oaxaca, at elevations of from 1400 to 2650 m.

TIME OF FLIGHT: November.

REMARKS: Four specimens (2 males, 2 females), four genitalic dissections, and four slide mounts of antennae and legs have been studied.

All the specimens show varying amounts of wear on the upper surface of the forewings; the holotype and one female paratype (FHR genitalic slide 19,311) are in the best condition. The latter specimen has slightly more

contrasting brown and reddish brown coloration, and the t. p. line is more distinct than are these characters on the holotype.

ETYMOLOGY: The specific name is from the Latin *brachiatus*, meaning with arms, in reference to the very long arms of the sacculus.

Anavinemina indistincta (Warren)
Figures 6, 47, 60, 74

Pherotesia indistincta Warren, 1906: 514.
Anavinemina indistincta: Rindge, 1964b: 19, figs. 8, 12 (male, female genitalia).

The color and maculation of the wings (fig. 60) are very similar to those of the preceding species, although the upper surface of the hind wings is paler gray. The forewings range from 16 to 19 mm in length. The male antennae have their longest pectinations 0.5 to 0.6 mm, being from 2.5 to 3.6 times as long as their basal segments, and the terminal 5 segments are simple. The palpi are similar to those of *brachiata* but may rise to 50 percent of the height of the eye in the females.

The genitalia of the present species are similar to those of *brachiata*. In the males (fig. 47) the costa either lacks or has a very slight swelling, the ampulla is shorter as it is about the same length as the valve, and each sacculus has its arm arising at two-fifths the length of the valve. In the females (fig. 74) the primary difference is in the origin of the ductus seminalis; in the present species it arises from the rounded shoulder on the right side of the posterior end of the corpus bursae.

The type locality of *indistincta* is Orizaba, Veracruz, Mexico; no recently caught specimens have been seen from Mexico. The species has been taken in Guatemala; in 1964 I reported it from Quezaltenango, and recent collecting has produced specimens from the adjacent departments of Solala, Chimaltenango, and Sacatepéquez. The recent specimens were caught by E. C. Welling at elevations of between 1750 and 2350 m during the months of June, September, October, and November; the reported dates from my 1964 paper included January, March, and November.

Originally I had six specimens (including the holotype, USNM 9370) and five genitalic preparations; none of these has been restudied. There are 15 moths (3 males, 12 females), 7 genitalic dissections (2 males, 5 females), and 5 preparations of antennae and legs (2 males, 3 females) before me now.

Anavinemina wellingi, new species
Figures 49, 50, 61, 78

DIAGNOSIS: The upper surface of the forewings is dark grayish brown with reddish brown scaling and indistinct maculation; the males have very long antennal pectinations. The male genitalia have a simple sacculus, and the anterior portion of the harpe has a prominent, subtriangular, apically setose projection. The female genitalia have the corpus bursae in the form of an elongate, slightly curved tube; the apophyses are thick, and the papillae anales are sclerotized.

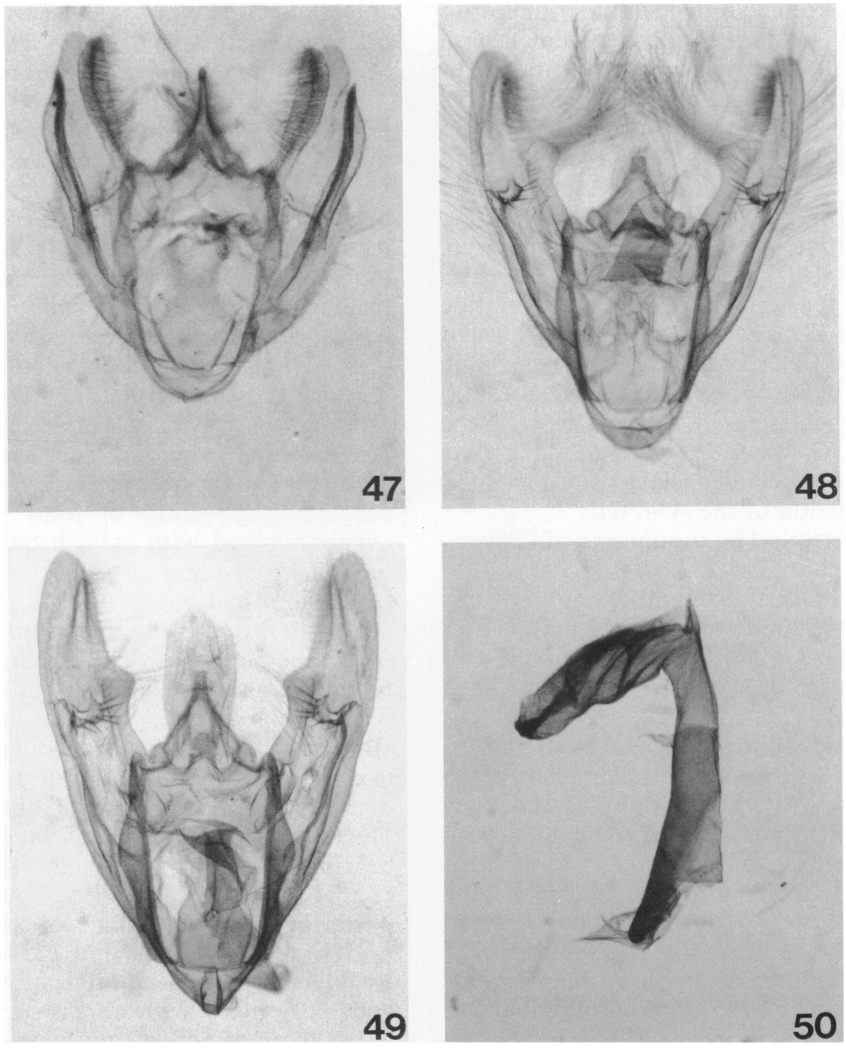
DESCRIPTION: *Adults*: Head with longest antennal pectinations of males 1.05 to 1.10 mm, being 6 times as long as their basal segments. Palpi rising to 20 percent height of eyes, and extending between 50 to 60 (males) and 80 percent (females) length of eyes in front of eyes.

Hind legs of males with hair pencil, and male abdomen with ventral row of setae on A3.

Forewings with upper surface dark grayish brown to olivaceous brown, with some reddish brown scaling, and with indistinct maculation; with traces of dark single t. a. line, double t. p. line, and obsolescent grayish white s. t. line; discal dot slightly elongate, with pale area between it and t. p. line. Hind wings with upper surface gray, becoming darker distally; discal spot dark gray; extra discal and s. t. lines either absent or partially present in lower part of wing. Under surface of forewings dark gray to gray, with apical area blackish gray except for small white area at apex, and with maculation absent or obsolescent; hind wings gray, evenly covered with dark gray scales, becoming slightly darker distally, and with prominent dark gray discal spot.

Length of Forewings: Holotype and paratypes, 18 mm.

Male Genitalia (figs. 49, 50): Uncus with sides of anterior portion tapering, posteriorly parallel, apex truncate, weakly bilobed. Gnathos with median portion broadly wedge shaped. Valves with prominent setose costal swelling; ampulla slender, in center of valve;



Figs. 47–50. Male genitalia of *Anavinemina*. **47**. *A. indistincta* (Warren); Santa María Caucej, Guatemala. **48**. *A. semicircula*, new species, holotype. 49, 50. *A. wellingi*, new species, holotype. **49**. Genitalia. **50**. Aedeagus (not to same scale).

sacculus sclerotized, slightly swollen distally; harpe broad, with anterior portion having prominently raised, angled, subtriangular projection with a few spines apically and along anterior margin. Cristae of two very long (0.8 mm) slender setae and about six very short (0.1 mm) setae on each side. Anellus very weakly sclerotized. Aedeagus 1.5 mm long, 0.3 mm wide; ventral surface weakly sclerotized, apex bluntly pointed; vesica, when exserted, angled back at about 120° to aedeagus, posterior portion with slender strip, spinose medially, 0.5 mm long, apically rounded, directed towards apex of aedeagus.

Female Genitalia (fig. 78): Sterigma membranous. Ductus bursae membranous, tapered, widened anteriorly. Corpus bursae an elongate tube, curved posteriorly and weakly swollen anteriorly; posterior end with small, weakly sclerotized area at junction with ductus bursae, and with a few short longitudinal striations; medially with faint traces of longitudinal striations; anterior end rounded, with minute denticulations. Ductus semin-

alis arising from rounded shoulder of corpus bursae near posterior end. Segment 8 with dense clump of elongate scales ventromedially. Apophyses thick; apophyses posteriores 1.6 mm long; apophyses anteriores 0.7 mm. Papillae anales sclerotized, curved, 1.1 mm long.

TYPES: Holotype, male, Paradera de Mika, 2000 m, Municipio Yolox, Oaxaca, Mexico, Nov. 5, 1980 (E. C. Welling) (fig. 61). The genitalia of the holotype are mounted on slide FHR 19,863A, and one antenna and set of legs on slide FHR 19,863B. Paratypes: Same data as holotype, 1 male; Río Guajolote, 2000 m, Mpio. Suchixtepec, Oaxaca, Mexico, Nov. 9, 1980 (E. C. Welling), 1 female.

All the type specimens have been deposited in the collection of the AMNH.

DISTRIBUTION: The mountains of Oaxaca, at 2000 m.

TIME OF FLIGHT: November.

REMARKS: Three specimens (2 males, 1 female), three genitalic dissections, and two slide mounts of male antenna and legs have been studied.

This species shares with *brachiata* and *indistincta* the synapomorphic characters of the female of the very thick apophyses, the sclerotized papillae anales, and segment 8 with the dense clump of elongate scales ventromedially. It differs from the two preceding species by having a simple sacculus instead of having the elongate free saccular arm.

ETYMOLOGY: I take pleasure in naming this species in honor of Eduardo C. Welling M., who has done so much collecting in Mexico and Guatemala.

Anavinemina striola, new species
Figures 62, 79

DIAGNOSIS: The upper surface of the forewings is dark brown except for the grayish white median area, which has a large, angulate discal dash. The female genitalia have the lateral portions of the lamella postvaginalis with a stipplelike sclerotization and a recessed area posteriad of the ductus bursae; the apophyses are slender, and the papillae anales are membranous. (The males have not been examined.)

DESCRIPTION: *Adults*: Head with palpi rising to one-half height of eyes, and extending 60 percent length of eyes in front of eyes.

Forewings with upper surface dark brown, except for grayish white median area; latter variably suffused with brown or reddish brown scaling basad and posteriad of large, black angular discal dash; s. t. line grayish white, obsolescent, with dark scaling along inner margin, and broader, more diffuse blackish brown scaling distally. Hind wings with upper surface gray, having grayish brown scaling overall; without maculation except for blackish brown terminal line. Under surface of forewings gray, with pattern of upper surface indicated, and with dark brown, diffuse area near apex, latter with large grayish white subrectangular spot; of hind wings gray, evenly covered with grayish brown scaling, having obsolescent discal dot and grayish brown terminal line.

Length of Forewing: Holotype, 18 mm.

Female Genitalia (fig. 79): Sterigma with membranous lamella antevaginalis; lamella postvaginalis broadly covered laterally with stipplelike sclerotization, median area membranous, rugose laterally and posteriorly of depressed area posteriad of ductus bursae. Ductus bursae membranous, lateral areas appearing thickened, rectangular, slightly longer than wide, joining corpus bursae dorsoposteriorly. Corpus bursae an elongate tube, posterior end swollen and curved to right, weakly tapering to bluntly pointed anterior end; posteriorly with dorsal surface having stipplelike area near ductus bursae, with some longitudinal striations on both ventral and dorsal surfaces; medially with closely set longitudinal striations dorsally and on right side; anterior end with area of faint transverse banding 0.6 mm wide, more prominent on dorsal than on ventral surface, changing to longitudinal striations on terminal 0.7 mm. Ductus seminalis arising on right side from curved end of corpus bursae. Segment 8 with moderately long but not dense scaling ventromedially. Apophyses slender; apophyses posteriores 2.5 mm long; apophyses anteriores 1.0 mm. Papillae anales membranous, 0.7 mm long.

TYPE: Holotype, female, Liquidambar,

Chiapas, Mexico, July 1940 (C. C. Hoffmann) (fig. 62). The genitalia of the holotype are mounted on slide FHR 19,806.

The holotype is in the collection of the AMNH.

DISTRIBUTION: Known only from the type locality.

TIME OF FLIGHT: July.

REMARKS: One specimen and one genitalic dissection have been studied.

Beginning with this species, all the remaining ones in the genus have slender apophyses, longer than in the preceding three taxa with thick apophyses, and membranous papillae anales, shorter than the sclerotized ones described above.

ETYMOLOGY: The specific name is the Latin *striola*, the diminutive of *stria*, meaning furrow or line, in relation to the striations on the corpus bursae.

Anavinemina semicircula, new species

Figures 48, 63

DIAGNOSIS: The upper surface of the forewings is dark gray with grayish white scaling, and small discal dots and the t. p. lines are indicated; the males have very long antennal pectinations. The male genitalia have a simple sacculus, and the anterior portion of the harpe has a prominent, raised, semicircular, distally setose projection. (The females have not been examined.)

DESCRIPTION: *Adults*: Head with longest antennal pectinations of males 1.0 mm, being 5.5 times as long as their basal segments, and with terminal 7 or 8 segments simple. Palpi rising only to lower margin of eyes, and extending between 25 to 30 percent length of eyes in front of eyes.

Hind legs of males with hair pencil, and male abdomen with ventral row of setae on A3.

Forewings with upper surface dark gray, with small grayish white area distad of each black discal dot, and larger, elongate area of similar color below veins Cu-Cu_2, plus some reddish brown scales between pale area and these veins; s. t. line grayish white, obsolescent. Hind wings with upper surface gray; without maculation except for gray discal spot and small intravenular terminal dots. Under surface of forewings dark gray, with pale areas of upper surface weakly indicated; discal dot and lower portion of t. p. line reflected from above; hind wings gray, evenly covered with dark gray scales, and with prominent dark gray discal spot.

Length of Forewings: Holotype, 18 mm.

Male Genitalia (fig. 48): Uncus with sides of anterior portion weakly S-shaped, posteriorly parallel, then tapered to bilobed apex. Gnathos with median portion V-shaped. Valves with prominent costal swelling having very many elongate setae; ampulla slender, in center of valve, thickly setose; sacculus sclerotized, distal two-thirds expanded toward middle of valve; harpe broad, with anterior portion having prominently raised semicircular projection, slightly concave basally, distally setose. Cristae of either one (right side) or two (left side), very long (0.8 mm) slender setae and with about six very short (0.1 mm) setae on each side. Anellus weakly sclerotized, constricted medioanteriorly, distal margin concave with striated margins. Aedeagus 1.6 mm long, 0.3 mm wide, with slight dorsoventral curve; ventral surface weakly sclerotized, apex bluntly pointed; vesica unarmed, partially very minutely spined.

TYPE: Holotype, male, Zapotitlán, 2650 m, Municipio Río Hondo, Oaxaca, Mexico, Nov. 12, 1980 (E. C. Welling) (fig. 63). The genitalia of the holotype are mounted on slide FHR 19,346A, and an antenna and set of legs on slide FHR 19,346B.

The holotype has been deposited in the collection of the AMNH.

DISTRIBUTION: Known only from the type locality in the mountains of Oaxaca, at 2650 m.

TIME OF FLIGHT: November.

REMARKS: One specimen, one genitalic dissection, and one slide mount of male antenna and legs have been studied.

More material is needed to tell if the asymmetrical number of long cristae is characteristic of the species or is but an example of individual variation. In all my other dissections in this genus where long setae are present, the number is the same on both sides.

ETYMOLOGY: The specific name is from the Latin *semicirculus*, meaning semicircle, in reference to the shape of the process of the harpe.

Anavinemina orphna Rindge
Figures 51, 64, 80

Anavinemina orphna Rindge, 1964b: 17, fig. 7 (male genitalia).

The color and maculation of the wings (fig. 64) are similar to those of the preceding species, although the upper surface of the forewings has a browner cast, the median area is slightly more distinct, and the discal dash is more elongate; the hind wings lack the prominent discal spot of *semicircula* on both the upper and lower surfaces. The forewings range from 15 to 20 mm in length. The male antennae have their longest pectinations 0.7 mm, being 4.2 times as long as their basal segments. (In the original description, I stated that the length of the pectinations was about 1.1 mm; that measurement was made on the holotype with the antennae in place, whereas the present lengths are taken from slide mounts and are more accurate.) The palpi rise to 33 percent of the height of the eyes, and extend between 33 (males) and 40 percent (females) of the length of the eyes in front of the eyes.

The male genitalia (fig. 51) are unique in having the inner margin of the sacculus with a basal and distal outward curvature, and by the very large, flat process of the harpe, its outer margin evenly rounded and with its outer half thickly covered with posteriorly directed curved spines. In the female genitalia (fig. 80) both the lamellae are rugose and with a minute stipplelike sclerotization, and the area posteriad of the ductus bursae is raised. The ductus bursae is rectangular, slightly wider than long. The corpus bursae has a curved posterior end, with a few longitudinal striations, and the remainder is straight, terminating in a striate, bluntly pointed end. The ductus seminalis arises from the end of the corpus bursae to the right of the ductus bursae. The apophyses are slender; the apophyses posteriores are 2.2 to 2.5 mm long, and the apophyses anteriores are from 0.9 to 1.2 mm in length.

I described *orphna* from a single male, taken at Popocatepetl Park, 8000 ft, México, Mexico, in June; the type is in the USNM and has not been restudied. The above descriptive notes are based on two males and two females from Montebello Lakes, Chiapas, Mexico, Dec. 9–10, 1972 (R. Wind), three genitalic slides (1 male, 2 females), and two male and one female slide mounts of antennae and legs. The upper surface of all the specimens is rather worn, so precise details of the maculation cannot be stated. The male genitalia of the Chiapas specimens agree very well with my original description and illustration; the female structures are described for the first time.

Anavinemina rindgei (Beutelspacher), new combination

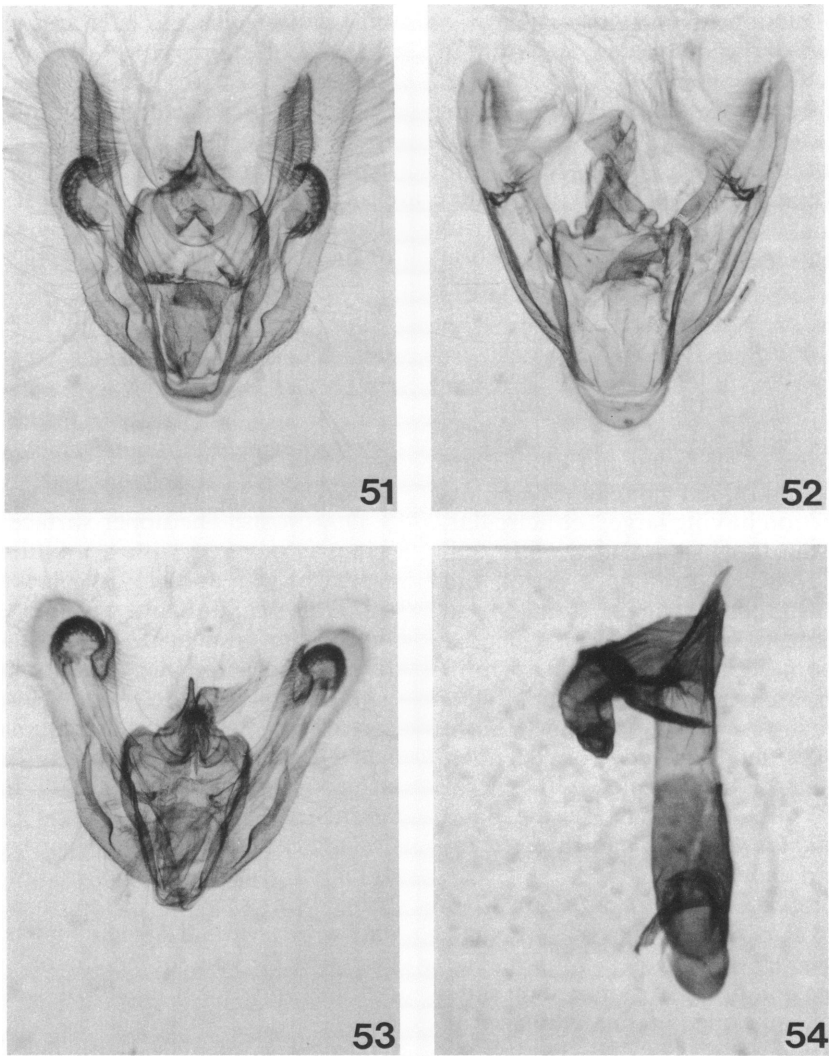
Pherotesia rindgei Beutelspacher, "1980" [1981]: 415, figs. 35 (adult), 36 (male genitalia).

This species is tentatively placed here; my identification is based on the rather dark photograph of the holotype and the rough sketch of the male genitalia given with the original description. The photograph of the male indicates a possible similarity to the following species, with the pale area on the forewings next to the discal spot. The genitalic drawing could place *rindgei* near *orphne*; it is possible that these structures might key out to couplet 6 in the key to the male genitalia given above. Unfortunately, no clear details of the uncus, gnathos, or the aedeagus with an exserted vesica are provided with the original description. Until additional material is in hand, this species will have to remain somewhat of an enigma.

The holotype, the only known specimen, was taken at Las Minas, Veracruz, Mexico, Sept. 23, 1972 (C. Beutelspacher), and has been deposited in the entomological collection of the Institute of Biology, UNAM.

Anavinemina evexa, new species
Figures 53, 54, 65

DIAGNOSIS: The upper surface of the forewings varies from reddish brown to dark brown, often with a pale area next to the discal spot, and the median area and cross lines are weakly defined. The male genitalia have the costa broadly swollen and setose distally,



Figs. 51–54. Male genitalia of *Anavinemina*. **51**. *A. orphna* Rindge; Chiapas, Mexico. **52**. *A. lunaris*, new species, holotype. 53, 54. *A. evexa*, new species, holotype. **53**. Genitalia. **54**. Aedeagus (not to same scale).

and the apical region of the valve has a large semicircular spinose projection. (The females have not been examined.)

DESCRIPTION: *Adults*: Head with palpi rising to 50 percent height of eyes, and extending 50 percent length of eyes in front of eyes. Male antennae with longest pectinations 1.0 mm.

Forewings with upper surface dark reddish brown to dark brown, with t. a. and t. p. lines black, weakly defined, or absent; median area either concolorous with remainder of wing or slightly paler; discal spot small, often with pale brown area between it and t. p. line outwardly curved in middle of wing, and with basal bend above inner margin; s. t. line obsolescent; terminal area with relatively small and faint rounded area near middle of outer edge of wing. Hind wings gray, slightly darkened distally; with or without small discal spot; extradiscal and s. t. lines obsolescent or absent. Under surface of forewings gray, with pale brownish scaling distad of discal dot, at apex, and middle of outer margin, with ob-

solescent maculation; of hind wings paler gray, with scattered dark gray scales, and minute discal dot.

Length of Forewings: Holotype, 19 mm; paratypes, 17 to 19 mm.

Male Genitalia (figs. 53, 54): Uncus with sides concave, terminal portion with parallel sides, apex angled ventrally and tapered to slender point. Gnathos with median portion broad, bluntly pointed. Valves without costal swelling, but with distal portion widened, prominently swollen ventrally and thickly covered with setae; ampulla absent; sacculus sclerotized, broad, with enlargement near base, then extending as slender ridge in center of valve, uniting with harpe and continuing distally; apical margin of valve bluntly pointed; apical portion having large, semicircular, sclerotized projection in apical area, with band of spines on posterior and lateral edges, and connected to harpe. Cristae of from one to three very long (0.65 to 1.00 mm) slender setae and about eight very short (0.15 mm) setae on each side. Anellus very weakly sclerotized. Aedeagus 1.7 to 1.8 mm long, 0.3 mm wide; apex pointed, formed from slender, sclerotized, lateral strip; vesica with sclerotized band 0.5 mm long, when exserted, band situated medially on vesica and directed inwardly toward aedeagus.

TYPES: Holotype, male, Zapotitlán, 2650 m, Municipio Río Hondo, Oaxaca, Mexico, Nov. 12, 1980 (E. C. Welling) (fig. 65). The genitalia of the holotype are mounted on slide FHR 19,675A, and one antenna and a set of legs are on slide FHR 19,675B. Paratypes: same data as holotype, 2 males.

The three specimens in the type series have been deposited in the AMNH.

DISTRIBUTION: The mountains of southern Mexico (Oaxaca).

TIME OF FLIGHT: November.

REMARKS: Three specimens, three genitalic dissections, and three slide mounts of antennae and legs have been studied.

The color and maculation of the upper surface of the wings is variable within this species. The three specimens, all caught at the same time and at the same place, vary from having forewings that are almost immaculate grayish black or dark brown (paratype) to a variegated reddish brown and having traces of maculation plus the pale area distad of the discal spot (holotype).

While *rindgei* apparently also has this pale area, it is a larger species, with the length of the forewing stated to be 21 mm. The male genitalia of the Veracruz species has the distal process of the harpe curved anteriorly; in the present species this process is nearer the apex of the valves and is curved posteriorly.

ETYMOLOGY: The specific name is from the Latin *evexus*, meaning rounded at the top, in reference to the shape of the process of the harpe.

Anavinemina lunaris, new species

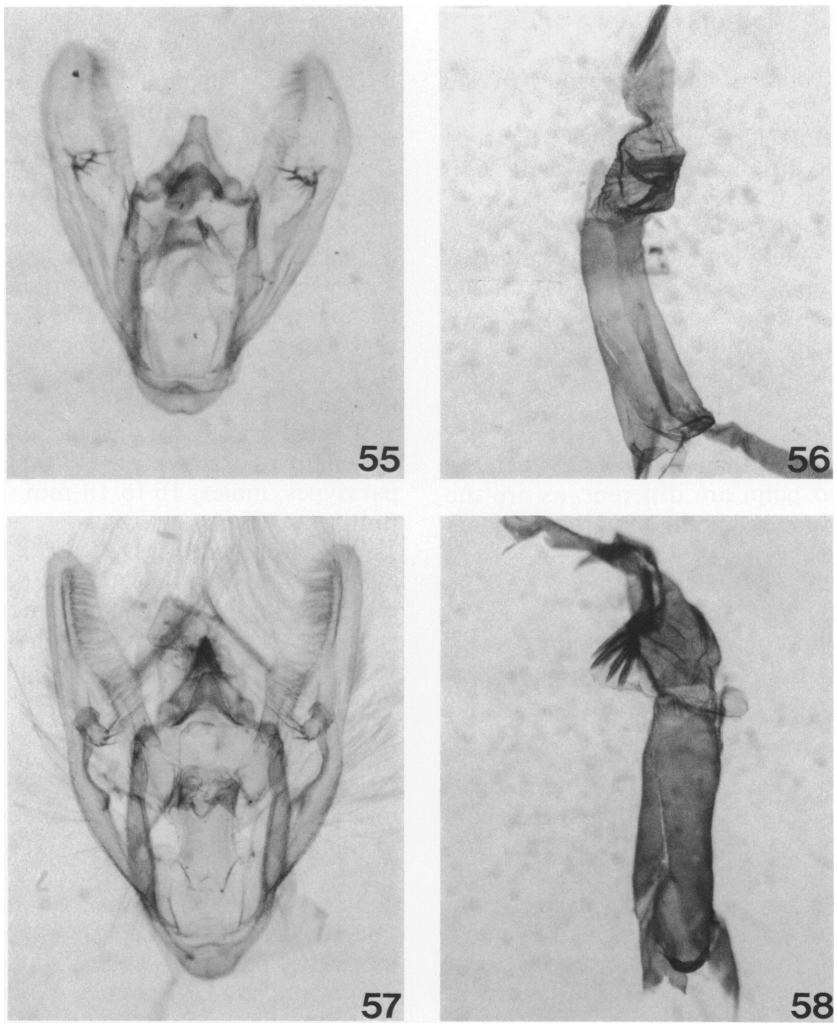
Figures 52, 66

DIAGNOSIS: The upper surface of the forewings is covered with a mixture of grayish white, brown, and grayish black scales, with a small discal dot, and with the t. p. and s. t. lines being indicated; the males have relatively long antennal pectinations and elongate palpi. The male genitalia have a simple sacculus, and the anterior portion of the harpe has a crescent-shaped, raised, distally setose projection. (The females have not been examined.)

DESCRIPTION: *Adults*: Head with longest antennal pectinations of males 0.85 mm, being 4 times as long as their basal segments, and with terminal 6 segments simple. Palpi rising to 10 percent height of eye, and extending 50 percent length of eyes in front of eyes.

Hind legs of males with hair pencil, and male abdomen with ventral row of setae on A3.

Forewings with upper surface covered with grayish white, reddish brown, and grayish black scales, producing a more or less even dark grayish brown appearance with some reddish brown tints; discal dot small, round, black; t. a. line partially represented; t. p. line double, complete, darkened at and below costa; s. t. line of grayish white cellular dots, shaded basally by dark scales in upper part of wing; terminal line of black intravenular dots. Hind wings with upper surface uniformly gray; without maculation except for blackish gray discal dot and black terminal line. Under surface of forewings dark gray, with



Figs. 55-58. Male genitalia and aedeagi (not to same scale) of *Anavinemina*. **55**, **56**. *A. acomos*, new species, holotype. **57**, **58**. *A. muraena* (Druce); Oaxaca, Mexico.

pale gray apex; discal spot and double t. p. line weakly represented; hind wings gray, evenly covered with scattered dark gray scales, and with prominent dark gray discal spot.

Length of Forewings: Holotype, 19 mm.

Male Genitalia (fig. 52): Uncus with sides of anterior portion tapered, posteriorly parallel, apex truncate, very weakly bilobed. Gnathos with median portion V-shaped. Valves with prominent costal swelling having very many elongate setae; ampulla slender, in center of valve, thickly setose; sacculus sclerotized, broad; harpe increasing in width anteriorly, with anterior portion having prominently raised, crescent-shaped, distally setose projection. Cristae of two very long (0.5 mm) slender setae and about eight very short (0.1 mm) setae on each side. Anellus weakly sclerotized, constricted medioanteriorly, distal margin weakly concave. Aedeagus 1.5 mm long, 0.3 mm wide; apex bluntly pointed, weakly sclerotized; vesica unarmed.

TYPE: Holotype, male, Zapotitlán, 2650 m, Municipio Río Hondo, Oaxaca, Mexico, Nov. 12, 1980 (E. C. Welling) (fig. 66). The genitalia of the holotype are mounted on slide

FHR 19,266A, and one antenna and set of legs on slide FHR 19,266B.

The holotype has been deposited in the collection of the AMNH.

DISTRIBUTION: Known only from the type locality in the mountains of Oaxaca, at 2650 m.

TIME OF FLIGHT: November.

REMARKS: One specimen, one genitalic dissection, and one slide mount of male antenna and legs have been studied.

According to the label data, this species and *semicircula* fly together at the same locality, the types of the two species bearing the same dates. The present species has browner forewings than does *semicircula*; the antennae and palpi are different, as are the shapes of the uncus, anellus, and the elements of the valves.

ETYMOLOGY: The specific name is from the Latin *lunaris*, meaning crescent shaped, in relation to the projection of the harpe.

Anavinemina acomos, new species

Figures 55, 56, 67

DIAGNOSIS: This species is recognized by the males lacking both the hind tibial hair pencil and the bristle row on the ventral surface of A3. The female genitalia have the sinus vaginalis lightly sclerotized anteriorly; the lamella postvaginalis has a few transverse ridges posteriorly; and the membranous corpus bursae is curved anteriorly but scarcely swollen. This is the only known species in the genus to occur in the United States.

DESCRIPTION: *Adults*: Head with longest antennal pectinations of males 0.7 mm, being 4 times as long as their basal segments, and with terminal 6 segments simple. Palpi rising to 10 percent height of eye, and extending between 30 (males) and 33 (females) percent length of eyes in front of eyes.

Hind legs of males without hair pencil, and male abdomen without ventral row of setae on A3.

Forewings with upper surface dark gray; t. a. line biconvex; median area either concolorous with remainder of wing or paler than basal and distal areas, females more contrastingly colored than males; discal dot minute; t. p. line broad, dark, partially double, reduced in thickness in middle of wing; s. t. line pale, weakly concave below costa and with or without basal dull black spots, then subparalleling outer margin, partially obsolescent; terminal line formed of prominent black, triangular intravenular spots. Hind wings with upper surface either unicolorous gray, without maculation except for very small discal dot and terminal line (males) or darkened distally and with partial extradiscal line (females). Under surface of forewings gray with very slight brownish or darker gray tint, having small discal dot and faint traces of maculation from upper surface (males), or with maculation more strongly represented (females); hind wings paler than forewings, with small discal dot and terminal line.

Length of Forewings: Holotype, 16 mm; paratypes, males, 16 to 18 mm, females, 15 mm.

Male Genitalia (figs. 55, 56): Uncus with evenly concave sides, apex truncate, weakly bilobed. Gnathos with median portion bluntly wedge shaped. Valves with small costal swelling; ampulla swollen, in center of valve, thickly setose; sacculus sclerotized, broad, one-half width of valve, with median, raised, triangular flange; harpe broad, narrowed anteriorly, anterior end with raised, ovoid, spinose projection. Cristae with one elongate (0.4 mm), very slender seta and with about 5 very short (0.1 mm) setae on each side. Anellus weakly sclerotized, with large anterior portion, posteromedial section slightly swollen medially, posterior end slightly rounded, finely punctate or dentate. Aedeagus 1.5 to 1.7 mm long, 0.35 mm wide, with slight dorsoventral curve; apex weakly sclerotized, bluntly pointed, its surface rugose; vesica, when exserted, extending partially ventrad, then posteriorly, its surface with numerous striations, terminating in dense bundle of setae 0.6 mm long at end of irregular, slender corneous strip.

Female Genitalia: Sinus vaginalis lightly sclerotized anteriorly, curved, with a few longitudinal ridges forming irregular posterior margin. Lamella antevaginalis with short, tunnel-like median section. Lamella postvaginalis lightly sclerotized, wider than long, posterior portion with transverse ridging. Ductus bursae membranous, tapering anteriorly. Corpus bursae an elongate, laterally compressed tube, curved anteriorly, scarcely swollen; posterior end very weakly sclerotized, with a few longitudinal striations; an-

terior end rounded, with faint rugose area on one side. Ductus seminalis arising ventrolaterally on right side from near posterior end of corpus bursae. Apophyses slender; apophyses posteriores 1.4 mm long; apophyses anteriores 1.0 mm in length. Papillae anales membranous, straight.

TYPES: Holotype, male, Flys Peak Canyon, Chiricahua Mts., Cochise Co., Arizona, June 17, 1974 (R. F. Sternitzky) (fig. 67). The genitalia of the holotype are mounted on slide FHR 17,640A, and one antenna and set of legs on slide FHR 17,640B. Paratypes: W Turkey CG [Campground], 5900 ft, Coronado NF [National Forest], Cochise Co., Arizona, Aug. 2, 1988 (C. D. Ferris), 3 males; Cedar Creek Campground, 7000 ft, Ruidoso, Lincoln Co., New Mexico, July 28, 1962 (E. and I. Munroe), at black light, 2 females.

The holotype has been deposited in the collection of the AMNH; paratypes are in the collections of that institution and of the CNC.

DISTRIBUTION: The mountains of southeastern Arizona and of south central New Mexico, at high elevations.

TIME OF FLIGHT: June, July, and early August.

REMARKS: Six specimens (4 males, 2 females), three genitalic dissections (2 males, 1 female), and one slide mount of male antenna and legs have been studied.

This species is the northernmost representative of the genus. The lack of both the tibial hair pencil and the row of setae on the ventral surface of A3 is unique for males in *Anavinemina*. The holotype and the two female paratypes are also distinctive in having the wide, evenly colored, pale gray median area of the upper surface of the forewings. The male paratypes, however, vary in the expression of this character; one has the median area slightly pale, whereas the other two do not have the median area differentiated from the remainder of the forewing.

ETYMOLOGY: The specific name is from the Greek *acomos*, meaning hairless, in reference to the lack of the tibial hair pencil.

Anavinemina axica (Druce)

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

Anavinemina axica: Rindge, 1964b: 12, fig. 5 (male genitalia).

The color and maculation of the wings are similar to most of the preceding species, with the upper surface of the forewings being a dark brown, the median area only slightly paler, and with a prominent whitish buff s. t. line; the hind wings become browner distally, and have a discal spot and an extradiscal line. The length of the forewings is 17 mm. The male antennae have their longest pectinations about 1.2 mm (measured on the holotype, not on a slide mount; my original figure was too long for *orphna* [see above], and it may be for this species also).

The male genitalia have a slender uncus, a simple sacculus, two elongate cristae with one seta longer and thicker than the other; the harpe has a setose knoblike projection and the vesica has a single longitudinal spine patch (see Rindge, 1964b: fig. 5).

Druce described *axica* from a single male taken at "Veracruz," Mexico; the type is in the USNM and has not been restudied. I have not seen any additional material since my original revision of the genus.

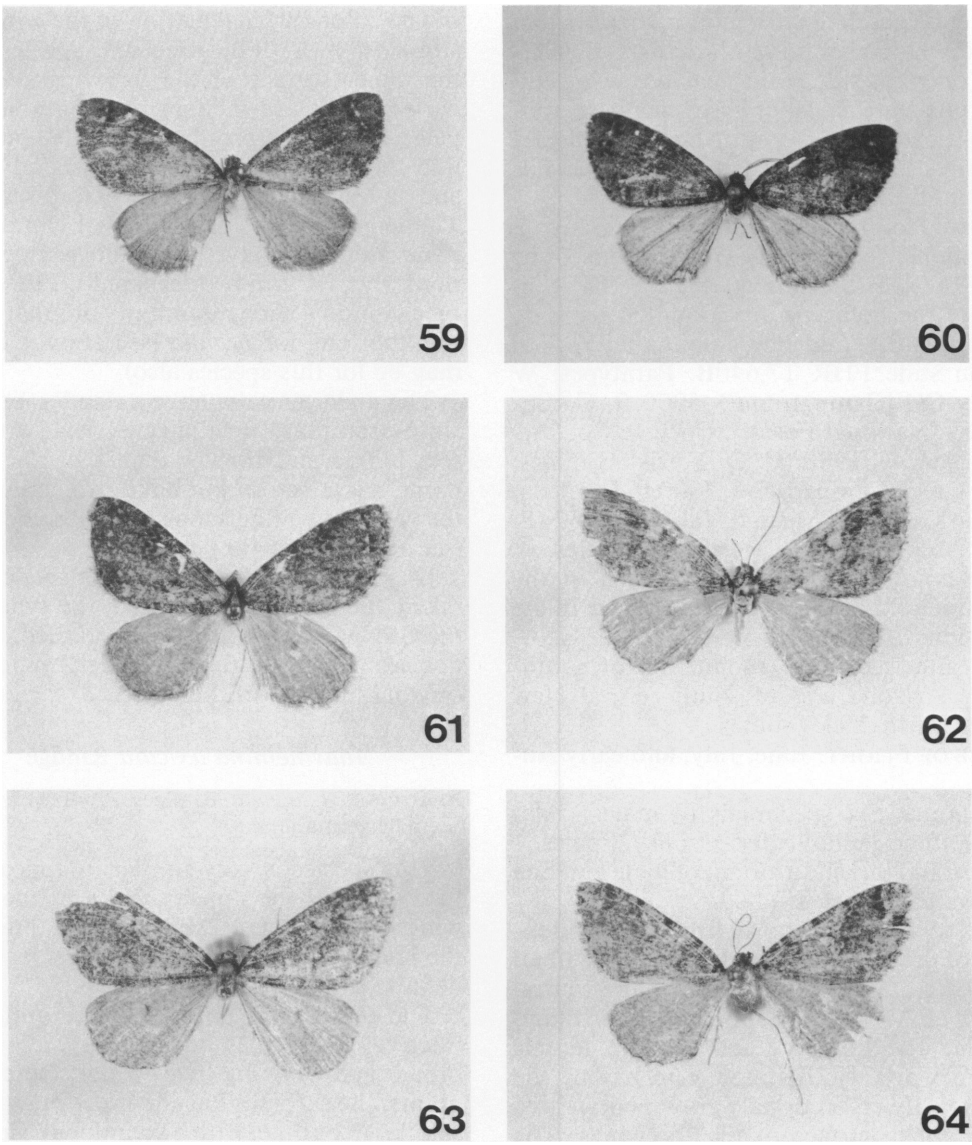
Anavinemina axicata Rindge

Anavinemina axicata Rindge, 1964b: 15, fig. 6 (male genitalia).

This species is very similar in appearance to *axica*, but the upper surface of the forewings tends to have a straighter s. t. line, and the under surface of the hind wings lacks the definite s. t. band of that species.

The genitalia of both sexes are quite distinctive. The males have the uncus with a broad apex having two widely separated points; the sacculus has the inner margin triangular in outline, with a prominent, slender, raised, digitate projection having closely appressed setae; the process of the harpe is large, raised, and lobate, with large, erect setae on the ventral surface; the cristae consist of one or two very long, slender, apically curved and flattened setae, plus several small setae at their base; and the vesica has an elongate, closely appressed, setose row of spines. The abdomen has prominent lateral tufts on A3. The female genitalia have the sterigma with weakly sclerotized, ovate or elliptical lateral areas, and the posterior end of the corpus bursae is heavily sclerotized.

This species was described from six specimens from the Distrito Federal and the State



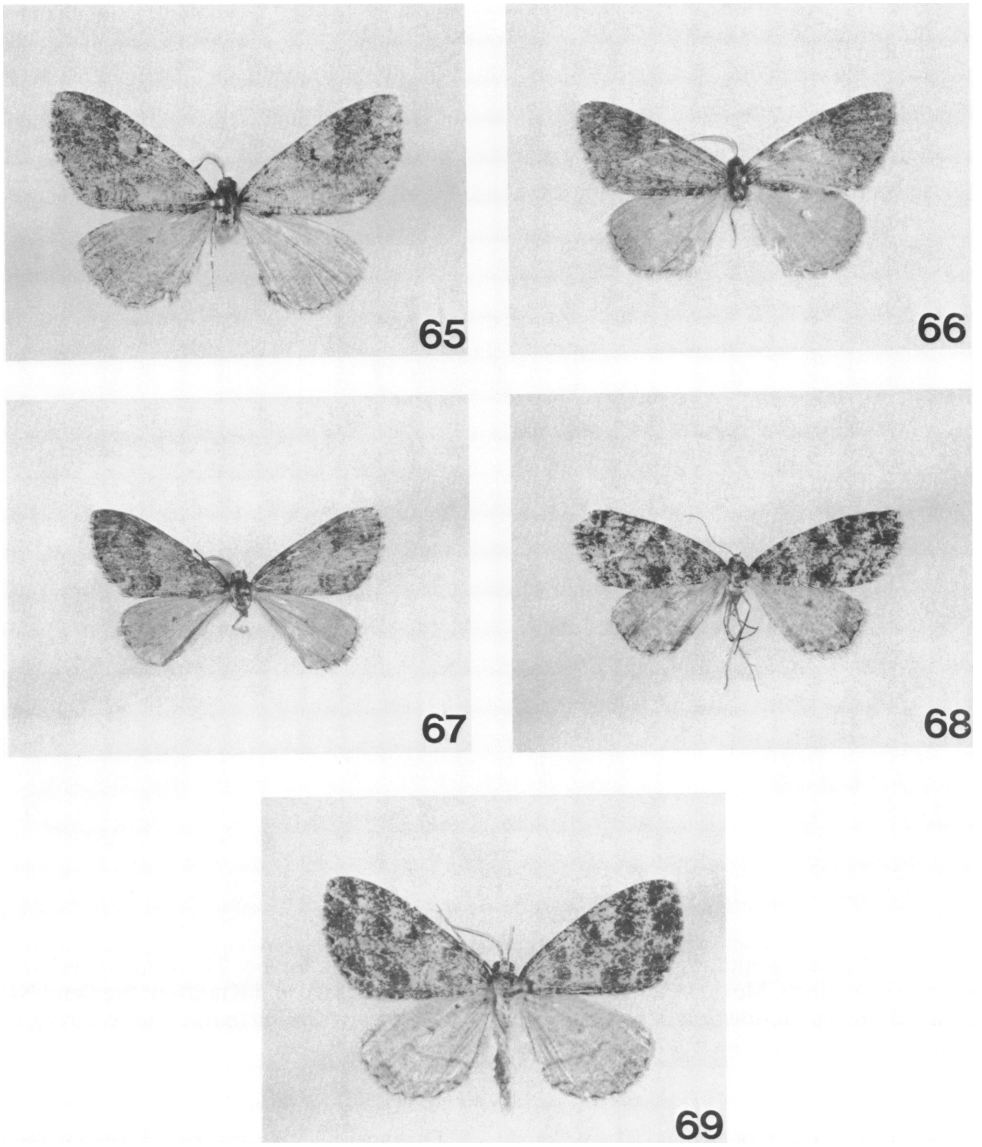
Figs. 59–64. Adults of *Anavinemina*. **59**. *A. brachiata*, new species, holotype, male. **60**. *A. indistincta* (Warren), male; Santa María Caucej, Guatemala. **61**. *A. wellingi*, new species, holotype, male. **62**. *A. striola*, new species, holotype, female. **63**. *A. semicircula*, new species, holotype, male. **64**. *A. orphna* Rindge, female; Chiapas, Mexico. X 1.2.

of México, Mexico, in the months of June, July, and August; the type locality is Mexico City. The type series is in the USNM; it has not been restudied, nor have any more specimens been examined since the description of *axicata*.

Anavinemina molybra Rindge
Figures 68, 81

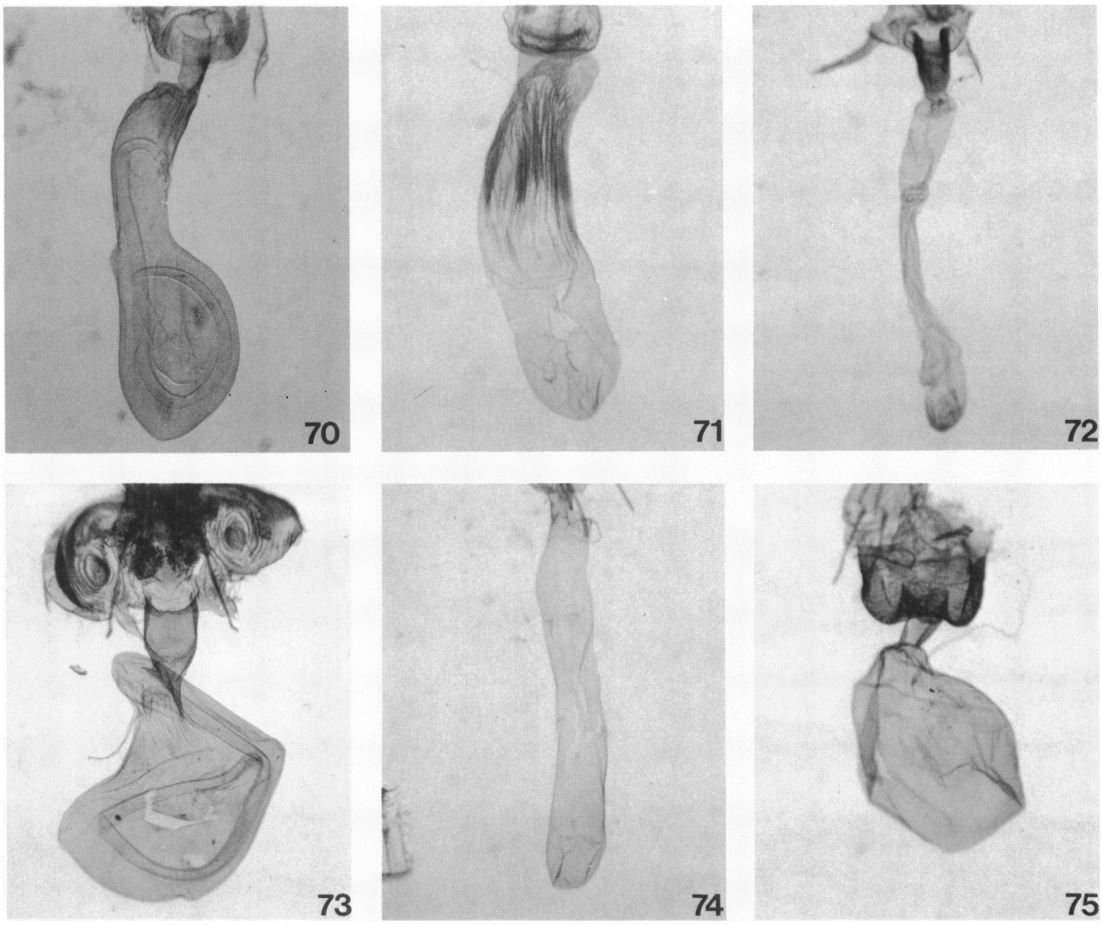
Anavinemina molybra Rindge, 1964b: 11, fig. 10 (female genitalia).

This species can be differentiated from all



Figs. 65–69. Adults of *Anavinemina*. **65**. *A. evexa*, new species, holotype, male. **66**. *A. lunaris*, new species, holotype, male. **67**. *A. acomos*, new species, holotype, male. **68**. *A. molybra* Rindge, holotype, female. **69**. *A. muraena* (Druce), male; Oaxaca, Mexico. X 1.2.

the preceding ones by the variegated color of the upper surface of the forewings. Their ground color is white, with numerous gray and blackish brown scales; dark t. a. and t. p. lines, and a discal dash are present, while the s. t. line is of the ground color with brownish black shadings on both sides. The pale gray hind wings have a prominent discal dot on both surfaces (fig. 68). The forewings are from 17 to 18 mm in length. The male antennae have their longest pectinations about 0.6 mm long, being 3 times as long as their basal segments, and the terminal 4 segments are simple. The palpi rise to 33 percent of the height



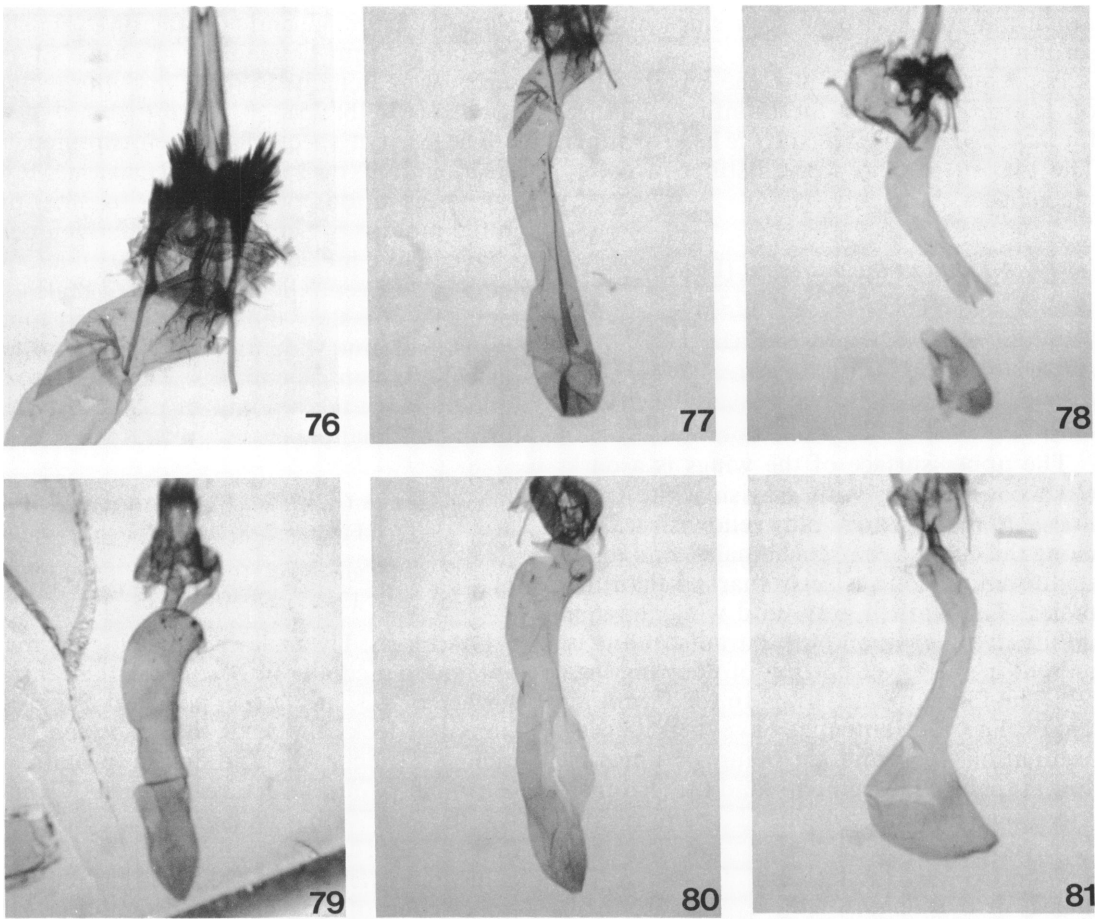
Figs. 70–75. Female genitalia. **70**. *Paraphoides stulta* Rindge, allotype. **71**. *Antiphoides errantaria* (McDunnough); Durango, Mexico. **72**. *Astalotesia bucurvata* Blanchard and Knudson; Big Bend National Park, Texas. **73**. *Arilophia rawlinsi*, new species, paratype. **74**. *Anavinemina indistincta* (Warren); Chuchexik, Guatemala. **75**. *Eufidonia notataria* (Walker); Pennsylvania.

of the eyes, and extend between 50 (males) and 60 percent (females) of the length of the eyes in front of them.

The male genitalia are still unknown. The female structures (fig. 81) have the ductus bursae lightly sclerotized and slightly longer than wide; the corpus bursae has the anterior portion strongly swollen, being somewhat footlike in outline, with a rather nebulous area of minute spines across the top of the "foot"; the ductus seminalis arises ventrally, anteriad of the ductus bursae; the apophyses anteriores are slender and 2.1 mm long, and the apophyses posteriores 0.9 mm.

This species was described from three specimens (an abdomenless male and two females) labeled Cerro Pelon, 2155 m, Municipio Yolox, Oaxaca, Mexico, in September; this material was from the author's collection and is in the AMNH. Since then two additional females have come to hand; both are from Oaxaca, were also collected by E. C. Welling, and are from the author's collection. One is labeled La Cabaña, 2800 m, Mpio. San Juan Atepec, and the other Zapotitlán, 2650 m, Mpio. Río Hondo; both were captured in the first half of November.

There are five specimens (1 male, 4 females



Figs. 76–81. Female genitalia of *Anavinemina*. 76, 77. *A. brachiata*, new species, paratype. **76**. Papillae anales and sterigma. **77**. Corpus bursae (not to same scale). **78**. *A. wellingi*, new species, paratype. **79**. *A. striola*, new species, holotype. **80**. *A. orphna* Rindge; Chiapas, Mexico. **81**. *A. molybra* Rindge; Oaxaca, Mexico.

including the holotype), three genitalic dissections, and one slide mount of a female antenna and set of legs before me now.

Anavinemina promureana Rindge

Anavinemina promuraena Rindge, 1964b: 8, figs. 4, 11 (male, female genitalia).

The color and maculation of the wings are very similar to those of *muraena*; the forewings range in length from 18 to 21 mm.

The male genitalia of the present species have the gnathos with its median portion very broad, its surface shortly spinose; the sacculus is weakly defined; the harpe has an elliptical, raised, spinose area; all the cristae are small and inconspicuous; and the vesica has an elongate, broad spine patch. The female genitalia have an elongate, slender ductus bursae that joins the corpus bursae posterodorsally, and the latter is elongate and has the anterior end weakly sclerotized, striate, swollen, and somewhat footlike.

This species was described from three specimens taken at Popocatepetl Park, 8000–10,000 ft, México, Mexico, in July; the holotype was a paratype of *Melanolophia phyararia* Dyar (now placed in *Segalenara*, described above). The three specimens are in the collection of the USNM, and no addi-

tional material has been seen since my description of this species.

Popocatepetl Park is also the type locality of *A. orphna* Rindge; the month of capture for that species was given on the label as June. The two species are very distinct in color, maculation, and genitalia.

Anavinemina muraena (Druce)
Figures 57, 58, 69, 155

Tephrosia muraena Druce, 1892 (1891–1900): 78 (partim); 1893 (1881–1900): pl. 48, figs. 17, 18.
Anavinemina muraena: Rindge, 1964b: 6, figs. 1, 3, 9 (venation, male and female genitalia).

The upper surface of the wings is a dark olivaceous brown, with grayish white cross lines and median area, plus yellowish scaling along the cubital vein; the females tend to be slightly more contrastingly marked than the males. The whitish gray hind wings have a diffuse discal spot, and the extradiscal line is present in the lower portion of the wing (fig. 69). The forewings are from 16 to 20 mm in length. The male antennae have their longest pectinations 0.6 mm long, being 3.5 times as long as their basal segments, and the terminal 4 to 6 segments are simple. The palpi rise to 33 percent of the height of the eyes, and extend between 67 (males) and 60 percent (females) of the length of the eyes in front of them.

The male genitalia (figs. 57, 58) are basically similar to those of the other species in the genus, but may be recognized by the group of from 4 to 8 thick spines arising from a common base in the vesica. When exserted the vesica extends dorsoposteriorly, with the group of spines fairly near the end of the aedeagus, then narrows and angles off to one side. The female genitalia (fig. 155) have the ductus seminalis arising from the left side of the corpus bursae near the ductus bursae; the latter is longer than wide, swollen medially, and has some folds or thickened areas in the stipplelike sclerotization. The anterior end of the corpus bursae has a swollen, footlike anterior end.

Druce described *muraena* from a number of specimens from Mexico and Guatemala. I designated as lectotype (1964b: 8) the male from Omiltemi, 8000 ft, Guerrero, Mexico; it is the specimen illustrated by Druce on his plate 48, figure 17, and is in the BMNH. The specimens from Guatemala in Druce's type series were renamed *Vinemina muraenata* Rindge (1964b: 25).

The present species has been captured in the mountains of Guerrero and Oaxaca, Mexico, at elevations of from 2000 to 2800 m, in the months of September and November. I have before me 66 specimens (20 males, 46 females), 12 genitalic dissections (7 males, 5 females), one slide mount of fore and hind wings, and nine slide mounts (5 males, 4 females) of antennae and legs. This is approximately twice the amount of material I had for my original paper.

Genus *Galenara* McDunnough
Figures 7, 8, 82–134

Galenara McDunnough, 1920: 14. Rindge, 1964c: 28–51, figs. 17–25, 27–30, 32, 33.

DIAGNOSIS: The male abdomen may or may not have a median row of setae on the ventral surface of A3, has lateral pocketlike depressions but lacks the setal tufts between segments A3 and A4, and has a prominent comblike paired structure between A7 and A8; the gnathos has an elongate tapered median portion; each valve has a sclerotized sacculus that extends as a flat area into the central portion of the valve, and the harpe has a prominent raised setose projection; the manica is membranous; the lamella antevaginalis is not sclerotized, and the lamella postvaginalis is a weakly sclerotized section posteriad of the ductus bursae; the signum is absent, but the anterior portion of the corpus bursae has an area or band of minute spines; and the hind wings have seven, eight, or nine veins.

DESCRIPTION: *Adults*: Head with antennae of about 47 to 64 segments; males with terminal 2 to 7 segments simple; longest pectinations 0.65 to 1.10 mm, being between 3.5 and 6.0 times as long as their basal segments. Palpi rising to between lower edge of eyes and 10 percent height of eyes, extending in males between 33 and 60 percent length of eyes in front of eye, and in females between 25 and 75 percent. Eyes of females usually smaller than those of males, rarely of equal size.

Forelegs with epiphysis of males arising between 45 and 50 percent length of segment

and being from 55 to 65 percent its length, of females arising between 55 and 65 percent length of segment and being 40 to 50 percent its length. Hind legs of males with or without tibial hair pencil.

Forewings with one accessory cell, rarely without it; R_1 free, or rarely stalked with R_2; mdc and ldc variable, being curved, angled, or biconcave; outer margin of wing smoothly rounded. Hind wings with seven, eight, or nine veins; Sc extending 50 to 60 percent length of cell; udc and ldc angled. Upper surface of forewings dark gray with black or grayish brown scaling, t. a. and t. p. lines present, median shade line often most prominent part of maculation; of hind wings grayish white or gray, with obsolescent maculation. Under surface pale gray or grayish brown, often suffused with darker scales, and with obsolescent maculation. Length of forewings, 15 to 24 mm.

Abdomen of males with or without median row of setae on ventral surface of A3, with setae being deciduous in some species, without lateral setal tufts but with lateral pocketlike depressions between A3 and A4, and with prominent comblike paired structure between A7 and A8 consisting of many, very long, slender, modified setae either tapering to point (figs. 7, 8) or with distal end flattened, several times as wide as stem of setae. Scaling of abdomen normal.

Male Genitalia (figs. 98–121): Uncus 0.4 to 0.6 mm long; sides tapered, with apical region parallel-sided; apex with either two or three points. Socius absent. Gnathos well sclerotized, laterally slender, convex at junction with tegumen; medially enlarged, flattened, sides tapered, apically bluntly pointed, and with posteroventral surface rugose. Each valve with sclerotized costa having small setose swelling near distal end; ampulla thickly setose; sacculus smoothly sclerotized, extended inwardly to occupy about half inner surface of valve, extending posteriorly to vicinity of harpe; harpe with large, raised, setose process at anterior end. Cristae numbering from about 2 to 20, of same size, 0.1 to 0.5 mm long. Anellus straplike, weakly sclerotized. Manica membranous. Aedeagus 1.5 to 2.3 mm long, 0.30 to 0.35 mm wide; posterior end lightly sclerotized, bluntly pointed. Vesica with either elongate strip of many short spines or with one large spine having swollen base, the last sometimes with several short spines attached; when exserted, extending at obtuse angle from end of aedeagus or at about right angle.

Female Genitalia (figs. 123–134): Sterigma with lamella antevaginalis membranous; lamella postvaginalis weakly sclerotized, appearing as small areas or rugosities posteriad of ductus bursae. Ductus bursae short, sclerotized, more or less square or rectangular, not always clearly differentiated from corpus bursae. Corpus bursae membranous, elongate, slightly curved, often with enlarged, asymmetrical, somewhat footlike anterior end; posterior end asymmetrical, partly or entirely sclerotized at junction with ductus bursae. Ductus seminalis arising from posterior end of corpus bursae, usually on ventral surface, rarely from right side or dorsally. Signum absent; anterior portion of corpus bursae with partial or complete band of inwardly projecting minute denticulations. Apophyses posteriores 1.65 to 2.80 mm long; apophyses anteriores 0.8 to 1.4 mm.

EARLY STAGES: McGuffin (1967: 12–18, figs. 20–25) described and illustrated the ultimate instar larva and pupa of *Galenara lallata* (Hulst).

FOOD PLANTS: *Pinus* spp. for *lallata* (McGuffin, op. cit.); Douglas fir, true fir, and spruce for *consimilis* Heinrich (Rindge, 1964: 29).

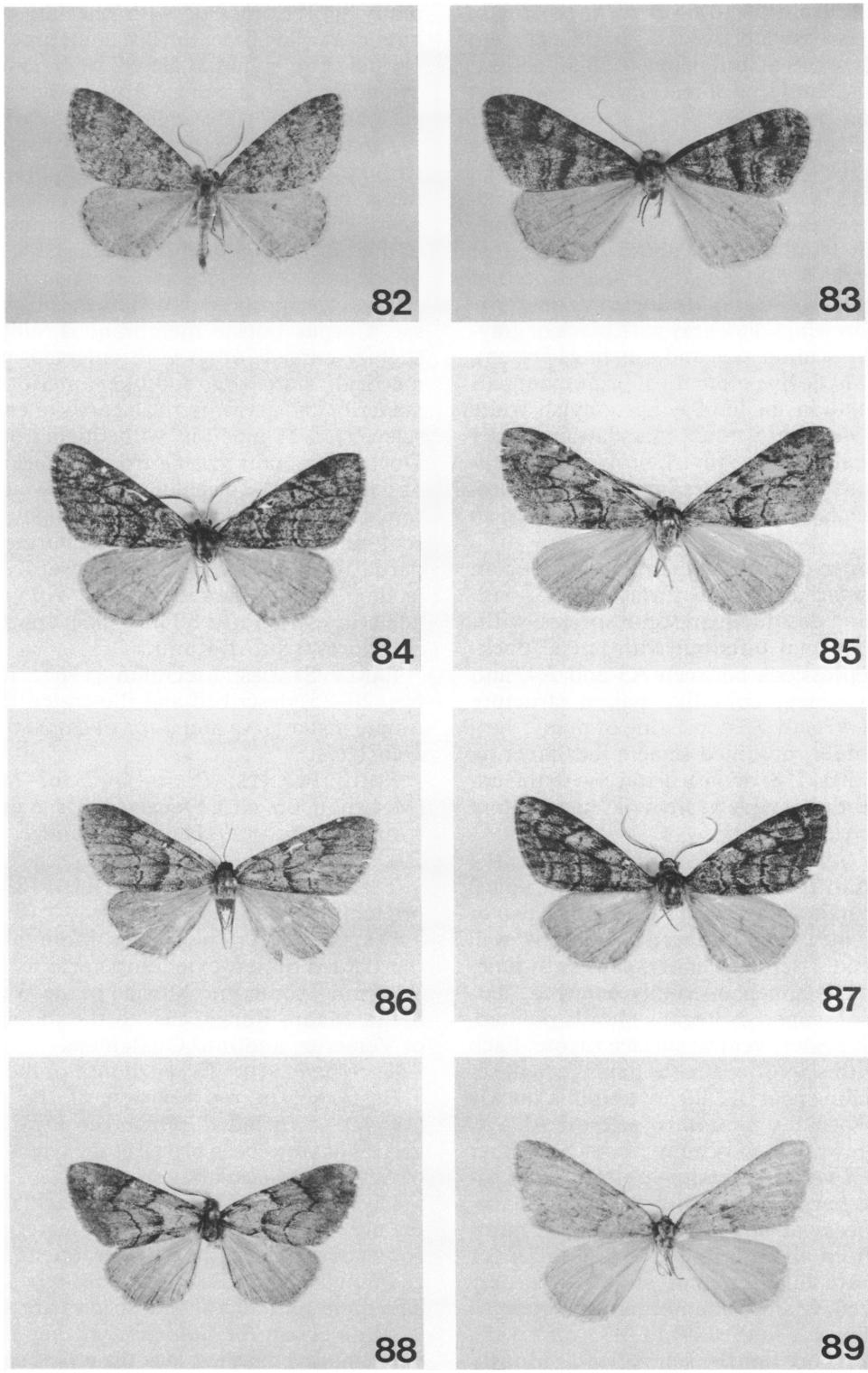
TYPE SPECIES: *Alcis lallata* Hulst, 1898; by original designation.

DISTRIBUTION: The Rocky Mountains of the United States, extending north as far as Wyoming, south into Mexico in the Western Sierra Madre Range, east to the mountains of Veracruz, and into Guatemala.

TIME OF FLIGHT: Every month of the year.

REMARKS: In my revision of the genus (1964c), I included *phyararia* Dyar; this species has now been placed as the type species of *Segalenara* (see above).

I also included *consimilis* Heinrich; its status needs to be reviewed when material becomes available, as the only specimens I have examined were those of the short type series. The male genitalia of this species are somewhat divergent for *Galenara*, as they have a very elongate gnathos, lack the raised spinose process of the harpe, have a hooklike process



Figs. 82–89. Adults of *Galenara*. **82.** *G. olivacea* Rindge, paratype, male. **83.** *G. stenomacra* Rindge, holotype, male. **84.** *G. lixarioides* McDunnough, male; Coconino Co., Arizona. **85.** *G. antilectos*, new

at the posterior end of the aedeagus, and have a single slender cornutus; each of these characters differentiates the species from the other members of *Galenara*. On the other hand, the female genitalia apparently have the characters of the present genus.

As defined in the present paper, seven species of *Galenara* were included in my 1964 revision of the genus. Of these, six were known from the southwestern United States and one from Mexico. Because of the collecting that has been done since then, particularly in Mexico and Guatemala, quite a different picture emerges as to the distribution of the genus. Of the original six, *lallata* is now known to occur in Mexico; this is the only species known to occur in both countries. In addition, seven species from Mexico and Guatemala are described as new in this revision. Just about every collection from these two countries that has specimens of *Galenara* seems to have something new and interesting; much work still needs to be done in the mountains of those nations before our knowledge of this genus is anywhere near complete. Nearly all of these collections consist of but a few specimens from any one locality; this has complicated working on the present revision of the genus because both sexes are not always present in any one sample.

As the maculation, color, and size of these taxa are quite similar to one another, it is recommended that genitalic dissections be studied in order to make identifications. New keys to the genitalia of both sexes have been made as an aid in identifying the species.

KEY TO SPECIES

Based on Male Genitalia[3]

1. Aedeagus with posterior end having a heavily sclerotized, hooklike process .. .. *consimilis*
   Aedeagus with posterior end bluntly pointed 2

2(1). Vesica with a row of spines 3
   Vesica with a single large spine 8

3(2). Uncus with apex flat, triangular 4
   Uncus with apex bilobed 7

4(3). Vesica with 4 to 6 large spines in posterior section arranged in a single row 5
   Vesica with 8 to 12 slender spines in posterior section in multiple rows (fig. 103) ..... *lixarioides*

5(4). Gnathos with median area tapering to a blunt point 6
   Gnathos with median area U-shaped, bluntly rounded (fig. 108) ... *ferrugina*

6(5). Anellus with anterior portion broad and flat (fig. 106) ..... *lixaria*
   Anellus with anterior margin narrowly sclerotized, then narrowed medially (fig. 104) ..... *antilectos*

7(3). Spines of vesica extending for about 45% length of aedeagus; when exserted, spines are on surface of vesica (fig. 101) .... *stenomacra*
   Spines of vesica extending for about 30% length of aedeagus; when exserted, spines are on a separate, lightly sclerotized sac (fig. 99) ..... *olivacea*

8(2). Uncus with broad apex (0.13–0.20 mm), having two widely separated, distinct points 9
   Uncus with slender (0.05–0.10 mm), distally parallel-sided, blunt apex 10

9(8). Uncus with apical portion laterally thickened, U-shaped dorsoventrally, and with lateral points 0.13 mm apart (fig. 110) ..... *cabira*
   Uncus with apical portion of same width, V-shaped dorsoventrally, with lateral points 0.15 to 0.20 mm apart (fig. 111) ..... *bispicula*

10(8). Vesica having spine with wide base, occupying about one-half width of aedeagus 12
   Vesica having spine with narrow base, occupying about one-third width of aedeagus 11

11(10). Gnathos bluntly wedge-shaped medially; length of valve from base of costa to apex 1.3 mm; distance from apex of valve to posterior edge of process of harpe 0.70 to 0.75 mm (fig. 119) ..... *lallata*
   Gnathos pointed medially, V-shaped; length of valve from base of costa to apex 1.1 mm; distance from apex of

[3] The males of *engonios*, *leberasae*, and *phoxe* are not included.

←

species, holotype, male. **86**. *G. leberasae*, new species, holotype, female. **87**. *G. lixaria* (Grote), male; Coconino Co., Arizona. **88**. *G. ferrugina*, new species, holotype, male. **89**. *G. cabira* (Druce), male; Distrito Federal, Mexico. X 1.2.

valve to posterior edge of process of harpe 0.6 mm (fig. 121) .... *tlaxcala*

12(10). Vesica with curved spine (fig. 114) .... *vernonae*

Vesica with straight spine 13

13(12). Gnathos with median portion having convex sides, rounded medially; vesica with relatively slender spine 0.5 mm long (figs. 115, 116) ..... *glaucaria*

Gnathos with median portion having straight sides, bluntly pointed medially; vesica with shorter, thick spine 0.4 mm long (figs. 117, 118) ..... *carina*

BASED ON FEMALE GENITALIA[4]

1. Ductus bursae tending to join the corpus bursae posterodorsally, with the posterior portion of the latter becoming ventrad to the ductus bursae, or with a slight indication of a membranous area between the two 2

Ductus bursae joining the corpus bursae posteriorly, often with the latter having an enlargement to the left of the junction 6

2(1). Corpus bursae strongly sclerotized for much of its length, with the membranous portion recurved posteriorly (fig. 123) ..... *olivacea*

Corpus bursae elongate, slender, mostly membranous 3

3(2). Corpus bursae of equal width, not enlarged anteriorly 4

Corpus bursae with anterior end enlarged, saclike 5

4(3). Ductus bursae with the posterolateral margins extended into the lamella postvaginalis (fig. 128) ..... *lixaria*

Ductus bursae with a rounded posterior margin (fig. 128) ..... *lixarioides*

5(3). Apophyses posteriores 2.6 to 2.8 mm long ..... *stenomacra*

Apophyses posteriores 2.2 to 2.3 mm long ..... *antilectos*

6(1). Corpus bursae of equal width, not enlarged anteriorly 7

Corpus bursae with anterior end enlarged, saclike 8

7(6). Ductus seminalis arising from a sclerotized projection on the right side of the posterior end of the corpus bursae (fig. 130) ..... *phoxe*

Ductus bursae arising ventrally from corpus bursae (fig. 129) ..... *bispicula*

8(6). Ductus seminalis arising from the dorsal surface ..... *egonios*

Ductus seminalis arising from the ventral surface 9

9(8). Corpus bursae with the posterior end having large swellings on both sides, with only the one on the right side sclerotized 10

Corpus bursae with the posterior end swollen on the left side of the ductus bursae only 11

10(9). Corpus bursae with a very large swelling posteriorly on the left side, and with the anterior saclike enlargement longer than wide (fig. 133) ..... *lallata*

Corpus bursae with a moderate swelling on the left side, being not much larger than the one on the right, and with the anterior saclike enlargement almost as high as wide (fig. 134) ..... *tlaxcala*

11(9). Corpus bursae with the posterior end completely sclerotized (fig. 131) .... *glaucaria*

Corpus bursae posteriorly with the caudal portion of the swelling on the left side membranous (fig. 127) .... *leberasae*

The males of *Galenara* can easily be separated into two groups, based on the spination of the vesica; one has an elongate row of numerous spines, whereas the other has what appears to be one large spine. Upon closer examination, the latter is found to consist of one thick spine, often with an enlarged base; from the base, and closely adhering to the thick spine, are a number of shorter and thin spines or setae. I consider the row of numerous spines to be the plesiomorphic condition. The corresponding separation of the females into these two groups is neither as easy nor as apparent. The character I have used is the point of attachment of the ductus bursae to the corpus bursae, but this is not always obvious.

As with *Anavinemina*, I am doing a review of the genus, with diagnostic notes on the previously described species as well as descriptions of the new ones. In so doing, the arrangement of the species is different from my earlier paper; the present treatment starts with those species that have the males with numerous spines in the vesica.

Group I

The included species are those with an elongate row of numerous spines in the ves-

[4] The females of *cabira*, *carina*, *consimilis*, *ferrugina*, and *vernonae* are not included.

ica, and with a dorsal or dorsoposterior union of the ductus bursae and the corpus bursae. The males may have their hind tibia with or without a hair pencil and the ventral row of setae on A3 present or absent. The apex of the uncus may terminate in either two points or be trilobed.

Galenara olivacea Rindge
Figures 82, 98, 99, 123

Galenara olivacea Rindge, 1958: 10, figs. 8, 21–23 (adult, male and female genitalia); 1964c: 50.

This species is one of three in which the males lack both the hind tibial hair pencil and the row of setae on the ventral surface of A3. It is unique in this genus due to its having nine (sometimes eight) veins in the secondaries, plus a strongly angled udc and ldc; these characters are found in *Anavinemina*. The lack of the tibial hair pencil and the conformation of the genitalia will distinguish *olivacea* from the species of the preceding genus.

While the typical wing pattern of *Galenara* is present in *olivacea*, it is not strongly represented (fig. 82). The color of the upper surface of the forewings is more of a light gray or a seeming grayish green (in fresh specimens) than that of the other species. The discal dots of the primaries are very small, the median line is obsolescent, and the s. t. line is strongly represented. The length of the forewings is from 16 to 20 mm. The male antennae have their longest pectinations 0.7 mm, being 4 times as long as their basal segments. The palpi extend between 33 (males) and 25 percent (females) of the length of the eyes in front of the eyes.

In the male genitalia (figs. 98, 99), the apex of the uncus has two prominent, ventrally curving points, the gnathos is tapered to a blunt point, the vesica has a large number of short spines in a short band, and when the vesica is exserted, the spines are on a lightly sclerotized sac that is separate from the remainder of the vesica. The female genitalia (fig. 123) are unique in the genus in that most of the corpus bursae is heavily sclerotized, with the smaller membranous portion being curved ventroposteriorly.

I described *olivacea* from a series of 34 specimens; the type locality is upper camp, Pinery Canyon, Chiricahua Mts., Cochise Co., Arizona, and the holotype is in the LAM. The known distribution of this species is the Chiricahua Mts. in southeastern Arizona. The species appears to be single brooded, as the adults have been captured in June and July.

There are 24 specimens (23 males, 1 female), five genitalic dissections (4 males, 1 female), and three slide mounts of antennae and legs (2 males, 1 female) before me.

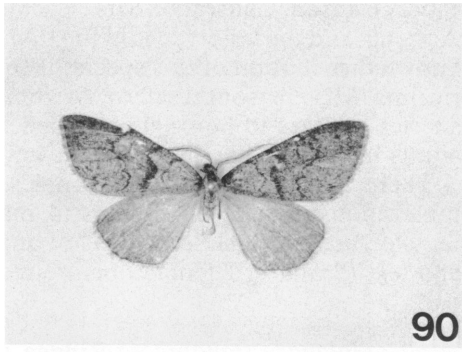
Galenara stenomacra Rindge
Figures 83, 100, 101, 124

Galenara stenomacra Rindge, 1958: 12, figs. 9, 24–26 (adult, male and female genitalia); 1964c: 49, fig. 30 (distribution).

This species is similar to *olivacea* in that the males lack both the hind tibial hair pencil and the row of setae on the ventral surface of A3. The forewings are a dark gray, with a broadly curved t. a. line, a more or less straight median line, and a prominent and elongate discal dash. The length of the forewings varies from 16 to 20 mm. The male antennae have their longest pectinations 0.7 mm, being 3.5 times as long as their basal segments, and only the terminal two segments are simple. The palpi extend between 60 (males) and 75 percent (females) of the length of the eyes in front of the eyes.

In the male genitalia (figs. 100, 101), the apex of the uncus has two moderately large points, the gnathos is tapered to a blunt point, the vesica has a large number of short spines in an elongate band, and when the vesica is exserted, the spines are on the posterior surface of the curved vesica. The female genitalia (fig. 124) have very long apophyses posteriores, as they are from 2.6 to 2.8 mm long; the ductus bursae is elongate and widened to unite with the corpus bursae; the latter has the anterior portion slightly swollen and angled.

I described *stenomacra* from a series of 22 specimens; the type locality is Coulter's Ranch Camp, south fork of the Little Colorado River, White Mts., Apache Co., Arizona, and the holotype (fig. 83) is in the AMNH. The known distribution of the species is eastern Arizona, western, central, and northern New Mexico, and east of the continental divide in central and northern Colorado. The species appears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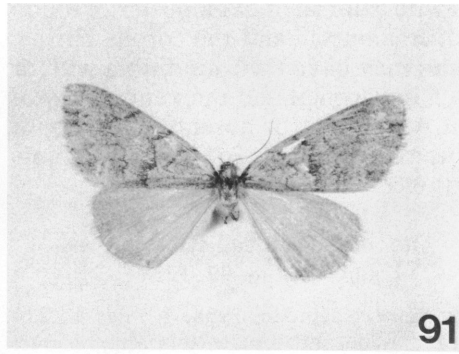
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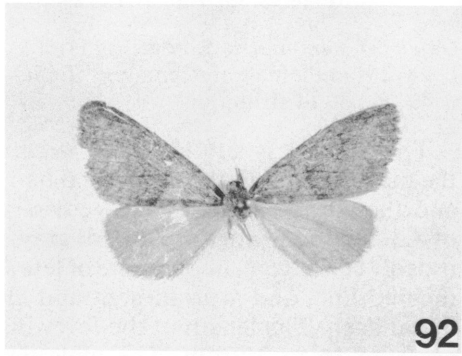
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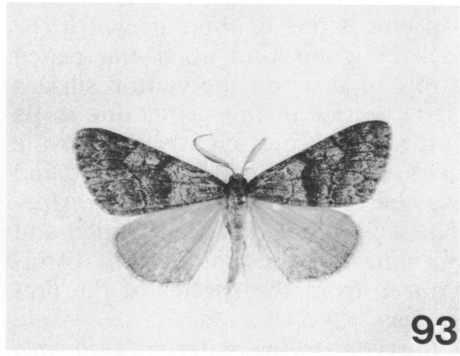
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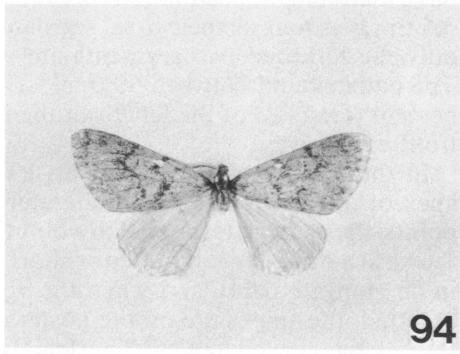
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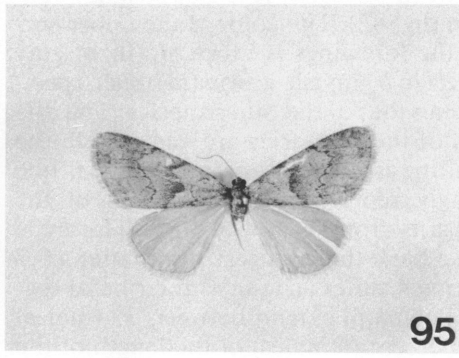
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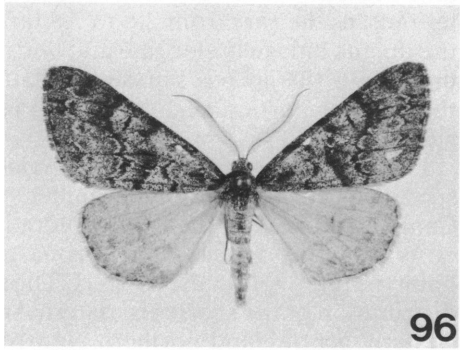
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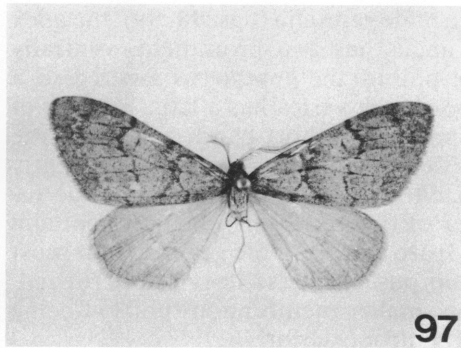
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to be single brooded, as the adults have been captured in June and July.

There are 149 specimens (106 males, 43 females), eight genitalic dissections (6 males, 2 females), and three slide mounts of antennae and legs (2 males, 1 female) before me.

Galenara lixarioides McDunnough
Figures 84, 102, 103, 125

Galenara lixaria: McDunnough (not Grote), 1920: 15 (partim), pl. 2, fig. 3 (male genitalia).
Galenara lixarioides McDunnough, 1945: 99, fig. 6 (aedeagus). Rindge, 1964c: 46, figs. 23, 25, 33 (aedeagus, distribution, sterigma and ductus bursae).

This is another species (along with the two preceding ones) in which the males lack both the hind tibial hair pencil and the row of setae on A3; an occasional abdomen will have the setal row weakly indicated, with the possibility that some slender setae may have been deciduous. The setae of the structure between A7 and A8 are uniformly slender for their entire length. When compared with *stenomacra*, the present species has the upper surface of the forewings darker, the t. a. line has two outward bends, the median line is sharply angled outwardly and then parallels the t. p. line, the discal dot is small, the t. p. line is more prominent and is outwardly pointed on veins M_3 and Cu_1, and the s. t. line is less prominent (fig. 84). The length of the forewings is from 16 to 22 mm. The male antennae have their longest pectinations 1.0 mm long, being 5 times as long as their basal segments. The palpi rise to about 30 percent of the height of the eyes, and extend between 50 (males) and 60 percent (females) of the length of the eyes in front of the eyes.

In the male genitalia (figs. 102, 103) the apex of the uncus is truncate and has a dorsal ridge, giving the appearance of its being three-lobed, and the gnathos is bluntly rounded. The vesica is armed with a band of numerous spines, with the posterior portion of 8 to 12 slender spines not being in a single row, and the anterior part with a large number of spines of varying length, decreasing anteriorly; when exserted, the spines are on the posterior surface of the curved vesica. The female genitalia (fig. 125) have a rectangular ductus bursae, and the corpus bursae is a simple tube that is not enlarged anteriorly.

The type locality for *lixarioides* is the Santa Catalina Mts., Pima Co., Arizona; the holotype is in the CNC (no. 5585). The known distribution of the species is basically the southern Rocky Mountain states, extending north into Converse Co., Wyoming, east of the continental divide in Colorado, western and central New Mexico, western Texas, central and eastern Arizona, and southern Utah. Adults have been captured from late April into September.

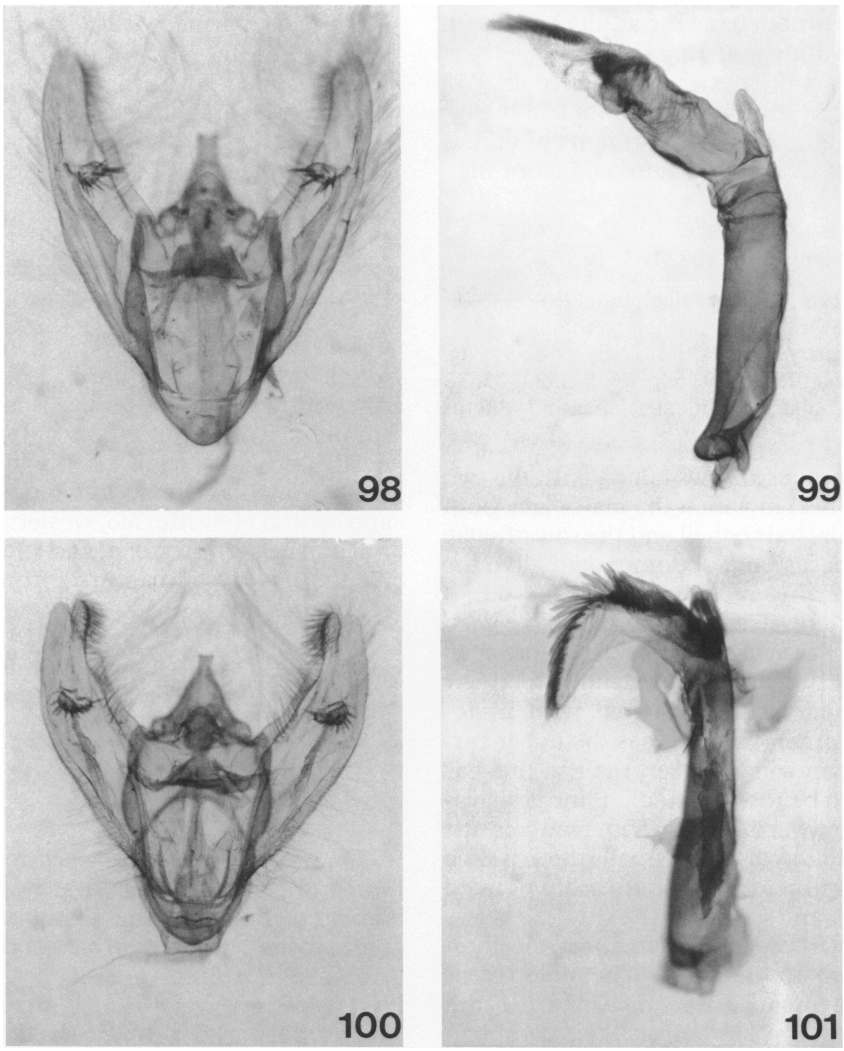
There are 197 specimens (141 males, 56 females), 17 genitalic dissections (12 males, 5 females), and three slide mounts of antennae and legs (2 males, 1 female) before me.

Galenara antilectos, new species
Figures 85, 104, 105, 126

DIAGNOSIS: The upper surface of the forewings of the males is a dark gray, with reddish brown scaling in the basal area and distad of the t. p. line, the median area is pale gray, the t. a. and t. p. lines are slender, black, and clearly defined, and the median line is sharply angled outwardly below the cell, then curved basally to touch the t. a. line above the inner margin. The males have both a hair pencil on the hind tibia and a row of setae ventrally on A3. The male genitalia have a truncate uncus with a triangular apex, and the vesica has a posterior single row of 5 or 6 large spines. The female genitalia have a tapered ductus bursae; the corpus bursae has the pos-

←

Figs. 90–97. Adults of *Galenara*. **90**. *G. bispicula*, new species, holotype, male. **91**. *G. phoxe*, new species, holotype, female. **92**. *G. vernonae*, new species, holotype, male. **93**. *G. glaucaria* (Grossbeck), male; Cochise Co., Arizona. **94**. *G. carina*, new species, holotype, male. **95**. *G. engonios*, new species, holotype, female. **96**. *G. lallata* (Hulst), male; Apache Co., Arizona. **97**. *G. tlaxcala*, new species, holotype, male. X 1.2.



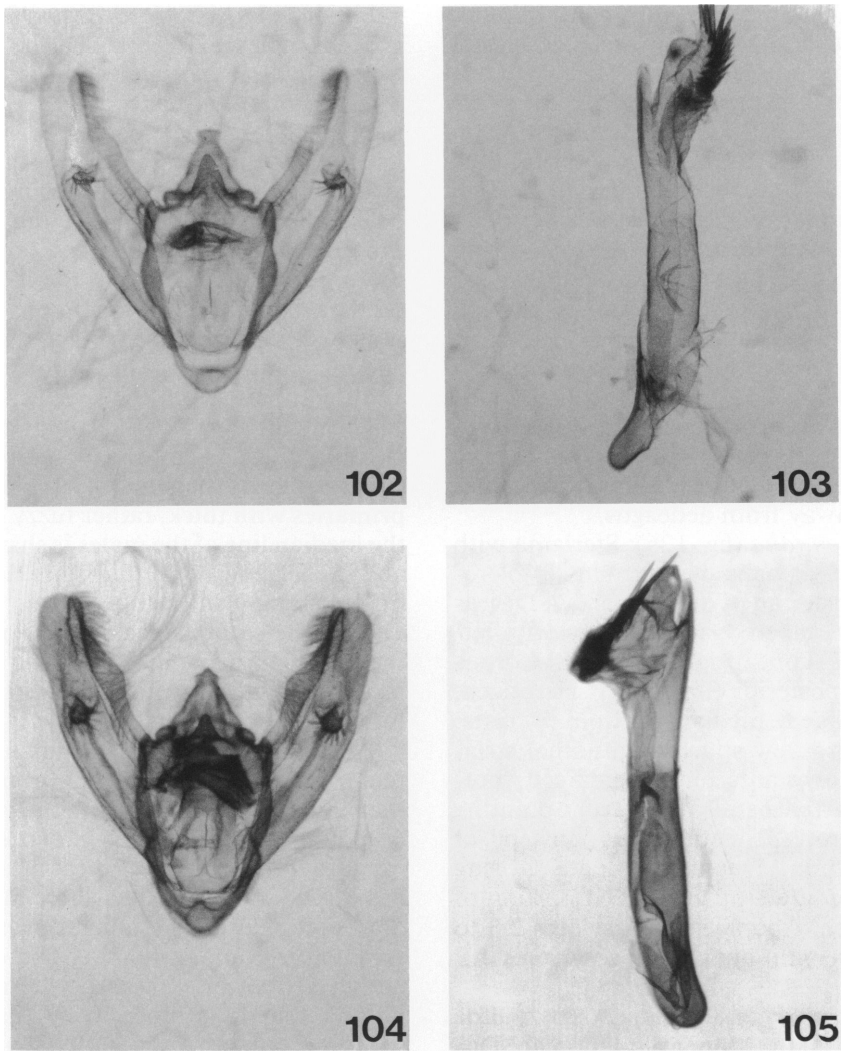
Figs. 98–101. Male genitalia and aedeagi (not to same scale) of *Galenara*. **98, 99**. *G. olivacea* Rindge; Arizona. **100, 101**. *G. stenomacra* Rindge; Colorado.

terior end sclerotized and the anterior end enlarged and somewhat footlike.

DESCRIPTION: *Adults*: Head with longest antennal pectinations of males 1.0 mm, being 6 times as long as their basal segments, and with the terminal 8 or 9 segments simple. Palpi rising to 15 percent height of eyes, and extending between 50 (males) and 40 percent (females) length of eyes in front of eyes.

Hind tibia of males with hair pencil, and male abdomen with ventral row of setae on A3. The setae of the structure between A7 and A8 are distally flattened and enlarged, being several times the width of their basal portions.

Males: Forewings with upper surface dark gray, with reddish brown scaling in basal area and distad of t. p. line, and with median area pale gray; t. a. and t. p. lines black, slender, clearly defined; t. a. line with outward bows below costa and above inner margin, straight in between; median line black, broadly shaded distally with grayish black, obliterating pale gray of median area, with sharp outward angle below cell, then broadly curved basally, approaching or touching lower bow of t. a.



Figs. 102–105. Male genitalia and aedeagi (not to same scale) of *Galenara*. **102**, **103**. *G. lixarioides* McDunnough; Texas. **104**, **105**. *G. antilectos*, new species, holotype.

line; discal spot small, round; t. p. line somewhat S-shaped, with slender distad projections on veins; s. t. line obsolescent, dark gray. Hind wings gray; discal dot and partial extradiscal line weakly represented or absent. Under surface of forewings grayish white, slightly darkened apically, with t. a., median, and t. p. lines weakly indicated; hind wings white, immaculate or with faint trace of minute discal dot.

Females: Forewings with upper surface uniformly dark gray, without reddish brown or pale gray areas; t. a. and t. p. lines thicker than in males, less clearly defined; median line black, broad, more or less straight. Hind wings similar to those of males, slightly darker gray, with extradiscal line tending to be more strongly represented. Under surface similar to that of males but with less maculation present.

Length of Forewings: Holotype, 21 mm; paratypes, 18 to 20 mm.

Male Genitalia (figs. 104, 105): Uncus with truncate apex and strong dorsal ridge, thus appearing triangular. Gnathos bluntly pointed medially. Valves with small to moderate

costal swelling; ampulla prominent, tubular, raised above face of valve; sacculus broad, flat, occupying one-half of inner face of valve, with thickened posteromedial margin; harpe sclerotized, clearly defined, terminating in elongate, distally swollen process bearing thick spines apically. Cristae slender, 6 to 9 in number, longest 0.3 mm, not prominent. Anellus with anterior margin thickened, and with median longitudinal fold. Aedeagus 2.2 mm long, 0.3 mm wide; posterior portion concave, with blunt apex; vesica with 20 to 25 spines, posterior 5 or 6 thick, up to 0.25 mm long, in single row, anterior spines short, arranged in a group; when exserted, vesica in shape of elongate triangle situated in concave area of posterior end of aedeagus, with spines along edge away from aedeagus.

Female Genitalia (fig. 126): Sterigma with lamella postvaginalis having small sclerotized area posteriad of ductus bursae. Ductus bursae short, tapered, wider anteriorly, lateral margins appearing thickened. Corpus bursae with posterior end evenly sclerotized, slightly enlarged; median portion elongate, slender, with a few short longitudinal striations posteriorly; anterior end enlarged, footlike, with partial band of inwardly pointing rows of sclerotized teeth across "instep" of footlike portion. Ductus seminalis arising ventrally in middle of sclerotized portion of corpus bursae. Apophyses posteriores 2.3 to 2.5 mm in length; apophyses anteriores 1.2 to 1.3 mm.

TYPES: Holotype, male, Arroyo Los Mimbres, 2200 m, Municipio Durango, Durango, Mexico, Aug. 14, 1984 (E. C. Welling) (fig. 85). The genitalia of the holotype are mounted on slide FHR 19,753A, and one antenna and set of legs on slide FHR 19,753B. Paratypes: Same data as holotype, 2 males; same data but dated Aug. 19, 1984, 1 male, 1 female, and 1 female dated Aug. 20, 1984.

All the type specimens have been deposited in the AMNH.

DISTRIBUTION: Known only from the type locality in the Western Sierra Madre in central Durango.

TIME OF FLIGHT: August.

REMARKS: Six specimens (4 males, 2 females), four genitalic dissections (2 males, 2 females), and two slide mounts of male antennae and legs have been studied.

I hesitated to associate the two females with the four males, even though all six specimens were caught at the same locality and within a week's time. The males are, generally speaking, freshly emerged specimens, whereas the females are obviously worn, presumably from an earlier eclosion; normally the males emerge before the females and hence they should be more abraded. The apparent differences in the times of emergence in the adults, based on the wear of the few specimens before me, might possibly be an artifact of collecting, and may not represent the normal emergence and flight pattern of this species.

The males have a contrastingly colored and clearly patterned upper surface of the forewings, whereas the females have unicolorous primaries with thick, rather fuzzy cross lines; the median line of the males is sharply angled and, as far as can be told, this line is more or less straight in the one female where it is visible (the second specimen is so worn that the maculation is mostly lost). Sexual dimorphism in color and pattern has not heretofore been known in *Galenara*.

The females, based on a study of their genitalia, definitely belong to the group of males that have numerous spines in the vesica. This last, plus the fact that the two sexes were caught at the same place and at the same time, has caused me to consider these moths as the opposite sexes of the same species, notwithstanding the above points. The only alternative is to consider them as separate species. I think that it is more likely that a single species occurs at this locality than that two different, relatively closely related species would be at this one locality.

ETYMOLOGY: The specific name is from the Greek *antilectos*, meaning questionable.

Galenara leberasae, new species

Figures 86, 127

DIAGNOSIS: The upper surface of the forewings is gray from the base to the curved median line, and darker gray from there for the remainder of the wing; the t. a. line is broadly convex, with basal bends on the cubital and anal veins, and the median line is outwardly angled into the cell, then broadly concave to the inner margin. The female genitalia have the corpus bursae with a strong

swelling to the left of the ductus bursae, with the posterior end being sclerotized, and the anterior end is angled and footlike. (The males have not been examined.)

DESCRIPTION: *Adults*: Head with palpi rising to lower edge of eyes, and extending 33 percent (females) length of eyes in front of eyes.

Forewings with upper surface gray from base to median line, darker gray for remainder of wing; cross lines black; t. a. line broadly convex, with basal bends on cubital and anal veins; median line narrowly shaded distally with grayish black, then fading out with some brown scaling, crossing radial vein at right angle to costa or with slight outward angle, then broadly and evenly concave to inner margin; discal dot small, black; t. p. line outwardly curved around cell, then weakly concave to anal vein, having outward projections on veins, with inward angle to inner margin; s. t. line pale gray, more or less complete; terminal line black, narrow. Hind wings pale gray, slightly darkened distally; discal dot obsolescent; extradiscal line complete, faint; terminal line black, narrow. Under surface of forewings gray, of hind wings pale gray; without maculation except for small discal dots on all wings.

Length of Forewings: Holotype, 18 mm.

Female Genitalia (fig. 127): Sterigma with small, sclerotized, elliptical area posteriad of ductus bursae in elongate area defined by low ridge, lamella postvaginalis posteriad of elongate area with lightly sclerotized, transverse ridges. Ductus bursae sclerotized, outer margins parallel, appearing thickened, with posterior and anterior sides oblique and parallel, extending farther anteriad on right side than left. Corpus bursae with asymmetrical posterior end, strongly enlarged on left side, right side not extending much beyond ductus bursae, with end sclerotized except for tip of enlargement; median section slender; anterior end strongly swollen, angled, footlike, and having band of short, inwardly projecting denticulations across "arch" of foot. Ductus seminalis arising from broad, slender base, situated anterioposteriorly, from broad portion of posterior end of corpus bursae to left of ductus bursae. Apophyses posteriores 1.9 mm in length; apophyses anteriores 1.0 mm.

TYPE: Holotype, female, Leberas, 1975 m, Municipio Concordia, Sinaloa, Mexico, Aug. 17, 1984 (E. C. Welling) (fig. 86). The genitalia of the holotype are mounted on slide FHR 19,802. The holotype has been deposited in the collection of the AMNH.

DISTRIBUTION: Known only from the type locality in Sinaloa.

TIME OF FLIGHT: August.

REMARKS: One specimen and one genitalic dissection have been studied.

ETYMOLOGY: The specific name is a noun in the genitive case, based on the type locality.

Galenara lixaria (Grote)

Figures 7, 87, 106, 107, 128

Phigalia lixaria Grote, "1881–1882" [1883]: 52.
Galenara lixaria: Rindge, 1964c: 44 (bibliography, description), figs. 22, 24, 29 (aedeagus, distribution, female genitalia).

This is one of the larger species in the genus, with the length of the forewings being from 17 to 24 mm. It is most likely to be confused with *lallata*; the present species can be distinguished from that taxon by the inward bend of the t. a. line on the anal vein, by the sharp angle in both the median and t. p. lines at the cell, by the brown scaling in the subterminal area, and by the dark, curved s. t. line (fig. 87). The surest way to separate the two is by genitalia, as *lixaria* has a row of setae in the vesica and *lallata* has a single large spine, and the former has a slender corpus bursae whereas *lallata* has a prominent posterior enlargement on the left side and a footlike anterior end.

The present species has the upper surface of the forewings darker, on average, than any of the 7 members of its group—those males with a row of spines in the vesica—and it is the largest species. It has the hair pencil on the hind tibia of the male, and the row of setae on the ventral surface of A3. The male antennae have their longest pectinations 1.1 mm, being 6 times as long as their basal segments. The palpi rise from the lower edge to 10 percent of the height of the eyes, and extend between 33 (males) and 50 percent (females) of the length of the eyes in front of the eyes.

In the male genitalia (figs. 106, 107) the apex of the uncus is truncate and has a dorsal

ridge, giving the appearance of its being trilobed, the gnathos has the median section attenuate and bluntly pointed, and the anterior portion of the anellus is flat and smoothly sclerotized. The vesica has a linear group of more than 20 spines, and the larger posterior 4 or 5 large spines are in a single row; when exserted, the spines are on the ventral surface of the vesica. The female genitalia (fig. 128) have a sclerotized, rectangular ductus bursae, the outer margins of which extend posteriorly into the lamella postvaginalis; the corpus bursae is a slender structure that is not enlarged at either end.

The holotype of *lixaria* is in the USNM, and was caught near Las Vegas Hot Springs, San Miguel Co., New Mexico. For my comments on the type, its condition, and the difficulties in ascertaining what species this specimen represents, see my previous paper (1964c: 46). The known distribution of this species is southern Utah, Arizona, and New Mexico. Specimens have been caught in mid-March, and from May into September.

There are 329 specimens (144 males, 185 females), 20 genitalic dissections (8 males, 12 females), one slide mount of wings, and six slide mounts of antennae and legs (3 males, 3 females) before me.

Galenara ferrugina, new species
Figures 88, 108, 109

DIAGNOSIS: This species is characterized by the reddish brown color of the upper surface of the forewings; the basal portion of them is uniformly pale as far as the angled median line, and then darker for the remainder of the wing. The males have a weakly developed hair pencil on the hind tibia and a row of setae ventrally on A3. The uncus has a truncate, trilobed posterior end, the gnathos is broadly U-shaped medially, and the vesica has four or five thick spines posteriorly in a single row. (The females have not been examined.)

DESCRIPTION: *Adults*: Head with longest antennal pectinations of males 1.0 mm, being 5 times as long as their basal segments, and with terminal 8 segments simple. Palpi rising to lower edge of eyes, and extending 25 percent length of eyes in front of eyes.

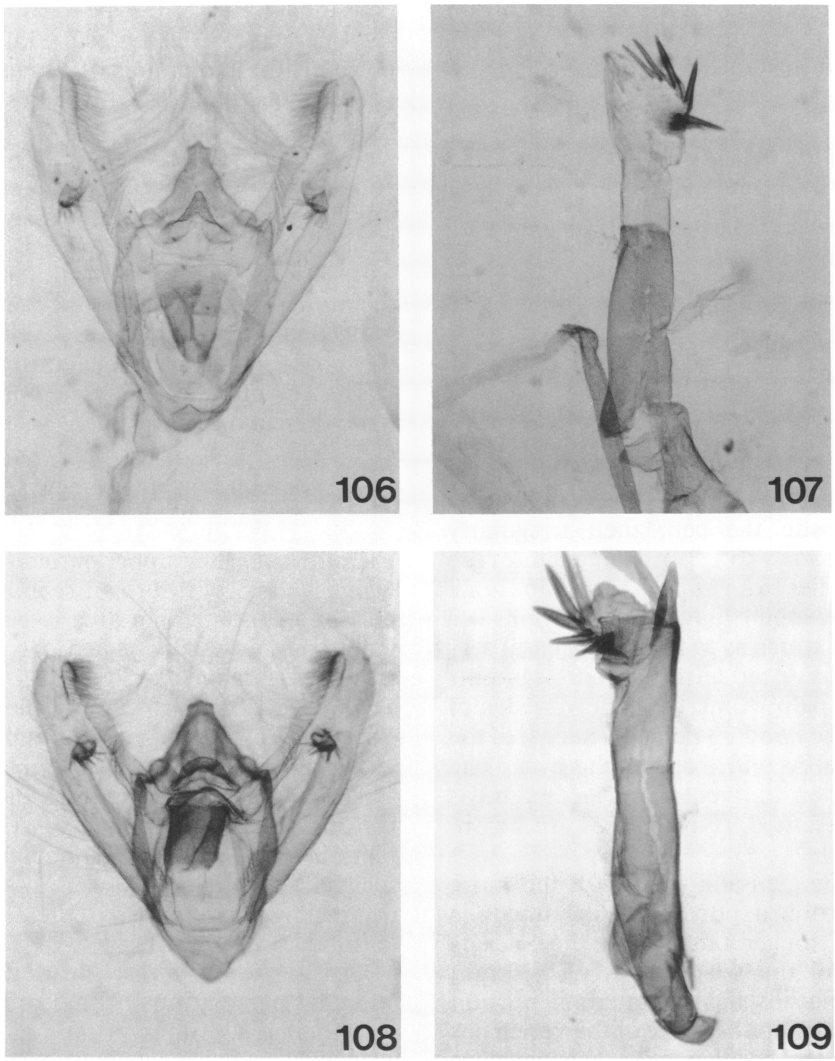
Hind legs of males with weakly developed hair pencil, and abdomen with strongly developed ventral row of setae on A3.

Forewings with upper surface pale reddish brown from base to median line, darker brown from there to wing margin, with distal portion of median area only very slightly paler than outer area; maculation distinct, cross lines black; t. a. line with strong outward curve below costa, outwardly oblique to anal vein, then sharply angled basad; median line with outward point below costa, sharp angle at bottom of cell, then broadly concave to inner margin, last section tending to be outwardly shaded with brownish black scales; t. p. line with outward angles on veins M_3 and Cu_1, then broadly concave to inner margin, having small outward extensions on veins; subterminal area with faint reddish brown scaling; s. t. line weakly indicated, with some narrow black scale lines in cells. Hind wings grayish brown, with dark gray discal dot and partial extradiscal line; terminal line narrowly black. Under surface of forewings gray, becoming irrorate with black scaling along costa and outer portion, with faint indication of median and t. p. lines, and with slender black terminal line; hind wings slightly paler gray, irrorate in outer portion, and with discal dots and terminal line.

Length of Forewings: Holotype, 18 mm.

Male Genitalia (figs. 108, 109): Uncus with truncate apex and strong dorsal ridge, thus appearing triangular. Gnathos broadly U-shaped medially. Valves with small costal swelling; ampulla prominent, tubular, raised above face of valve; sacculus broad, flat, with thickened posteromedial margin, occupying one-half of inner face of valve; harpe sclerotized, terminating in prominent ovate process thickened distally, and bearing thick spines apically. Cristae slender, about 8 in number, longest 0.3 mm, not prominent. Anellus wide, relatively short (0.6 mm), tapering posteriorly to two small points. Aedeagus 2.4 mm long, 0.3 mm wide; sclerotized posteriorly, terminating in blunt point; vesica with 15 to 18 spines, posterior 4 or 5 thick, up to 0.35 mm long, in single row, anterior spines short, arranged in group; when exserted, vesica in shape of rounded swelling, with spines along ventral and left surface.

TYPE: Holotype, male, 4 km W Chimaltenango, ca. 1850 m, Chimaltenango, Gua-



Figs. 106–109. Male genitalia and aedeagi (not to same scale) of *Galenara*. **106**, **107**. *G. lixaria* (Grote); Arizona. **108**, **109**. *G. ferrugina*, new species, holotype.

temala, Oct. 12, 1976 (E. C. Welling) (fig. 88). The genitalia of the holotype are mounted on slide FHR 19,797A, and one antenna and set of legs on slide FHR 19,797B.

The holotype has been deposited in the collection of the AMNH.

DISTRIBUTION: Chimaltenango, Guatemala.

TIME OF FLIGHT: October.

REMARKS: One specimen, one genitalic slide, and one slide mount of an antenna and legs have been studied.

A very distinct and easily recognized species, with its paler brown and darker brown forewings having very distinct cross lines.

ETYMOLOGY: The specific name is from the Latin *ferruginus*, meaning rusty, rust colored, in reference to the color of the upper surface of the primaries.

Group II

The included species are those with what appears to be one large spine in the vesica, and with a posterior union of the ductus bursae and the corpus bursae. As far as is known,

all males have their hind tibia with a hair pencil, with the ventral row of setae on A3, and with the posterior end of the uncus bilobed.

Galenara cabira (Druce)
Figures 89, 110

Boarmia (?) cabira Druce, 1892 (1891–1900): 73; 1893 (1881–1900): pl. 48, fig. 8.
Galenara cabira: Rindge, 1964c: 39, figs. 20, 32 (aedeagus, sterigma and ductus bursae).

This species has the upper surface of the forewings grayish brown, with dark brown cross lines; the t. a. line is angled in the cubital cell, the median line is somewhat W-shaped and broadly shaded distally with reddish brown, and the t. p. line is outwardly angled opposite the cell, then irregularly curved posteriorly (fig. 89). The length of the forewings varies from 16 to 20 mm. The male antennae have their longest pectinations 0.9 mm, being 5 times as long as their basal segments, and have the terminal four segments simple. The palpi come to the lower edge of the eyes, and extend 33 percent (males) of the length of the eyes in front of the eyes. The row of setae on the ventral surface of A3 is weakly represented. (No females are before me.)

In the male genitalia (fig. 110), the more heavily sclerotized portion of the uncus is quite broad, longer than wide, the apex is U-shaped, with the two points being 0.13 mm apart, the gnathos has the median portion wedge-shaped, and the spine of the vesica has a large rounded basal portion that is more than one-half the width of the aedeagus, with the slender, parallel-sided posterior extension being on the right side and equal in length to the length of the basal portion. The female genitalia have the sterigma membranous except for a pair of lateral, lightly sclerotized, posteriorly divergent pieces, weakly convoluted posteriorly, the ductus bursae is longer than wide, and the ductus seminalis arises ventromedially near the ductus bursae. (The one female genitalia examined for my 1964 paper did not have an inflated corpus bursae, so details about that structure are lacking.)

Druce described *cabira* from two males; I designated the lectotype (1964c: 40), and it is in the USNM. The type locality is Las Vigas, Veracruz, Mexico. The known distribution is the mountains of Veracruz and the Distrito Federal, with the dates of capture being March and November. No new material has come to hand since my 1964 paper, and I have not reexamined the Veracruz specimens; I am still assuming that the San Angel, D. F. specimen (in AMNH) is conspecific with Druce's lectotype. More material from the mountains of eastern and central Mexico is needed before a definitive evaluation of this problem can be satisfactorily solved.

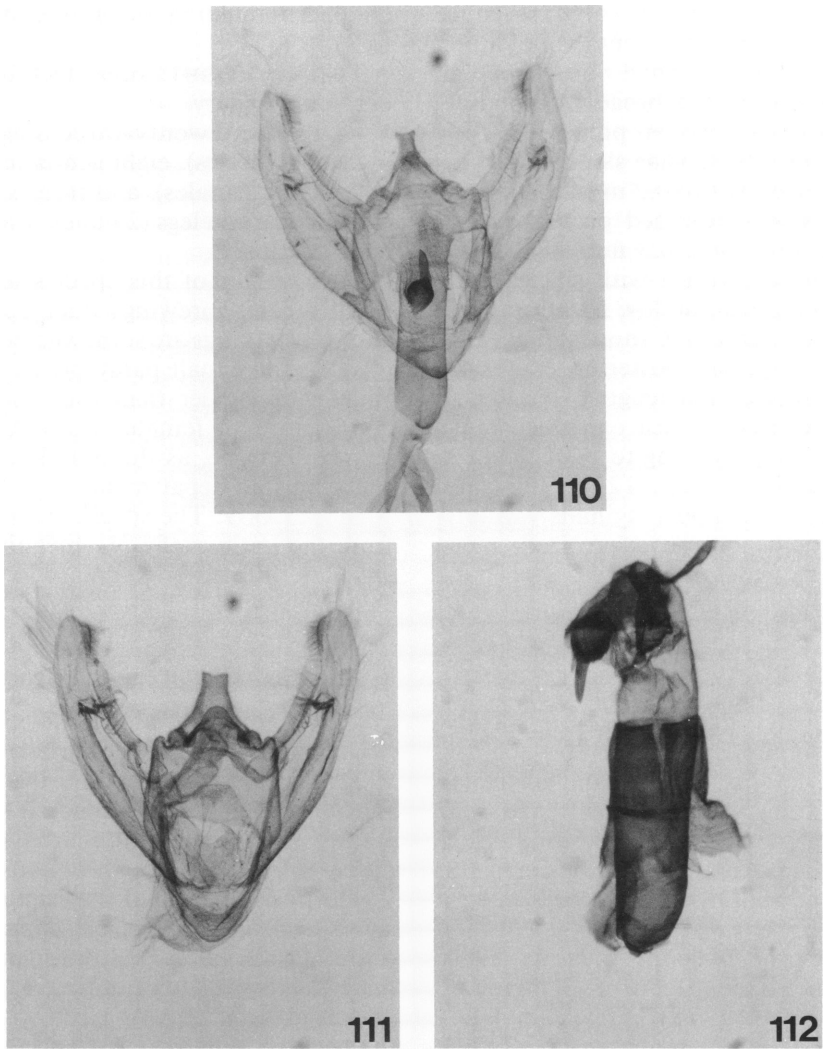
There is one male specimen and one genitalic dissection before me.

Galenara bispicula, new species
Figures 8, 90, 111, 112, 129

DIAGNOSIS: The upper surface of the forewings is gray, with brown scaling, the basal portion of the median area is pale gray, the t. a. line is outwardly angled, the median line is strongly shaded distally with grayish black and then reddish brown, and the t. p. line is clearly defined. The male genitalia have the terminal part of the uncus heavily sclerotized, square, with a V-shaped apex; the row of setae on the ventral surface of A3 is weakly represented. The female genitalia have a high, sclerotized ridge on the ventral surface connecting the posterior end of the ductus bursae and the corpus bursae.

DESCRIPTION: *Adults*: Head with longest antennal pectinations of males 0.70 to 0.75 mm, being 4.5 times as long as their basal segments, and with terminal 7 segments simple. Palpi rising to between lower edge of eye and 20 percent its height, and extending between 33 (males) and 50 percent (females) length of eyes in front of eyes. Male abdomen with row of setae on ventral surface of A3 weakly represented.

Forewings with upper surface gray, with brown and some reddish brown scaling, and with basal portion of median area paler gray; t. a. and t. p. lines, black, slender, clearly defined; t. a. line outwardly curved to below cell, angled posteriorly to anal vein, then outwardly oblique to inner margin; median line black, broadly shaded distally with grayish black then reddish brown, outwardly angled



Figs. 110–112. Male genitalia of *Galenara*. **110**. *G. cabira* (Druce); Distrito Federal, Mexico. 111, 112. *G. bispicula*, new species, holotype. **111**. Genitalia. **112**. Aedeagus (not to same scale).

from costa into cell, then broadly concave to inner margin; discal spot small or obsolescent, sometimes long and slender; t. p. line outwardly angled to end of cell, then generally concave to anal vein, being concave in each cell, then angled basally to inner margin; s. t. line variably indicated, from obsolescent to partially represented, often with dark scaling in terminal area opposite cell. Hind wings gray; discal dot and extradiscal line absent or obsolescent; terminal line black, narrow. Under surface of forewings gray, of hind wings pale gray; all wings without maculation except for pattern of upper surface very faintly indicated, and for obsolescent discal dot on secondaries.

Length of Forewings: Holotype, 17 mm; paratypes, 13 to 18 mm.

Male Genitalia (figs. 111, 112): Uncus with terminal portion heavily sclerotized, quite broad, about twice as wide as long, concave, apex V-shaped with the two points 0.15 to 0.20 mm apart. Gnathos rounded medially. Valves with small costal swelling; ampulla

raised distally above face of valve; sacculus broad, flat, occupying about one-half of inner face of valve, with thickened posteromedial margin; harpe sclerotized, broad, terminating in elongate, distally swollen process bearing thick spines apically. Cristae slender, 6 to 12 in number, longest 0.1 to 0.2 mm, not prominent. Anellus with rounded posterior end. Aedeagus 1.6 mm long, 0.3 mm wide; posterior end pointed; vesica with single spine having large elliptical, hollow basal portion, its surface with numerous short spines, and with slender, tapering posterior extension being slightly shorter than length of basal portion; when exserted, vesica expanded ventrally, with spine projecting to right side.

Female Genitalia (fig. 129): Sterigma membranous, lamella postvaginalis variably crenulate. Ductus bursae sclerotized, rectangular, slightly wider than long. Corpus bursae with lightly sclerotized posterior end having high, sclerotized ridge connecting anterior part of ductus bursae with corpus bursae on ventral surface, ridge wider posteriorly, tapering anteriorly; median section weakly curved, membranous; anterior end slightly enlarged and having partial band of short, inwardly-pointing rows of denticulations. Ductus seminalis arising from right side of sclerotized ridge. Apophyses posteriores 1.8 mm in length; apophyses anteriores 0.9 to 1.1 mm.

TYPES: Holotype, male, El Aguacata, 1900 m, Municipio Mixco, Dept. of Guatemala, Guatemala, Oct. 16, 1976 (E. C. Welling) (fig. 90). The genitalia of the holotype are mounted on slide FHR 19,873. Paratypes, all from Guatemala and collected by E. C. Welling: Baleu, 1350 m, Mpio. San Cristobal Verapaz, Alta Verapaz, June 6, 7, 8, 1966, 3 males, 1 female; Chajsel, 1400 m, Mpio. Coban, Alta Verapaz, Dec. 29, 30, 1972, Jan. 1, 1973, 3 females; Chuchexik, 2250 m, Mpio. Santa Lucía Utatlan, Sololа, Oct. 17, 1966, 8 males; Zaragoza, 2000 m, Chimaltenango, Oct. 27, 1975, 4 males; same data as holotype, 1 male; Tacpan Guatemala, 2150 m, Chimaltenango, June 25, 1987, 2 males.

All the type specimens have been deposited in the collection of the AMNH.

DISTRIBUTION: The mountains of Guatemala (Alta Verapaz, Sololа, Chimaltenango, and Guatemala) at elevations of from 1350 to 2250 m.

TIME OF FLIGHT: June, October, December, and January.

REMARKS: Twenty-three specimens (19 males, 4 females), eight genitalic dissections (6 males, 2 females), and three slide mounts of antennae and legs (2 males, 1 female) have been studied.

The females of this species tend to have slightly paler forewings than do the males, and the markings are somewhat less contrasting. The three male paratypes from Baleu are smaller and paler than the other males. A comparison of females from Alta Verapaz cannot be done, as the only known females are from that department.

ETYMOLOGY: The specific name is formed from the Latin prefix *bi-*, meaning two, and *spiculus*, pointed, in reference to the shape of the uncus.

Galenara phoxe, new species
Figures 91, 130

DIAGNOSIS: The upper surface of the forewings is an even pale gray, the t. a. line is sharply angled, and the median line is biangulate. The female genitalia have very little differentiation between the ductus bursae and the corpus bursae, and the ductus seminalis arises from an angled, sclerotized extension of the corpus bursae on the right side. (The males have not been examined.)

DESCRIPTION: *Adults*: Head with palpi rising to lower edge of eyes, and extending 50 percent (females) length of eyes in front of eyes.

Forewings an even pale gray or very slightly paler gray basad of median line; cross lines grayish black; t. a. line sharply angled outwardly below costa to radial vein, moderately angled and straight to below cell, then concave to inner margin; median line narrowly shaded distally with grayish black, outwardly oblique from costa, sharply angled in cell, then proceeding at right angles to inner margin to below cell, then outwardly angled, and turned posteriorly to meet inner margin at right angle; discal dash elongate, not prominent; t. p. line outwardly angled to end of cell, then weakly concave to inner margin,

being concave in each cell; s. t. line pale, double, with dark median scaling; terminal area with dark scaling opposite cell and at tornus. Hind wings gray, without maculation. Under surface of forewings gray, of hind wings slightly paler gray; all wings without maculation except for obsolescent discal dash on forewings.

Length of Forewings: Holotype, 18 mm.

Female Genitalia (fig. 130): Sterigma with lamella postvaginalis weakly and irregularly sclerotized posteriad of ductus bursae, and with surrounding area crenulate. Ductus bursae trapezoidal, wider anteriorly than posteriorly, sclerotized with minute dots. Corpus bursae with posterior end not clearly differentiated from ductus bursae except for larger sclerotized spots and increased width, left side curved, right side with angulate projection ventrally, not swollen dorsally, with sclerotization ending at anterior end of projection; median section twisted, with faint longitudinal striations; anterior end slightly enlarged and having partial band of short, inwardly pointing denticulations. Ductus seminalis arising from apex of angulate projection on right side posteriorly of corpus bursae. Apophyses posteriores 1.8 mm in length; apophyses anteriores 0.9 mm.

TYPE: Holotype, female, Atlamira Guadalupe, 2850 m, Municipio Huamantia, Tlaxcala, Mexico, July 22, 1984 (E. C. Welling) (fig. 91). The genitalia of the holotype are mounted on slide FHR 19,800. The holotype has been deposited in the collection of the AMNH.

DISTRIBUTION: The higher mountains of Tlaxcala.

TIME OF FLIGHT: July.

REMARKS: One specimen and one genitalic dissection have been examined.

This species is very distinct in the point of origin of the ductus seminalis.

ETYMOLOGY: The specific name is from the Greek *phoxos*, meaning pointed, in relation to the origin of the ductus seminalis.

Galenara vernonae, new species
Figures 92, 113, 114

DIAGNOSIS: The upper surface of the forewings is grayish brown, being slightly paler basad of the median line, the cross lines are weakly represented, and the median line is only slightly curved. The male genitalia have the uncus with an elongate, slender apical section, the process of the harpe is constricted medially, and the vesica has a curved spine. (The females have not been examined.)

DESCRIPTION: *Adults*: Head with palpi rising to lower edge of eyes, and extending 25 percent (males) length of eyes in front of eyes; (the holotype is without antennae).

Male abdomen with ventral row of setae on A3 absent or obsolescent, but tibial hair pencil strongly represented.

Forewings grayish brown, slightly paler basad of median line; cross lines blackish brown, weakly represented; t. a. line broadly and evenly convex except for basal bend on cubital vein; medial line slightly shaded distally with grayish black in lower part of wing, weakly angled outwardly below costa, then slightly and evenly concave to inner margin; t. p. line somewhat S-shaped, with outward projections on some veins in lower part of wing; s. t. line pale, obsolescent. Hind wings gray, without maculation except for obsolescent extradiscal line. Under surface of forewings pale gray, of hind wings slightly paler gray; all wings without maculation.

Length of Forewings: Holotype, 17 mm.

Male Genitalia (figs. 113, 114): Uncus with terminal portion elongate, slender, with parallel sides, apex with two small divergent points. Gnathos bluntly pointed medially. Valves with small, gently rounded costal swelling; ampulla sharply raised above surface of valve, posterior end 0.075 mm from apex of valve; sacculus broad, flat, evenly increasing in width posteriorly, with thickened posteromedial margin; harpe weakly sclerotized, terminating in elongate, medially constricted, swollen process bearing thick spines apically. Cristae slender, about 2 in number, 0.2 mm long, not prominent. Anellus narrowed medially from wide anterior portion. Aedeagus 1.8 mm long, 0.3 mm wide; posterior end pointed; vesica with single curved spine having broad, flat base, its widest portion being parallel with outer wall of aedeagus, basal portion with some short spines, outer margin with two longer spines flat on surface.

TYPE: Holotype, male, Colón, Puebla, Mexico, Jan. 18, 1920 (C. C. Hoffmann) (fig. 92). The genitalia of the holotype are mounted on slide FHR 17,301.

The holotype is in the collection of the AMNH.

DISTRIBUTION: The State of Puebla. (I have not been able to locate the specific locality on maps.)

TIME OF FLIGHT: January.

REMARKS: One specimen and one genitalic dissection have been studied.

As mentioned above, both antennae are missing; their bases, the entire front, and the right eye have been covered by a shiny, transparent substance. The specimen is somewhat worn, and hence the maculation may not be fully represented.

ETYMOLOGY: The specific name is a patronym in honor of Adelaide Vernon, my long time assistant in the Department of Entomology.

Galenara glaucaria (Grossbeck)
Figures 93, 115, 116, 131

Cleora ? glaucaria Grossbeck, 1912: 291.
Galenara glaucaria: Rindge, 1964c: 41 (bibliography, description), figs. 19, 21, 28 (distribution, aedeagus, female genitalia).

The forewings have an upper surface that is covered with a mixture of dark gray, black, and brown scales, with recently caught specimens having a very faint grayish blue tint in certain lights; the cross lines are black, and the outwardly shaded median line is usually sharply angled (fig. 93). The length of the forewings varies from 16 to 20 mm. The male antennae have their longest pectinations 0.8 mm, being 5 times as long as their basal segments, and with the terminal 8 segments simple. The palpi rise to the lower edge of the eyes, and extend between 40 (males) and 50 percent (females) of the length of the eyes in front of the eyes.

In the male genitalia (figs. 115, 116), the uncus has the tapering posterior section without a clearly defined break to the parallel-sided apex, the latter having a small dorsal swelling and two small apical points; the gnathos is tapered to a broadly rounded median point; the sacculus has an inner edging about 0.05 mm width; the anellus has a smooth surface; the vesica has a single large spine whose triangular base occupies about three-fifths of the width of the aedeagus, and whose surface is covered with numerous short spines, and when the vesica is exserted, the spine is pointing ventrally and slightly to the right. The female genitalia (fig. 131) have apophyses posteriores that are from 2.2 to 2.5 mm long; the ductus bursae is sclerotized, widening anteriorly, and broader than long; the corpus bursae has an asymmetrical, sclerotized posterior end with a diagonal posterior margin, the left side being broadly swollen, and the anterior end is enlarged into a diagonal footlike swelling having a partial band of rows of inwardly pointing dentitions.

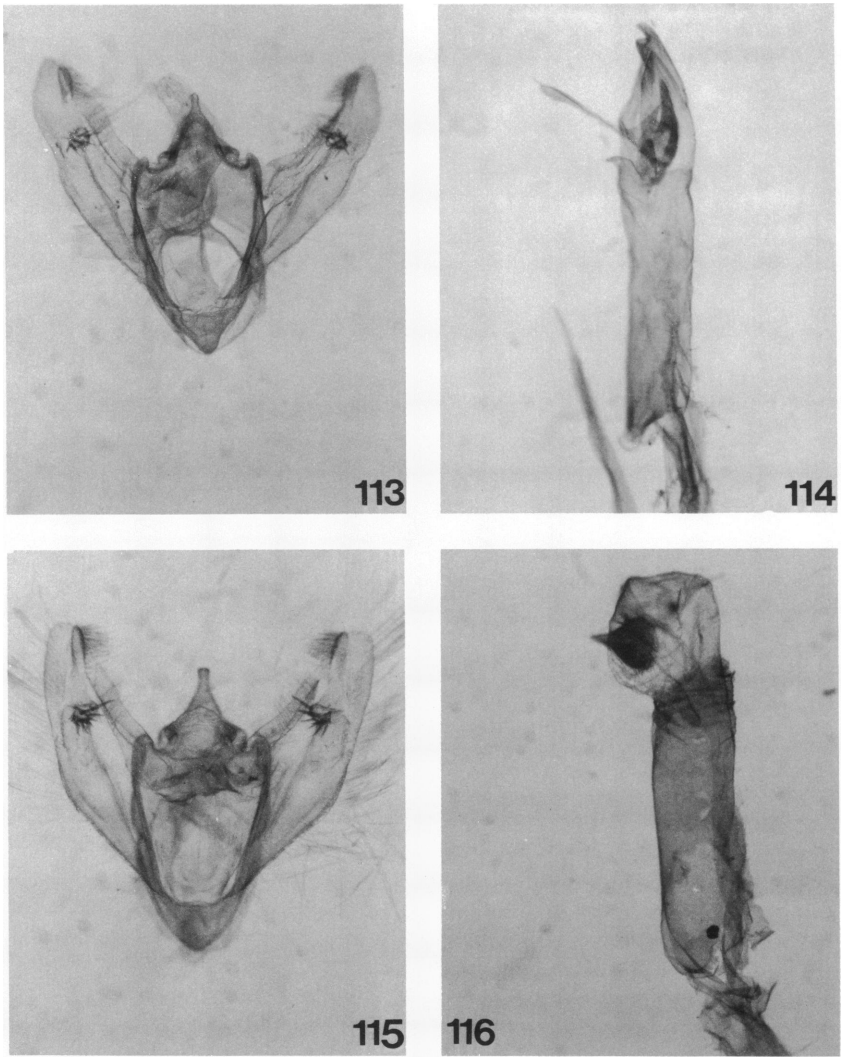
Grossbeck described *glaucaria* from two females; the holotype is in the USNM, and the type locality is Redington, Pima Co., Arizona. The known distribution of the species is southeastern Arizona, with the adults having been captured from mid-February into October.

There are 113 specimens (88 males, 25 females), seven genitalic dissections (4 males, 3 females), and two slide mounts of antennae and legs (1 male, 1 female) before me.

Galenara carina, new species
Figures 94, 117, 118

DIAGNOSIS: This species is similar to *glaucaria*, differing primarily as follows: the upper surface of the forewings is less contrastingly colored, being more of an even gray, and the median line is more narrowly shaded distally and has a stronger basad bend, meeting the t. a. line. The male genitalia differ from the preceding species by the uncus having its terminal portion clearly defined and with but a minute dorsal projection, the gnathos has an evenly tapered median section, the sacculus has the extension from the inner margin obsolescent, the anellus has a prominent longitudinal ridge, and the spine in the vesica has a pointed base and two large lateral spines. (The females have not been examined.)

DESCRIPTION: *Adults*: Head with longest antennal pectinations of males 0.7 mm, being 4 times as long as their basal segments, with terminal 7 segments simple. Palpi rising to one-third height of eye, and extending 35 percent (males) length of eyes in front of eyes.

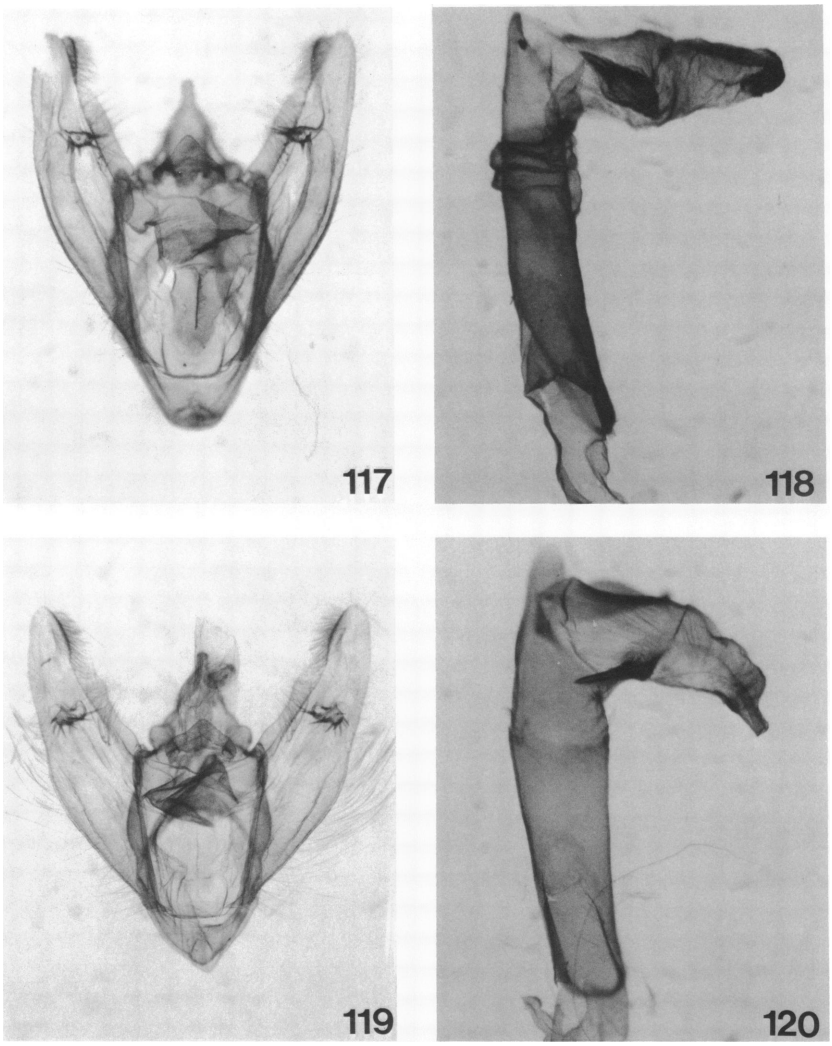


Figs. 113–116. Male genitalia and aedeagi (not to same scale) of *Galenara*. **113**, **114**. *G. vernonae*, new species, holotype. **115**, **116**. *G. glaucaria* (Grossbeck); Arizona.

Forewings unicolorous gray; cross lines black; t. a. line angled outward below costa to radial vein, angled below and in fold, straight in between; median line narrowly shaded distally with grayish black, sharply angled in cell, then broadly concave to anal vein, touching t. a. line in fold, angled basad from anal vein to inner margin; discal dash small; t. p. line somewhat S-shaped, with outward projections on veins in lower part of wing; s. t. line pale, irregular, tending to be partially shaded by black distally. Hind wings gray, with weakly represented extradiscal line and thin black terminal line. Under surface of forewings pale gray, of hind wings grayish white; all wings without maculation except for small discal dots.

Length of Forewings: Holotype, 17 mm.

Male Genitalia (figs. 117, 118): Uncus with terminal portion clearly defined, with parallel sides, a minute dorsal swelling, and two lobate points. Gnathos evenly tapered to blunt point. Valves with small, gently rounded costal swelling; ampulla sharply raised above surface of valve, anterior end 0.05 mm from apex of valve; sacculus broad, flat, with thick-



Figs. 117–120. Male genitalia and aedeagi (not to same scale) of *Galenara*. **117, 118**. *G. carina*, new species, holotype. **119, 120**. *G. lallata* (Hulst); New Mexico.

ened posteromedial margin but without inwardly projecting edging; harpe sclerotized, clearly defined, terminating in erect, elongate swollen process having thick spines apically. Cristae slender, about 8 in number, 0.1 mm long, not prominent. Anellus with prominent longitudinal ridge. Aedeagus 1.8 mm long, 0.3 mm wide; posterior end bluntly pointed; vesica with single spine having pointed base, and with two large lateral spines on opposite sides of central spine; when exserted, vesica extending at about right angle to aedeagus, with spine directed toward apex of aedeagus.

TYPE: Holotype, male, Tepalcates Forest Lookout, 8500 ft, 30.2 mi E El Salto, Durango, Mexico, July 10, 1981 (R. Holland) (fig. 94). The genitalia of the holotype are mounted on slide FHR 19,282A, and one antenna and a set of legs on slide FHR 19,282B.

The holotype is in the collection of the AMNH.

DISTRIBUTION: The mountains of southern Durango, at about 2600 m.

TIME OF FLIGHT: July.

REMARKS: One specimen, one genitalic dis-

section, and one slide mount of an antenna and legs have been studied.

ETYMOLOGY: The specific name is from the Latin *carina*, meaning ridge, keel, in reference to the structure of the anellus.

Galenara engonios, new species
Figures 95, 132

DIAGNOSIS: The upper surface of the forewings is pale gray from the base to the sharply biangulate median line, and darker gray for the remainder of the wing. The female genitalia have very little differentiation between the ductus bursae and the corpus bursae, the ductus seminalis arises dorsally, and the corpus bursae has a large, angled, footlike anterior end. (The males have not been examined.)

DESCRIPTION: *Adults*: Head with palpi rising to lower edge of eyes, and extending 50 percent (females) length of eyes in front of eyes.

Forewings with upper surface pale gray from base to sharply defined, biangulate median line, a mixture of gray and darker gray for remainder of wing; cross lines black; t. a. line deeply outcurved, with strong broad tooth on anal vein, and sharply angled outwardly to inner margin; median line broadly shaded distally with grayish black and then brown, sharply biangulate, going straight from costa into cell, acutely angled and straight to below cubital vein, sharply angled outwardly for short distance, then obliquely outward to inner margin; discal dash small, inconspicuous; t. p. line outwardly angled to end of cell, then weakly concave to inner margin, with strong outwardly pointing projections on veins; s. t. line obsolescent. Hind wings grayish white, slightly darkened distally; without maculation except for trace of minute discal dot and slender terminal line. Under surface of forewings gray, of hind wings pale gray; maculation obsolescent, forewings with faint traces of median and t. p. lines.

Length of Forewings: Holotype, 15 mm.

Female Genitalia (fig. 132): Sterigma with lamella postvaginalis convoluted. Ductus bursae sclerotized, trapezoidal, wider anteriorly than posteriorly, without demarcation between it and corpus bursae, ductus with sclerotized lateral margins. Corpus bursae with asymmetrical posterior end, broadly curved to left, and with prominent bulge on right side, sclerotized, and with small, irregular transverse ridge at approximate junction between ductus bursae and corpus bursae; median section slender; anterior end curved at approximate right angle, elongate, footlike, and having slender, encircling band of short, inwardly projecting denticulations. Ductus seminalis arising from dorsal surface of bulge on right side of posterior end of corpus bursae. Apophyses posteriores 1.7 mm in length; apophyses anteriores 0.9 mm.

TYPE: Holotype, female, Río Guajolote, 2000 m, Municipio Suchixtepec, Oaxaca, Mexico, Nov. 9, 1980 (E. C. Welling) (fig. 95). The genitalia of the holotype are mounted on slide FHR 19,313A, and one antenna and set of legs on slide FHR 19,313B.

The holotype has been deposited in the collection of the AMNH.

DISTRIBUTION: Known only from the type locality in Oaxaca.

TIME OF FLIGHT: November.

REMARKS: One specimen, one genitalic dissection, and one slide mount of an antenna and set of legs have been studied.

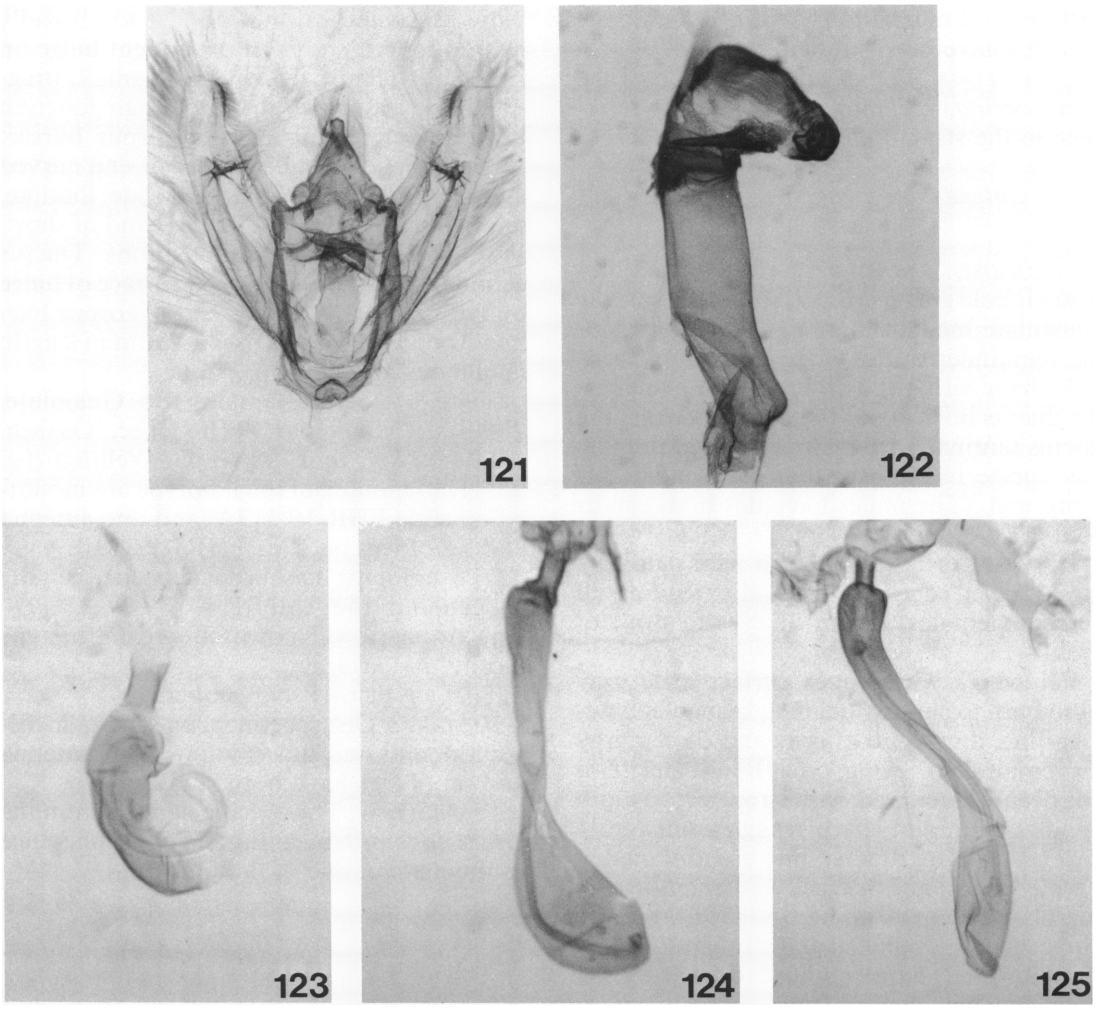
ETYMOLOGY: The specific name is from the Greek *engonios*, meaning angled, in reference to the median line of the forewings.

Galenara lallata (Hulst)
Figures 96, 119, 120, 133

Alcis lallata Hulst, 1898: 193.
Galenara lallata: Rindge, 1964c: 36 (bibliography, description), figs. 18, 19, 27 (male genitalia, distribution, female genitalia).

This is one of the largest species in the genus, with the length of the forewings ranging from 19 to 23 mm. In size, color, and pattern (fig. 96), it is likely to be confused with *lixaria*; see that species, above, for the distinguishing characters. The genitalia of these two species are quite distinct; if in doubt about a determination, a study of a dissection will separate the two.

The male antennae of *lallata* have their longest pectinations 1.1 mm long, being five times as long as their basal segments. The palpi rise from the lower edge (males) to 10 percent (females) of the height of the eyes,



Figs. 121–125. Genitalia of *Galenara*. 121, 122. *G. tlaxcala*, new species, holotype. **121**. Male genitalia. **122**. Aedeagus (not to same scale). 123–125. Female genitalia. **123**. *G. olivacea* Rindge; Arizona. **124**. *G. stenomacra* Rindge; New Mexico. **125**. *G. lixarioides* McDunnough; Arizona.

and extend 50 percent (males and females) of the length of the eyes in front of the eyes.

The great majority of the specimens have the upper surface of the forewings dark grayish brown, with the maculation tending to be somewhat obscure, and with the extradiscal line of the hind wings extending in a more or less straight line across the wings. There are occasional specimens that have the forewings pale gray, with prominent maculation, and with the extradiscal line having a deep curve near the anal margin. Insofar as I can tell the two do not differ in the structures of their genitalia. As the pale specimens fly together with the dark ones, I therefore consider the pale moths to be but a color form of *lallata*.

In the male genitalia (figs. 119, 120) the uncus has a relatively short apical section, with two small lateral points, and the gnathos has the median section rounded or bluntly wedge shaped. The vesica has a single large spine with its slender base being about one-fourth the width of the aedeagus; the base has several small setae or spines that are appressed to the surface of the base and large spine. When exserted the longitudinally striate vesica extends ventrally, with the spine pointing to the left and dorsally. The female

genitalia (fig. 133) have a short sclerotized ductus bursae, slightly wider than long; the corpus bursae has an asymmetrical posterior end with a large membranous swelling to the left side and a smaller sclerotized bulge on the right; the anterior end is broadly swollen, angled, and footlike, with a broad band of inwardly projecting denticulations across the "arch" of the foot; the ductus seminalis arises ventrally from the membranous portion at the posterior end of the corpus bursae.

The last stage larva and pupa were described and illustrated by McGuffin (1967: 12–18, figs. 20–25). The food plants were two species of *Pinus* in Durango.

Even Hulst confused *lixaria* and *lallata* when describing the latter species; he had at least three specimens when naming *lallata* and two of them were *lixaria*. Barnes and McDunnough (1916: 184) designated the lectotype, and it is in the AMNH. The type locality of this species is the San Francisco Mts., Coconino Co., Arizona, elevation 8,000–10,000 ft. The known distribution of this species is the southern Rocky Mountain states of Colorado, Utah, Arizona, and New Mexico, continuing south into Mexico in the Western Sierra Madre Range into Chihuahua and Durango. The adults have been caught in June, July, and August; this probably indicates that the species is single brooded.

There are 241 specimens (187 males, 54 females), 21 genitalic dissections (15 males, 6 females), and three slide mounts of antennae and legs (2 males, 1 female) before me.

Galenara tlaxcala, new species
Figures 97, 121, 122, 134

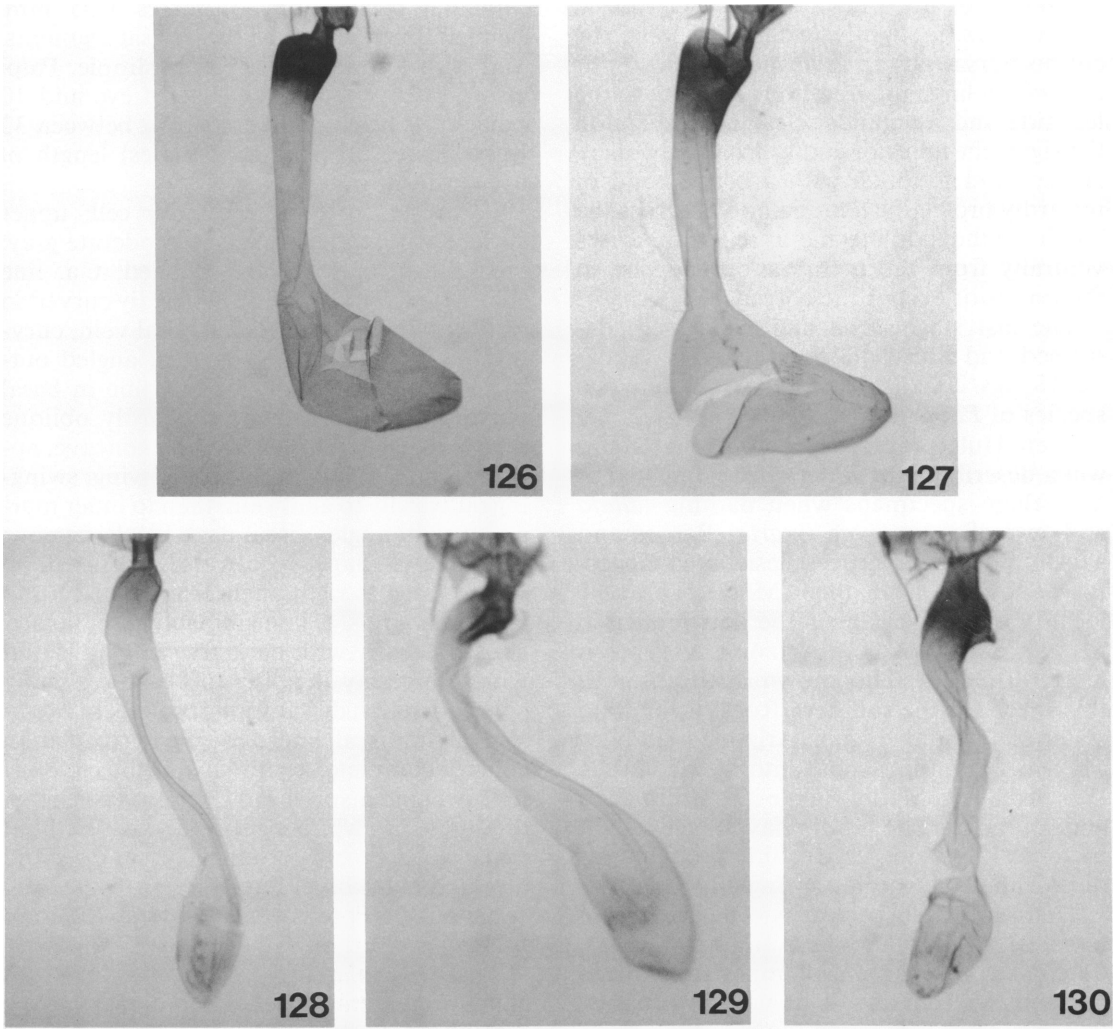
DIAGNOSIS: The upper surface of the forewings is pale to moderate gray, the t. a. line is outwardly curved, the median line is narrowly shaded distally and is quite near the t. a. line, and the t. p. line is S-shaped; the forewings are 20 mm long. The male genitalia have the uncus with a moderate dorsal swelling distally, the gnathos is V-shaped, and the distance from the apex of the valve to the posterior edge of the process of the harpe is 0.6 mm. The female genitalia have the anterior end of the corpus bursae broadly swollen, very deep and relatively short.

DESCRIPTION: *Adults*: Head with longest antennal pectinations of males 1.05 mm, being 6 times as long as their basal segments, and with terminal 6 segments simple. Palpi rising to between lower edge of eye and 10 percent its height, and extending between 33 (males) and 50 percent (females) length of eyes in front of eyes.

Forewings without accessory cell; upper surface varying from pale to moderate gray; cross lines black, clearly defined; t. a. line sharply outwardly oblique, broadly curved in cell, with inward tooth on cubital vein, curving inwardly to anal vein, then angled outward to inner margin; median line in basal portion of median area, outwardly oblique across radial vein, then broadly concave, approaching t. a. line in middle of wing, swinging outwardly to anal vein, then to inner margin at right angle; discal dash black, narrow; t. p. line S-shaped, outwardly pointed on veins, going at right angle from anal vein to inner margin; s. t. line grayish white, lunate, shaded basally with dark gray in cells. Hind wings pale gray, tending to become slightly darker distally; discal spot obsolescent or absent; extradiscal line dull gray, irregular in course, complete; terminal line black, very narrow. Under surface of forewings pale gray, of hind wings whitish gray; all wings without maculation except for small discal dots and t. p. and extradiscal lines.

Length of Forewings: Holotype, 20 mm; paratypes, 20 mm.

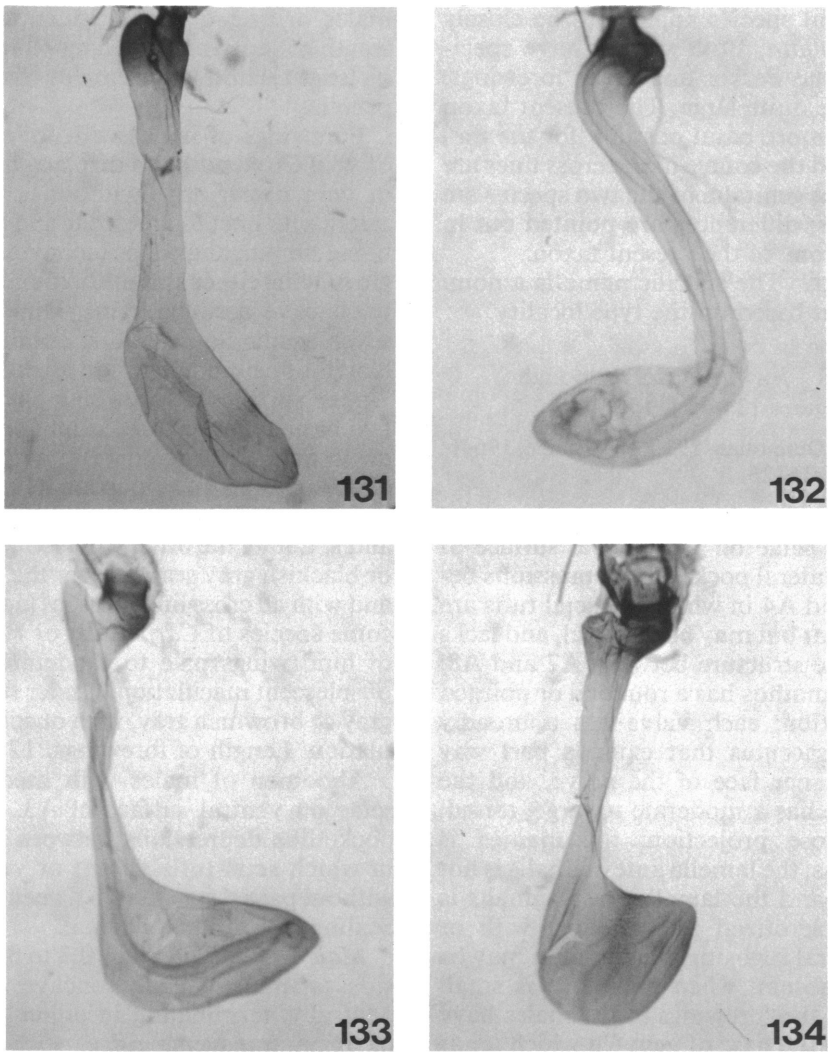
Male Genitalia (figs. 121, 122): Uncus with small to moderate swelling on dorsal surface distally, ventrally with two weak points. Gnathos with median portion V-shaped, bluntly pointed. Valves with moderate costal swelling; length of costa, from base to apex, 1.1 mm (1.3 mm in *lallata*); ampulla sharply raised distally above face of valve; sacculus broad, flat, with thickened posteromedial margin, and having slight triangular swelling into center of valve basad of middle of sacculus; length from apex of valve to posterior edge of process of harpe 0.6 mm (0.70 to 0.75 mm in *lallata*); harpe sclerotized, broad, terminating in elongate, distally swollen process bearing thick spines apically. Cristae slender, about 10 in number, longest 0.3 mm, not prominent. Anellus broadest anteriorly. Aedeagus 2.2 mm long, 0.45 mm wide; posterior end bluntly pointed; vesica with single spine



Figs. 126–130. Female genitalia of *Galenara*. **126**. *G. antilectos*, new species, paratype. **127**. *G. leberasae*, new species, holotype. **128**. *G. lixaria* (Grote); Arizona. **129**. *G. bispicula*, new species, paratype. **130**. *G. phoxe*, new species, holotype.

having elongate, pointed base one-third width of aedeagus, its surface with short spines and with two longer ones appressed to sides of elongate spine; when exserted, longitudinally striate vesica expanded ventrally, with spine directed to left side and dorsally.

Female Genitalia (fig. 134): Sterigma with sclerotized, convoluted area as wide as ductus bursae, situated posteriorly thereof, and being wider than long; lamella postvaginalis with some transverse ribbing posteriad of convoluted area. Ductus bursae sclerotized, with prominent lateral margins, length approximately equal to width, sides converging posteriorly. Corpus bursae with asymmetrical posterior end, left side membranous, broadly swollen but not as wide as ductus bursae, right side sclerotized, swollen, then sharply constricted anteriorly; median portion slender, with weak longitudinal striations; anterior end broadly swollen, very deep and relatively short, with prominent band of inwardly directed denticulations across posterior side and laterally. Apophyses posteriores 2.0 mm in length; apophyses anteriores 1.0 mm.



Figs. 131–134. Female genitalia of *Galenara*. **131**. *G. glaucaria* (Grossbeck); Arizona. **132**. *G. engonios*, new species, holotype. **133**. *G. lallata* (Hulst); Utah. **134**. *G. tlaxcala*, new species, paratype.

TYPES: Holotype, male, Atlamira Guadalupe, 2850 m, Municipio Huamantia, Tlaxcala, Mexico, July 22, 1984 (E. C. Welling) (fig. 97). The genitalia of the holotype are mounted on slide FHR 19,875. Paratypes: Same data as holotype, 1 male, 1 female.

The type series has been deposited in the collection of the AMNH.

DISTRIBUTION: Known only from the type locality.

TIME OF FLIGHT: July.

REMARKS: Three specimens (2 males, 1 female), three genitalic dissections (2 males, 1 female), and one slide mount of an antenna and set of legs (male) have been studied.

The holotype has darker gray forewings than does the paratype male; the median line of the holotype and the paratype female are noticeably closer to the t. a. line than is that of the paler male.

This species flies together with *phoxe*; judging by the condition of the specimens, the latter species may fly somewhat earlier than does *tlaxcala*. The two can be separated from one another by their size, by the course of the cross lines, and by the genitalia.

The present species appears to be closely related to *lallata*. Both species have specimens with the darker and paler forewings, and both are quite large. The present taxon has a much more basal position for the median line, and the course of the cross lines are different. The genitalia of the two species are quite similar; differences are pointed out in the descriptions of the present taxon.

ETYMOLOGY: The specific name is a noun in apposition based on the type locality.

Genus *Vinemina* McDunnough

Figures 135–154, 156–160

Vinemina McDunnough, 1920: 16. Rindge, 1964b: 23–38, figs. 15–26.

DIAGNOSIS: The male abdomen has a median row of setae on the ventral surface of A3, has the lateral pocketlike depressions between A3 and A4 in which the setal tufts are usually absent but may be vestigial, and lacks the comblike structure between A7 and A8; the slender gnathos has a rounded or pointed median section; each valve has a broadly sclerotized sacculus that extends part way across the inner face of the valve, and the broad harpe has a moderate to large, raised, apically setose projection; the manica is membranous; the lamella antevaginalis is not sclerotized, and the lamella postvaginalis is a weakly sclerotized median area with or without lateral rugosities; the signum may be present or absent, when present it is small and curved; the forewings of the males have a fovea near the base of vein Cu which tends to displace the vein posteriorly; and the hind wings have seven veins.

DESCRIPTION: *Adults*: Head with antennae of about 45 to 58 segments; males with terminal 8 to 10 segments simple; longest pectinations 0.7 to 1.1 mm, being between 4 and 6 times as long as their basal segments. Palpi rising to between lower edge of eyes and 25 percent their height in males, up to 33 percent in females, extending in males between 40 and 50 percent length of eyes in front of eyes, and in females between 55 and 60 percent. Eyes of females slightly smaller than those of males.

Forelegs with epiphysis of males arising between 45 and 50 percent length of segment and being 40 to 45 percent its length, of females arising between 55 and 60 percent length of segment and being 40 to 45 percent its length. Hind legs of males with tibial hair pencil.

Forewings of males with fovea near base of vein Cu, tending to displace basal portion of vein posteriorly; without accessory cell, rarely with one; R_1 free; mdc and ldc variable, being curved, angled, or biconvex; outer margin of wing either smoothly rounded or weakly concave between veins. Hind wings with seven veins; Sc extending about 50 percent length of cell; udc and ldc angled or curved. Upper surface of forewings pale gray, with two basic types of maculation: one with little or no dark basal scaling but with broad median band and outer portion of wing more or less darkened, having prominent discal dash and s. t. line, the other suffused with greenish or blackish gray scaling over the entire wing, and with all cross lines present (appearing like some species of *Carphoides* or *Paraphoides*); of hind wings pale to moderate gray, with obsolescent maculation. Under surface either gray or brownish gray, with obsolescent maculation. Length of forewings, 12 to 19 mm.

Abdomen of males with median row of setae on ventral surface of A3, with lateral pocketlike depressions between A3 and A4 in which setal tufts absent or vestigial, and without paired structure between A7 and A8. Scaling of abdomen normal.

Male Genitalia: Uncus 0.3 to 0.4 mm long; sides tapered or weakly concave; apex curved ventrally, terminating in either single point or short transverse ridge, with or without small lateral points. Socius absent. Gnathos slender, sclerotized, with median section rounded or pointed, having posteroventral surface rugose. Each valve with sclerotized costa having small to digitate setose median swelling; ampulla moderate, setose; sacculus smoothly sclerotized, extending inwardly to occupy part of inner face of valve, with or without one or two small triangular processes along median margin, and extending posteriorly to harpe; harpe wide, with moderate to large, raised, apically setose projection. Cristae numbering between about 8 and 50, either tiny or very long, slender, often S-shaped. Anellus lightly sclerotized or membranous, anteriorly enlarged, posteriorly straplike. Manica membranous. Aedeagus 1.7

to 2.1 mm long, 0.3 to 0.4 mm wide; posterior end lightly sclerotized, rounded or pointed. Vesica with single large spine, 0.3 to 1.5 mm long; when exserted, spine usually projected at about right angle to aedeagus, with vesica having several small projections or digitate swellings.

Female Genitalia: Sterigma with lamella antevaginalis membranous; lamella postvaginalis weakly sclerotized in median area, with or without lateral rugosities; ductus bursae short, lightly sclerotized, with length equal to, or slightly longer than, width. Corpus bursae membranous or with variable amount of sclerotization at or near posterior end; slightly curved, with anterior end rounded or weakly enlarged; posterior end curved, symmetrical or asymmetrical with regards attachment of ductus bursae. Ductus seminalis arising from posterior end of corpus bursae, either dorsally or laterally. Signum present or absent; when present, located at anterior end of corpus bursae, and wider than long, having two lateral points. Apophyses posteriores 1.5 to 2.5 mm long; apophyses anteriores 0.8 to 1.5 mm.

EARLY STAGES: Unknown, except for a photograph and accompanying notes by Peterson (1968: 91, fig. 33) for eggs of *V. opacaria* (Hulst).

FOOD PLANTS: Unknown.

TYPE SPECIES: *Cidaria opacaria* Hulst, 1881; by original designation.

DISTRIBUTION: Southwestern United States (Colorado, Utah, Arizona, New Mexico, and western Texas), south into the mountains of Mexico and Guatemala.

TIME OF FLIGHT: March through December.

REMARKS: The species of *Vinemina* are rather variable in color and maculation, and are likely to be confused with members of several other genera. Four of the included species do not have the broad, prominent median band on the forewings and have a more or less reduced pattern; these are similar in facies to certain members of *Anavinemina*, *Carphoides*, *Paraphoides*, and *Astalotesia*. The two species of *Vinemina* with the prominent median band have a general similarity in appearance to *Prionomelia spododea* (Hulst) and its relatives, members of the Boarmiini [see Rindge, 1972, as *Mericisca* (*Merisma*) *spododea*], as well as to *Antiphoides errantaria*.

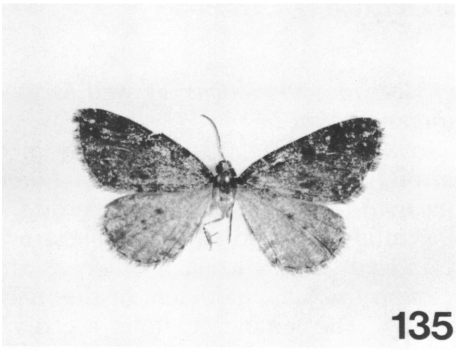
Notwithstanding this variability in maculation, the included members of *Vinemina* appear to form a monophyletic group when the genitalia are studied. The male structures are indeed similar to each other, as are the secondary sexual characters of the male abdomens. The female genitalia are divisible into two groups, more or less comparable to the two color-pattern divisions of the wings. If in doubt as to the identity of a species or of its generic placement, study its genitalia.

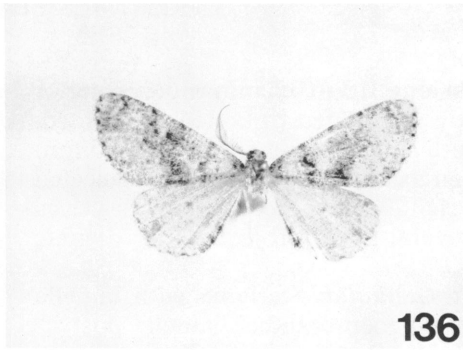
In my 1964 revision, four species were included in the present genus. Additional collecting since then has produced more specimens in the genus, including two previously undescribed species, plus some range extensions for the others; these are given below. New keys have been provided as an aid in recognizing the taxa in this genus.

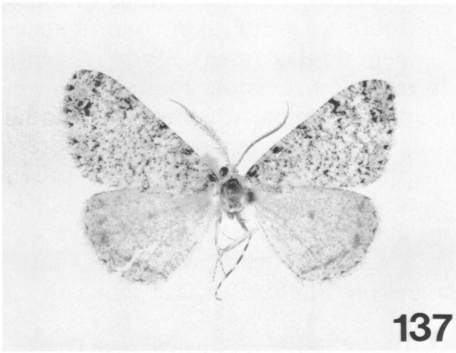
KEY TO SPECIES

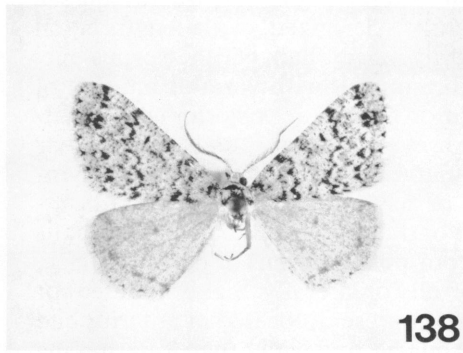
BASED ON MACULATION

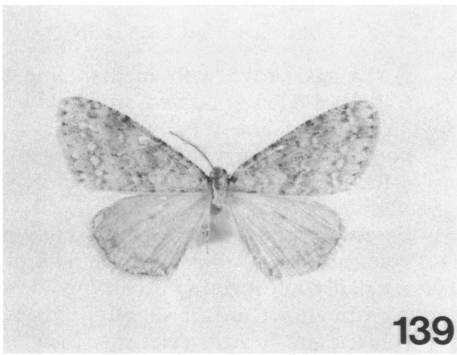
1. Forewings above with median line black, thick, angled or curved, much wider than other crosslines 2
   Forewings above with indistinct maculation, the median line weakly represented or absent 3
2(1). Forewings above with basal area having obsolescent t. a. line curved outwardly but usually not meeting broad median band; entire upper surface slightly suffused with black and brown scales (fig. 142) ..... *opacaria*
   Forewings above with t. a. line usually touching or joining broad median band; upper surface more or less heavily suffused with black and brown scales (fig. 141) ..... *catalina*
3(1). Forewings above pale grayish or faintly grayish green 4
   Forewings above entirely dark olivaceous brown or with at least median area brown 5
4(3). Forewings with median line W-shaped (figs. 139, 140) ..... *olivaria*
   Forewings with median line obsolescent or weakly represented, when present more or less straight or zigzag (fig. 138) .. *perdita*
5(3). Forewings with upper surface predominantly dark olivaceous brown (fig. 135) ..... *muraenata*

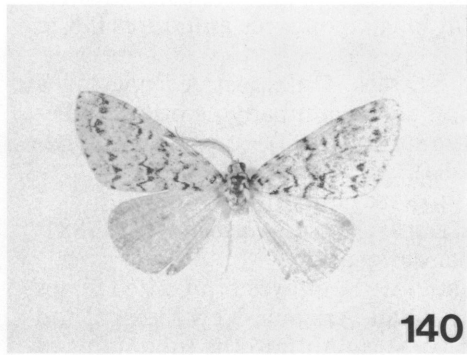


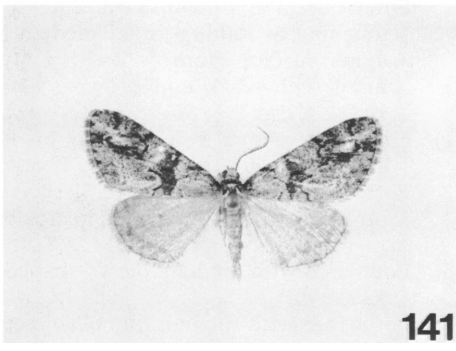


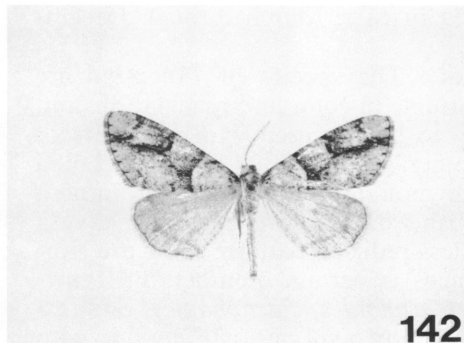












Figs. 135–142. Adult males of *Vinemina*. **135**. *V. muraenata* Rindge; Chiapas, Mexico. **136**. *V. digita*, new species, holotype. **137**, **138**. *V. perdita* Guedet; Cochise Co., Arizona. 139, 140. *V. olivaria*, new species. **139**. Holotype. **140**. Paratype. **141**. *V. catalina* McDunnough; Grant Co., New Mexico. **142**. *V. opacaria* (Hulst); Otero Co., New Mexico. X 1.25.

Forewings with upper surface more or less brown, with considerable gray scaling, but with at least outer part of median area blackish brown (fig. 136) ..... *digita*

BASED ON MALE GENITALIA

1. Valves with costa having small swelling 2
   Valves with costa having elongate digitate projection, in length equal to width of base of uncus, and with numerous elongate terminal setae (fig. 145) ..... *digita*
2(1). Sacculus with slender terminal projection extending over process of harpe (fig. 143) ..... *muraenata*
   Sacculus without terminal projection ... 3
3(2). Vesica with spine relatively short (0.3 to 1.0 mm), straight, broad, and with bifurcate base (fig. 154) ..... *opacaria*
   Vesica with spine relatively long (0.8 to 1.5 mm), straight or with curved apex, slender, with truncate or rounded base ... 4
4(3). Spine of vesica with curved apex (fig. 152) ..... *catalina*
   Spine of vesica straight 5
5(4). Cristae very long, curved, approximately 40 in number (fig. 147) ..... *perdita*
   Cristae short, straight, approximately 10 in number (fig. 149) ..... *olivaria*

BASED ON FEMALE GENITALIA[5]

1. Corpus bursae entirely membranous, or with small sclerotized area on dorsal surface posteriorly 2
   Corpus bursae with prominent sclerotized area completely encircling the structure 3
2(1). Corpus bursae entirely membranous, and with posterior end having ductus seminalis arising from lobe on right side anteriad of ductus bursae; signum present (fig. 156) ..... *muraenata*
   Corpus bursae with small sclerotized area on dorsal surface posteriorly, and with ductus seminalis arising from caudal end of corpus posterodorsally of ductus bursae; signum absent (fig. 157) .... *digita*
3(1). Signum present; ductus seminalis arising to right of ductus bursae (fig. 158) .. *perdita*
   Signum absent; ductus seminalis arising either dorsad of or to left of ductus bursae 4
4(3). Corpus bursae heavily sclerotized for entire posterior one-fourth or one-fifth its length (fig. 160) ..... *opacaria*
   Corpus bursae heavily sclerotized on posterior one-half its length but with posterior end membranous (fig. 159) ..... *catalina*

[5] The females of *olivaria* are not included.

Vinemina muraenata Rindge

Figures 135, 143, 144, 156

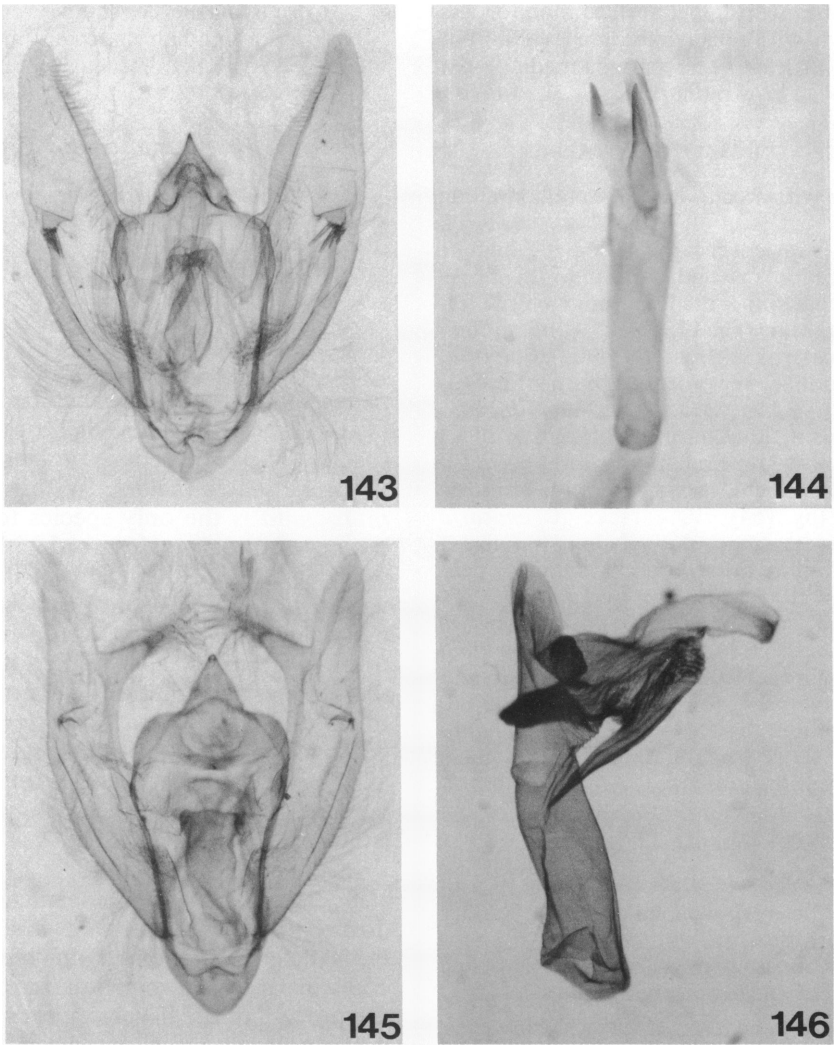
Tephrosia muraena Druce, 1892 (1891–1900): 78 (partim).

Vinemina muraenata Rindge, 1964b: 25, figs 15, 23 (male and female genitalia).

In general appearance this species is very similar to *Anavinemina muraena* (fig. 69)—so much so that Druce included specimens of it in his type series when describing that species. The two species can be separated by the generic characters. Within *Vinemina*, *muraenata* is the only species to have dark brown, or dark brown mixed with gray, forewings (fig. 135). The length of the forewings varies from 14 to 17 mm in Mexican specimens, and from 18 to 21 mm in the moths from Guatemala. The male antennae have their longest pectinations 0.9 mm, being 5.5 times as long as their basal segments. The palpi only rise to the lower margin of the eyes, and they extend between 50 (males) and 55 percent (females) of the length of the eyes in front of the eyes.

In the male genitalia (figs. 143, 144), the slender apical portion of the uncus has a small dorsal ridge, and the apex is a very short transverse ridge; the sacculus terminates laterally in a slender projection that extends over the process of the harpe; there is a very large and prominent group of elongate cristae; and the spine in the vesica is 0.6 mm long and has a rounded base. The female genitalia (fig. 156) have an elongate ostium bursae and a rectangular ductus bursae; the corpus bursae is membranous, with an elongate, tapered portion on the left side joining the ductus bursae, a large, longitudinally ridged swelling on the right side, from whence the ductus seminalis arises, and a slender central and anterior portion, the last having a signum with two lateral points.

I described *muraenata* from a series of nine specimens; the type locality is Totonicapán, Totonicapán, Guatemala, elevation 8500–10,500 ft, and the holotype is in the USNM. The known distribution is the mountains of Guatemala (Totonicapán, Quezaltenango)



Figs. 143–146. Male genitalia and aedeagi (not to same scale) of *Vinemina*. **143, 144.** *V. muraenata* Rindge; Chiapas, Mexico. **145, 146.** *V. digita*, new species, holotype.

and southern Mexico (Chiapas). The three Mexican specimens are smaller than those of the type series from Guatemala.

There are three specimens (2 males, 1 female), three genitalic dissections, and one slide mount of a male antenna and set of legs before me.

Vinemina digita, new species
Figures 136, 145, 146, 157

DIAGNOSIS: The upper surface of the forewings is gray and has a variable amount of dark grayish brown scaling, either in the outer portion of the median area or more or less widespread over the wings. The male genitalia are recognized by the very long, digitate costal process, and the female structures by having the corpus bursae membranous except for a small sclerotized area posterodorsally.

DESCRIPTION: *Adults*: Head with longest antennal pectinations of males 1.1 mm, being 6 times as long as their basal segments, and with terminal 10 segments simple. Palpi rising between 10 (males) and 33 percent (fe-

males) height of eyes, and extending between 50 (males) and 55 percent (females) length of eyes in front of eyes.

Forewings with upper surface gray, with variable amounts of dark grayish brown scaling, being mainly in outer portion of median area (males) to more or less widespread over entire wing except for basal portion of median area and distad of t. p. line (females); cross lines black; t. a. line thick, prominent, with inward angle on cubital vein; median line nebulous, thick, shaded distally, with outward angle on cubital vein; discal dot black, small; t. p. line inwardly oblique to discal dot, sharply curved outwardly, then irregularly concave in lower portion of wing, more clearly defined in male than in female; s. t. line of white dots or lunules, either obsolescent below upper portion of wing (males) or complete (females). Hind wings gray, either slightly (males) or thickly (females) covered with dark gray scaling; discal dot round, dark gray; s. t. line complete, paralleling wing margin, with dark gray area between it and wing margin in middle of wing and broadened at costa, more prominent in females than males; terminal line black, interrupted by veins. Under surface of wings gray, with pattern of upper surface more or less repeated; males with weak dark gray subterminal areas below apex of forewings and in middle of hind wings; females with these areas black, prominent, and having creamy white apex of forewings and dark spot at apex of hind wings.

Length of Forewings: Holotype, 17 mm; paratype, 19 mm.

Male Genitalia (figs. 145, 146): Uncus triangular, without dorsal ridge, apex with two minute points. Gnathos semicircular, of even width, having very small median point projecting ventrally. Valves with very long, digitate costal process, only slightly shorter than width of base of uncus, having group of specialized, curved, flattened, apically truncate scales from each apex, intermingling medially when valves flattened; ampulla a slender ridge, with very few spines; sacculus with straight ridge paralleling edge of valve, with distal portion having median extension in center of valve with raised margin; harpe appearing short, curved outwardly, terminating in elongate, raised process having two or three apical setae. Cristae numerous, prominent, slender, located distad of flat area of anellus with sharp boundary on each side. Anellus lightly sclerotized ventrally, flat; dorsal surface becoming more heavily sclerotized posteriorly, with posterolateral angles projecting ventrally as slender tapering points. Aedeagus 2.1 mm long, 0.35 mm wide; posterior end sclerotized, bluntly pointed, with small, raised, median ridge; vesica with single tapering spine, 1.0 mm long, having rounded crenulate base; when exserted, membranous portion of vesica extended at right angle to aedeagus and anteriad of its posterior end, sac of vesica on right side with longitudinal striations, that on left side smooth, and with spine angled back towards aedeagus.

Female Genitalia (fig. 157): Ostium bursae elongate, funnel-shaped, membranous, with numerous fine, irregular longitudinal ridges. Ductus bursae longer than wide, tapered, lateral margins appearing thickened. Corpus bursae very long, 9.0 mm, slender, membranous except for small sclerotized area dorsally near posterior end in widest part of corpus bursae; with two groups of corneous swollen projections near sclerotized area (these may be adventitious growths); anterior end slightly swollen, bluntly pointed; signum absent. Apophyses posteriores 2.5 mm long; apophyses anteriores 1.5 mm.

TYPES: Holotype, male, Río Guajolote, 2000 m, Municipio Suchixtepec, Oaxaca, Mexico, Nov. 9, 1980 (E. C. Welling) (fig. 136). The genitalia of the holotype are mounted on slide FHR 19,385A, and one antenna and a set of legs are on slide FHR 19,385B. Paratype: Paradera de Mika, 2000 m, Mpio. Yolox, Oaxaca, Mexico, Nov. 14, 1980 (E. C. Welling), 1 female.

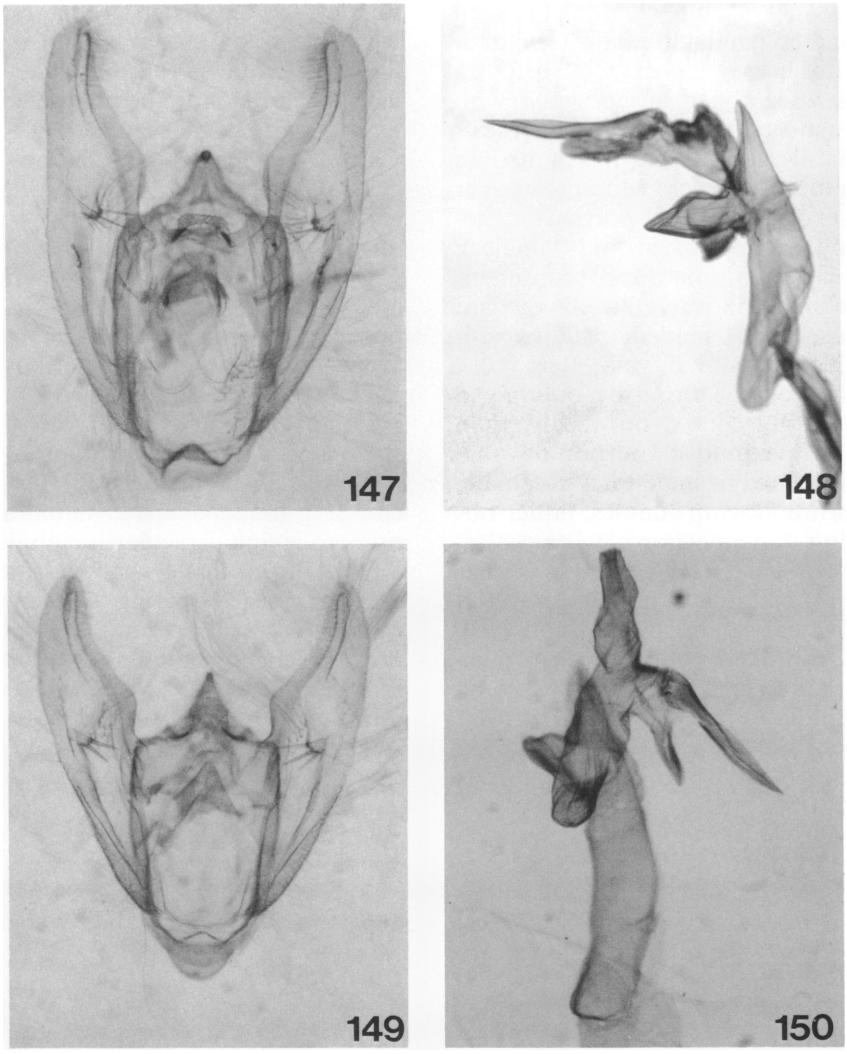
Both specimens have been deposited in the AMNH.

DISTRIBUTION: The mountains of Oaxaca.

TIME OF FLIGHT: November.

REMARKS: Two specimens, two genitalic dissections, and two slide mounts of antennae and legs have been studied.

This species is unique in the genus, as it is the only known taxon that has marked sexual dimorphism in wing coloration, the very small median enlargement of the gnathos, the digitate costal projection from the valves with their specialized, flattened setae, and the very long corpus bursae.



Figs. 147–150. Male genitalia and aedeagi (not to same scale) of *Vinemina*. **147**, **148**. *V. perdita* Guedet; Arizona. **149**, **150**. *V. olivaria*, new species, paratype.

ETYMOLOGY: The specific name is from the Latin *digitus*, meaning finger, in relation to the shape of the costal process.

Vinemina perdita Guedet
Figures 137, 138, 147, 148, 158

Vinemina perdita Guedet, 1939: 34. Rindge, 1964b: 28, figs. 17, 21, 24 (aedeagus, distribution, female genitalia).

This species differs from all others in the genus in having the upper surface of the forewings pale gray or faintly grayish green (in fresh specimens), with an even, overall type of maculation; the cross lines are usually indistinct, but an occasional specimen will have relatively distinct cross lines, and they tend to more or less zigzag in nature (figs. 137, 138). The length of the forewings varies from 15 to 19 mm. The male antennae have their longest pectinations 0.8 mm, being 4.5 times as long as their basal segments. The palpi only rise to the lower margin of the eyes, and they extend between 50 (males) and 60 percent (females) of the length of the eyes in front of the eyes.

In the male genitalia (figs. 147, 148) the uncus is sharply curved ventrally, and the apex is a single point; the costal swelling is large, and has a small anteromedian depression; the sacculus has some small, asymmetrical raised ridges posteromedially; there is a large group of elongate, curved cristae; the spine in the vesica is 1.0 to 1.1 mm long and has a swollen base, and when exserted the spine points away from the aedeagus at a right angle. The female genitalia (fig. 158) have an elongate ostium bursae, and a rectangular ductus bursae that is about twice as long as wide; the corpus bursae is membranous except for a sclerotized and punctate area on the right side posteriorly at about one-fourth the distance from the posterior end, the sclerotized area extending across the ventral surface to the left side and slightly anteriad; the corpus bursae has some longitudinal striations, and a small, flat, two pointed signum; the ductus seminalis arises from the posterior end of the corpus bursae dorsad of the ductus bursae.

The holotype is in the CAS (no. 4796), and is from Fly's Peak, Chiricahua Mts., Cochise Co., Arizona, at elevations of from 8000 to 9000 ft (2439 to 2744 m). The known distribution is in Cochise Co., Arizona, having been taken in July and August.

There are six specimens (5 males, 1 female), five genitalic dissections (4 males, 1 female), and two slide mounts (1 male, 1 female) of antennae and legs before me. Of these five males (including one paratype), four have a very indistinct pattern on the upper surface of the forewings, while the other has very definite cross lines, with a zigzag t. p. line. The single female tends to have obsolescent maculation, but it is more prominent than the four males.

Also before me is a single female labeled "9 mi. WSW of San Jose de Babicora, Chihuahua State, Mexico, 20 VII 1985," and "collected at UV light R. S. Wielgus." Unfortunately this specimen was damaged when it was sent to me; the antennae and abdomen are missing. The wings are in beautiful condition, with the upper surface of the forewings being a mottled greenish gray and pale gray, with black, zigzag median and t. p. lines, a row of dots for the s. t. line, and an incomplete t. a. line. While the maculation is similar to that of the one clearly marked Arizona male, there are several differences; this leads one to believe that this specimen represents an undescribed species. However, until more material comes to hand, and the genitalia can be studied, it will have to remain unplaced.

Vinemina olivaria, new species

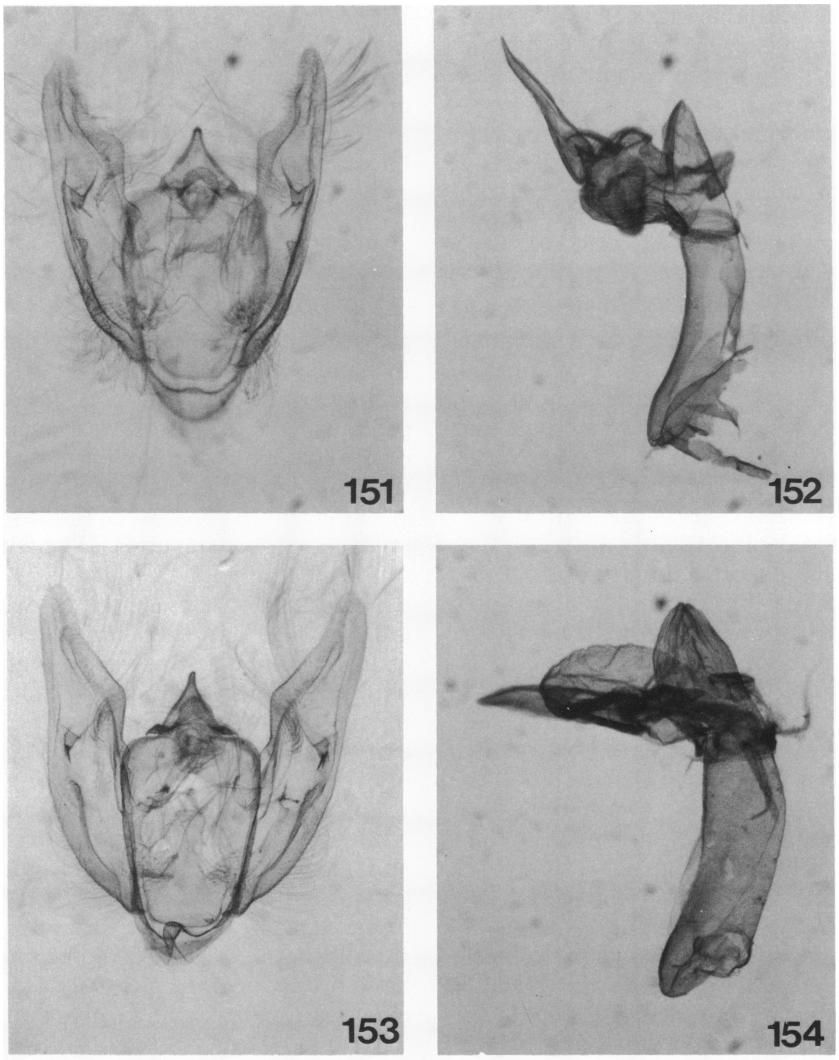
Figures 139, 140, 149, 150

DIAGNOSIS: The upper surface of the forewings has a mixture of grayish white and grayish green scales, tending to be arranged in bands, and either with or without black scaling to emphasize the cross lines. The male genitalia have the costal swelling near the base of the costa, a group of very long setae from the inner face of the valve between the costal swelling and the process of the harpe, and the cristae are inconspicuous. (The females have not been studied.)

DESCRIPTION: *Adults*: Head with longest antennal pectinations of males 1.1 mm, being 6 times as long as their basal segments, and with terminal 10 segments simple. Palpi rising to 10 percent (males) height of eyes, and extending 50 percent length of eyes in front of eyes.

Forewings with upper surface grayish white, with grayish green or dull olivaceous scaling and bands; cross lines either indicated by grayish green bands or by being edged by black scales; t. a. line broadly geminate, sharply pointed inwardly on veins; median band broad, biconvex; discal dash moderate, elongate; t. p. line white, with or without black basal line, sharply pointed outwardly on all veins; subterminal area grayish white, broad, complete; s. t. line of white dots, inwardly bordered with either grayish green or black; terminal line of dark cellular spots. Hind wings pale gray, heavily covered with dark gray scaling; without maculation except for round gray discal spot, partial s. t. line, and incomplete terminal line. Under surface of wings gray, forewings more heavily suffused with darker gray than hind wings; maculation of forewings obsolescent, with small discal dot, s. t. line a row of whitish dots, and with or without grayish black scaling in terminal area below whitish apex; of hind wings similar to upper surface.

Length of forewings: Holotype, 17 mm; paratypes, 17 to 18 mm.



Figs. 151–154. Male genitalia and aedeagi (not to same scale) of *Vinemina*. **151, 152.** *V. catalina* McDunnough; Durango, Mexico. **153, 154.** *V. opacaria* (Hulst); Sonora, Mexico.

Male Genitalia (figs. 149, 150): Uncus with sides weakly concave, apically slender, apex with two small lateral points. Gnathos with large median area having parallel sides, apically bluntly rounded; dorsal surface with short, evenly spaced denticulations. Valves with prominent costal swelling near base of costa; ampulla an elongate, raised ridge; sacculus with pointed ridge running diagonally towards edge of valve near end of sacculus, inner margin with raised ridge; harpe with slightly raised process having from 3 to 5 apical setae, all of same size or with larger and smaller ones; area between process of harpe and costal swelling on inner surface of valve with group of very long, slender, S-shaped setae. Cristae slender, about 18 in number, not conspicuous. Anellus broad, lightly sclerotized. Aedeagus 1.7 mm long, 0.3 mm wide, and curved; posterior end bluntly pointed; vesica with single, apically tapering spine, 0.7 to 0.9 mm long, having slightly swollen base; when exserted, membranous portion of vesica with two basal sacs, two larger posterior sacs more or less paralleling axis of aedeagus, one anteriad, the oth-

er posteriad, and with spine between them, pointing away from aedeagus.

TYPES: Holotype, male, Zapotitlán, Municipio Río Hondo, Oaxaca, Mexico, Nov. 12, 1980 (E. C. Welling) (fig. 139). The genitalia of the holotype are mounted on slide FHR 19,354A, and one antenna and a set of legs are on slide FHR 19,354B. Paratypes: Same data as holotype, 2 males.

The type specimens have been deposited in the AMNH.

DISTRIBUTION: The mountains of Oaxaca.

TIME OF FLIGHT: November.

REMARKS: Three males, three genitalic dissections, and three slide mounts of antennae and legs have been studied.

The holotype (fig. 139) and one paratype have practically no black scaling on the upper surface of the forewings, whereas the other paratype (fig. 140) has the cross lines prominently marked with black.

ETYMOLOGY: The specific name is from the Latin *olivarius*, meaning of or pertaining to olives, in reference to the color of the wings.

Vinemina catalina McDunnough
Figures 141, 151, 152, 159

Vinemina catalina McDunnough, 1945: 98, fig. 4 (aedeagus). Rindge, 1964b: 35, figs. 20, 21, 26 (aedeagus, distribution, female genitalia).

This species differs from all the preceding ones by having the upper surface of the forewings grayish white, suffused with black and dark brown scales, and with a broad, prominent, black median band; the slender t. a. line either touches or closely approaches the median band (fig. 141). The length of the forewings varies from 12 to 18 mm. The male antennae have their longest pectinations 0.7 mm, being 4 times as long as their basal segments. The palpi rise to 10 percent of the height of the eyes, and they extend between 40 (males) and 50 percent (females) of the length of the eyes in front of the eyes.

In the male genitalia (figs. 151, 152) the slender, ventrally curved apical portion of the uncus has a small dorsal ridge, and the apex a slightly concave rim; the costa has a median swelling; the sacculus has a small, erect, laterally flattened projection having a few short, slender distal setae; the process of the harpe is slender and usually has two or three apical spines; the cristae number about 30 on each side, and are very long and curved; the spine in the vesica is long and slender, 1.0 to 1.5 mm in length, the apex is curved, and the base is slightly enlarged and appears hollow; when exserted, the membranous portion of the vesica has several small sacs, is longitudinally striated in part, and the spine may extend posteriorly. The female genitalia (fig. 159) have an elongate corpus bursae that is sclerotized from approximately the middle to about nine-tenths its length, with the posterior end being membranous; the anterior end may be slightly swollen and have some concentric lines or ridges.

The holotype, male, is in the CNC (no. 5569); the type locality is the Santa Catalina Mts., Pima Co., Arizona. The known distribution is Arizona, New Mexico and western Texas, extending south into Mexico in the Western Sierra Madre Mountains, having been taken in Sonora, Durango, and Hidalgo. Nearly all the specimens have been caught from about mid-June to mid-August; a few are dated March and September.

The Hidalgo specimens are two females from Cuesta Colorado, 8500 ft (W. Howe). The one dated Mar. 8, 1978 is quite similar to specimens from the north, although there is but little dark scaling basad of the median line, and the t. a. line does not reach the median band. The specimen dated Sept. 2, 1978 has the upper surface of the forewings heavily suffused with olivaceous and brown scales. The genitalia of both appear to fall within the range of normal variation of *catalina*.

There are 185 specimens (132 males, 53 females), 20 genitalic dissections (12 males, 8 females), one male wing slide, and seven slide mounts (2 males, 5 females) of antennae and legs before me.

Vinemina opacaria (Hulst)
Figures 142, 153, 154, 160

Cidaria opacaria Hulst, 1881: 27.

Vinemina opacaria: Rindge, 1964b: 31 (bibliography, synonymy, description), figs. 2, 16, 18, 19, 22, 25 (hind wing venation, male genitalia, aedeagi distribution, female genitalia).

Vinemina opacaria nigaria Cassino, 1928: 95.

Hydriomena delfini Beutelspacher, 1984: 218, figs. 2, 7 (adult, male genitalia). NEW SYNONYMY; new combination.

This species is very similar in appearance to *catalina*, although it tends to be larger; the length of the forewings ranges from 14 to 19 mm. The upper surface of the primaries is less heavily shaded with dark scaling than in the preceding species, and the t. a. line is usually absent but when present it does not touch the broad, prominent, black median band (fig. 142). The male antennae have their longest pectinations 0.7 mm, being 4 times as long as their basal segments. The palpi rise to 25 percent of the height of the eyes in front of the eyes, and they extend between 50 (males) and 60 percent (females) of the length of the eyes in front of the eyes.

The male genitalia (figs. 153, 154) differ from those of *catalina* by the longer and more numerous cristae, and by the spine in the vesica being shorter and thicker, and having a bifurcate base. The length is variable within *opacaria*, as it ranges from 0.31 to 1.06 mm: see table 1 in my previous paper (1964b: 36) for lengths and widths listed by localities. When exserted, the spine projects at almost a right angle away from the aedeagus. The female genitalia of *opacaria* (fig. 160) have an elongate corpus bursae in which only the posterior one-fifth is sclerotized. The apophyses are longer in the present species than in *catalina*, as the apophyses posteriores are 2.1 to 2.2 mm long (1.50 to 1.75 mm), and the apophyses anteriores are 1.0 to 1.1 mm (0.8 mm).

I designated a male as the lectotype in the AMNH (1964b: 34); it is from Colorado. The holotype male of *nigaria* is in the MCZ, and is from Alpine, Brewster Co., Texas. The known distribution is Colorado, Utah, and Arizona, extending into western Texas and south into Sonora, Chihuahua, Durango, and the Distrito Federal, Mexico. The moths have been caught from late March into September.

Hydriomena delfini Beutelspacher is of interest for several reasons, not the least of which is that it was described in the Larentiinae. It also extends the distribution of *opacaria* farther to the south, as the previous known range was as far as the mountains of Durango. The holotype was caught in the Cerra del Ajusco, Distrito Federal, in late June, and has been deposited in the Instituto de Biología, UNAM. I have not studied it, but the figures of the holotype and the crude sketch of its genitalia leave very little doubt as to the proper placement of this name. The apparent lack of a t. a. line, plus the vague outline of a short spine in the aedeagus preclude the possibility of the species being *catalina*.

There are 776 specimens (549 males, 227 females), 54 gentalic dissections (45 males, 9 females), one male wing slide, and five slide mounts (3 males, 2 females) of antennae and legs before me.

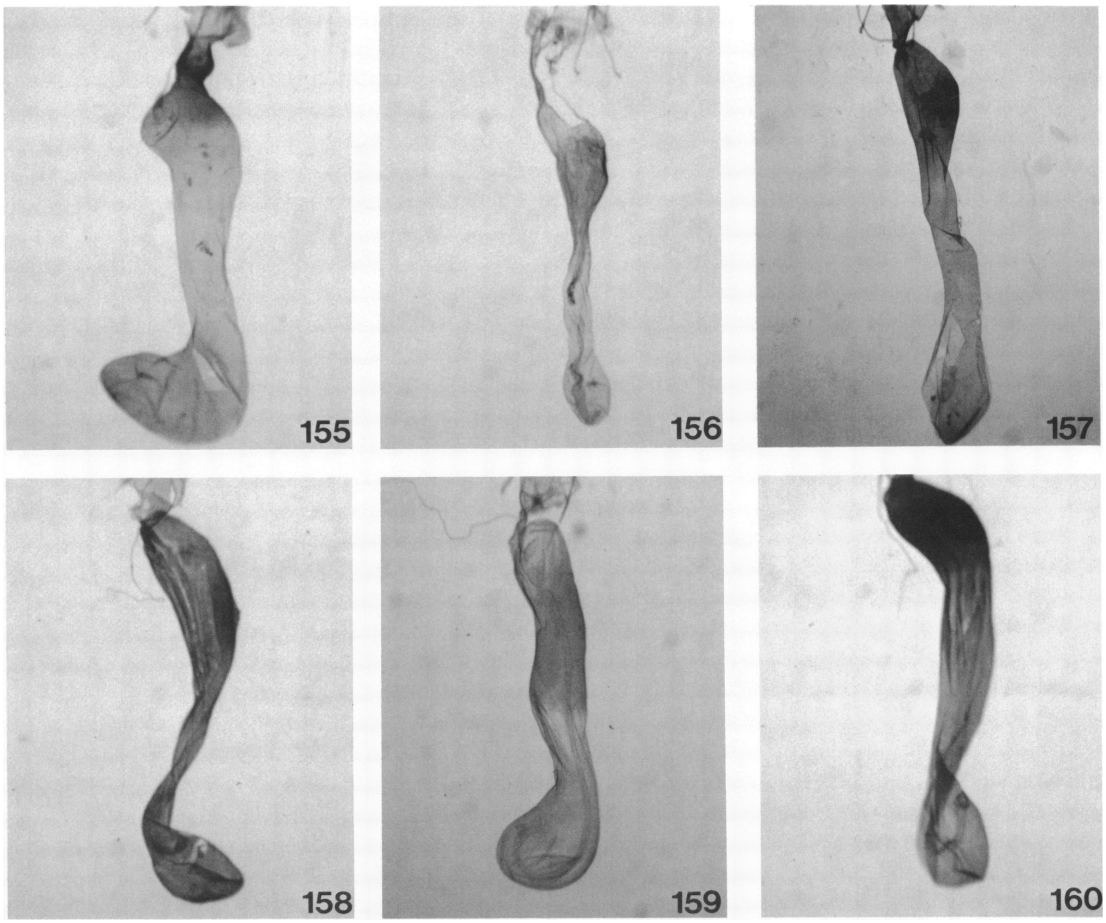
Tesiophora, new genus
Figures 9, 10, 161–182

DIAGNOSIS: The male abdomen has a median row of setae on the ventral surface of A3, a small pocketlike indentation with a few elongate setae on each side between segments A3 and A4, and a prominent comblike paired structure between A7 and A8; the uncus is thick anteriorly, with the more slender distal portion arising dorsally; the gnathos has an elongate, slender, tapered median portion; each valve has an armlike costa, attached anteriorly, that extends beyond the distal end of the valve, and the posterior end of the sacculus has a large, semicircular, outwardly spinose process; the manica is membranous; the lamella antevaginalis is relatively small and rugose, the lamella postvaginalis is usually large and more or less trilobed, with the area enclosed by the lamellae bearing numerous setae; the signum is absent; and the hind wings have seven veins.

DESCRIPTION: *Adults*: Head with antennae of about 53 to 64 segments; males with terminal 6 to 9 segments simple; longest pectinations 0.55 to 0.80 mm, being between 3 and 4 times as long as their basal segments. Palpi rising to between 25 to 33 percent height of eyes, extending in males between 25 and 50 percent length of eyes in front of eyes, and in females between 33 and 50 percent. Eyes of females smaller than those of males.

Forelegs with epiphysis of males arising between 50 and 55 percent length of segment and being from 53 to 60 percent its length, of females arising about 60 percent length of segment and being 40 to 45 percent its length. Hind legs of males with tibial hair pencil.

Forewings either without or with one accessory cell, when present weakly defined; R_1 free; mdc and ldc weakly to moderately curved; outer margin of wing smooth or

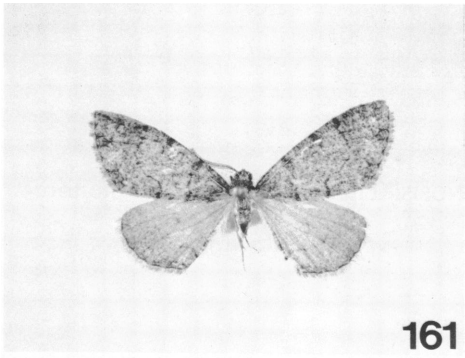


Figs. 155–160. Female genitalia. **155**. *Anavinemina muraena* (Druce); Oaxaca, Mexico. **156**. *Vinemina muraenata* Rindge; Chiapas, Mexico. **157**. *V. digita*, new species, paratype. **158**. *V. perdita* Guedet; Arizona. **159**. *V. catalina* McDunnough; Durango, Mexico. **160**. *V. opacaria* (Hulst); Arizona.

slightly concave between veins. Hind wings with seven veins; Sc extending 45 to 50 percent length of cell; udc and ldc straight, curved, or angled. Upper surface of forewings gray, brown, or dark brown, maculation indistinct but with median area often paler than basal and distal portions; hind wings pale gray or brown, with obsolescent maculation. Under surface pale gray or grayish brown, hind wings slightly paler than forewings, with obsolescent maculation. Length of forewings, 14 to 19 mm.

Abdomen of males with median row of setae on ventral surface of A3, with small pocketlike indentation with a few elongate setae on each side between A3 and A4, and with prominent comblike paired structure between A7 and A8 consisting of many, very long, slender, modified setae with their distal ends curved and flattened, becoming several times as wide as stem of setae (figs. 9, 10). Scaling of abdomen normal.

Male Genitalia: Uncus thickened medioanteriorly, with narrower, more slender distal portion arising dorsally, apically swollen, somewhat hoodlike, terminating either in single point or as transverse ridge; sides concave. Socius as lateral setae on thickened portion of uncus. Gnathos prominently convex between base of uncus and tegumen; medially heavily sclerotized, with elongate, slender, tapered projection terminating in point. Each valve with sclerotized costa having slight, weakly setose swelling medially, extending distally as thickly setose free arm, attached anteriorly, extending beyond end of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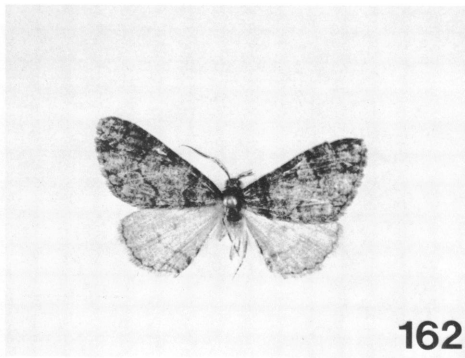
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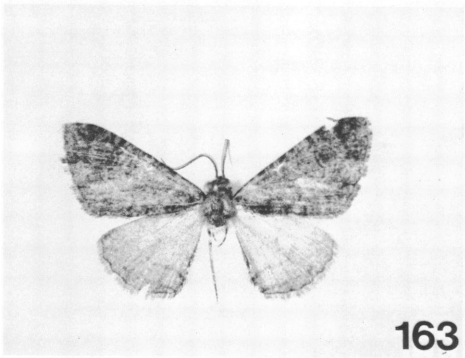
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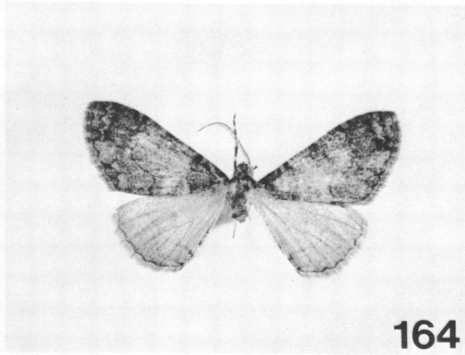
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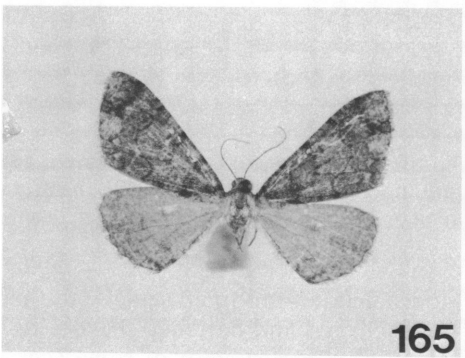
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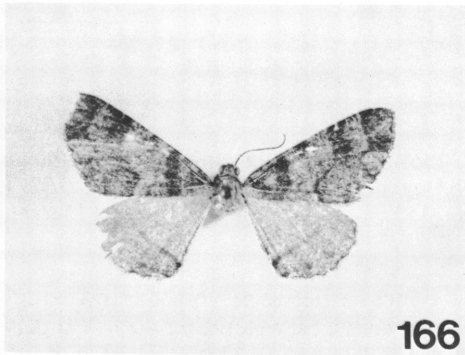
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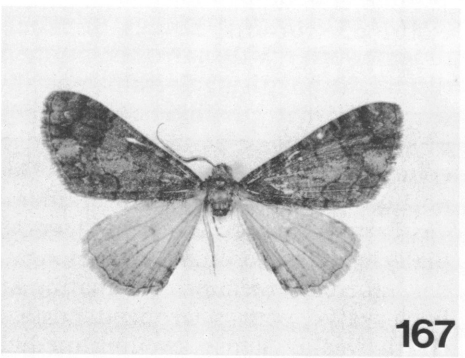
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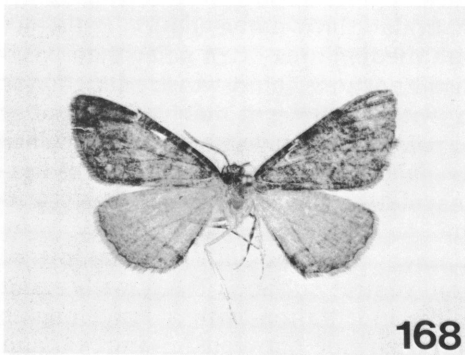
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valve; ampulla absent; sacculus broadly sclerotized, swollen, terminating about middle of outer margin of valve as point or projection, with large symmetrical or asymmetrical, semicircular, outwardly spinose process near its distal end; harpe weakly sclerotized or membranous. Cristae absent. Anellus elongate, deeply bifurcate. Manica membranous. Aedeagus 1.5 to 2.0 mm long, 0.35 to 0.40 mm wide; curved, posterior end slender, sclerotized. Vesica with either a group of numerous slender spines or an elongate plate, 0.3 to 0.5 mm long; when exserted, sharply recurved, with one or more small sacs, and with spines or plate projecting towards aedeagus at right angle.

Female Genitalia: Sterigma with lamella antevaginalis relatively small and rugose; lamella postvaginalis usually large, heavily sclerotized, and more or less trilobed; swollen area enclosed by lamellae bearing numerous setae. Ductus bursae membranous or lightly sclerotized, short, with length equal to width or with length about twice width. Corpus bursae membranous, slightly curved or with footlike anterior end; posterior end asymmetrical, membranous or with small area of weak sclerotization. Ductus seminalis arising from posterior end of corpus bursae, from either ventral or dorsal surface. Signum absent; anterior portion of corpus bursae with bands of minute spicules and/or transverse, encircling, small ridges. Apophyses posteriores 1.8 to 3.0 mm long; apophyses anteriores 0.8 to 1.6 mm.

EARLY STAGES: Unknown.

FOOD PLANTS: Unknown.

TYPE SPECIES: *Tephrosia humidaria* Schaus, "1900" [1901].

DISTRIBUTION: Southwestern United States (western Texas, New Mexico) and the mountains of Mexico, being found in the Eastern Sierra Madre and the Transverse Volcanic Belt, south through Oaxaca in the Southern Sierra Madre, the Chiapas Central Massif, and into Guatemala (Chimaltenango).

TIME OF FLIGHT: March through August, and October into December.

REMARKS: Based on the male genitalia, this is one of the most distinctive genera in the tribe. The autapomorphic characters include the uncus with its medioanterior swelling, the free costal arms, the absence of the ampulla, and the semicircular spinose process at the end of the sacculus. It is premature to list the female genitalic characteristics, as only four of the seven species are known from that sex.

Tesiophora includes seven species, six of which are being described as new; the only previously named taxon is *Tephrosia humidaria* Schaus.

ETYMOLOGY: The generic name is an anagram of *Pherotesia*; the gender is feminine.

KEY TO SPECIES

BASED ON EXTERNAL CHARACTERS AND DISTRIBUTION

1. Upper surface of forewings pale gray with black scaling; New Mexico and Texas (fig. 161) ..... *entephros*
   Upper surface of forewings not as above; Mexican 2
2(1). Upper surface of forewings dark gray, heavily suffused with black; San Luis Potosí (fig. 162) ..... *aquila*
   Upper surface of forewings brown or brownish gray 3
3(2). Palpi projecting 40 to 50% length of eyes in front of eyes 4
   Palpi projecting 25 to 30% length of eyes in front of eyes 6
4(3). Both surfaces of hind wings with discal spots; Oaxaca 5
   Both surfaces of hind wings without discal spots; Chiapas (fig. 168) ..... *exallos*
5(4). Upper surface of forewings gray with reddish brown and blackish brown scaling (fig. 163); front mottled with brown and black scales ..... *cerezal*

←

Figs. 161–168. Adults of *Tesiophora*. **161**. *T. entephros*, new species, holotype, male. **162**. *T. aquila*, new species, holotype, male. **163**. *T. cerezal*, new species, holotype, male. 164, 165. *T. humidaria* (Schaus). **164**. Lectotype, male (USNM). **165**. Female, Puebla, Mexico. **166**. *T. orthe*, new species, holotype, female. **167**. *T. pulla*, new species, holotype, male. **168**. *T. exallos*, new species, holotype, male. X 1.2.

Upper surface of forewings blackish brown (fig. 167); front with broad black band across top ..... *pulla*

6(3). Both surfaces of hind wings with straight, broad, extra discal line extending across wing (fig. 166); Tamaulipas ..... *orthe*

Both surfaces of hind wings with curved, narrow, extra discal line extending part way across wings (figs. 164, 165); eastern Mexico ..... *humidaria*

BASED ON MALE GENITALIA[6]

1. Valves asymmetrical (fig. 178) .... *exallos*

Valves symmetrical 2

2(1). Sacculus 1.2 to 1.5 mm long, with distal end rounded 3

Sacculus 1.6 to 1.7 mm long, with distal end angled 4

3(2). Transverse group of spines in vesica 0.2 mm long (figs. 173, 174) ..... *entephros*

Transverse group of spines in vesica 0.4 mm long (figs. 171, 172) ..... *aquila*

4(2). Uncus with apex angled ventrally, terminating in elongate, prominent point, and with width of apex slightly wider than posterior portion of projecting medioanterior area 5

Uncus with apex curved, terminating in small point, and with width of apex slightly narrower than posterior portion of projecting medioanterior area (fig. 177) .. *humidaria*

5(4). Transverse group of spines in vesica 0.3 mm long (figs. 175, 176) ..... *pulla*

Transverse group of spines in vesica 0.5 mm long (figs. 173, 174) ..... *cerezal*

BASED ON FEMALE GENITALIA[7]

1. Lamella postvaginalis membranous (fig. 180); apophyses posteriores 1.8 to 2.0 mm long ..... *cerezal*

Lamella postvaginalis sclerotized; apophyses posteriores 2.6 to 3.0 mm long 2

2(1). Corpus bursae curved, C-shaped, with anterior end slightly swollen (fig. 179) .... *aquila*

Corpus bursae straight, with anterior end not swollen 3

3(2). Lamella postvaginalis trilobed, with each part of approximately equal size and having scalloped posterior margin (fig. 181) ..... *humidaria*

Lamella postvaginalis more or less triangular, not as above (fig. 182) ..... *orthe*

[6] The males of *orthe* are not included.

[7] The females of *entephros*, *exallos*, and *pulla* are not included.

Tesiophora entephros, new species

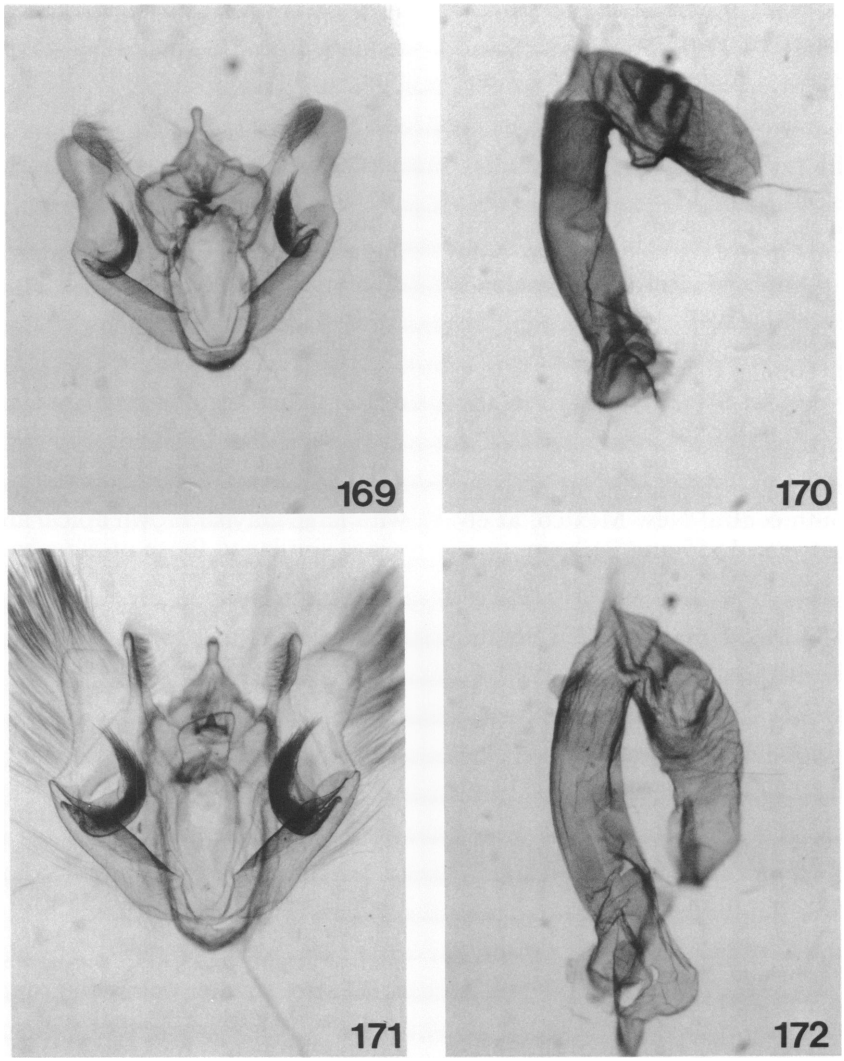
Figures 10, 161, 169, 170

DIAGNOSIS: The upper surface of the forewings is pale gray with scattered black scaling, and with the t. a. and t. p. lines thin or partially obsolescent. The males have long palpi, as they extend about 50 percent the length of the eyes in front of the eyes. In the male genitalia, the sacculus is relatively short (1.2 to 1.4 mm) and has the distal end rounded; the transverse group of spines in the vesica is 0.2 mm long. (The females have not been studied.)

DESCRIPTION: *Adults*: Head with longest antennal pectinations of males 0.55 to 0.60 mm, being 3 times as long as their basal segments, and with about the terminal 6 segments simple. Palpi rising to 15 percent height of eyes, and extending 50 percent (males) length of eyes in front of eyes.

Forewings with upper surface pale gray with scattered black scaling; maculation weakly defined, with t. a. and t. p. lines grayish black, thin or partially obsolescent; median area tending to be slightly paler than adjacent areas; t. a. line either single or with broad basal shade line, varying from straight to slightly outwardly curved; median line absent or represented on costa by dark spot; discal spot small; t. p. line S-shaped, slightly thickened and irregular in upper portion of wing and with some black scaling distally in subterminal area; s. t. line obsolescent or absent, when present in form of a few gray spots, some specimens with dark, outwardly curved band or row of scales below costa and basad of s. t. line; terminal line of small, black, intravenular dots, those in cells M_1 and M_2 extending inward to s. t. line. Hind wings pale gray with darker gray scaling; minute discal dot present or absent; partial extradiscal line present in lower portion of wing; terminal line grayish black. Under surface of wings gray, forewings with grayish black scaling, latter absent from hind wings; maculation of upper surface weakly indicated below but with discal dot of hind wings more strongly indicated.

Length of Forewings: Holotype, 16 mm; paratypes, 15 to 18 mm.



Figs. 169–172. Male genitalia and aedeagi (not to same scale) of *Tesiophora*. **169**, **170**. *T. entephros*, new species, holotype. **171**, **172**. *T. aquila*, new species, holotype.

Male Genitalia (figs. 169, 170): Uncus with strong medioanterior swelling, curving to rather wide dorsal portion, apical area with rounded terminus, its posterior margin more or less vertical and ending in transverse ventral ridge. Valves with free costal arm tending to be slightly swollen apically; sacculus symmetrical, 1.2 to 1.4 mm long, distal end broadly curved and forming base for prominent curved process. Anellus 1.0 mm long. Aedeagus 1.5 to 1.7 mm long, 0.4 mm wide; vesica with small, indistinct group of spines; when exserted, vesica projecting at about 135° angle to aedeagus, with small basal sac, two median lateral sacs on opposite sides, one of which has group of spines 0.2 mm long at right angle to aedeagus, with longitudinal row of small spines 0.5 mm, and with terminal one-third of vesica a simple tube.

TYPES: Holotype, male, W slope, Dog Canyon Camp Grounds, 6300 ft, Guadalupe Mt. National Park, Culberson Co., Texas, Aug. 26, 1986 (R. Holland) (fig. 161). The genitalia of the holotype are mounted on slide FHR

19,777A, and one antenna and a set of legs are on slide FHR 19,777B. Paratypes: Same data as holotype, 2 males; McKittrick Canyon, 5100 ft, Guadalupe Mts., Culberson Co., Texas, March 29, 1968 (A. Blanchard), 4 males; Mount Locke, 6700 ft, Davis Mts., Texas, March 26, 1968 (A. and M. E. Blanchard), 4 males; Pine Camp, 8600 ft, 2 mi NE Cloudcroft, Otero Co., New Mexico, July 4, 1964 (F., P., and M. Rindge), 1 male; 3 mi E Capitan Gap Road, 6800 ft, Capitan Mts., Lincoln Co., New Mexico, May 30, 1982 (R. Holland), 1 male.

The holotype and 8 paratypes are in the AMNH, and the 4 Mount Locke paratypes are in the USNM.

DISTRIBUTION: The mountains of western Texas and south central New Mexico, at elevations of between 1555 and 2620 m.

TIME OF FLIGHT: March, May, July, and August.

REMARKS: Thirteen males, five genitalic dissections, and two slide mounts of antennae and legs have been studied.

The spining of the vesica is difficult to distinguish unless the structure is exserted; the measurement given in the description is from the single exserted vesica before me.

ETYMOLOGY: The specific name is from the Greek *entephros*, meaning ash colored, in reference to wing coloration.

Tesiophora aquila, new species
Figures 162, 171, 172, 179

DIAGNOSIS: The upper surface of the forewings is dark gray, more or less densely covered with black scaling; the females tend to have the median area paler than do the males, and also to have a more prominent, rounded, pale gray area at the middle of the outer margin of the primaries. The sacculus of the male genitalia is 1.5 mm long and has the distal end rounded; the transverse group of spines in the vesica is 0.4 mm long. In the female genitalia, the lamella postvaginalis has large lateral pieces, and the median area terminates posteriorly in two projecting, inwardly curved processes.

DESCRIPTION: *Adults*: Head with longest antennal pectinations of males 0.7 mm, being 4 times as long as their basal segments, and with about terminal 8 segments simple. Palpi rising to 33 percent height of eyes, and extending from 33 (males) to 45 percent (females) length of eyes in front of eyes.

Forewings with upper surface similar to that of *entephros*, differing mainly as follows: darker, being dark gray, more or less densely covered with black scaling; t. p. line tending to have more pronounced basal curve above inner margin. Females tending to have median area paler than males, being more contrasting in color, and with a more prominent, rounded, pale gray area at middle of outer margin. Hind wings of both sexes slightly darker than those of *entephros*. Under surface of forewings gray with grayish black scaling; maculation of upper surface weakly indicated, with discal dash more prominent, and with large grayish brown apical area; of hind wings similar to those of *entephros* but with more prominent maculation.

Length of Forewings: Holotype, 15 mm; paratypes, 14 to 19 mm.

Male Genitalia (figs. 171, 172): Similar to those of *entephros*, differing mainly as follows: Gnathos more bluntly pointed. Valves with free costal arm wider apically; sacculus 1.4 to 1.5 mm long, with large curved process, being 0.80 to 0.85 mm long anteroposteriorly (0.55 to 0.70 mm in *entephros*). Anellus 1.1 to 1.2 mm long, with broader lateral arms. Aedeagus 1.8 mm long, 0.35 mm wide; vesica, when exserted, recurved to become parallel with aedeagus, two median sacs of unequal size, smaller one with group of spines 0.4 mm long at angle to aedeagus, with longitudinal row of small spines 0.3 to 0.4 mm.

Female Genitalia (fig. 179): Sterigma with lamella antevaginalis broad, about width of abdomen, sclerotized, with median swollen area bearing numerous setae, curving posteriorly, ventral edge crenulate; lamella postvaginalis narrower, with large lateral, sclerotized, elliptical pieces, median area membranous anteriorly, sclerotized posteriorly, inner margin rounded, with posterior portion having raised lateral structures curving medially but not meeting. Ductus bursae tapering anteriorly, twice as long as wide, with thickened lateral margins, curving to right to join corpus bursae. Corpus bursae curved, C-shaped; posterior end narrowly sclerotized, with longitudinal striations; anterior end slightly swollen, vaguely footlike, with

transverse striations, and with band of inwardly pointing spicules, inverted U-shaped, with one branch on each side of corpus bursae. Ductus seminalis arising dorsally, at about right angle to corpus bursae, extending to left side. Apophyses posteriores 3.0 mm long; apophyses anteriores 1.5 mm.

TYPES: Holotype, male, Torre Forestal, El Platanito, 1160 m, Municipio Ciudad del Maíz, San Luis Potosí, Mexico, Aug. 1, 1984 (E. C. Welling) (fig. 162). The genitalia of the holotype are mounted on slide FHR 19,923. Paratypes, all from San Luis Potosí, Mexico, and collected by E. C. Welling: same data and date as holotype, 2 males; same data but July 31, 1984, 4 males, 2 females; El Platanito, 1100 m, Mpio. Ciudad del Maíz May 23, 24, 1985, 1 male, 1 female; same data but 1050 m, July 27, 1985, 1 male, 1 female; Puerto Ojo de León, 1400 m, Mpio. Ciudad de León, July 25, 1984, 4 males, 2 females; Nuñez, 1400 m, Mpio. Guadalcazar, July 24, 1984, 1 female.

The type series has been deposited in the AMNH.

DISTRIBUTION: San Luis Potosí, at elevations of from 1050 to 1400 m.

TIME OF FLIGHT: May, July, and August.

REMARKS: Twenty specimens (13 males, 7 females), 3 genitalic dissections (2 males, 1 female), and 2 slide mounts (1 male, 1 female) of antennae and legs have been studied.

ETYMOLOGY: The specific name is from the Latin *aquilus*, meaning dark colored or blackish, in reference to the wing coloration.

Tesiophora cerezal, new species
Figures 163, 173, 174, 180

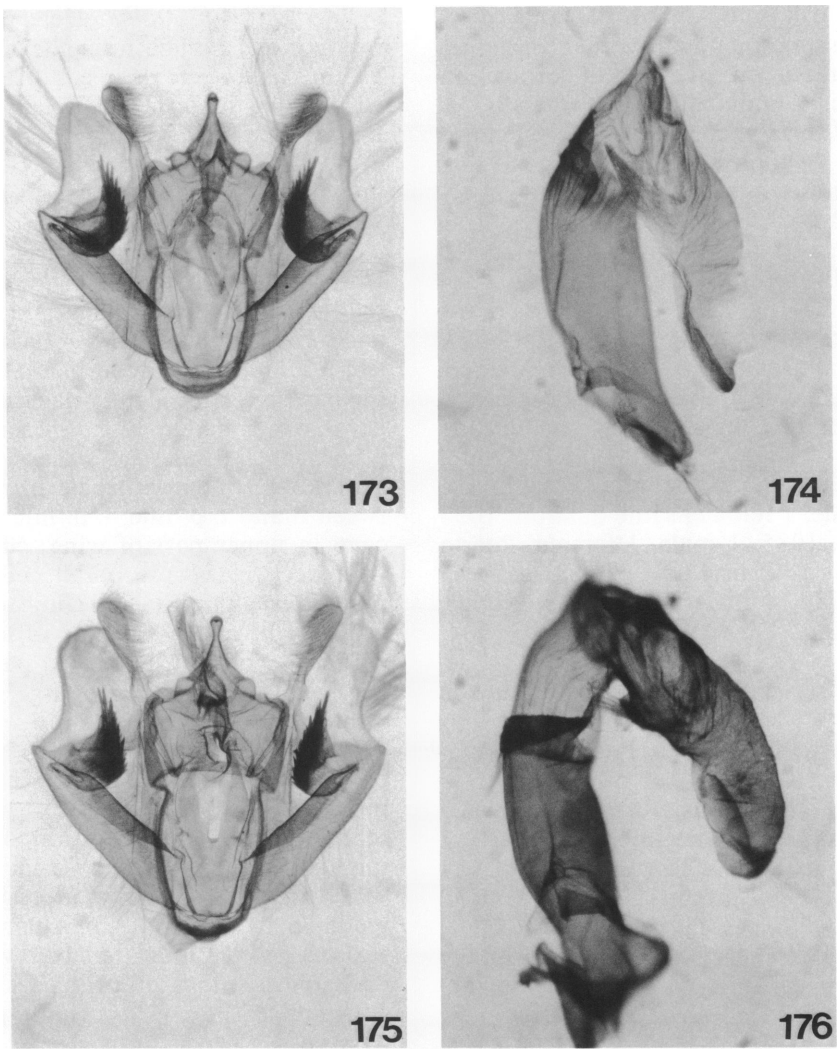
DIAGNOSIS: The upper surface of the forewings is dark gray with blackish brown scaling, and with some reddish brown scales distad of the t. p. line; the basal area is blackish, and the t. a. and t. p. lines are black and slender; and there is a large pale area at the middle of the outer margin of the primaries. The sacculus of the male genitalia is 1.75 mm long and has the distal end bluntly pointed; the transverse group of spines in the vesica is 0.5 mm long. The female genitalia have a tripartite lamella postvaginalis, and the apophyses posteriores are from 2.6 to 2.8 mm long.

DESCRIPTION: *Adults*: Head with longest pectinations of male antennae 0.8 mm, being 5 times as long as their basal segments, and with about the terminal 7 segments simple. Palpi rising from 40 to 50 percent height of eyes, and extending 50 percent length of eyes in front of eyes in both sexes. Front mottled with brown and black scales.

Forewings with upper surface dark gray with blackish brown scaling, and with some reddish brown scales distad of t. p. line; t. a. and t. p. lines black, slender; basal area blackish; t. a. line with broad black basal edging; median area only slightly paler than remainder of wing; median line represented by dark costal spot, obsolescent across wing; discal spot small, often with pale brown area between it and t. p. line; t. p. line weakly concave in upper part of wing, curved basad, with deep curve in cubital cell, outwardly pointed on anal vein, and going to inner margin at right angle; s. t. line obsolescent but with dark, outwardly curved band of scales below costa, extending to large, pale area at middle of outer margin. Hind wings slightly darkened distally; gray discal spot present; extradiscal line irregularly curved, extending most of way across wing; s. t. line partially represented in lower portion of wing; terminal line grayish black. Under surface of wings gray, forewings with more grayish black scaling than hind wings; maculation of upper surface weakly indicated below plus some dark apical scaling on primaries.

Length of Forewings: Holotype, 16 mm; paratypes, 18 to 19 mm.

Male Genitalia (figs. 173, 174): Similar to those of *entephros*, differing mainly as follows: Uncus with medioanterior swelling narrower posteriorly; apical portion more prominently projecting ventrally, with strong apical point. Valves with free costal arm more slender; sacculus 1.75 mm long, bluntly pointed apically, and with larger curved process, being 0.85 mm long anteroposteriorly. Anellus 1.2 mm long, with lateral areas extending farther anteriad. Aedeagus 2.0 mm long, 0.4 mm wide; vesica, when exserted, recurved to become parallel with aedeagus, without projecting sacs, larger group of spines diagonal instead of transverse, 0.5 mm long, broad, tapering to point, with longitudinal row of small spines 0.4 mm long.



Figs. 173–176. Male genitalia and aedeagi (not to same scale) of *Tesiophora*. **173**, **174**. *T. cerezal*, new species, paratype. **175**, **176**. *T. pulla*, new species, holotype.

Female Genitalia (fig. 180): Sterigma with lamella antevaginalis broad, about width of abdomen, sclerotized, with prominent bilobed median swollen area having numerous setae, curving posteriorly and with ventral edge broadly crenulate; lamella postvaginalis about same width, with large, lateral, smoothly sclerotized elliptical pieces, median area sclerotized posteriorly, posterior margin truncate, weakly crenulate, with posterior portion having semicircular lateral structures. Ductus bursae tapering anteriorly, about twice as long as wide, with thickened lateral margins. Corpus bursae weakly curved; posterior end slightly sclerotized, with longitudinal striations; anterior end slightly swollen, with transverse striations, and with band of inwardly pointing spicules, inverted U-shaped, with one branch on each side of corpus bursae. Ductus bursae arising dorsally, at about right angle to corpus bursae, extending to left side. Apophyses posteriores 2.6 to 2.8 mm; apophyses anteriores 1.3 to 1.5 mm.

TYPES: Holotype, male, Cerezal, 2300 m, Municipio Ixlepejl, Oaxaca, Mexico, Nov. 7,

1980 (E. C. Welling) (fig. 163). The genitalia of the holotype are mounted on slide FHR 19,985. Paratypes: Same data as holotype, 1 male; Puerto Antonio, 1200 m, Mpio. Comaltepec, Oaxaca, Mexico, Nov. 3, 16, 1980 (E. C. Welling), 2 females; Tacpan Guatemala, 2125 m, Chimaltenango, Guatemala, Oct. 29, 1975 (E. C. Welling), 1 female.

All the specimens from the type series have been deposited in the AMNH.

DISTRIBUTION: The mountains of southern Mexico (Oaxaca) and Guatemala (Chimaltenango).

TIME OF FLIGHT: October and November.

REMARKS: Five specimens (2 males, 3 females), four genitalic dissections (2 males, 2 females), and two slide mounts (1 male, 1 female) of antennae and legs have been studied.

ETYMOLOGY: The specific name is a noun in apposition based on the type locality.

Tesiophora humidaria (Schaus), new combination

Figures 9, 164, 165, 177, 181

Tephrosia humidaria Schaus, "1900" [1901]a: 185.

In general appearance this species is very similar to the preceding species except that the upper surface of the forewings is dark brown, with the median area being slightly paler. The maculation of the upper surface is practically identical with that of *cerezal*, although the pale area on the outer edge of the middle of the forewings is less strongly represented. On the under surface there tends to be more dark scaling on the forewings than in *cerezal*, although this is variable in the two males of *humidaria* before me; the lectotype is only slightly darker, whereas the AMNH topotypical specimen is heavily marked with dull black below the apex of the forewings. The length of the forewings is 16 to 18 mm. The palpi rise to 25 percent of the height of the eyes, and they extend between 25 (males) and 33 percent (females) of the length of the eyes in front of the eyes.

The male genitalia (fig. 177) are very similar to those of *entephros*, differing mainly as follows: The uncus has a longer dorsal portion, and the apical region is more attenuate. The sacculus is 1.6 to 1.7 mm long, terminating in a rounded point; the curved process is from 0.75 to 0.85 mm long anteroposteriorly. The anellus is 1.2 to 1.3 mm long, while the aedeagus varies from 1.9 to 2.0 mm. Unfortunately, neither vesica was exserted and so nothing can be said about its configuration; as far as can be told, the transverse spines are about 0.4 mm long, are wide basally and taper to a point, and the longitudinal row may be about 0.3 mm in length.

The female genitalia (fig. 181) are similar to those of *aquila*, differing mainly as follows: The lamella antevaginalis appears to be less high, and has fewer creases and only a rough edge; the lamella postvaginalis has three more or less equal sized pieces, the outer ones having two short longitudinal folds from their posterior margin and lateral structures curving medially but not meeting. The ductus bursae is very short; the corpus bursae is straight, only slightly sclerotized posteriorly, and has some faint striations anteriorly. The apophyses posteriores are 2.6 mm long, and the apophyses anteriores are 1.6 mm.

Schaus described *humidaria* from at least one male and one female. The male, labeled by Schaus as "type," is hereby designated as the lectotype (fig. 164) and bears my label to that effect; it is in the USNM, and has its genitalia mounted on slide DCF 1468. The type locality is Orizaba, Veracruz, Mexico. There is a topotype male and female (fig. 165) from Puebla, Puebla, Mexico, both from the collection of C. C. Hoffmann, in the AMNH before me, in addition to the lectotype. The last specimen does not bear any date of capture on its pin label; the other specimens are dated April and October, respectively.

Tesiophora orthe, new species

Figures 166, 182

DIAGNOSIS: The upper surface of the forewings is dark brown, with some gray scaling in the median area; the t. a. and t. p. lines are relatively broad, with the former having a broad blackish basal edging. The female genitalia have a shallow lamella antevaginalis with an irregular edge, a very large, circular, median indentation bearing many elongate setae on its convex surface, and the lamella postvaginalis has the lateral pieces smaller than the median one. (The males have not been studied.)

DESCRIPTION: *Adults*: Head with palpi rising 15 percent height of eyes, and extending 33 percent (females) length of eyes in front of eyes.

Forewings with upper surface dark brown, with gray scaling in median area and distal portion of subterminal area, plus a grayish white area in middle of outer margin of wing; t. a. and t. p. lines black, relatively broad; t. a. line with broad (1 mm) blackish basal edging, very weakly curved; median line indicated by dark costal spot; discal dot apparently absent; t. p. line S-shaped, smoothly curved, and having broad (1.5 mm) blackish shading distally in upper part of wings; s. t. line indicated by blackish brown area below apex of wing, extending to rounded, grayish white area in middle of outer margin of wing, and by some obsolescent grayish white lunules in lower portion; terminal line of black cellular spots. Hind wings gray; discal dot absent; extradiscal line broad, straight, fading out towards costa; s. t. line obsolescent; terminal line black. Under surface of wings gray, forewings with grayish black scaling; maculation of upper surface repeated below but fainter.

Length of Forewings: Holotype, 18 mm.

Female Genitalia (fig. 182): Sterigma with lamella antevaginalis narrower than width of abdomen, sclerotized, anterior portion rounded, with irregular ventral edge; median indentation very large, circular, bearing many elongate setae on its convex surface; lamella postvaginalis as wide as lamella antevaginalis, with lateral sclerotized pieces truncate apically, smaller than posteriorly projecting median piece, latter rounded posteriorly, and having wide lateral structures curving medially but not meeting. Ductus bursae short, lateral margins appearing thickened, tapering anteriorly, length about equal to width. Corpus bursae slightly curved; posterior end very lightly sclerotized ventrad of dorsal junction with ductus bursae; anterior end with a few minute transverse striations, and with a curved band of minute, inwardly pointing spicules. Ductus seminalis arising dorsally, at about right angle to corpus bursae, extending to right side. Apophyses posteriores 2.6 mm long; apophyses anteriores 1.6 mm.

TYPE: Holotype, female, mountains SW of Ciudad Victoria, Tamaulipas, Mexico, June 11, 1970 (W. H. Howe) (fig. 166). The genitalia of the holotype are mounted on slide FHR 16,188A, and one antenna and a set of legs are on slide FHR 16,188B.

The holotype is in the collection of the AMNH.

DISTRIBUTION: Known only from the type locality in Tamaulipas.

TIME OF FLIGHT: June.

REMARKS: One specimen, one genitalic dissection, and one slide mount of an antenna and set of legs have been studied.

The outer margin of the left forewing, below the apex, has been lost, thus giving the primaries an asymmetrical appearance.

ETYMOLOGY: The specific name is from the Greek *orthos*, meaning straight, in relation to the extradiscal line on the hind wings.

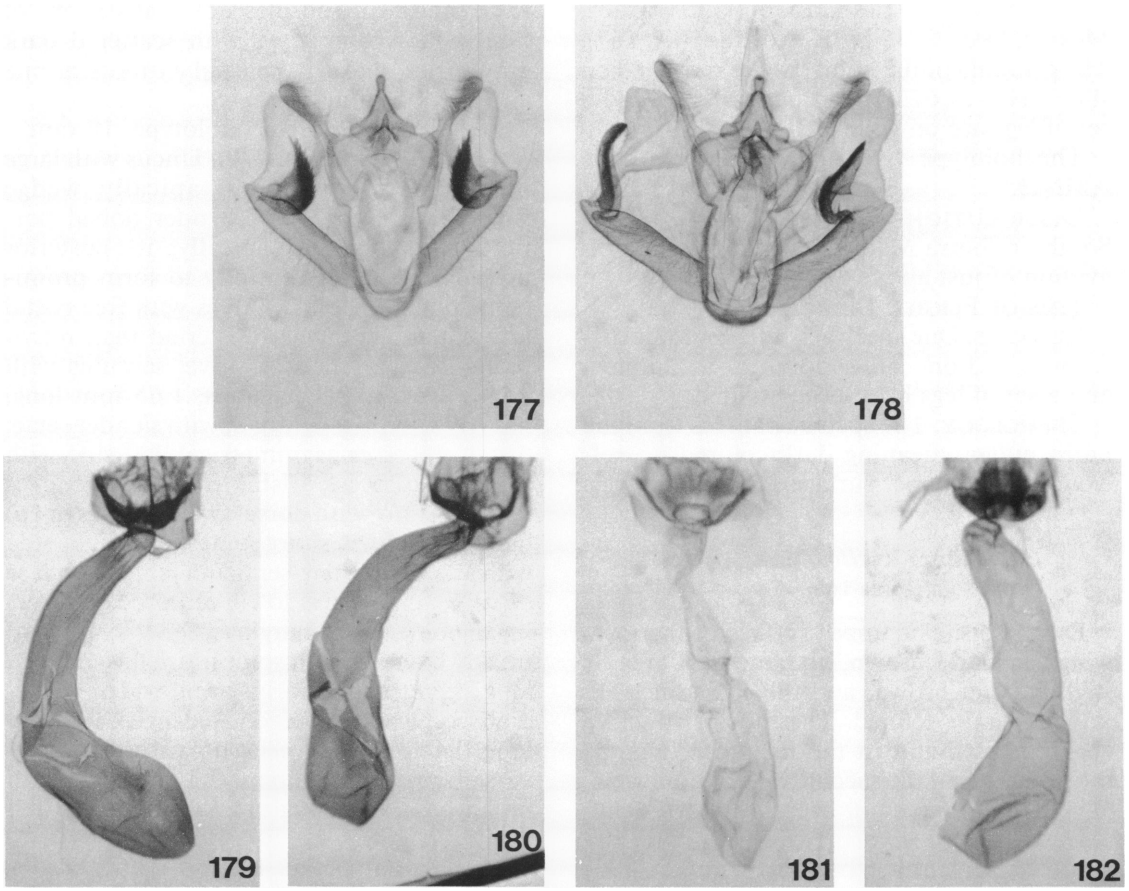
Tesiophora pulla, new species

Figures 167, 175, 176

DIAGNOSIS: The upper surface of the forewings is deep brown, the median area is slightly paler brown, the t. a. and t. p. lines are slender but clearly defined, and there is a grayish brown circular area at the middle of the outer edge of the forewings. The sacculus of the male genitalia is 1.8 mm long and has a bluntly pointed distal end; the transverse group of spines in the vesica is 0.3 mm long. (The females have not been studied.)

DESCRIPTION: *Adults*: Head with longest pectinations of male antennae 0.9 mm, being 4 times as long as their basal segments, and with about the terminal 9 segments simple. Palpi rising to 15 percent height of eyes, and extending 50 percent (males) length of eyes in front of eyes. Front with broad black band across top.

Forewings with upper surface deep brown, with t. a. and t. p. lines black, slender but clearly defined; median area slightly paler brown than adjacent areas; t. a. line arising from large costal spot, extending almost straight across wing; median line partially indicated; discal spot obsolescent; t. p. line with upper half straight but with outwardly pointed teeth on veins, then S-shaped in lower portion of wing; subterminal area with broad black band from costa to grayish brown circular area at middle of outer edge of wing; s. t. line grayish brown, angulate in cells an-



Figs. 177–182. Genitalia of *Tesiophora*. 177, 178. Males. **177**. *T. humidaria* (Schaus), holotype (USNM). **178**. *T. exallos*, new species, holotype. 179–182. Females. **179**. *T. aquila*, new species, paratype. **180**. *T. cerezal*, new species, paratype. **181**. *T. humidaria* (Schaus); Puebla, Mexico. **182**. *T. orthe*, new species, holotype.

teriad of circular area, more rounded posteriad thereof; terminal line black, enlarged in cells, some cells with row of black scales extending to s. t. line. Hind wings gray, becoming tinged with reddish brown distally; discal spot small, weakly curved; extradiscal line partially represented, slender; s. t. line obsolescent; terminal line black. Under surface of wings pale gray; forewings with some darker gray scaling, with prominent discal dash, weakly represented t. p. line, and large black area near apex; hind wings paler than forewings, especially basally, and with prominent black discal spot and extradiscal line; all wings with black terminal line.

Length of Forewings: Holotype, 19 mm.

Male Genitalia (figs. 175, 176): Similar to those of *cerezal*, differing mainly as follows: Uncus with apex broader and thicker. Valves with larger basal swelling on costa; sacculus 1.8 mm long, and with larger curved process, being 0.9 mm long anterposteriorly. Anellus 1.3 mm long, with wider lateral areas. Aedeagus 1.9 mm long, 0.4 mm wide; vesica, when exserted, recurved to become almost parallel with aedeagus, with rounded basal sac, two posteriorly pointed small sacs near base, and with flat swelling distad to the latter and bearing transverse spines, 0.3 mm long, with spine patch rectangular in outline, and with longitudinal row of small spines 0.6 mm long, extending from base of transverse row to partially up one of lateral sacs.

TYPE: Holotype, male, nr. Oaxaca, 6 mi N

of Route 190 on Route 175, 6600 ft, Oaxaca, Mexico, Dec. 27, 1979 (R. Holland) (fig. 167). The genitalia of the holotype are mounted on slide FHR 19,673A, and one antenna and a set of legs are on slide FHR 19,673B.

The holotype is in the collection of the AMNH.

DISTRIBUTION: Central Oaxaca, in the Southern Sierra Madre Mountains, at an elevation of just above 1900 m.

TIME OF FLIGHT: December.

REMARKS: One specimen, one genitalic dissection, and one slide mount of an antenna and a set of legs have been studied.

ETYMOLOGY: The specific name is from the Latin *pullus*, meaning dark-colored, in reference to the upper surface of the forewings.

Tesiophora exallos, new species
Figures 168, 178

DIAGNOSIS: The upper surface of the forewings is dark brown, the median area is slightly paler brown, and the cross lines are rather weakly defined. The most distinctive character is found in the male genitalia, as the processes of the sacculi are asymmetrical. (The females have not been studied.)

DESCRIPTION: *Adults*: Head with palpi rising to 33 percent height of eyes, and extending 40 percent (males) length of eyes in front of eyes.

Forewings with upper surface of forewings dark brown, with t. a. and t. p. lines black, weakly defined; median area only slightly paler than remainder of wing; t. a. line arising from large costal spot, extending almost straight across wing; median line obsolescent; discal spot apparently absent; t. p. line weakly S-shaped, with outwardly pointing teeth on veins in upper portion of wing; s. t. line dark, paralleling outer margin of wing, with distal pale spots in cells bordered outwardly by black scales; terminal area with relatively small and faint circular area at middle of outer edge of wing; terminal line black, slender, some cells having row of black scales extending to spots of s. t. line. Hind wings gray, darkened distally; without discal dot; extradiscal line grayish black, slightly sinuate, extending almost completely across wing; s. t. line obsolescent; terminal line black. Under surface of forewings gray, with numerous dark gray and brownish gray scales, especially near apex, and with obsolescent maculation; of hind wings paler gray, with scattered dark gray scales, and with partial extradiscal line and black terminal line.

Length of Forewings: Holotype, 18 mm.

Male Genitalia (fig. 178): Uncus with large medioanterior swelling, apically wedge shaped, with relatively slender dorsal portion, latter enlarged apically, its posterior margin extending ventrally to form prominent spinelike point. Valves with free costal arm extending farther posteriad than membranous square end of valve; sacculus with symmetrical basal portions, 1.65 mm long, heavily sclerotized, broad, with slender setae; distal processes asymmetrical: left side with S-shaped process arising from near end of basal portion, with dorsal (when valves open) band of slender, short spines, and right side with sclerotized, flat, semicircular base on face of valve, giving rise to curved process tapering to point, inner margin (when valves open) thickly covered with spines. Anellus 1.2 mm long, slender anteriorly, arms widened medially, apically tapered. Aedeagus 1.8 mm long, 0.4 mm wide; vesica not exserted, transverse row of spines about 0.2 mm long, with broad base, and longitudinal row about 0.4 mm in length.

TYPE: Holotype, male, San Cristobal de las Casas, Chiapas, Mexico, Dec. 18, 1971 (R. Wind) (fig. 168). The genitalia of the holotype are mounted on slide FHR 16,634. The type locality is at 16°45′N, 92°38′W.

The holotype has been deposited in the AMNH.

DISTRIBUTION: Known only from the type locality in the mountains of the Chiapas Central Massif.

TIME OF FLIGHT: December.

REMARKS: One specimen and one genitalic dissection have been studied. The upper surface of the forewings is somewhat rubbed; fresh specimens are needed to ascertain the pattern.

ETYMOLOGY: The specific name is from the Greek *exallos*, meaning quite different, in relation to the processes of the sacculi.

Minyolophia, new genus
Figures 11, 183–202

DIAGNOSIS: The male abdomen has the secondary sexual modifications on segment A3

medially, laterally between segments A3 and A4, and A7 and A8; the last has but a few widely spaced capitate setae medially, increasing in number laterally, with the ends of their basal sclerotized band extended and curved dorsally, the apices becoming widened and thickly covered with numerous elongate setae. The male genitalia are of two types: one has valves with symmetrical, flat saccular ridges, and an unarmed vesica; the second has the left valve with a very long and thin saccular arm, and two dentate processes in the vesica. The female genitalia have an elongate corpus bursae, the posterior portion of which tends to be longitudinally striate; the ductus seminalus arises on the right side of the striate area well anteriad of the junction with the ductus bursae. The moths have an overall brown and cream or yellow, minutely spotted upper surface, and the hind wings have seven veins.

DESCRIPTION: *Adults*: Head with antennae of about 51 to 54 segments; males with terminal five to eight segments simple; longest pectinations 0.5 to 0.6 mm, being three times as long as their basal segments; antennae of females simple. Palpi rising to between 20 to 40 percent height of eyes, extending in males betweeen 33 and 50 percent length of eyes in front of eyes, and in females 33 percent. Eyes of females smaller than those of males.

Forelegs with epiphysis of males arising between 45 and 55 percent length of segment and being from 50 to 55 percent its length, of females arising at 55 percent length of segment and being 45 to 50 percent its length. Hind legs of males with strongly developed hair pencil.

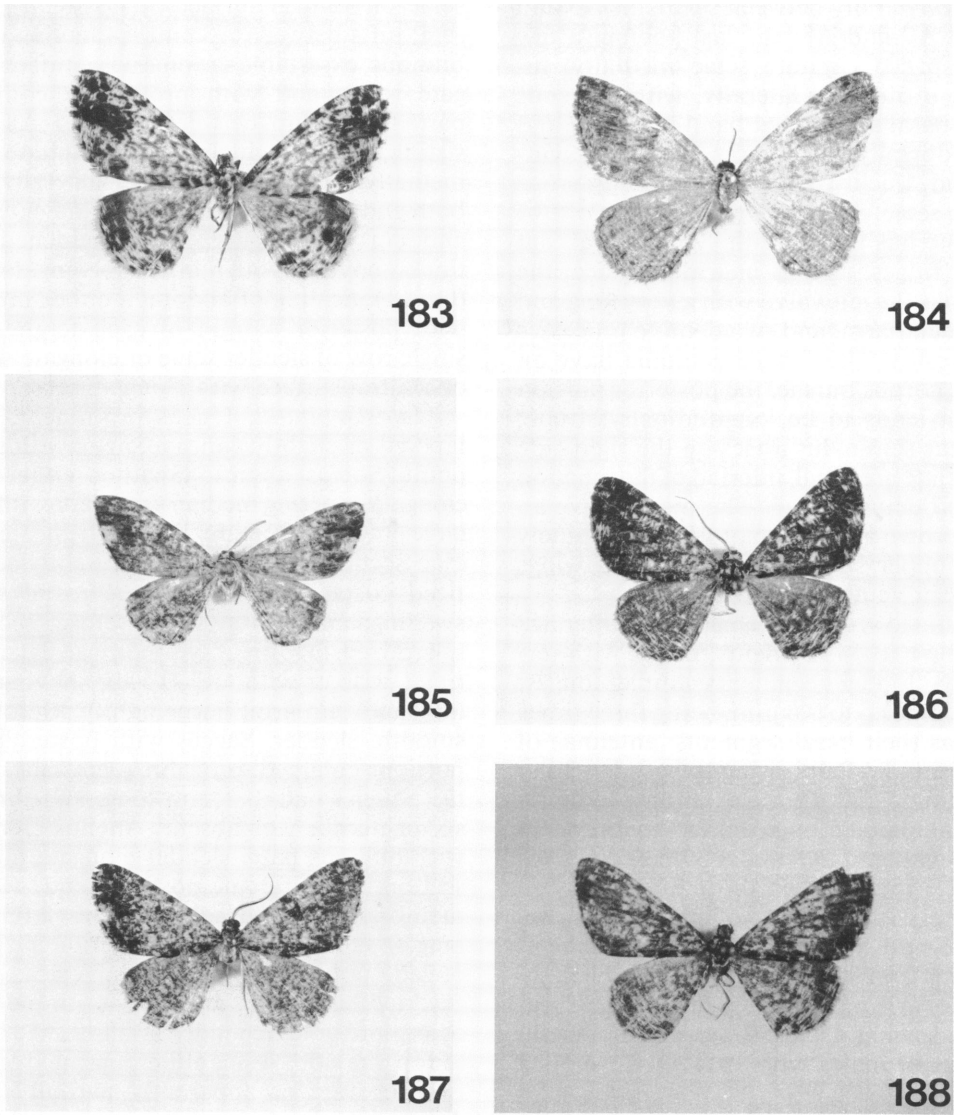
Forewings usually without accessory cell, rarely with weakly developed vein to make one cell; R_1 shortly united with Sc; R_{3+4} and R_5 stalked; mdc and ldc weakly developed, slightly curved or biconvex; outer margin of wings evenly rounded. Hind wings with seven veins; Sc extending 40 to 45 percent length of cell; udc and ldc weakly developed or vestigial, almost straight or weakly curved. Upper surface of all wings with overall brown and cream or yellow minutely spotted pattern. Under surface brown, with cream or yellow speckling, the latter sometimes enlarged along outer margins of wings.

Length of Forewings: 14 to 18 mm.

Abdomen of males with median row of setae on ventral surface of A3; with lateral setal tufts between A3 and A4 having membranous, exsertable sac plus basal tuft of elongate setae; and with prominent comblike paired structure between A7 and A8 consisting of a few widely spaced capitate setae medially, increasing in numbers laterally, with both ends of basal sclerotized band extended and curved dorsally, apices widened and thickly covered with numerous elongate setae (fig. 11). Scaling of abdomen either normal, with posterior margin of each tergite with single row of slender setae or elongate scales, or ventral surface with elongate setae.

Male Genitalia: Uncus prominent, sides tapered or slightly concave, apex with single point. Socius absent. Gnathos either with elongate, tapering median section or with very large angled structure having truncate median section. Each valve with lightly sclerotized costa, with or without costal setose swelling; ampulla swollen, setose; sacculus sclerotized, in form of symmetrical, flat, raised ridge, with or without left valve having very long and thin arm; harpe lightly sclerotized, smooth, slender. Saccus with posterolateral portions enlarged, projecting ventrally. Cristae either small, 0.3 mm long, and three to six in number, or absent. Anellus elongate, with bulbous base, slender elongate median section, and bifurcate posterior end. Manica membranous. Aedeagus 1.65 to 2.05 mm long, 0.3 to 0.4 mm wide; posterior end sclerotized, pointed or rounded. Vesica, when exserted, extending at angle as simple tube, or as more or less rounded swelling, with short sac on one side; vesica either unarmed or with two separate or apparently partially fused dentate processes.

Female Genitalia: Sterigma membranous. Ductus bursae either sclerotized, elongate, three times as long as wide, posterior end appearing similar to sterigma, ventral surface with small median indentation, dorsal surface with large concave indentation, slightly increasing in width anteriorly, and entire surface with a few scattered striations, or short, posteriorly sclerotized, apex thick, M-shaped. Corpus bursae membranous, straight, elongate; anterior end not enlarged; posterior end lightly sclerotized and with longitudinal striations. Ductus seminalis arising on right side in posterior portion of corpus bursae, 0.75 to 1.00 mm from junction of ductus bursae and



Figs. 183–188. Adult males of *Minyolophia*. **183**. *M. distincta*, new species, paratype. **184**. *M. inermis*, new species, holotype. **185**. *M. yanayacu*, new species, holotype. **186**. *M. parilis*, new species, holotype. **187**. *M. hadra*, new species, holotype. **188**. *M. prolixa*, new species, holotype. X 1.2.

corpus bursae. Signum absent. Apophyses posteriores 2.4 to 2.5 mm long; apophyses anteriores 0.9 to 1.0 mm.

EARLY STAGES: Unknown.

FOOD PLANTS: Unknown.

TYPE SPECIES: *Minyolophia yanayacu*, new species.

DISTRIBUTION: French Guiana, Colombia, Ecuador, Peru and Bolivia.

TIME OF FLIGHT: February, August, and October into December.

REMARKS: The autapomorphic characters for *Minyolophia* are the reduced or vestigial cross veins in the wings, and the dorsolateral extension of the male abdominal process between A7 and A8, with their distal enlargement and thick setal covering.

The members of this genus are recognized by the overall finely brown and cream or yellow spotted pattern of the upper surface, which is unlike any other group or species within the tribe. Cross lines, when present,

are not solid, straight or curved, as in *Melanolophia*; instead, they are represented by spots or are sharply lunulate within each cell.

Seven species are included in the genus, and all look very much alike in their color and maculation. The male genitalia can be used to separate the species into two groups. One has symmetrical valves, without the arm on the left valve, and an unarmed vesica; the second has the saccular arm and the vesica with two sclerotized, dentate processes. Two species is included in the first; the remaining four are most easily recognized by the nature of the asymmetrical saccular processes and by the spining of the vesica.

ETYMOLOGY: The generic name is formed from the Greek prefix *miny-*, plus the suffix *-olophia*. The gender is feminine.

KEY TO SPECIES
BASED ON MALE GENITALIA

1. Valves symmetrical; vesica unarmed 2
   Left valve with very long ribbonlike process; vesica with one or two thick, spiny processes 4
2. Gnathos with elongate, tapering median section; valves with straight costa 3
   Gnathos with truncate median section; valves with prominent costal setose swelling (fig. 191) ..... *inermis*
3. Flat saccular ridges extending to near anterior margin of gnathos, and being about four times longer than wide (fig. 189) ..... *distincta*
   Flat saccular ridges extending past posterior part of anellus, and being about three times longer than wide ..... *azenioides*
4. Process of left valve straplike, 1.4 mm long, 0.06 mm wide 5
   Process of left valve slender, elongate, 1.6 to 2.2 mm long, 0.03 to 0.05 mm wide ... 6
5. Vesica with both spiny processes short and of same length (0.3 mm) (figs. 195, 196) ..... *parilis*
   Vesica with spiny processes longer, of different lengths (0.55 and 0.45 mm) (figs. 193, 194) ..... *yanayacu*
6. Process of left valve shorter than valve (fig. 197) ..... *hadra*
   Process of left valve longer than valve (fig. 199) ..... *prolixa*

Minyolophia distincta, new species
Figures 183, 189, 190

DIAGNOSIS: This species has more ochraceous yellow scaling on the upper surface of the wings than in any other taxa. The male genitalia have an elongate pointed gnathos, symmetrical valves with flat saccular ridges, and an unarmed vesica. (The females have not been examined.)

DESCRIPTION: *Adults*: Abdomen of males with elongate setae on ventral surface in addition to normal scaling.

Upper surface of wings ochraceous brown and dark brown, with latter concentrated in outer portion of wings opposite cell and above tornus on forewings and in anterolateral part of hind wings; discal dots present on all wings (fig. 183). Under surface similar to upper but with most of outer one-third of all wings broadly blackish brown.

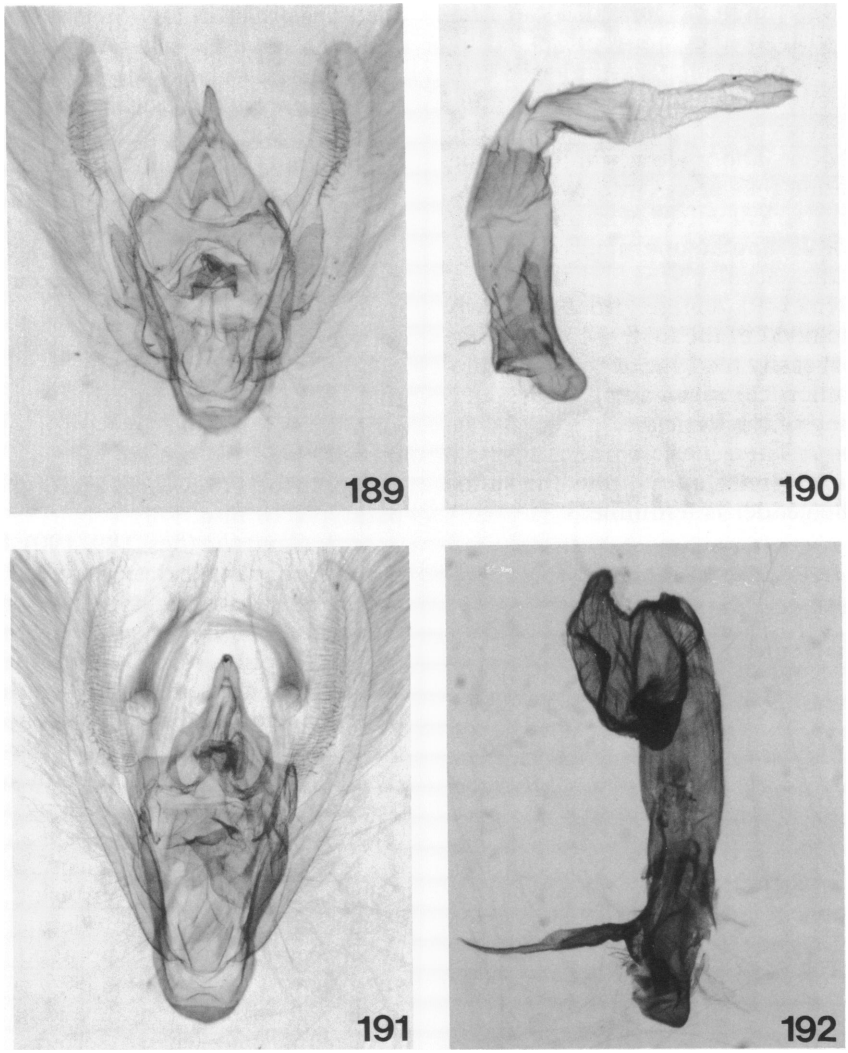
Length of Forewings: Holotype, 16 mm; paratype, 18 mm.

Male Genitalia (figs. 189, 190): Uncus with weakly concave sides, tapering to evenly curved, slender point. Gnathos with elongate median section recurved, wedge-shaped, tapering to point. Valves without setose costal swelling; each sacculus with symmetrical, flat ridge, extending posteriorly to near anterior portion of gnathos, and having irregularly serrate outer margin. Cristae inconspicuous, three to six on each side, longest ones 0.3 mm. Anellus with broad ovate anterior part, 0.4 mm wide; median extension with sharply defined dorsal ridge; posterior end flatly Y-shaped. Saccus with moderately enlarged, evenly rounded posterolateral points. Aedeagus 1.65 to 1.80 mm long; posterior end with lightly sclerotized, elongate and narrow point. Vesica unarmed; when exserted, extending as simple tube at about right angle to aedeagus, basal portion with some longitudinal striations.

TYPES: Holotype, male, 2 to 4°S, 78°W, 875 m [Zamora], Ecuador, Nov.–Dec., 1934 (W. von Hagen). The genitalia of the holotype are mounted on slide FHR 19,898A, and an antenna and a set of legs are on slide 19,898B. Paratype: E of Cumberatza, 800–900 m, Zamora, Ecuador, Nov. 21, 1970 (L. E. Peña) (fig. 183), 1 male.

Both type specimens are in the AMNH.

DISTRIBUTION: Eastern Ecuador, probably along the Río Zamora, at elevations of 800 to 900 m. Von Hagen was an amateur collector who worked the southern Oriente out of Gualaquisa (Brown, 1941: 13), a town near the junction of the Río Blanco and Río Za-



Figs. 189–192. Male genitalia and aedeagi (not to same scale) of *Minyolophia*. **189**, **190**. *M. distincta*, new species, holotype. **191**, **192**. *M. inermis*, new species, holotype.

mora. Cumberatza is about 70 km (air) upstream from Gualaquisa.

TIME OF FLIGHT: November and December.

REMARKS: Two males, two genitalic slides, and one slide mount of antennae and legs have been studied. The selection of the holotype was based on the fact that it had one of my more recent dissections. This is more important to me than the rather vague locality data, especially when both specimens are from nearby localities.

ETYMOLOGY: The specific name is from the Latin *distinctus*, meaning separate or different, in reference to the male genitalic structures.

Minyolophia azenioides (Herbulot), new combination

Melanolophia azenioides Herbulot, 1988: 116, figs. 2, 8 (holotype, male genitalia).

This species is similar to *distincta* in maculation, size, and male genitalia. The male structures differ from those of the preceding species primarily in having shorter and wider

flat saccular ridges, as they extend posteriorly just beyond the posterior portion of the anellus; in *distincta* they are nearer the anterior margin of the gnathos. These symmetrical structures widen more abruptly and have a more serrate inner margin than is found in *distincta*, and are about three times as long as wide (four times in *distincta*).

Herbulot described this species from two males taken in French Guiana; the type locality is "environs de Cayenne, piste de Regina au PK 43." The holotype and paratype are in his collection; I have not examined either one, nor seen any specimens of this species.

Minyolophia inermis, new species
Figures 184, 191, 192

DIAGNOSIS: This species has reduced pale scaling on the upper surface of the wings, but is similar to *distincta* in having the large dark area on the forewings opposite the cell. The male genitalia have a truncate gnathos, symmetrical valves with prominent costal swellings and flat saccular ridges, and an unarmed vesica. (The females have not been examined.)

DESCRIPTION: *Adults*: Abdomen of males with normal scaling ventrally.

Upper surface of wings brown, with some ochraceous scaling, with large dark brown area in outer portion of wings opposite cell and with smaller area above inner margin; hind wings unicolorous; apparently without definite cross lines except for s. t. line on hind wings.

Length of Forewings: Holotype, 18 mm.

Male Genitalia (figs. 191, 192): Uncus with S-shaped lateral margins, tapering to evenly and sharply curved slender point. Gnathos sharply angled posteriorly, apical region broadly truncate. Valves with large costal swelling, having numerous, elongate, curved setae; each sacculus with symmetrical flat ridge, extending posteriorly to near middle of gnathos, and having smoothly rounded outer margin. Cristae absent. Anellus with tapered anterior part, 0.3 mm at widest portion; median extension with inverted Y-shaped ridge; posterior end deeply concave. Saccus with moderately enlarged, evenly rounded posterolateral points. Aedeagus 1.8 mm long; with longitudinal striations, primarily on right side, and with rounded posterior end. Vesica unarmed; when exserted, forming globular swelling with two small sacs posteriorly.

TYPE: Holotype, male, La Merced, 1300 m, Chanchamayo, Peru, Sept. 15, 1951 (J. de Rivas) (fig. 184). The genitalia of the holotype are mounted on slide FHR 19,996A, and part of one antenna and a set of legs are on slide FHR 19,996B.

The holotype is in the collection of the AMNH.

DISTRIBUTION: Known only from the type locality.

TIME OF FLIGHT: September.

REMARKS: One specimen, one genitalic dissection, and one slide mount of an antenna and set of legs have been studied.

The upper surface of the type is somewhat worn; complete details as to maculation will have to await more material.

The genitalia of this species have several characters that make them easily recognizable. The curved truncate gnathos and the prominent costal swelling are similar to all the following species, as is the general form of the exserted vesica. On the other hand, the vesica is similar to that of *distincta* in that it is unarmed.

ETYMOLOGY: The specific name is from the Latin *inermis*, meaning unarmed, in reference to to the lack of spines in the vesica.

Minyolophia yanayacu, new species
Figures 185, 193, 194, 201

DIAGNOSIS: This species is smaller than *distincta*, the upper surface of the wings is darker and has a prominent pale yellow area at the middle of the outer margin of the forewings. The male genitalia have a very large angled gnathos with the median portion tapered and broadly, bluntly rounded, the process of the sacculus of the left valve is relatively broad and evenly curved, and the vesica has two broad sclerotized processes that are weakly spinose. The female genitalia have an elongate sclerotized ductus bursae with a small ventral and a larger dorsal indentation posteriorly.

DESCRIPTION: *Adults*: Abdomen of males with normal scaling ventrally.

Upper surface of wings dark brown, with pale yellow scaling, usually forming small spots. Forewings with t. a. line weakly indicated; discal spot black, with area distad suffused with some yellow scaling; t. p. line of lunate, yellow cellular spots; s. t. line partially represented; apex with small pale spot, and middle of outer margin with large pale yellow area. Hind wings similar to forewings, with obsolescent discal dot, extradiscal and s. t. lines, and with some small areas of pale yellow scaling along outer margin. Under surface similar to upper but with outer one-third of all wings blackish brown and with pale yellow areas along outer margins as on upper surface or slightly enlarged.

Length of Forewings: Holotype, 14.0 mm; paratype, 15.5 mm.

Male Genitalia (figs. 193, 194): Uncus with weakly biconcave sides, apex angled ventrally to point. Gnathos wide laterally, then sharply angled posteriorly, distal portion curved dorsally, apical region tapering, apex broadly and bluntly rounded. Valves with prominent setose costal swelling; each sacculus asymmetrical, both with large, elongate, biconvex flaplike process; left valve with long, flat, slender sclerotized process, about 1.4 mm long, 0.06 mm wide, evenly curved and with median twist. Cristae absent. Anellus elongate, lightly sclerotized, anterior portion slightly enlarged, 0.3 mm wide; median extension slightly tapered, with dorsal ridge posteriorly; posterior end evenly enlarged. Saccus with posterolateral points 0.2 mm deep. Aedeagus 1.7 mm long, 0.4 mm wide; posterior end with two slender, lightly sclerotized, longitudinal areas, truncate between. Vesica with two broad, weakly spinose processes; when exserted, forming a subtriangular swelling at end of aedeagus, with small sac ventrally, and both processes posteriorad, 0.55 and 0.45 mm long respectively.

Female Genitalia (fig. 201): Ductus bursae sclerotized, elongate, 1.5 mm long, three times as long as wide; posterior end appearing similar to sterigma, ventral surface with small median indentation, dorsal surface with large concave indentation, slightly increasing in width anteriorly; entire surface with a few scattered striations. Corpus bursae membranous, inner surface lined with minute teeth; posterior end somewhat convoluted and with a few longitudinal striations. Ductus seminalis arising 0.75 mm anteriad of junction of ductus bursae and corpus bursae. Apophyses posteriores 2.4 mm long; apophyses anteriores 0.9 mm.

TYPES: Holotype, male, Yanayacu (2°25'S, 79°20'W), 400 m, Guayas, Ecuador, Oct. 11, 1977 (L. E. Peña) (fig. 185). The genitalia of the holotype are mounted on slide FHR 19,902. Paratype: Same data as holotype, 1 female.

Both type specimens are in the AMNH.

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

TIME OF FLIGHT: October.

REMARKS: Two specimens, two genitalic dissections, and one slide mount of a female antenna and legs have been studied.

ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

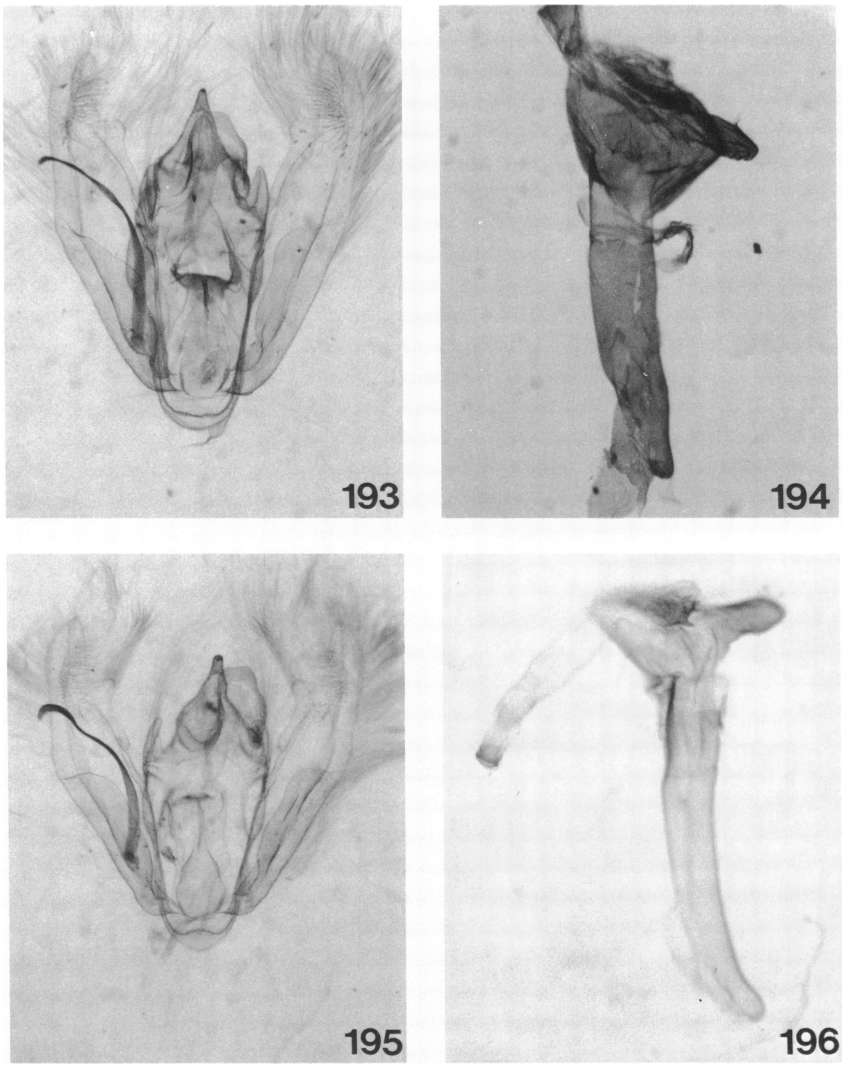
Minyolopohia parilis, new species
Figures 11, 186, 195, 196

DIAGNOSIS: This species is similar to *yanayacu* in appearance, but the upper surface of the wings is a darker brown and has fewer yellow markings, especially along the outer margins of the wings. The male genitalia differ from those of *yanayacu* by the process of the left valve not having a median twist, and by the short processes of the vesica being of equal length and their apices more spinose. (The females have not been examined.)

DESCRIPTION: *Adults*: Similar to those of *yanayacu*, differing mainly as follows: Upper surface of wings a darker brown, with reduced yellow scaling, especially along outer margins of wings, and with t. a. and t. p. lines indicated by white cellular dots. Under surface similar to upper but appearing to have more yellow scaling basad of broad, blackish brown outer one-third of wings.

Length of Forewings: Holotype, 16 mm; paratypes, 15 to 17 mm.

Male Genitalia (figs. 195, 196): Similar to those of *yanayacu*, differing mainly as follows: Gnathos more evenly curved, apical portion less tapered, apically truncate. Left valve with elongate process slightly wider, without median twist but having curved area basad of more sharply curved apex. Anellus with more slender median extension, longer



Figs. 193–196. Male genitalia and aedeagi (not to same scale) of *Minyolophia*. **193, 194**. *M. yanayacu*, new species, holotype. **195, 196**. *M. parilis*, new species, holotype.

dorsal ridge, and more prominent T-shaped apex. Saccus with posterolateral points 0.3 mm deep. Aedeagus with posterior end having dorsal longitudinal area more heavily sclerotized and wider than ventral one. Vesica with processes of same length, 0.3 mm, and with distal ends more strongly spinose.

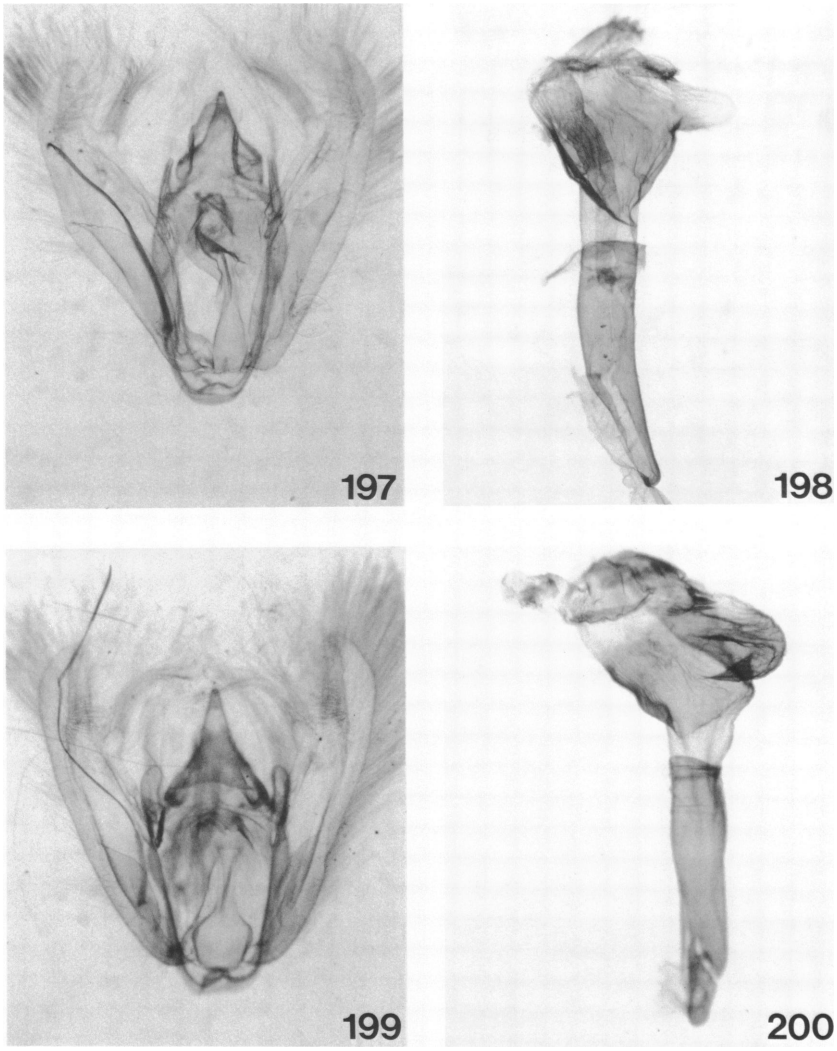
TYPES: Holotype, male, Callanga, Cuzco, Peru, Feb. 16, 1953 (F. L. Woytkowski) (fig. 186). The genitalia of the holotype are mounted on slide FHR 19,900A, and one antenna and a set of legs are on slide 19,900B. Paratypes: Same data as holotype, one dated Feb. 14, 1953, the other two Feb. 16, 1953, 3 males; Satipo [Junin], Peru, no date, (P. Paprzycki), 1 male.

All five specimens are from the John L. Sperry collection, and are deposited in the AMNH.

DISTRIBUTION: Peru (Cuzco and Junin), at elevations of from about 900 to 1500 m (Lamas, 1976).

TIME OF FLIGHT: February.

REMARKS: Five specimens, two genitalic dissections, and one slide mount of an antenna and legs have been studied.



Figs. 197–200. Male genitalia and aedeagi (not to same scale) of *Minyolophia*. **197**, **198**. *M. hadra*, new species, holotype. **199**, **200**. *M. prolixa*, new species, holotype.

ETYMOLOGY: The specific name is from the Latin *parilis*, meaning equal, in reference to the spinose processes of the aedeagus.

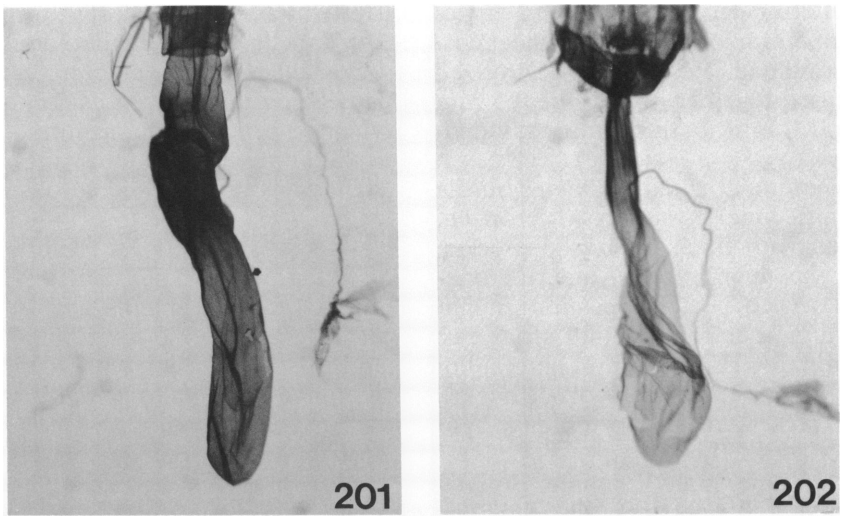
Minyolophia hadra, new species
Figures 187, 197, 198

DIAGNOSIS: This species is similar to *parilis* in appearance but tends to have a pale elongate area distad of the discal spot of the forewings on both the upper and under surfaces. The male genitalia differ from those of the preceding species by the longer and thinner process of the left valve, and by the more heavily dentate ends of the two thick sclerotized areas in the vesica. (The females have not been examined.)

DESCRIPTION: *Adults:* Similar to those of *parilis*, differing mainly as follows: Upper surface of wings dark brown with faint gray cast; forewings with slightly more prominent pale yellow area in middle of outer margin; both upper and under surfaces tending to have pale elongate area distad of discal spot of forewings.

Length of Forewings: Holotype, 15 mm.

Male Genitalia (figs. 197, 198): Similar to those of *yanayacu*, differing mainly as fol-



Figs. 201, 202. Female genitalia of *Minyolophia*. **201**. *M. yanayacu*, new species, paratype. **202**. *M. prolixa*, new species, paratype.

lows: Left valve with process longer (1.6 mm) and thinner (0.03 mm), and having partial twist about mid point. Anellus more slender anteriorly, 0.7 mm wide, and with narrower median extension. Aedeagus 2.0 mm long, 0.55 mm wide; posterior end lightly sclerotized on left side, without elongate sclerotized areas. Vesica with two large sclerotized processes, apically prominently dentate, 0.60 and 0.35 mm long respectively.

TYPE: Holotype, male, Finca San Pablo, 1800 m, 3 km N of Alban, Cundinamarca, Colombia, Aug. 1–12, 1967 (P. and B. Wygodzinsky) (fig. 187). The genitalia of the holotype are mounted on slide FHR 19,896A, and one antenna and a set of legs are on slide 19,896B.

The holotype is in the collection of the AMNH.

DISTRIBUTION: This species is known only from the type locality.

TIME OF FLIGHT: August.

REMARKS: One specimen, one genitalic dissection, and one slide mount of an antenna and legs have been studied.

ETYMOLOGY: The specific name is from the Greek *hadros*, meaning thick or stout, in relation to the armament of the vesica.

Minyolophia prolixa, new species
Figures 188, 199, 200, 202

DIAGNOSIS: This species is similar in appearance to *yanayacu* but both the upper and under surfaces of the wings appear slightly paler due to a larger number of pale yellowish scales; the pale yellow area at the middle of the outer margin of the forewings is noticeably smaller, and there is a more prominent yellow area above the anal angle of the hind wings. The male genitalia differ from all other species by having the process of the left valve longer than the valve itself. The female genitalia have the posterior end of the ductus bursae with a thick, heavily sclerotized M-shaped process, and the posterior portion of the corpus bursae is straight, slender, and has numerous longitudinal striations.

DESCRIPTION: *Adults*: Similar to those of *yanayacu*, differing mainly as follows: Upper and under surfaces appearing slightly paler due to larger number of pale yellow scales; t. a. and t. p. lines indicated by larger cellular spots; outer margin of forewings with reduced pale yellow area at middle; hind wings with larger yellow area on anal margin above anal angle.

Length of Forewings: Holotype, 15 mm; paratypes, 15 mm.

Male Genitalia (figs. 199, 200): Similar to those of *hadra*, differing mainly as follows: Gnathos more sharply angled medially, posteriorly directed portion tapering, apical region broad, medially concave. Left valve with process longer than valve, S-shaped. Anellus broad anteriorly, 0.4 mm wide, median extension slender, having dorsal ridge extend-

ing onto anterior part; posterior end flared. Aedeagus 2.05 mm long, 0.35 mm wide; posterior end rounded. Vesica with sclerotized processes fused together, upper one 0.5 mm long, lower 1.0 mm, both prominently dentate distally.

Female Genitalia (fig. 202): Ductus bursae short, 0.5 mm long, posteriorly sclerotized, apical region with thick M-shaped process. Corpus bursae membranous, anterior one-half weakly twisted, posterior portion straight and with numerous longitudinal striations. Ductus seminalis arising 1.0 mm anteriad of junction of ductus bursae and corpus bursae. Apophyses posteriores 2.5 mm long; apophyses anteriores 1.0 mm.

TYPES: Holotype, male, Chapare, Bolivia, Sept. 1–7, 1948 (J. Foerster) (fig. 188). The genitalia of the holotype are mounted on slide FHR 20,088. Paratypes, both from Chapare, Bolivia: Aug. 29, 1949 (L. E. Peña), 1 male; Aug. 26–30, 1948 (J. Foerster), 1 female.

The type series is in the collection of the AMNH.

DISTRIBUTION: Known only from the type locality.

TIME OF FLIGHT: August and September.

REMARKS: Three specimens (2 males, 1 female), three genitalic dissection, and one slide mount of a male antenna and legs have been studied.

ETYMOLOGY: The specific name is from the Latin *prolixus*, meaning stretched far out or elongate, in relation to the process of the left valve.

Genus *Melanolophia* Hulst

Figures 1–4, 12, 203–233

Melanolophia Hulst, 1896: 357. Rindge, 1964a: 250–359, text figs. 1–76, 98–148, 154, pls. 3–8; 1967b: 1–9.

DIAGNOSIS: The male abdomen may or may not have the secondary sexual modifications on segment A3 medially, laterally between segments A3 and A4, and A7 and A8; the gnathos has from one to three median points; each valve has a sclerotized sacculus that has an arm either on the face of the valve or attached at the base only, with the arms usually being asymmetrical, and the harpe is a lightly sclerotized band; the manica is membranous; the exserted vesica is angled anteriorly at about 135 to 160° to the aedeagus; the lamella antevaginalis varies from being inconspicuous to a large projection, and the lamella postvaginalis is usually a strongly developed process; the signum is either very small or absent; the hind wings usually have eight veins and are concolorous with the forewings.

DESCRIPTION: *Adults*: Head with antennae of about 51 to 75 segments; males with terminal 4 to 11 segments simple; longest pectinations 0.6 to 1.0 mm, being between 3.5 and 5.0 times as long as their basal segments; antennae of females simple, rarely shortly pectinate. Palpi rising to between lower edge of eyes and 50 percent height of eyes, extending in males between 40 and 60 percent length of eyes in front of eye, and in females between 50 and 80 percent. Eyes of females usually smaller than those of males, rarely of equal size.

Forelegs with epiphysis of males arising between 45 and 55 percent length of segment and being from 50 to 60 percent its length, of females arising between 55 and 60 percent length of segment and being 40 to 45 percent its length. Hind legs of males usually with tibial hair pencil, rarely without.

Forewings with one accessory cell; R_{1+2} stalked; mdc and ldc variable, being curved, angled, or biconvex; outer margin of wing weakly concave between veins. Hind wings with eight veins; Sc extending 40 to 50 percent length of cell; udc and ldc curved. Upper surface of all wings unicolorous brown, with rather indistinct pattern continued on hind wings from forewings. Under surface paler than upper surface, with maculation absent or weakly represented, showing through from upper surface, with discal spots present, and with broad subterminal band present in some species.

Length of Forewings: 13 to 25 mm.

Abdomen of males usually with median row of setae on ventral surface of A3 (rarely without), lateral setal tufts between A3 and A4 present or absent (when present varying from small pocketlike indentation with or without a few elongate setae, to more or less equal sized setal tufts, to having one "tuft" fused together to form prominent curved process and with the other tuft of elongate separate setae, both on membranous, exsertable

sac; figs. 1–4), and with prominent comblike paired structure between A7 and A8 (rarely without) consisting of numerous, very long, slender, modified setae enlarged and curved distally (fig. 12); with elongate, setose membrane between A8 and tegumen plus saccus. Scaling of abdomen normal; posterior margin of each tergite with single row of slender setae or elongate scales.

Male Genitalia: Uncus prominent, sides tapered or concave, apex either slender, pointed, with single point, or variously swollen, terminating in one or two points. Socius absent. Gnathos well sclerotized, variable, enlarged medially, rounded or terminating in from one to three points. Each valve with sclerotized costa having small to prominent setose swelling; ampulla with anterior portion swollen, thickly setose; sacculus sclerotized, with variably shaped arm on each valve usually asymmetrical (rarely symmetrical), either on inner face of valve or free and attached at anterior end only, with each apex or terminal portion usually variously setose or spinose; harpe membranous or weakly sclerotized, rarely with small spine patch and a few elongate spines. Cristae absent. Anellus elongate, weakly sclerotized, more or less constricted medially, posterior end variably shaped. Manica membranous. Aedeagus 2.0 to 3.5 mm long, 0.2 to 0.4 mm wide; posterior end pointed, sclerotized, one side with longitudinal striations. Vesica unarmed; when exserted, angled anteriorly to about 135°, sometimes almost paralleling aedeagus, with or without one or more small sacs (fig. 222).

Female Genitalia: Sterigma with lamella antevaginalis varying from inconspicuous to a large projection; lamella postvaginalis usually sclerotized, strongly developed, symmetrical or asymmetrical. Ductus bursae short to moderate, longer than wide, sclerotized or punctate, joining corpus bursae on right side, either dorsally or ventrally. Corpus bursae membranous, elongate, asymmetrical, curved, anterior end often somewhat footlike; posterior end asymmetrical, lightly sclerotized or punctate near junction with ductus bursae. Ductus seminalis arising from posterior surface of short extension of corpus bursae beyond junction with ductus bursae. Signum very small (rarely absent), usually with posterolateral corners extended. Apophyses posteriores about 1.8 to 2.5 mm long; apophyses anteriores 0.8 to 1.3 mm.

EARLY STAGES: McGuffin (1977: 103–106, figs. 200, 201) has summarized and described the early stages of the three Canadian species; Salkeld (1983: 54–57) has described and illustrated the eggs of two of these species. Little is known from all the non-North American species, which constitute the bulk of the genus, with the exception of a defoliator in Colombia (see below).

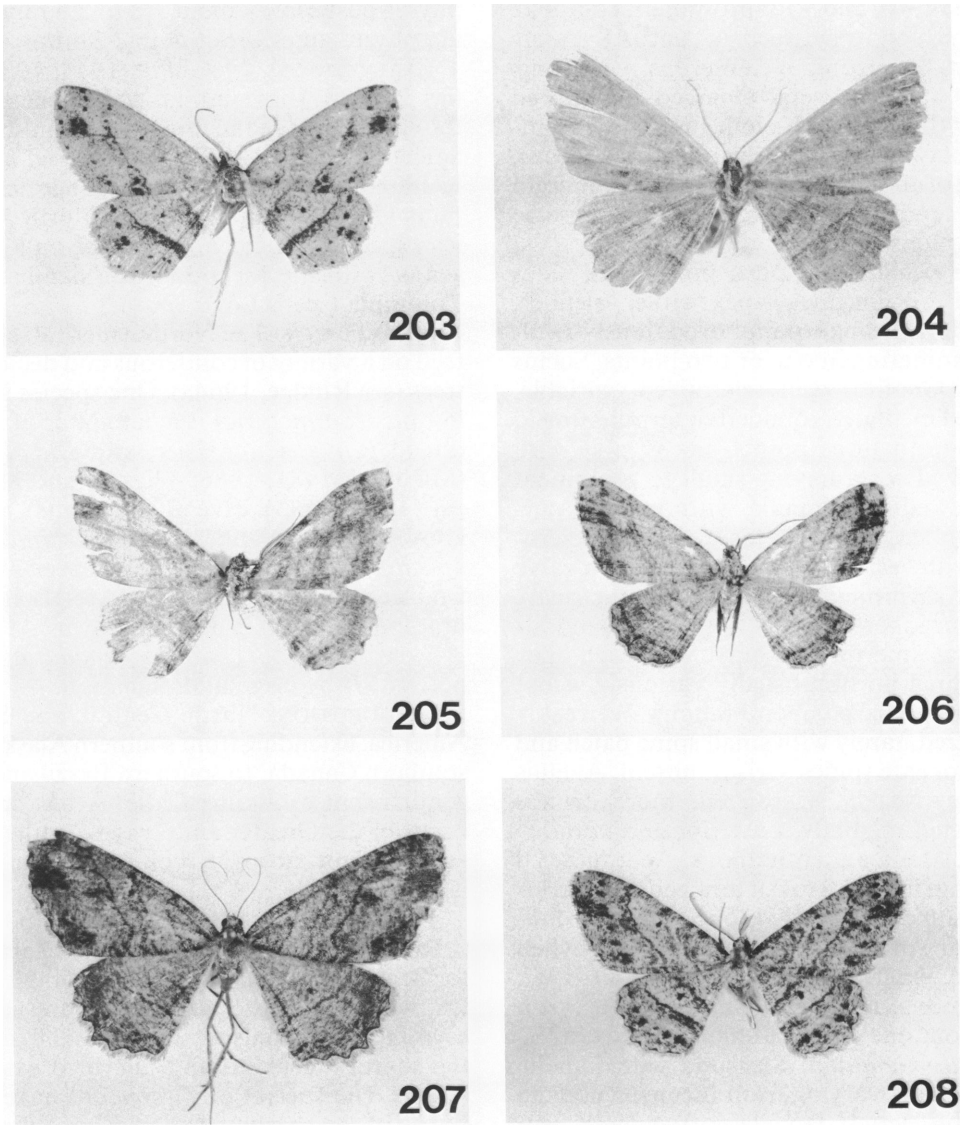
FOOD PLANTS: The North American species feed on a variety of coniferous and deciduous trees (see Rindge, 1964a). One species in Colombia (*commotaria*) is a defoliator of introduced *Pinus*, *Cupressus*, and *Eucalyptus* (Madrigal, 1981, 1986; Wiesner and Madrigal, 1983); the native food plant(s) is unknown. In Sao Paulo, Brazil, *Melanolophia apicalis* also feeds on the same species of introduced pine (specimens in AMNH); its natural food plant(s) is also unknown.

TYPE SPECIES: *Tephrosia canadaria* Guenée, 1857; by original designation.

DISTRIBUTION: North, Central, and South America, extending from southern Alaska and southern Canada, to southern Brazil and Argentina, but excluding Chile. A few species occur in the Greater and Lesser Antilles; the genus is not strongly represented on these islands.

TIME OF FLIGHT: Every month of the year.

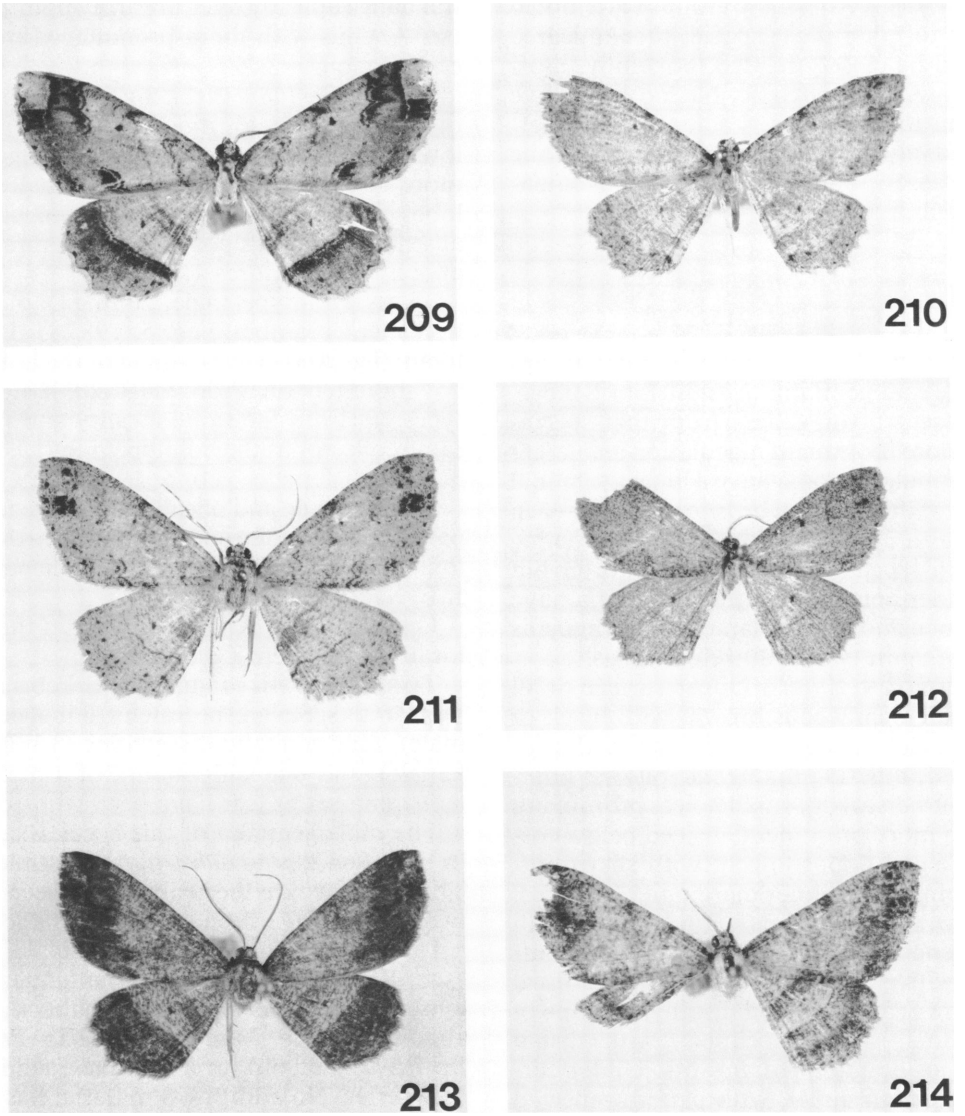
REMARKS: The autapomorphic characters for *Melanolophia* are the arms of the sacculus, which originate basally and are usually asymmetrical, elongate, slender, and free, plus the sharply recurved and unarmed exserted vesica. The species of *Tesiophora* have processes of the sacculus but they arise distally, and are usually symmetrical and semicircular; only in *exallos* are they asymmetrical. The exserted vesicas of *Tesiophora* are also sharply recurved but they have two separate groups of spines, one a short clump and the other an elongate, slender row; the members of that genus lack the longitudinal striations of the aedeagus that are usually present in *Melanolophia*. Within the tribe, the species of *Melanolophia* are easily recognized on the generic level by the unicolorous brown upper surface of the wings with the pattern of the forewings continued onto the hind wings. The members of *Minyolophia* have a unicolorous



Figs. 203–208. Adults of *Melanolophia*. **203**. *M. calimae*, new species, holotype, male. **204**. *M. ovata*, new species, holotype, female. **205**. *M. peridoxa*, new species, holotype, male. **206**. *M. pseudodoxa*, new species, holotype, male. **207**. *M. mima*, new species, paratype, female. **208**. *M. anchicaya*, new species, holotype, male. X 1.2.

upper surface but lack definite cross lines on the wings. The species of *Eufidonia* show a transition from more or less unicolorous upper surface to having the hind wings sharply contrasting in color with the forewings; the latter condition is usually found in the other genera covered in the present revision. While the unicolorous upper surface is distinctive within the Melanolophiini, it is commonly present in many genera of the Boarmiini and in other tribes of the Ennominae; consequently, I consider it to be plesiomorphic.

This is by far the largest genus in the tribe, as it includes about as many species as are in all the other genera combined. In my 1964 revision I included 75 species; several more have been described since then by Poole (1970: *misma* and *distracta*, both from Ven-



Figs. 209–214. Adult males of *Melanolophia*. **209**. *M. orthogonia*, new species, holotype. **210**. *M. muriensis*, new species, holotype. **211**. *M. plecte*, new species, holotype. **212**. *M. necopina*, new species, holotype. 213, 214. *M. sullivani*, new species. **213**. Holotype. **214**. Paratype. X 1.2.

ezuela) and Herbulot (1976: *tephrias*, *zorca*, and *venedictoffae* from Ecuador, and *moinieri* and *rindgei* from Panama; 1985: *lalannei* from Martinique and *lalanneae* from Guadaloupe); 1986: *rufimontis* from Martinique. Both the above authors have included systematic and distributional data on previously described species, and I had a second paper (1967b) on the genus that made some lectotype designations and also gave additional distributional data. Herbulot (1988) has also described *Melanolophia azenioides*; I have placed it in *Minyolophia* (see above).

As an aid in subdividing this large number of species, I proposed seven species-groups in my 1964 paper. These were based on a combination of characters that included wing coloration and pattern, the length of the forewings, the secondary sexual modifications of the male abdomen, and the male and female

genitalia. In erecting these groups I attempted to place together those species that appeared to me to be closely related; hopefully, most groups are monophyletic, but no tests have been run to see if this is actually so. References to group numbers in the following species descriptions refer to the abovementioned subdivisions.

Melanolophia calimae, new species
Figures 203, 215, 226

DIAGNOSIS: This species is similar in appearance and genitalia to *substriata* Rindge. The present taxon differs from that species by the more prominent maculation and larger size; the male genitalia have a longer terminal portion of the uncus, a broader gnathos, each valve has a noticeably longer costal swelling and both saccular processes are shorter but have wider apices; the female genitalia have a very long and slender lamella postvaginalis terminating in two small setose lobes.

DESCRIPTION: *Adults*: Upper surface of all wings pale ochraceous brown, with black or grayish black maculation similar to that of *substriata*, differing mainly as follows: Forewings with discal dot smaller, less prominent; t. p. line more prominent, curved below costa, thickened opposite cell, with sharp outward point above inner margin in black area; s. t. line of larger dots. Hind wings with prominent median line, often shaded outwardly with grayish black scaling; extradiscal line more heavily shaded distally; s. t. line of larger dots, some specimens with distad shading of double median dots. Under surface paler than upper, with pattern reflected more prominently than in *substriata*.

Length of Forewings: Holotype, 19 mm; paratypes, 18 to 21 mm.

Male Genitalia (fig. 215): Similar to those of *substriata*, differing mainly as follows: Uncus with terminal portion with elongate, parallel sides, posterior margin with sides raised, slightly concave medially. Gnathos with median enlargement broader, as wide as base of uncus, lateral lobes larger, with median raised strip. Each valve with costa having larger, longer swelling, extending three-fifths length of costa as ridgelike process; right valve with shorter process, extending to gnathos, and having deeper incision on outer surface; left valve not attaining posterior margin of anellus, terminal portion wider, with small ventral flange apically over inwardly pointing setae. Anellus with more pronounced median constriction.

Female Genitalia (fig. 226): Similar to those of *striata* (Warren), differing mainly as follows: Lamella postvaginalis much longer and more slender, terminating in two small setose lobes. Corpus bursae sharply curved; signum absent. Apophyses posteriores 2.2 mm long; apophyses anteriores 1.1 mm.

TYPES: Holotype, male, Calima Dam, 3000 ft, Valle, Colombia, Feb. 5, 1987 (J. B. Sullivan) (fig. 203). The genitalia of the holotype are mounted on slide FHR 20,080. Paratypes, all from the same locality and by the same collector as the holotype: Jan. 15, 1985, 3 males, 1 female; Feb. 5, 1987, 2 males.

The holotype and one male and one female paratypes are in the collection of the AMNH; four male paratypes are in the collection of J. B. Sullivan.

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

TIME OF FLIGHT: January and February.

REMARKS: Seven specimens (6 males, 1 female), four genitalic dissections (3 males, 1 female), and one slide mount of a male antenna and set of legs have been studied.

The male genitalia of this species key out in my 1964 key to *substriata* in couplet 23. The differences in the genitalia between these two species have been enumerated above.

I described *substriata* from four males from "Ob. Río Negro," Norte de Santander, Colombia; there was also one female, without abdomen, from Tumatumari, Río Potaro, British Guiana but it was not included in the type series. No additional material has been seen. The above two localities are either in or are east of the Andes, with the river drainage probably going into the Caribbean. The new species is from the west coast of Colombia, an area that has a large percentage of endemic species in *Melanolophia*.

ETYMOLOGY: The specific name is a noun in the genitive case, based on the type locality.

Melanolophia ovata, new species
Figures 204, 227

DIAGNOSIS: This species apparently has the upper surface of all wings dark brown (although it is badly rubbed), with both the median and extradiscal lines on the hind wings

well developed. The female genitalia have an ovate sterigma, with the lamella antevaginalis being a small liplike structure on the left side, and the lamella postvaginalis being large, sclerotized, with a posteromedian scooplike process tapering anteriorly, and with asymmetrical lateral ridges. (The males have not been studied.)

DESCRIPTION: *Adults*: Female antennae with longest pectinations 0.4 mm, apical setae 0.15 mm in length.

Upper surface of all wings dark brown; forewings apparently relatively plain, with traces of median and t. p. lines at inner margin, and blackish brown spotting opposite cell in subterminal area and above inner margin distad of t. p. line (forewings badly rubbed, so details are sketchy); hind wings with broad, straight, grayish black median band, discal dot, and straight, complete extradiscal line, last being shaded near anal margin by dull orange scales on both sides. Under surface apparently grayish brown, without maculation except for small discal dots.

Length of Forewings: Holotype, 22 mm.

Female Genitalia (fig. 227): Sterigma ovate; lamella antevaginalis small, liplike, on left side, posteriad of several concentric ridges that extend posteriorly around margin of lamella postvaginalis; lamella postvaginalis ovate, heavily sclerotized except for lightly sclerotized posterior end, posterior portion with median scooplike process tapering anteriorly and terminating in sharp, ventrally curved point, lateral areas with raised asymmetrical ridges. Ductus bursae arising to right of center of sterigma, anteriad of shallowly W-shaped ridges; slender, elongate, lightly sclerotized posteriorly. Corpus bursae slightly curved, weakly enlarged anteriorly, membranous; posterior end large, apically blunt or flattened, with ductus bursae joining corpus bursae dorsally or on left side in area of longitudinal ridges; signum small, posterior margin sclerotized, flatly U-shaped, terminating in two lateral points. Ductus seminalis arising posteriorly from blunt end of corpus bursae. Apophyses posteriores 2.2 mm long; apophyses anteriores 1.2 mm.

TYPE: Holotype, female, Pance, 4000 ft, Valle, Colombia, Jan. 29, 1987 (J. B. Sullivan) (fig. 204). The genitalia of the holotype are mounted on slide FHR 20,053.

The holotype is in the collection of the AMNH.

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

TIME OF FLIGHT: January.

REMARKS: One specimen and one genitalic dissection have been studied.

I am placing this species in Group III, largely on the basis of the shortly pectinate female antennae. It appears to be related to the *piura-producta-vulsa* group. The exact picture of the relationships within this group is very obscure, due to lack of material—I described *piura* from a single male from northwestern Peru, *producta* from another single male from central Ecuador, and *vulsa* from a single female from the Sierra del Libane, Colombia. The two males have the prominent extradiscal line on the upper surface of the hind wings, whereas *vulsa* does not. I consider it highly unlikely that the present species could be the female of either *piura* or *producta*.

More and better material of *ovata* is needed before a complete description of the maculation can be given.

ETYMOLOGY: The specific name is from the Latin *ovatus*, meaning egg-shaped, in relation to the sterigma.

Melanolophia peridoxa, new species

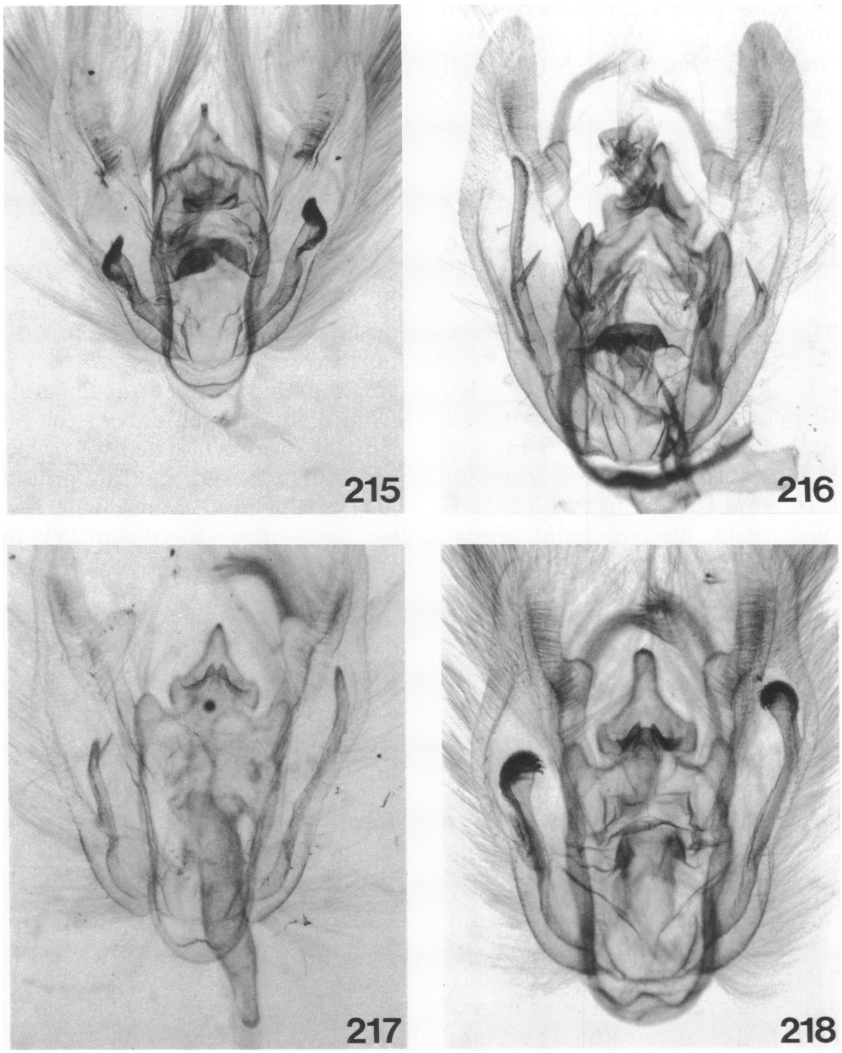
Figures 205, 216

DIAGNOSIS: This species is similar to *eudoxa* Rindge in the color and pattern of the wings, but it is slightly smaller, and has the markings on the under surface of all wings heavier, with a larger longitudinal stripe from the median line to the s. t. band. The male genitalia of these two species are of a similar type; the present species has the process of the left valve approximately twice as long as that of the right side, both with a thick spine, medially situated on the left and apically on the right side. (The females have not been studied.)

DESCRIPTION: *Adults*: Upper surface of wings similar to those of *eudoxa* but with t. p. and extradiscal lines tending to be more prominently double, and with a wider longitudinal stripe from median to s. t. line on forewings. Under surface of wings with heavier dark markings, including a more prominent longitudinal stripe on the forewings.

Length of Forewings: Holotype, 18 mm.

Male Genitalia (fig. 216): Uncus and gna-



Figs. 215–218. Male genitalia of *Melanolophia*. **215**. *M. calimae*, new species, holotype. **216**. *M. peridoxa*, new species, holotype. **217**. *M. pseudodoxa*, new species, holotype. **218**. *M. mima*, new species, holotype.

thos similar to those of *eudoxa* but with latter structure having a shallower median indentation in present species. Valves with processes of sacculus strongly asymmetrical, left one approximately twice as long as one on right side; left process extending just beyond middle of uncus, slender, of equal width, basal one-half smoothly sclerotized, with prominent, inwardly angled spine medially, and with outer one-half partially spined for its length; right process smoothly sclerotized, apically pointed, with prominent, inwardly angled spine arising before apex, being similar in size and shape to one on left side. Aedeagus with posterior end having elongate, slender, curving, sclerotized projection similar to that of *eudoxa*.

TYPE: Holotype, male, 3 km (air) SE of Zamora, ca. 1200 m, Zamora-Chinchipe, Ecuador, June 1–3, 1986 (S. McKamy) (fig. 205). The genitalia of the holotype are mounted on slide FHR 19,951.

The holotype has been deposited in the collection of the AMNH.

DISTRIBUTION: Known only from the type locality.

TIME OF FLIGHT: June.

REMARKS: One specimen and one genitalic dissection have been examined.

This species keys out to *inatrata* in couplet 48 of my 1964 key; the two species can be separated by the pair of thick spines on the processes of the valves in the present species.

While the holotype is somewhat worn, the genitalia are very distinctive, while showing a number of similarities to *eudoxa*.

ETYMOLOGY: The specific name is formed from the Greek prefix *peri-*, around or near, and the Greek word *doxa*, to indicate a similarity between this species and *eudoxa*.

Melanolophia pseudodoxa, new species
Figures 206, 217

DIAGNOSIS: This is a small species, similar to *peridoxa*, with the color and type of maculation that is also found in *eudoxa* Rindge and *trisurca* (Dognin). The male genitalia have the process of the right valve long and slender, extending as far as the middle of the uncus, and the left process is shorter and has a thick spine near its apex. (The females have not been studied.)

DESCRIPTION: *Adults*: Upper surface of wings similar to those of *eudoxa* but less contrastingly colored, having s. t. band and part of terminal area darkened; cross lines slender, not as prominent as in *eudoxa*; terminal area of forewings darkened opposite cell. Under surface of wings similar to those of *eudoxa* but less heavily suffused with dark scales and lacking longitudinal stripe of forewings. Abdomen with lateral hair pencil between A3 and A4 reduced or deciduous.

Length of Forewings: Holotype, 17.5 mm.

Male Genitalia (fig. 217): Uncus and gnathos similar to those of *eudoxa*, but with former more slender apically and gnathos having median area broader and shorter. Valves with processes of sacculus strongly asymmetrical, right one extending to middle of uncus, left one only part way between posterior end of sacculus and tegumen; both processes with curved bases; left process smoothly sclerotized, distal portion weakly curved, bearing prominent, inwardly angled spine before shortly spinose apical region; right process smoothly sclerotized, of equal width for its length, apically curved and finely spinose. Aedeagus with posterior end having elongate, slender, curving, sclerotized projection similar to that of *eudoxa*.

TYPE: Holotype, male, Sta. Isabel, 600 m, 65 km SW of Cuenca, Azuay, Ecuador, Feb. 19, 1965 (L. E. Peña) (fig. 206). The genitalia of the holotype are mounted on slide FHR 14,345.

The holotype is in the collection of the AMNH.

DISTRIBUTION: Known only from the type locality.

TIME OF FLIGHT: February.

REMARKS: One specimen and one genitalic dissection have been studied.

In my 1964 key, this species keys out to couplet 27, as *triloba*. The present species has an entirely differently shaped gnathos than does that Central American species, as well as the obvious differences in the uncus, processes of the sacculus, and apex of the aedeagus. In general, the genitalia appear much more similar to those of *trisurca*, but differ in the apical region of the uncus, the details of the processes of the sacculus, and the apex of the aedeagus.

ETYMOLOGY: The specific name is formed from the Greek prefix *pseudo-*, false, and the Greek word *doxa*, to indicate that while having the appearance of *eudoxa*, the two species are distinct.

Melanolophia mima, new species
Figures 207, 218, 228

DIAGNOSIS: This species is so similar in appearance to *eudoxa* Rindge and *trisurca* (Dognin) that it is advisable to use the genitalia for identification. The male structures are more similar to those of the latter species, and may be recognized by the shorter median extensions of the gnathos, by the processes of each sacculus being more rounded and having more spines, with the left one lacking a single thick spine, and by the longer aedeagus. The female genitalia have the membra-

nous area surrounding the ostium bursae anteriorly more rugose than in *trisurca*.

DESCRIPTION: *Adults*: Very similar in color and pattern to both *eudoxa* and *trisurca*.

Length of Forewings: Holotype, 21 mm; paratypes, 22 to 25 mm.

Male Genitalia (fig. 218): Similar to those of *trisurca*, differing mainly as follows: Uncus with terminal portion slightly longer and thinner. Gnathos with median extensions shorter, their lengths being less than space between them. Valves with processes of each sacculus more rounded, having more spines on each apical section; left process with spines on apical section without one single thick spine; right process with terminal one-fourth slightly narrower, with curve instead of angle. Aedeagus 1.2 mm long (1.1 mm in *trisurca*), and less curved.

Female Genitalia (fig. 228): Similar to those of *trisurca*, differing mainly as follows: Membranous area outside of ostium bursae more rugose; membranous central area of ostium bursae wider, extending to surrounding ridged areas; (ostial area partially obscured by some type of growth making it difficult to make out the finer details).

TYPES: Holotype, male, Finca Monte Bello, 2000 m, 5 km S Bitaco, Valle, Colombia, Jan. 30, 1988 (J. B. Sullivan). The genitalia of the holotype are mounted on slide FHR 20,076. Paratypes, all from Valle, Colombia, and collected by J. B. Sullivan: Alto Río Quindio, E above Salento, Quindio, Jan. 24, 1987, 1 male; Calima Dam, 3000 ft, Jan. 15, 1985, 1 male; Pance, 4000 ft. Jan. 20, 1986, 1 female (fig. 207).

The holotype and the female paratype have been deposited in the collection of the AMNH; the two male paratypes are in the collection of J. B. Sullivan.

DISTRIBUTION: Western Colombia, at elevations of about 900 to 2000 m.

TIME OF FLIGHT: January.

REMARKS: Four specimens (three males, one female) and four genitalic dissections have been studied.

The male genitalia of this species key out to *trisurca* in couplet 25 of my 1964 key. The differences between the two species have been outlined above. My genitalic comparisons were made with male specimens of *trisurca elongata* Rindge from Peru, Bolivia and Argentina (the last being a range extension for the species), while the female structures were compared with a single dissection of the nominate subspecies from Ecuador.

ETYMOLOGY: The specific name is from the Latin *mimus*, mimic or imitate, in reference to the maculation.

Melanolophia anchicaya, new species
Figures 208, 219, 229

DIAGNOSIS: This is a relatively small species that appears similar to *vegrande* Rindge, but differs in having less dark scaling on the upper surface of the wings distad of the t. p. line, and by having the s. t. line of separate black spots. The male genitalia differ from those of *vegrande* by the more sharply angled uncus, by the gnathos having a broader bifurcate apex, by the longer setose costal swellings, and by both sacculus processes having broader apices. (The females have not been studied; but see under Remarks, below.)

DESCRIPTION: *Adults*: Upper surface of wings similar to those of *vegrande* but with t. p. line more S-shaped, area distad of t. p. line varying from being slightly darker to noticeably darker than median area, with s. t. line consisting of distinct black dots narrowly outlined distally by creamy white, and with or without longitudinal streak below cell. Under surface similar to upper but with more dark scaling and larger s. t. dots.

Length of Forewings: Holotype, 18 mm; paratypes, 17 to 19 mm.

Male Genitalia (fig. 219): Uncus sharply angled ventrally, apex tapering to single point. Gnathos with median indentation prominent, apical points widely separated, parallel, not converging as in *trisurca*. Each valve with prominent setose swelling; processes of sacculus similar to those of *vegrande* but both with broader apices; one on left side with straight, elongate basal portion, spinose apex tapering, extending half way between anellus and gnathos, and with single spine to left of apex one-half as long as apex; process on right side with elongate basal portion gently curved, of even width, apical area opposite gnathos, spines at about right angle to basal portion, recurving ventrally, and with single spine to

right of apex, similar to one on left side. Aedeagus 1.9 mm long, curved, with elongate sharp apex.

TYPES: Holotype, male, Anchicaya, 3000 ft, Valle, Colombia, June 29, 1981 (J. B. Sullivan) (fig. 208). The genitalia of the holotype are mounted on slide FHR 20,074. Paratypes: Same data as holotype, 650 m, Feb. 2, 1989, 3 males (the wings of one are off the thorax and are glued to a piece of light cardboard); same data but 350 m, Feb. 3, 1989, 2 males.

The holotype has been deposited in the collection of the AMNH; paratypes are in the collections of that institution and of J. B. Sullivan.

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

TIME OF FLIGHT: February and June.

REMARKS: Six specimens and two genitalic dissections have been studied.

This species keys out to couplet 25 of my 1964 key. The process of the left valve extends about half way between the posterior margins of the anellus and tegumen, thus placing the present species in the *trisurca-accurata-vegrande* complex of Group III.

The holotype (June) has relatively pale wings, whereas the paratypes (February) have considerably more black scaling on the wings. This may indicate seasonal dimorphism similar to that found in *sullivani*, described below.

There is before me a single female, in very poor condition, from Calima Dam, 3000 ft, Valle, Colombia, Jan. 15, 1985 (J. B. Sullivan), with its genitalia mounted on slide FHR 20,061 (fig. 229). This specimen, based on its genitalia, belongs in Group III. Assuming seasonal dimorphism, with specimens caught in January and February having considerably more dark scaling on the wings, it is possible that the present specimen might be the female of *anchicaya*. The upper surface of all wings is broadly suffused with dark brown; the pattern (or what can be seen of it) seems to be similar to that of the holotype of *anchicaya*, with prominent discal dots and cross lines. The genitalia differ from those of *mima* by having a longer, very lightly sclerotized posteroventral process extending almost to the center of the ostium bursae, by a longer ductus bursae which joins the corpus bursae diagonally, and by a shorter corpus bursae that does not have a signum.

ETYMOLOGY: The specific name is a noun in apposition taken from the type locality.

Melanolophia orthogonia, new species

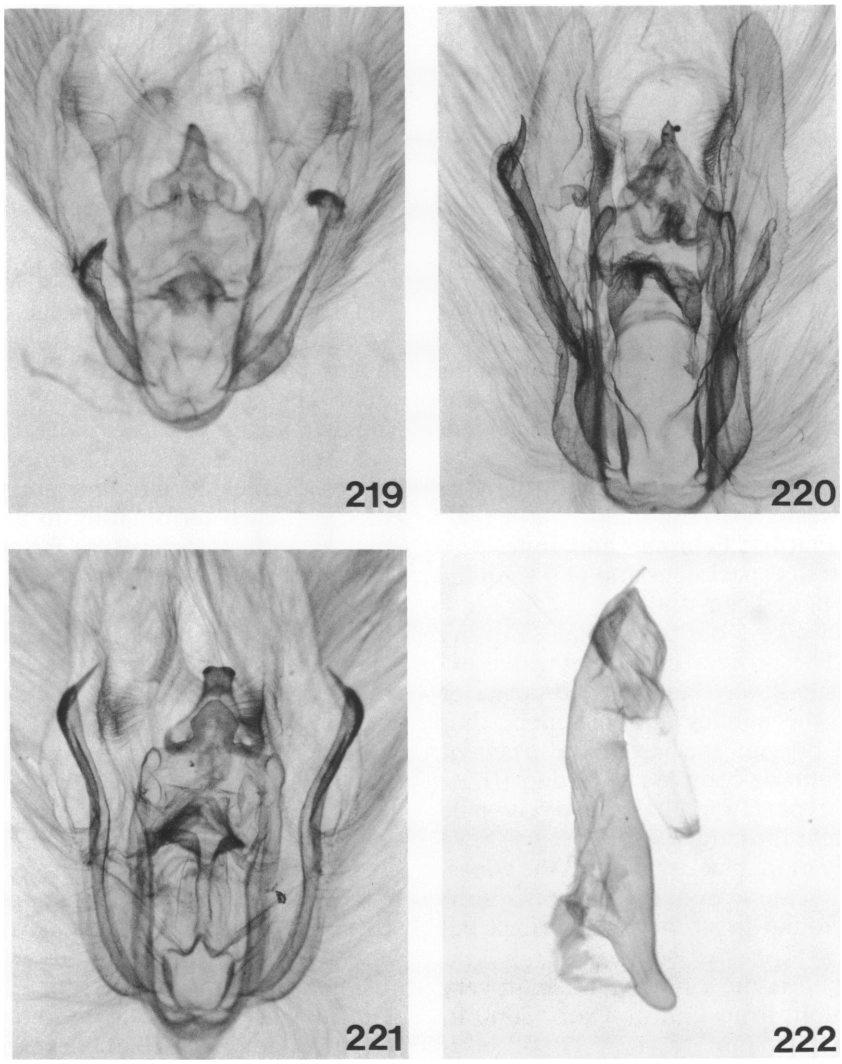
Figures 2, 209, 221, 222, 230

DIAGNOSIS: The upper surface of the wings is very similar to that of *isoforma* Rindge, but is browner and more contrastingly colored. The male genitalia have a broadly rectangular uncus with two lateral points. The gnathos is bluntly sagittiform, and the processes of the sacculus are practically symmetrical, each terminating in a single spine that extends posteriorly as far as the end of the uncus. The female genitalia have an asymmetrical lamella antevaginalis, which is broadly swollen posteriorly on the left side, and with several concentric sclerotized ringlike projections to the right, while the lamella postvaginalis is triangular and terminates in a slender, parallel-sided projection with a deep median incision.

DESCRIPTION: *Adults*: Upper surface of wings similar to that of *isoforma* but browner and more contrasting in color; forewings with median line represented by angled dash on costa and being obsolescent across wing; t. p. line tending to be double above inner margin and more evenly rounded than in *isoforma*. Hind wings with wider, more strongly represented, double median line; extradiscal line complete, straighter, more strongly shaded distally with dark brown than in *isoforma*.

Length of Forewings: Holotype, 22.5 mm; paratypes, 21 to 22 mm.

Male Genitalia (figs. 221, 222): Uncus broad, 0.25 mm wide, rectangular; apex with lateral dorsoposterior swellings, each terminating in well defined lateral points. Gnathos with median portion bluntly sagittiform. Valves with processes of sacculus practically symmetrical, slender, posterior one-half with finely spined ridge, terminating in single spine extending posteriorly as far as apex of uncus. Anellus with broad, almost square, anterior portion, sharply narrowed medially, broadly flared posteriorly. Uncus 3.0 mm long, api-



Figs. 219–222. Male genitalia of *Melanolophia*. **219**. *M. anchicaya*, new species, holotype. **220**. *M. muriensis*, new species, holotype. 221, 222. *M. orthogonia*, new species, holotype. **221**. Genitalia. **222**. Aedeagus (not to same scale).

cally narrowed and curved; exserted vesica with slight basal swelling.

Female Genitalia (fig. 230): Sterigma with asymmetrical lamella antevaginalis, having several concentric ringlike projections anteriorly, compressed together on left side, more widely spaced on right, terminating in subtriangular plate, left side longer than right, anterior margin most posteriad of ringlike projections, with partial ringlike ridge on ventral surface anteriorly, posterior margin weakly crenulate and with partial longitudinal ridge; lamella postvaginalis subtriangular, tapering posteriorly, terminating in slender, parallel-sided projection with deep median incision. Ductus bursae very short, slender, membranous. Corpus bursae curved, very slightly enlarged anteriorly; posterior end sclerotized on right side dorsally and laterally for short distance, joining ductus bursae dor-

sally; signum small, appearing U-shaped, wider than high. Ductus seminalis arising posteriorly on left side of corpus bursae opposite sclerotized area. Apophyses posteriores 2.4 mm long; apophyses anteriores 3.3 to 3.4 mm.

TYPES: Holotype, male, Sebundoi, 2600 m, between Santa Barbara and La Bonita, Napo-Pastaza, Ecuador, Sept. 11–15, 1977 (L. E. Peña) (fig. 209). The genitalia of the holotype are mounted on slide FHR 19,701A, and one antenna and a set of legs are on slide FHR 19,701B. Paratypes: Otavalo to Apuela, 2200 m, Imbabura, Ecuador, Sept. 8–10, 1977 (L. E. Peña), 2 females.

All the type specimens are in the collection of the AMNH.

DISTRIBUTION: Known only from the three specimens of the type series from Ecuador.

TIME OF FLIGHT: September.

REMARKS: Three specimens, three genitalic dissections, and two slide mounts of antennae and legs have been studied.

In appearance and color, this species could easily be mistaken for any number of species of my Group VI (1964a: 321–348), with the exception of the first four. A study of the genitalia is nearly always required in order to be certain of the identifications. The present species differs from all described taxa by the very broad, parallel-sided uncus, and by the configuration of the sterigma.

In my 1964 key, the male genitalia come out at couplet 71, for *delinquaria*. The structures of the two species are very different in both size and form, as *orthogonia* is larger and has but a single large spine at the apex of each process of the sacculus.

ETYMOLOGY: The specific name is from the Latin *orthogonius*, meaning rectangular, in reference to the shape of the uncus.

Melanolophia muriensis, new species
Figures 3, 210, 220

DIAGNOSIS: The wing color and pattern are similar to those of *nebularia* (Schaus), but the median shade line of the upper surface of the hind wings is less strongly represented and the outer dark band on the under side of all wings is more prominent. The male genitalia are more like those of *immarcata* but the process of the left sacculus is longer, extending to the apex of the uncus, and terminates in a single large spine. (The females have not been studied.)

DESCRIPTION: *Adults*: Wings similar in color and pattern to those of *nebularia*; upper surface with maculation weakly represented, especially median shade line on hind wings; under surface tending to have broader and more prominent outer band on all wings.

Length of Forewings: Holotype, 20 mm.

Male Genitalia (fig. 220): Uncus with apical region short and relatively broad, with slender, high dorsoposterior ridge, and with small projecting apical point. Gnathos with strong median lobe and wide lateral areas. Valves with processes of sacculus strongly asymmetrical; that of left side extending as far as apex of uncus, with constriction at one-third length, posterior two-thirds with flat inner surface, slightly widening distally, having spinose dorsal ridge (with valves open) curved apically, terminating in single, large, curved spinelike projection; process of right sacculus extending to near shoulder of tegumen, with median constriction, distal portion concave, with two short spines on inner surface. Anellus broad, three-fourths width of inner portion of saccus, anterior part elevated, posterior end slightly narrower than broad semicircular apex having lateral areas extending anteriorly. Aedeagus 2.4 mm long; vesica not exserted.

TYPE: Holotype, male, Muri, [nr.] Novo Friburgo, Río de Janeiro, Brazil, May 12, 1953 (H. Ebert) (fig. 210). The genitalia of the holotype are mounted on slide FHR 17,420. Muri is located at 22°20′S, 42°31′W, while Novo Friburgo is at 22°16′S, 42°32′W.

The holotype is in the AMNH.

DISTRIBUTION: Known only from the type locality, which is apparently at an elevation of between 500 and 1000 m.

TIME OF FLIGHT: May.

REMARKS: One specimen and one genitalic dissection have been studied.

In my 1964 key, the present species comes out at couplet 15, for *immarcata*. The male genitalia and secondary sexual characters on the abdomen of the two species have a number of similarities, but the form and length of the process of the left sacculus are very

different. Based on color and pattern, specimens of *muriensis* are likely to be confused with the adults of *nebularia* (*consimilaria* Walker, 1860, not *consimilaria* Duponchel; see Herbulot, 1976: 95), as both occur in southeastern Brazil, including the state of Río de Janeiro. The male genitalia of these two species are quite different, and no problems will be encountered when these structures are examined for identification purposes.

ETYMOLOGY: The specific name is an adjective derived from the name of the type locality.

Melanolophia plecte, new species
Figures 211, 223, 231

DIAGNOSIS: The upper surface of the wings is very similar to that of *semarcata* Rindge. The male genitalia have the process of the left sacculus variable in length, extending from near the posterior end of the tegumen to three-quarters the length of the uncus, with a constriction at 0.8 to 1.0 mm from the base, a diagonal row of spines extending posteromedially on the under surface of the arm distally, and with the terminal portion broadly spinose dorsally. The process of the right sacculus is slightly shorter than the anellus, and is without spines. The anellus is tapered posteriorly, with a very broad semicircular apex. The female genitalia have the sterigma with an apparent dorsal longitudinal split, a low encircling lamella antevaginalis, and a slightly off-center lamella postvaginalis that is elongate, posteriorly tapered and with a broad apex having a small median indentation.

DESCRIPTION: *Adults*: Upper surface of wings similar to those of *semarcata*, but tending to be slightly browner in color; hind wings with s. t. line tending to have smaller spots than in *semarcata*.

Length of Forewings: Holotype, 22 mm; paratypes, 21 to 23 mm.

Male Genitalia (fig. 223): Uncus with strong dorsoposterior ridge. Gnathos with strong median lobe and angled lateral shoulderlike areas. Valves with processes of sacculus strongly asymmetrical; that of left valve variable in length, extending from near posterior end of tegumen to three-quarters length of uncus, with constriction at 0.8 to 1.0 mm from base, with diagonal row of spines extending posteriomedially (with valves open) distad, and with terminal portion broadly spinose dorsally; process of right sacculus slightly shorter than anellus, with constriction at two-thirds its length, without any spines. Anellus tapered posteriorly, being one-half width of very broad semicircular apex having lateral areas extending anteriorly. Aedeagus with exserted vesica swollen and longitudinally striate posteriorly, and having large sac near posterior end with very few striations.

Female Genitalia (fig. 231): Ostium bursae with raised ringlike lining, having very slender median separation ventrally. Sterigma with apparent longitudinal split dorsally; lamella antevaginalis a low encircling ridge; lamella postvaginalis situated slightly on left side, elongate, posterior portion weakly tapered, apex broad and with small median indentation. Ductus bursae membranous, short, longer than wide. Corpus bursae weakly curved, scarcely enlarged anteriorly; posterior end with short dorsal extension, sclerotized and striate; signum small, length about equal to width, having lateral posterior points. Ductus seminalis arising posteriorly from ventral lobe of corpus bursae. Apophyses posteriores 2.4 mm long; apophyses anteriores 1.2 mm.

TYPES: Holotype, male, Finca San Pablo, 1800 m, 3 km N Alban, Cundinimarca, Colombia, Aug. 1–12, 1967 (P. and B. Wygodzinsky) (fig. 211). The genitalia of the holotype are mounted on slide FHR 14,926. Paratypes: Same data as holotype, 4 males, 1 female.

All the type specimens are in the AMNH.

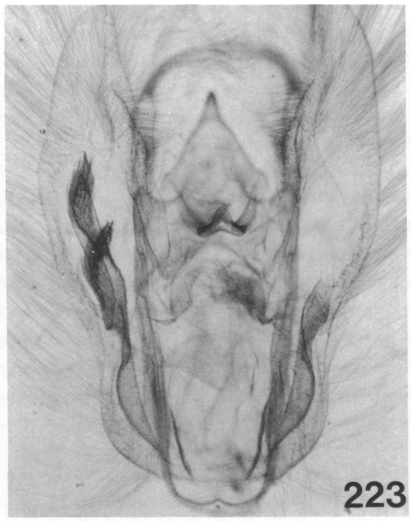
DISTRIBUTION: Known only from the type locality on the Cordillera Oriental.

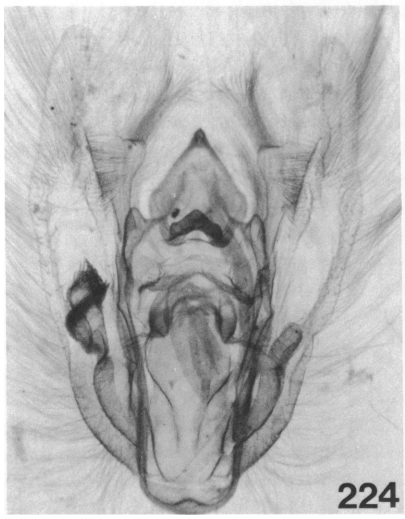
TIME OF FLIGHT: August.

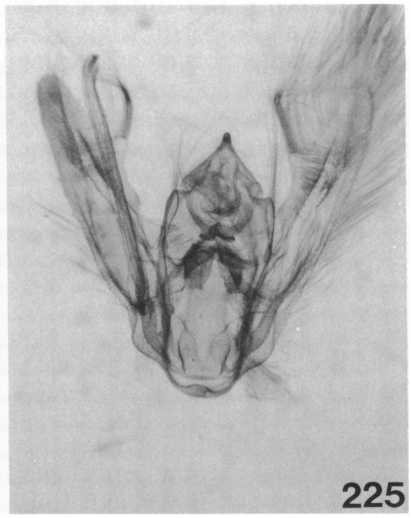
REMARKS: Six specimens (5 males, 1 female), and five genitalic dissections (4 males, 1 female) have been studied.

In my 1964 key, the present species comes out at couplet 15, for *agnataria*; *plecte* can be separated from that species by the different configuration of the process of the left sacculus.

There is some individual variation in color and maculation within this species. Some







Figs. 223–225. Male genitalia of *Melanolophia*. **223**. *M. plecte*, new species, holotype. **224**. *M. sullivani*, new species, holotype. **225**. *M. necopina*, new species, holotype.

specimens, including the holotype, appear to have more scattered dark scaling above on their slightly paler wings, whereas others project a "smoother" and faintly darker color; there are differences in color and the amount of maculation on the under surface of the wings in addition. This amount of variation could very well be of specific value in this species complex; however the genitalia show, without question, that the specimens are conspecific. The process of the left sacculus shows a considerable variation in length, which is rather unusual in *Melanolophia*. Its length may be from 0.9 to 1.3 mm, while the left valve varies from 1.75 to 1.83 mm. Notwithstanding the differences in the length of the process, the form of that structure is quite consistent and easily recognized.

ETYMOLOGY: The specific name is from the Greek *plectos*, meaning twisted, in relation to the appearance of the process of the left sacculus.

Melanolophia sullivani, new species
Figures 4, 213, 214, 224, 232

DIAGNOSIS: The wing color and pattern are similar to those of *muscosa* (Warren), but have more dark scaling on both the upper and under surfaces of the wings. The male genitalia are similar to those of *plecte*, differing by having a shorter, more curved uncus with a prominent dorsal ridge, a shorter (1.3 to 1.4 mm) process on the left sacculus, and a broader anellus. The female genitalia differ from those of *plecte* by having a round ostium bursae, by the lamella postvaginalis arising posteriorly and extending for a short distance anteriorly, and by a longer and membranous dorsal posteriad extension of the corpus bursae.

DESCRIPTION: *Adults*: Wings similar to those of *muscosa*; upper surface with more dark scaling, especially in outer portion of all wings; under surface tending to have broader and more prominent outer band on all wings.

Length of Forewings: Holotype, 20 mm; paratypes, 18 to 21 mm.

Male Genitalia (fig. 224): Uncus with apical region short, posterior margin sharply recurved, with strong dorsal ridge, apex weakly recurved and with blunt termination. Gnathos with median portion chevron-shaped, with posterolateral margins concave. Valves with processes of sacculus strongly asymmetrical; that of left side extending to near posterior margin of anellus, 1.3 to 1.4 mm long, with median constriction, apical portion with diagonal row of spines extending posteromedially (with valves open) distad, and with terminal portion broadly spinose dorsally, these two areas either adjacent or partially superimposed; process of right sacculus shorter than anellus, with constriction at two-thirds its length, without any spines. Anellus broad, as wide as inner portion of saccus, anterior portion elevated, posterior end slightly narrower than very broad semicircular apex having lateral areas extending anteriorly. Aedeagus with exserted vesica swollen and longitudinally striate posteriorly, with small, laterally flattened, semicircular sac near anterior area of attachment to aedeagus.

Female Genitalia (fig. 232): Ostium bursae with raised ringlike lining, without median ventral separation as in *plecte*. Sterigma round, complete; lamella antevaginalis vestigial; lamella postvaginalis arising posteroventrally, extending into central region of ostium, sclerotized, anterior portion scoop shaped. Ductus bursae membranous, very short. Corpus bursae weakly curved, scarcely enlarged anteriorly; posterior end with elongate, membranous, dorsal extension, projecting well beyond corpus bursae into ostium; signum absent. Ductus seminalis arising posteriorly from ventral lobe of corpus bursae. Apophyses posteriores 2.5 mm long; apophyses anteriores 1.2 mm.

TYPES: Holotype, male, Anchicaya, 3000 ft, Valle, Colombia, Jan. 23, 1988 (J. B. Sullivan) (fig. 213). The genitalia of the holotype are mounted on slide FHR 20,078. Paratypes, all from Valle, Colombia, and collected by J. B. Sullivan: same data as holotype, 5 males; same data but June 29, 1981 (fig. 214), 5 males; same locality, 650 m, Feb. 1, 2, 3, 1989, 14 males, 3 females; Calima Dam, 3000 ft, Jan. 15, 1985, 1 female.

The holotype is in the collection of the AMNH; paratypes are in that collection and in that of J. B. Sullivan.

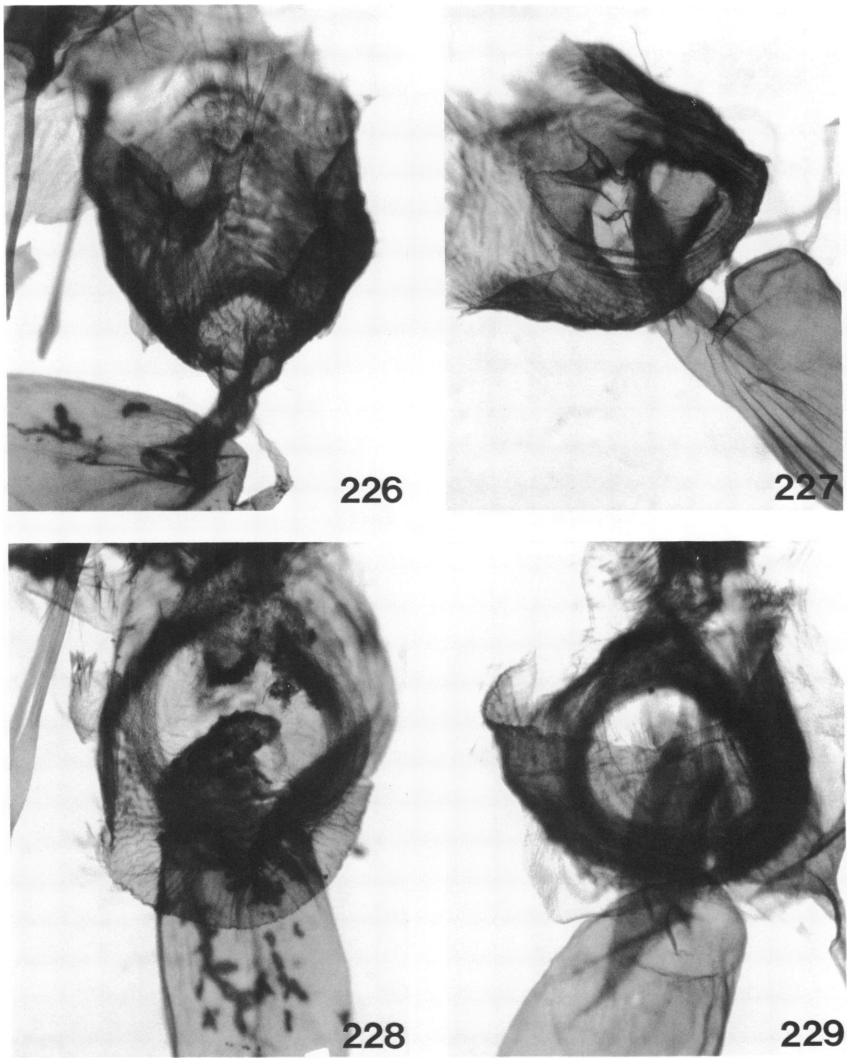
DISTRIBUTION: Known only from Valle in western Colombia, on the western slope of the Cordillera Central, from 650 to 915 m.

TIME OF FLIGHT: January, February, and June.

REMARKS: Twenty-nine specimens (25 males, 4 females), six genitalic dissections (5 males, 1 female) and one slide mount of antenna and set of legs have been studied.

In my 1964 key, the present species comes out at couplet 15 for *agnataria*; the preceding species, *plecte*, also keys out here. Both *sullivani* and *plecte* have similar types of the process of the left sacculus; the arm is noticeably shorter in the present species than in *plecte*. These two species are easily distinguished from one another by their color and pattern; each gives the appearance of another, related species, rather than being similar to one another.

The males caught in January and February tend to be darker brown, not only in color but with a larger amount of dark scaling, than are the ones captured in June (figs. 213, 214).



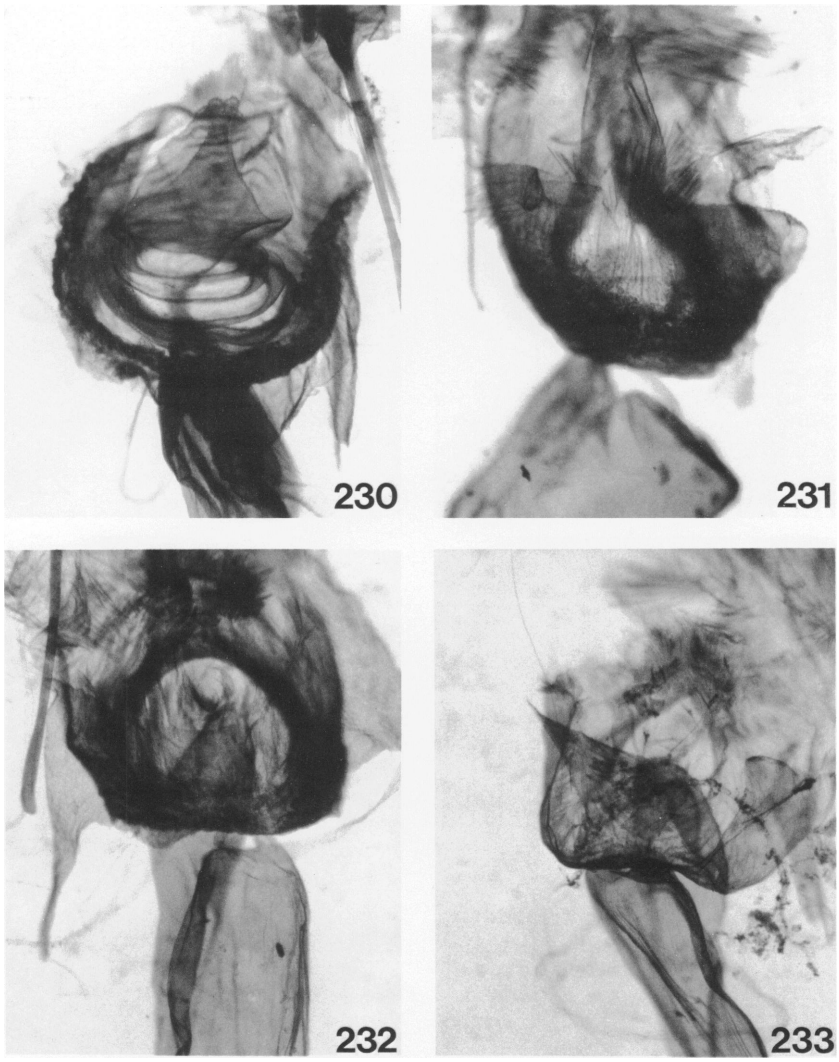
Figs. 226–229. Female genitalia of *Melanolophia*. **226**. *M. calimae*, new species, paratype. **227**. *M. ovata*, new species, holotype. **228**. *M. mima*, new species, paratype. **229**. *M. anchicaya* (?), new species.

ETYMOLOGY: This species is named in honor of Dr. J. Bolling Sullivan, of Beaufort, North Carolina, who collected the type series.

Melanolophia necopina, new species
Figures 212, 225, 233

DIAGNOSIS: The upper surface of the wings of this relatively small species is a uniform grayish brown, with poorly defined maculation. The male genitalia are similar to those of *paraconara* Rindge, differing in the process of each sacculus, as the left one is very long, straight, and with the weakly curved apex having a group of short, straight setae of equal length that arise as a unit at the apex; the process of the right sacculus extends to the end of the tegumen and is without spines. The female genitalia have a weakly sclerotized sterigma, a prominent ductus bursae-dorsal extension of the corpus bursae, with the last being slightly curved and only weakly swollen anteriorly.

DESCRIPTION: *Adults*: Upper surface of



Figs. 230–233. Female genitalia of *Melanolophia*. **230**. *M. orthogonia*, new species, paratype. **231**. *M. plecte*, new species, paratype. **232**. *M. sullivani*, new species, paratype. **233**. *M. necopina*, new species, paratype.

wings uniform grayish brown, with median area of forewings slightly paler in some specimens. Forewings with cross lines and discal spots obsolescent or weakly represented; t. p. line tending to be present, subparalleling outer margin, wavey in course, with basal bend above inner margin; s. t. line varying from absent to completely indicated by row of dark spots. Hind wings with small black discal spot and straight extradiscal line extending most of way across wing; s. t. line similar to that of forewings. Under surface brownish gray or gray, with obsolescent maculation; discal dots often present.

Length of Forewings: Holotype, 17 mm; paratypes, 16 to 20 mm.

Male Genitalia (fig. 225): Similar to those of *paraconara*, differing mainly as follows: Uncus with parallel-sided apex shorter, dorsal ridge tending to be double. Gnathos with lobate median portion narrower, 0.26 to 0.33 mm (0.40 to 0.45 mm in *paraconara*). Process of left sacculus longer than valve, slender, straight, curved apically, with tightly

compressed group of short, straight setae arising from tip of apex; process of right sacculus extending to end of tegumen, simple, without spines, and having median constriction. Anellus of similar shape but shorter, 1.0 to 1.2 mm (1.5 to 1.6 mm in *paraconara*). Aedeagus also similar in shape and smaller, 2.4 to 2.5 mm long (2.9 to 3.1 mm); exserted vesica with short basal swelling (0.5 mm long; 1.0 mm in *paraconara*).

Female Genitalia (fig. 233): Sterigma weakly sclerotized, without prominent lamellae. Ductus bursae-dorsal extension of bursae elongate, sclerotized posteriorly, extending posteriad of corpus bursae. Corpus bursae slightly curved, only weakly swollen anteriorly. Ductus seminalis arising posteriorly from right side of ventral lobe of corpus bursae. Apophyses posteriores 2.0 mm long; apophyses anteriores 1.1 mm.

TYPES: Holotype, male, Otavalo to Apuela, 2200 m, Imbabura Province, Ecuador, Sept. 8–10, 1977 (L. E. Peña) (fig. 212). The genitalia of the holotype are mounted on slide FHR 19,709A, and an antenna and set of legs are on slide FHR 19,709B. Paratypes, all from Ecuador and collected by L. E. Peña: same data as holotype, 3 males; N of Perucho, near Otavalo, 2000 m, Imbabura, Jan. 7, 1971, 3 males; Perucho, 1900 m, Pichincha, Sept. 18–19, 1977, 1 male; Guallabamba R., 1650 m, NE of Quito, Pichincha, June 7, 1965, 1 male; Yanayacu (70°20′W, 2°25′S), 400 m, Guayas, Oct. 11, 1977, 1 female.

All the type specimens are in the AMNH.

DISTRIBUTION: Ecuador (Imbabura, Pichincha, Guayas), at elevations of from 400 to 2200 m.

TIME OF FLIGHT: January, June, September, and October.

REMARKS: Ten specimens (9 males, 1 female), six genitalic dissections (5 males, 1 female), and three slide mounts of antennae and legs (all males) have been studied.

In its small size and dark coloring with obscure maculation, *necopina* is unlike most other members of Group VII. A study of the male genitalia places it in this group, with the structures indicating a close similarity to *paraconara*, a Colombian species. In fact, in my 1964 key to the species of *Melanolophia*, the present taxon keys out to couplet 11, for *paraconara*. The genitalic differences of the two have been outlined above.

ETYMOLOGY: The specific name is from the Latin *necopinus*, meaning unexpected, in relation to the color and maculation on the one hand, and the genitalic structures on the other hand.

Genus *Pherotesia* Schaus

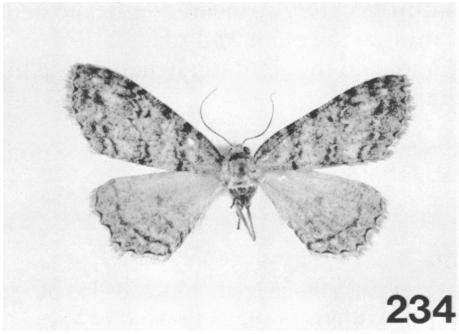
Figures 13, 14, 234–248, 250–271

Pherotesia Schaus, "1900" [1901]: 246. Rindge, 1964a: 359–383, pl. 8, figs. 3–15, pl. 9, figs. 1–8, text figs. 77–95, 149–153, 155–163.

DIAGNOSIS: The male abdomen may or may not have the median row of setae ventrally on A3, may or may not have the lateral setal tufts between segments A3 and A4, and does have the prominent comblike paired structures between A7 and A8; the gnathos has either a U- or V-shaped median portion; each valve has a moderate to broad sacculus that may or may not have a symmetrical arm, and the harpe may be either flat and unornamented or have an arm, raised process, or a spinose transverse ridge; the manica is membranous; the lamella antevaginalis is usually not sclerotized or differentiated, and the lamella postvaginalis varies from being membranous to two large lateral plates; the signum is absent; the hind wings of the males have eight or nine veins, with or without a raised scent patch on vein Cu_2 on the under surface, and when the scent patch is present the hind wings often have a squared outer margin; the hind wings of the females have eight veins, and the upper surface of the forewings may be sexually dimorphic in color from the males.

DESCRIPTION: *Adults*: Head with antennae of about 57 to 73 segments; males with terminal 4 to 8 segments simple; longest pectinations 0.60 to 1.35 mm, being between 2.5 and 7.0 times as long as their basal segments; females with either simple or shortly pectinate antennae. Palpi rising to between 33 and 50 percent height of eyes, extending in males between 50 and 60 percent length of eyes in front of eye, and in females between 40 and 50 percent. Eyes of females usually smaller than those of males, rarely of equal size.

Forelegs with epiphysis of males arising between 45 and 50 percent length of segment and being from 50 to 70 percent its length, of females arising between 55 and 60 percent length of segment and being 35 to 50 percent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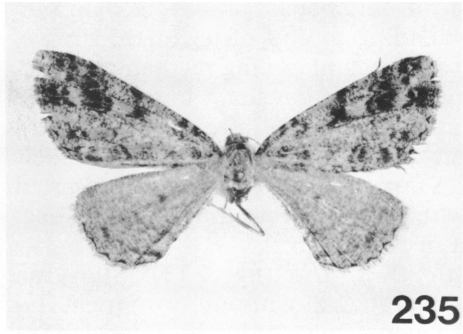
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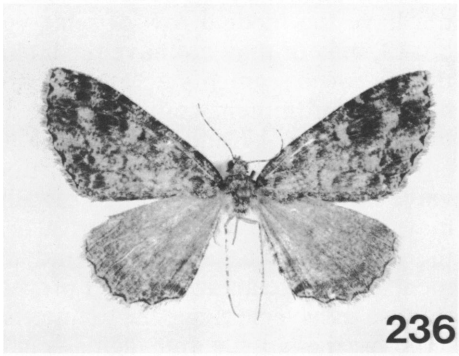
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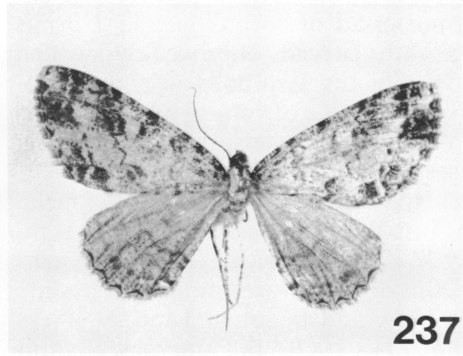
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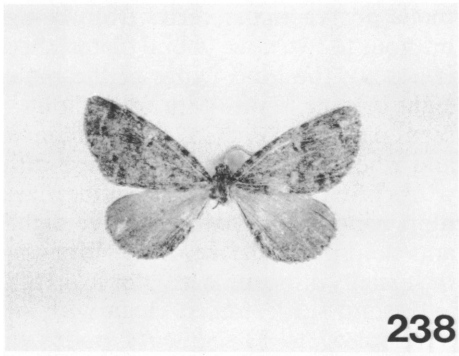
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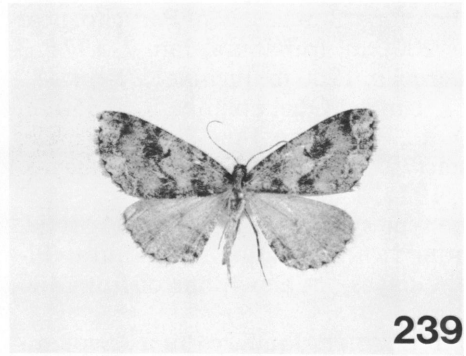
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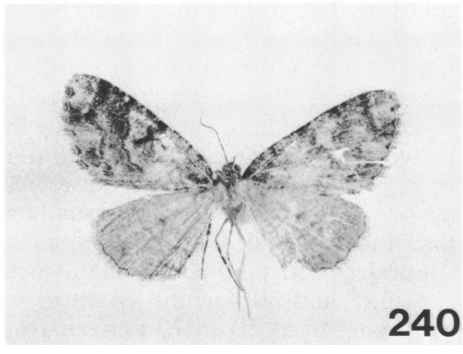
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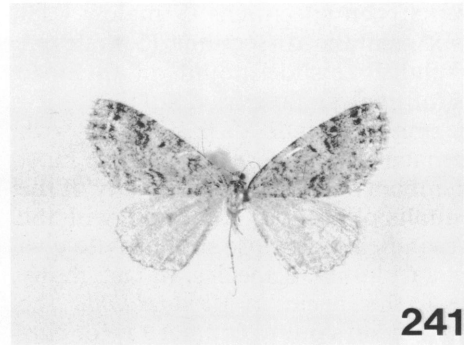
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its length. Hind legs of males with tibial hair pencil, sometimes reduced or deciduous.

Forewings either similar to each other in color in both sexes, or females dimorphic, being noticeably paler and with more contrasting maculation; with one accessory cell; vein R_1 free; mdc and ldc angled or curved; outer margin of wing either smoothly rounded or slightly concave between veins. Hind wings of males with or without raised scent patch distally on vein Cu_2; when present outer margin usually straight or slightly concave, angled at vein M_3, forming a somewhat elongate, square hindwing; with eight or nine veins, M_2 and M_3 strongly developed and stalked or separate; females with seven veins; both sexes with Sc extending 45 to 50 percent length of cell; udc and ldc angled. Upper surface either with forewings having reticulate pattern of dark brown on whitish gray base, with reduced pattern on hind wings and strong subterminal band, or forewings brown or yellowish brown, with median area U- or V-shaped and paler, with hind wings immaculate or with subterminal band. Under surface paler than above, variably reflecting pattern of upper surface. Length of forewings, 17 to 27 mm.

Abdomen of males with or without (perhaps deciduous) median row of setae on ventral surface of A3, with lateral setal tufts between A3 and A4, outer one arising from lobelike process, rarely absent or present as small pocketlike indentation with several elongate setae, and with prominent comblike paired structure between A7 and A8 consisting of numerous, very long, slender, modified setae enlarged and curved distally (figs. 13, 14). Scaling of abdomen normal.

Male Genitalia: Uncus prominent, sides tapering or concave, apex either slender, pointed, with single point or bluntly rounded. Socius usually absent, rarely present. Gnathos well sclerotized, enlarged medially, rounded or terminating in single point. Each valve with sclerotized costa, with or without costal setose swelling; ampulla swollen, setose; sacculus sclerotized, moderate to broad, either without ornamentation or projection, or with symmetrical variably shaped arm on each valve; harpe either flat and unornamented or with projection, raised setose process, or transverse spinose ridge. Cristae present or absent, when present often elongate, either of approximately equal size or with one larger than others. Anellus lightly to heavily sclerotized, variously shaped, posterior end truncate or bifurcate, short to extremely long, extending posteriorly beyond uncus. Manica membranous. Aedeagus 1.7 to 3.6 mm long, 0.2 to 0.6 mm wide; posterior end rounded, pointed, or with large, heavily sclerotized hooklike process. Vesica with one elongate, heavily sclerotized cornutus, several smaller cornuti, or unarmed; when exserted, projecting to one side or recurved, with cornutus or cornuti often at more or less right angle to aedeagus.

Female Genitalia: Sterigma with lamella antevaginalis usually membranous, not differentiated; lamella postvaginalis varying from membranous to two large lateral plates. Ductus bursae short, longer than wide, joining corpus bursae dorsally or posteriorly. Corpus bursae membranous, usually asymmetrical, elongate, with anterior end rounded; posterior end more or less punctate, lightly sclerotized, and with some longitudinal striations. Ductus seminalis arising dorsally or laterally from posterior end of corpus bursae. Signum absent; corpus bursae with anterior end longitudinally or transversely striated, rarely with minutely denticulate area. Apophyses posteriores about 2.0 to 3.0 mm long; apophyses anteriores 1.0 to 1.5 mm.

EARLY STAGES: Unknown.

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Figs. 234–241. Adults of *Pherotesia*. **234**. *P. ralla*, holotype, female. **235**. *P. minuisca* Rindge, female; Puntarenas, Costa Rica. **236**. *P. malinaria* Schaus, female; Oaxaca, Mexico. **237**. *P. dystactos*, new species, holotype, female. 238, 239. *P. garka*, new species. **238**. Holotype, male. **239**. Paratype, female. **240**. *P. quadra*, new species, holotype, female. **241**. *P. pedaria*, new species, holotype, female. X 1.2.

FOOD PLANTS: Unknown.

TYPE SPECIES: *Pherotesia malinaria* Schaus, "1900" [1901]; by monotypy.

DISTRIBUTION: From Mexico to Bolivia, Paraguay, Argentina, and southern Brazil; the genus is not known to occur in the Antilles.

TIME OF FLIGHT: Every month of the year.

REMARKS: The autapomorphic character for *Pherotesia* is the sexual dimorphism in the number of veins in the hind wings, as the males usually have nine and the females seven. In the males, vein Sc divides near the wing margin, and vein M_2 is present, extending from cross vein ldc to the margin. Many of the males have a raised scent patch on vein Cu_2 on the under surface of the hind wings; this is the only genus in which this character occurs. In most of those species that have the scent patch the shape of the hind wing is modified so that the outer margin appears angled or square; all species without the patch have hindwings that are rounded and shaped like their females.

Some species of *Pherotesia* are distinctive within the tribe in having sexual dimorphism in the color and pattern of the upper surface of the forewings. This is not noticeable in the members of Group I, which are almost entirely South American in distribution. This character appears most noticeable in many of the more highly modified species in Group II, especially those from Mexico and Guatemala. In these examples the forewings of the males tend to be dark and rather unicolorous, whereas the females show paler, more contrasting colors with a definite pattern.

Nearly all the species have, on the male abdomen, the median row of setae on the ventral surface of A3; in *liciata* Dognin this structure may be deciduous, and in one or more of the new Mexican and Guatamalan species described below, the structure is not present (but the males are not known for some of them). Lateral setal tufts between A3 and A4 are normally present, and very noticeable in many of the species; in some Central American species these tufts are smaller and, once again for the new Mexican and Guatemalan species, they are absent, although the pocketlike indentations on each side are present.

I included 19 species in this genus in my 1964 revision. Since then *cristata* Herbulot (1976, Ecuador) and *rindgei* Beutelspacher ("1980" [1981], Mexico) have been proposed; the latter species has been transferred to *Tesiophora* (see above). Additional collecting since my revision has produced more specimens from more localities, and has enabled me to restudy and to reevaluate the members of this genus. In this paper I change the rank of one former subspecies to species, describe the previously unknown female genitalia of another species, and describe seven taxa as new. In my 1964 paper more than one-half of the species were to be found in South America; with the addition of the new taxa in this paper, almost twice as many species are now known from Mexico and Central America as compared with South America. Several of the new species are known only from one sex; much more collecting is necessary before we will begin to have a really complete picture of *Pherotesia*.

Pherotesia ralla, new species
Figures 234, 261

DIAGNOSIS: This species differs from *potens* Warren by its smaller size and by the slender s. t. line on both surfaces of the hind wings. The female genitalia have a mebranous ostium bursae, an elongate sclerotized ductus bursae, and a membranous ovoid corpus bursae with a small corneous area on the dorsal surface. (The males have not been studied.)

DESCRIPTION: *Adults*: Upper surface of forewings whitish or grayish white, heavily

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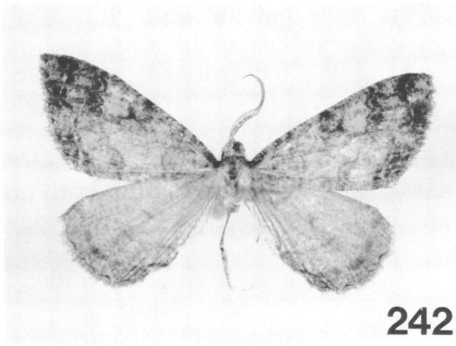
Figs. 242–249. Adults. 242, 243. *Pherotesia hamata* Rindge. **242**. Holotype, male. **243**. Allotype, female. 244, 245. *P. obunca*, new species. **244**. Holotype, male. **245**. Paratype, female. 246, 247. *P. bifurca* Rindge; Chimaltenango, Guatemala. **246**. Male. **247**. Female. **248**. *P. inhamata*, new species, holotype, male. **249**. *Melanotesia siderata* (Dognin); La Paz, Bolivia. X 1.2.



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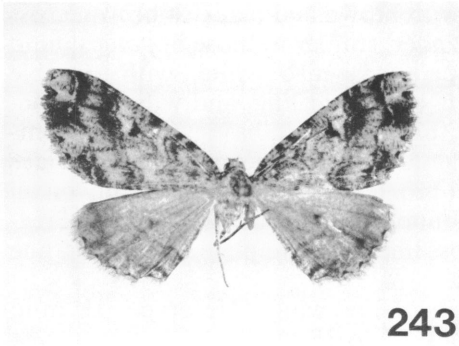

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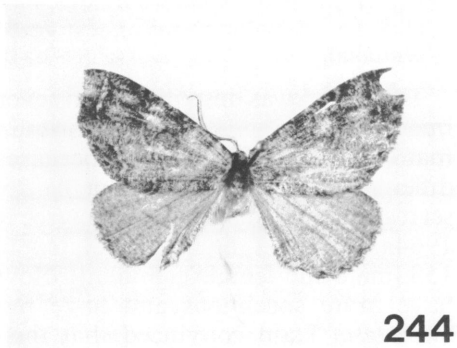

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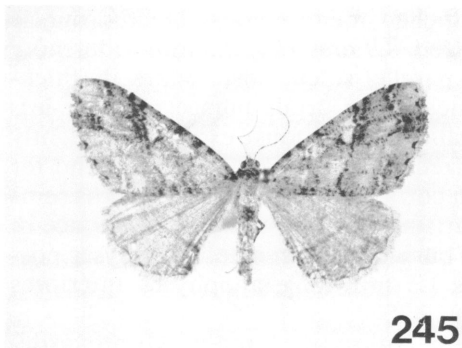

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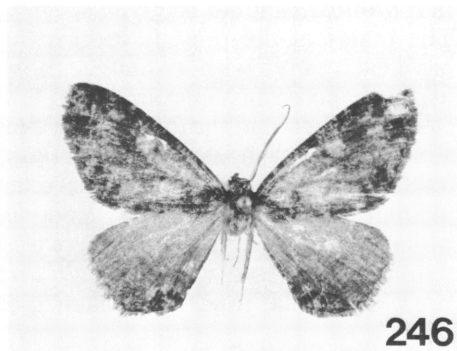

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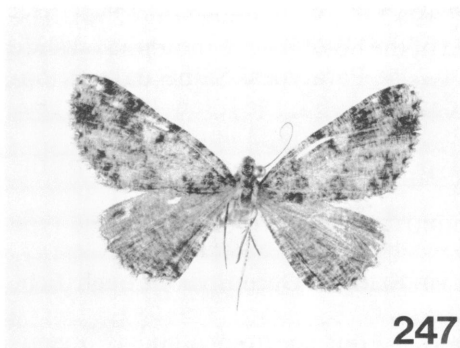

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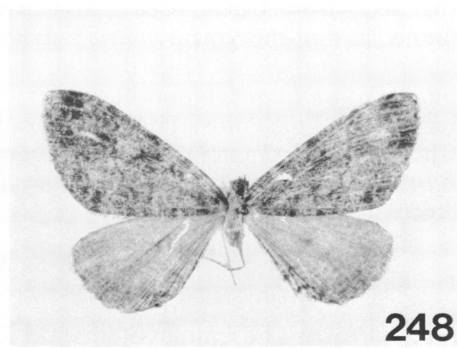

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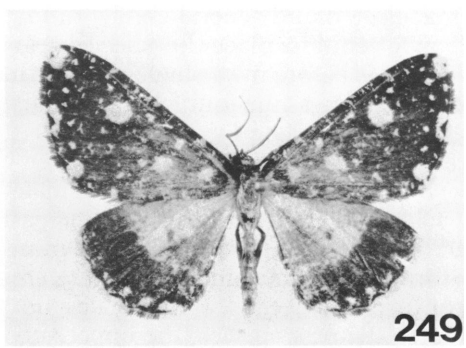

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scaled with brown and blackish brown; cross lines slender, similar to those of *potens*; hind wings pale brownish white, with variable amounts of gray scaling, and with less maculation than in *potens*, having s. t. line complete, slender for entire length. Under surface without broad dull black band distally on all wings found in *potens*, but with traces of regular cross lines and complete slender s. t. line present.

Length of Forewings: Holotype, 18 mm; paratypes, 17 to 18 mm.

Female Genitalia (fig. 261): Ostium bursae and lamellae membranous. Ductus bursae sclerotized, 0.9 mm long, 0.3 mm wide, more or less parallel sided, posterodorsally thickened medially. Corpus bursae more or less elliptical, membranous except for lightly sclerotized and striate posterior end and for swollen corneous area dorsally. Ductus seminalis arising from posteroventral surface of corpus bursae on right side. Apophyses posteriores 1.5 mm long; apophyses anteriores 0.8 mm.

TYPES: Holotype, female, Monteverde, 4600 ft [1400 m], Puntarenas, Costa Rica, Jan. 22, 1962 (C. W. Palmer) (fig. 234). The genitalia of the holotype are mounted on slide FHR 11,204. Paratypes: Same data as holotype, dated Dec. 30, 1961, Jan. 17–19, 1962, and Feb. 20–22, 1962, 3 females.

The type series is in the collection of the AMNH.

DISTRIBUTION: Known only from the type locality.

TIME OF FLIGHT: December through February.

REMARKS: Four specimens and two genitalic dissections have been studied.

The maculation and general configuration of the female genitalia place this species near *potens*. There is before me a single male with the same label data as the four females of this species, bearing the date December 2, 1961; in my revision (1964a: 365, 428) it was identified as *potens*. I do not believe that this male is conspecific with *ralla* for the following reasons: the length of its forewings is 24 mm, and the forewings of the females of *potens* are as long or longer than those of the males, not shorter as in the new species; the upper surface of the hind wings has the s. t. band markedly increasing in width anteriorly, not being of the same narrow width throughout; and the under surface of all wings has the broad, dark, diffuse band distally, characteristic of *potens*, but being absent in the present species.

ETYMOLOGY: The specific name is from the Latin *rallus*, meaning thin, in relation to the s. t. line of the hind wings on both the upper and under surfaces.

Pherotesia minuisca Rindge, new status

Figures 235, 250, 262

Pherotesia malinaria minuisca Rindge, 1964a: 375, pl. 8, fig. 15 (holotype male), text fig. 88 (male genitalia).

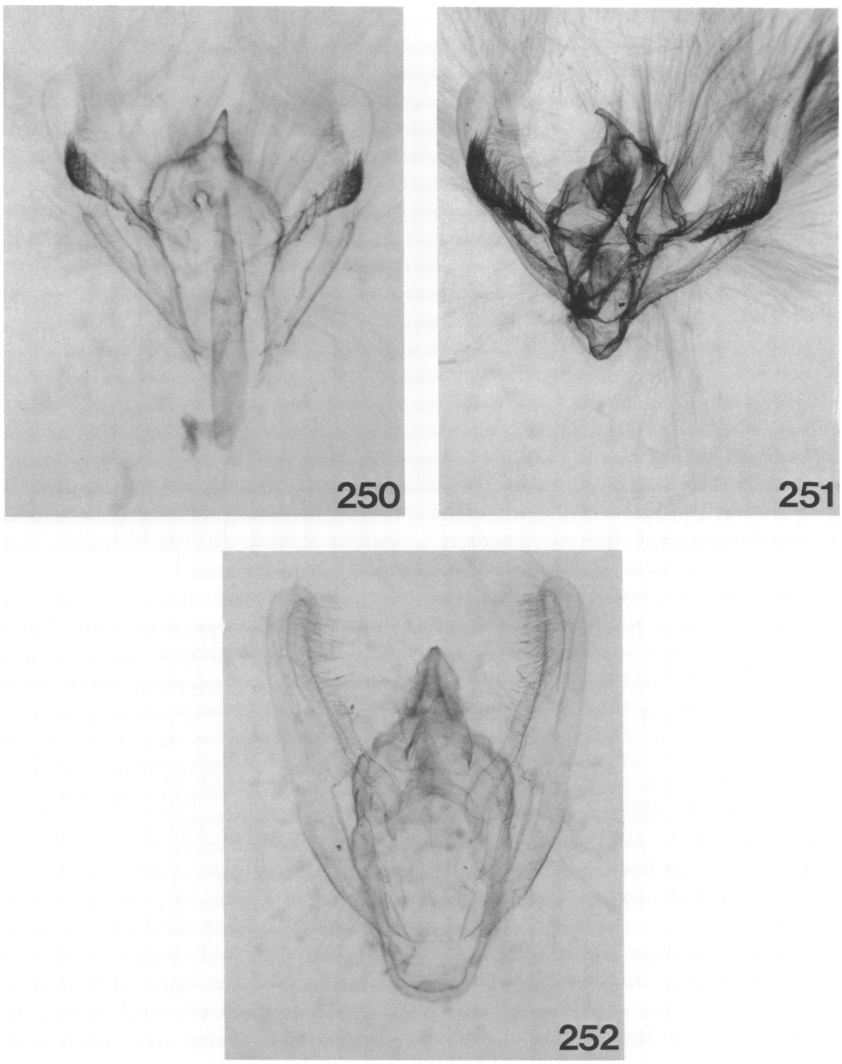
This taxon was described from seven specimens from the province of Chiriquí, Panama. It was named primarily because of the differences in the male genitalia (fig. 251) that set it aside from *malinaria* Schaus (see Rindge, 1964a: 374, pl. 8, fig. 14 [male], text figs. 89, 153 [male and female genitalia]). Now that I have more specimens and have restudied *Pherotesia* I am convinced that the differences in the genitalia of both sexes indicate that *minuisca* should be given species status. The males of the present species (fig. 250) have each valve with a smaller, more irregularly shaped transverse area with fewer and smaller spines, and the females (fig. 262) have a narrower and shorter (0.075 to 0.083 mm; 0.085 to 0.100 mm for *malinaria*) sclerotized median strip of the lamella postvaginalis, which has the posterior end with two separate semicircular pieces, whereas *malinaria* has a single somewhat mushroom-shaped cap (fig. 263).

The one male (fig. 236) and two females (fig. 235) from Costa Rica that I originally named as nominotypical *malinaria* should be placed as *minuisca*. Thus the known distribution of *malinaria* is southern Mexico (Veracruz, San Luis Potosí, Hidalgo, Oaxaca, and Chiapas) and Guatemala (Chimaltenango); *minuisca* is found in Costa Rica (Puntarenas) and Panama (Chiriquí).

Pherotesia dystactos, new species

Figures 237, 264, 265

DIAGNOSIS: The females of this species may be distinguished from the members of that sex of *malinaria* by the paler upper surface



Figs. 250–252. Male genitalia of *Pherotesia*. **250**. *P. minuisca* Rindge; Puntarenas, Costa Rica. **251**. *P. malinaria* Schaus; Hidalgo, Mexico. **252**. *P. garka*, new species, holotype.

of the forewings, having more yellowish scales, and by the slender, complete s. t. line on the under surface of the hind wings. The genitalia have the lateral sclerotized areas similar to those of *malinaria* but the new species has an irregularly shaped, lightly sclerotized lamella postvaginalis. (The males have not been studied.)

DESCRIPTION: *Adults*: Upper surface of forewings largely pale yellowish or ocher, suffused with dark brown and blackish brown scales; t. a. line weakly represented, biconcave; median line absent except for costal spot; discal dot prominent, slightly angled; t. p. line originating as slender yellow line in center of large blackish brown costal spot, passing through prominent dark blotch opposite discal dot and separated from latter by yellow area, line posteriad of this dark, slender, outwardly pointed on veins, thickened above inner margin; subterminal area broad, darkened anteriorly, paler below; s. t. line pale, shaded basally by blackish brown, widest below costa and above inner margin; ter-

minal area pale below apex and at middle of wing; fringe dark, yellow at vein endings. Upper surface of hind wings grayish brown with yellowish tinge, becoming darker distally; discal dot rather poorly defined; extradiscal and s. t. lines extending almost across wing, latter thicker than former, and with black terminal line. Under surface similar to upper, with pattern repeated, forewings having pale apical spot and being outlined by prominent dull black area; hind wings with more clearly defined discal spot and wider s. t. band.

Length of Forewings: Holotype, 22 mm; paratypes, 20 to 21 mm.

Female Genitalia (figs. 264, 265): Sterigma with large, lateral sclerotized areas; lamella postvaginalis raised, with irregular margins, lightly sclerotized with small dots, and with two separate posterolateral pieces. Ductus bursae lightly sclerotized, posterolateral margins appearing thickened, with ductus slightly longer than wide. Corpus bursae membranous, posterior end swollen, more broadly so on left side than on right, narrowed medially and with some longitudinal striations, anteriorly weakly enlarged and with short area of longitudinal rows of minute inwardly pointing denticulations before apex. Ductus seminalis arising dorsally from right side of posterior end of corpus bursae. Apophyses posteriores 2.3 to 2.5 mm; apophyses anteriores 0.9 to 1.3 mm.

TYPES: Holotype, female, Coban, 1200 m, Alta Verapaz, Guatemala, Aug. 1, 1981 (E. C. Welling) (fig. 237). The genitalia of the holotype are mounted on slide FHR 20,019. Paratypes: Chajsel, 1400 m, Municipio Coban, Alta Verapaz, Guatemala, Dec. 29, 1972, Jan. 1, 1973 (E. C. Welling), 2 females.

The type series is in the collection of the AMNH.

DISTRIBUTION: Known only from the type locality in Alta Verapaz, Guatemala.

TIME OF FLIGHT: August, December, and January.

REMARKS: Three specimens, three genitalic dissections, and one slide mount of an antenna and set of legs have been studied.

Pherotesia malinaria also occurs in Guatemala (Chimaltenango); the pair of moths before me have a noticeably darker upper surface of the forewings that shows very little pale scaling. The yellowish or ocher areas of the forewings will separate this species from *malinaria*.

ETYMOLOGY: The specific name is from the Greek *dystactos*, meaning irregular, in reference to the shape of the lamella postvaginalis.

Pherotesia quadra, new species
Figures 240, 266

DIAGNOSIS: The female of the present species can be recognized by the contrastingly colored forewings having a large angled discal dash. The genitalia have the lateral irregularly sclerotized areas of the sterigma similar to those of *malinaria*, but the new species has a membranous lamella postvaginalis (*malinaria* has a sclerotized median strip) and a short square ductus bursae. (The males have not been studied.)

DESCRIPTION: *Adult*: Upper surface of forewings white or grayish white, heavily suffused with reddish brown, dark brown, and blackish brown scales; basal dash present; t. a. and median lines poorly defined except for costal dots; discal dash large, black, angular; t. p. line arcuate, concave between veins, lined basally by white and distally by dark scales; subterminal area broad, dark, clearly defined; s. t. line black, thick below costa, going straight to vein M_2, then concave and sinuous, with black spot above hind margin, entire line narrowly edged with white; terminal area pale below apex and at middle of wing. Upper surface of hind wings an even gray, with small discal dot, complete extradiscal line, and partial s. t. line. Under surface similar to upper but with more yellowish scaling; forewings with prominent pale apical spot, outlined by dull black area, and with discal dot and t. p. lines represented; hind wings appearing more granular, with more prominent discal dot, complete extradiscal line and darkened area in outer area below apex.

Length of Forewings: Holotype, 19 mm.

Female Genitalia (fig. 266): Sterigma with large, lateral, irregularly sclerotized areas; lamella postvaginalis irregularly swollen, membranous. Ductus bursae lightly sclerotized, short, square, lateral margins appearing thickened. Corpus bursae membranous, with posterior end curved, anterior portion almost straight. Ductus seminalis arising at posterior

end of corpus bursae on right side. Apophyses posteriores 2.2 mm; apophyses anteriores 1.0 mm.

TYPE: Holotype, female, Montebello Lakes, Chiapas, Mexico, Dec. 9–10, 1972 (R. Wind) (fig. 240). The genitalia of the holotype are mounted on slide FHR 17,615.

The holotype is in the collection of the AMNH.

DISTRIBUTION: Known only from the type locality, which I have not located. It was not mentioned in Wind's obituary; the only phrase pertaining to this verified that he was collecting in Chiapas at the time the specimen was caught (Arnaud and Davis, 1976: 241). When I purchased this specimen (among others), Wind's mailing address was San Cristobal las Casas; I am assuming that the collecting area was somewhere nearby.

TIME OF FLIGHT: December.

REMARKS: One specimen and one genitalic dissection have been studied.

The female genitalia are more like those of *malinaria* than any other species. But it will take a study of the males to verify its placement and relationships within the genus.

ETYMOLOGY: The specific name is from the Latin *quadrus*, meaning square, in relation to the shape of the ductus bursae.

Pherotesia garka, new species
Figures 238, 239, 252, 267

DIAGNOSIS: This species is similar to *supplanaria* (Dyar) but may be distinguished by the more evenly colored, less mottled upper surface of the wings, by the secondary sexual characters of the males, and by the genitalia. The male abdomen of the present species has the lateral setal tufts between A3 and A4 absent but has pocketlike indentations instead, and it lacks the median ventral row of setae ventrally on A3. The male genitalia have simple valves, an elongate bifurcate anellus, and the aedeagus has a slender, elongate rod. The female genitalia have a membranous ductus bursae, and the ductus seminalis arises medially from an elongate swelling on the posterior portion of the corpus bursae.

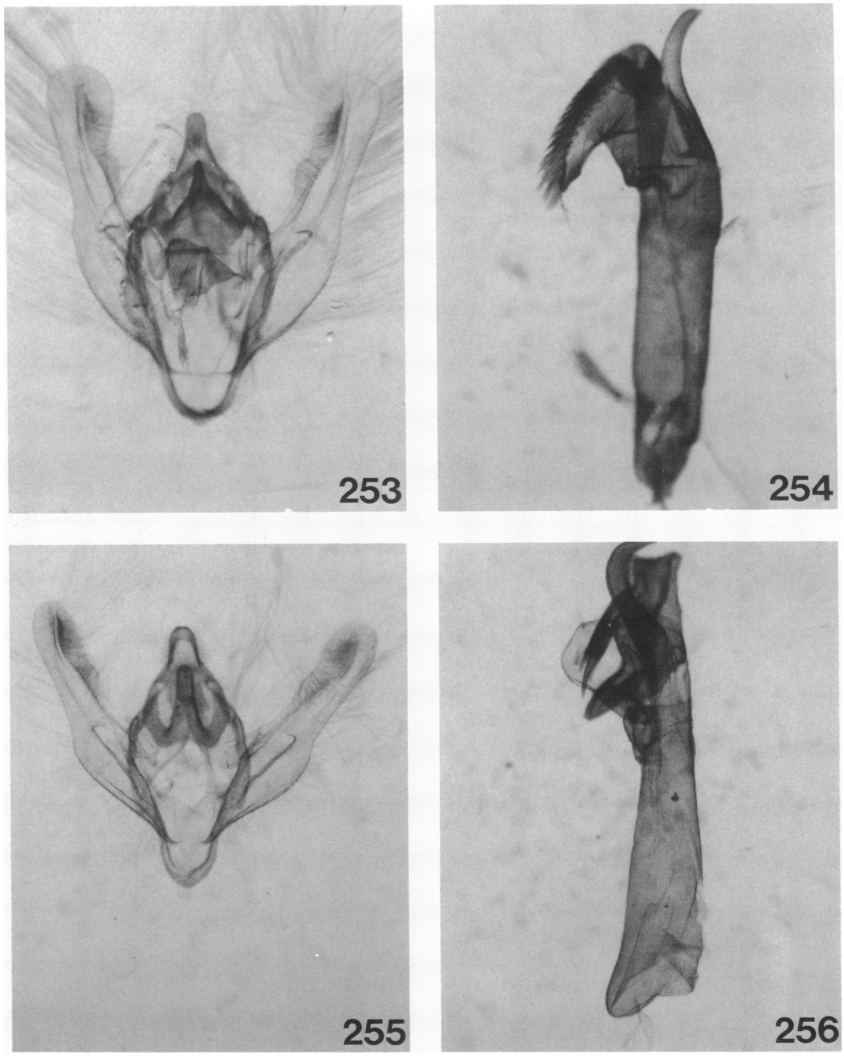
DESCRIPTION: *Adults*: Male hind tibia without groove but with obsolescent hair pencil of a few setae. Abdomen of male without median row of setae ventrally on A3, and with lateral setal tufts between A3 and A4 reduced to pocketlike indentations. Hind wings without raised scent patch.

Upper surface of forewings brown, with median area tending to be paler and contrasting, especially in females; t. a. line variable in intensity, tending to be slightly convex; discal dot black, curved or angled; t. p. line S-shaped in lower part of wing; subterminal area broad, with dark areas opposite discal dot and above inner margin near t. p. line; s. t. line white, slender, irregular in course, broadly shaded with black below costa; terminal area pale below apex and at middle of wing; terminal line black, slender, but widened in cells. Hind wings with upper surface brownish gray, paler than forewings; small discal dot, partial extradiscal line and more complete s. t. line present; terminal line similar to that of forewings. Under surface of all wings grayish brown; forewings tending to have pale apex, with grayish black surrounding area; maculation obsolescent except for discal dots on all wings.

Length of Forewings: Holotype, 15.5 mm; paratypes, 16 to 17 mm.

Male Genitalia (fig. 252): Uncus tapering distally, apically curved ventrally; laterally and dorsally setose. Gnathos with median area elongate, sclerotized, bluntly pointed. Valves with swollen, setose ampulla; sacculus broad, weakly sclerotized, outer margin of valves narrowed medially; harpe, at outer portion of sacculus, with small digitate swelling. Cristae with two or three elongate setae (0.4 mm) and six or seven short ones (0.1 mm) on each side. Anellus weakly sclerotized, deeply bifurcate, 0.9 mm long, extending posteriorly to near base of uncus. Aedeagus a simple tube, with a slender, elongate, sclerotized rod slightly longer than one-half length of aedeagus.

Female Genitalia (fig. 252): Lamellae membranous. Ductus bursae funnel-shaped, membranous. Corpus bursae membranous, slender, elongate, weakly S-shaped; anterior end slightly swollen, bluntly pointed, with shallow longitudinal striations; posterior end slender, with moderate swelling ventrally. Ductus seminalis arising from right side of ventral swelling. Apophyses posteriores 2.0 mm long; apophyses anteriores 1.00 to 1.05 mm.



Figs. 253–256. Male genitalia and aedeagi (not to same scale) of *Pherotesia*. **253**, **254**. *P. hamata* Rindge; Oaxaca, Mexico. **255**, **256**. *P. obunca*, new species, paratype.

TYPES: Holotype, male, Chajsel, 1400 m, Municipio Coban, Alta Verapaz, Guatemala, Dec. 29, 1972 (E. C. Welling) (fig. 238). The genitalia of the holotype are mounted on slide FHR 17,299A, and one antenna and a set of legs are on slide FHR 17,299B. Paratypes, all from Alta Verapaz, Guatemala, and collected by E. C. Welling: Same data as holotype, 1 female; same data as holotype but dated Jan. 3, 1973, 1 female; Baleu, Mpio. San Cristobal Verapaz, June 6, 8, 16, 1966, 3 females.

All six specimens of the type series have been deposited in the AMNH.

DISTRIBUTION: Alta Verapaz, Guatemala.

TIME OF FLIGHT: June, December, and January.

REMARKS: Six specimens (1 male, 5 females), three genitalic dissections (1 male, 2 females), and two slide mounts (1 male, 1 female) of antennae and legs have been studied.

This species comes out to couplet 3 in my 1964 key; it differs from both *caeca* Rindge and *alterata* Warren in lacking the very large exsertable spine in the vesica.

The females of this species (fig. 239) are

similar in appearance to the holotype of *supplanaria* (Dyar); see Rindge, 1964a: pl. 9, fig. 2 for a photograph of this specimen. In the present species the t. p. line is more sinuous, and the female genitalia do not have the median constriction of the corpus bursae found in Dyar's species.

I would question my association (1964a: 376, pl. 9, fig. 1, text fig. 90) of the male from Orisi, Costa Rica, with the holotype of *supplanaria* from Mexico. This is based on the widely separated localities of the two, and by the fact that the male has forewings that are 3 mm longer than Dyar's type. More material is needed before this problem can be solved.

ETYMOLOGY: The specific name is from the Greek *garka*, meaning rod, in reference to the configuration of the aedeagus.

Pherotesia pedaria, new species
Figures 241, 268

DIAGNOSIS: This species is similar to *supplanaria* (Dyar) but may be distinguished by the different courses of the cross lines, particularly the t. p. line. The female genitalia have a sclerotized ductus bursae, and the anterior portion of the corpus bursae is enlarged and footlike. (The males have not been studied.)

DESCRIPTION: *Adults*: Head with front having dark brown band across upper one-third.

Upper surface of forewings grayish white, heavily scaled with reddish brown and blackish brown scales; cross lines black; t. a. line biconvex; median area paler than remainder of wing, with nebulous brown median band and reddish brown area in cubital cell; discal dash black; t. p. line S-shaped, outwardly pointed on veins, and tending to be geminate; subterminal area paler in its outer portion; s. t. line grayish white, heavily shaded basally in cells with black scaling in upper part of wing, less heavily below; terminal area with two dark streaks opposite cell, and with pale area below them; terminal line primarily formed of black intravenular spots. Hind wings with upper surface pale gray, with round, dark gray discal dot and s. t. line; terminal line brownish black. Under surface grayish white, more or less covered with dark gray scales, with forewings tending to be darker than hind wings; forewings with white apex, broadly surrounded by grayish black area, with discal dot, faint traces of cross lines, and with paler area at middle of terminal area; hind wings with large discal spots, and blotches representing s. t. band near middle of wing and below apex.

Length of Forewings: Holotype, 16 mm.

Female Genitalia (fig. 268): Lamellae membranous. Ductus bursae sclerotized, parallel-sided, about twice as long as wide. Corpus bursae membranous, strongly S-shaped, anterior portion enlarged, footlike, and with a few, shallow longitudinal striations. Ductus seminalis arising ventrally, anteriad of ductus bursae. Apophyses posteriores 1.75 mm long; apophyses anteriores 0.8 mm.

TYPE: Holotype, female, Paradera de Mika, 2000 m, Municipio Yolox, Oaxaca, Mexico, Nov. 5, 1980 (E. C. Welling) (fig. 241). The genitalia of the holotype are mounted on slide FHR 19,840.

The holotype has been deposited in the AMNH.

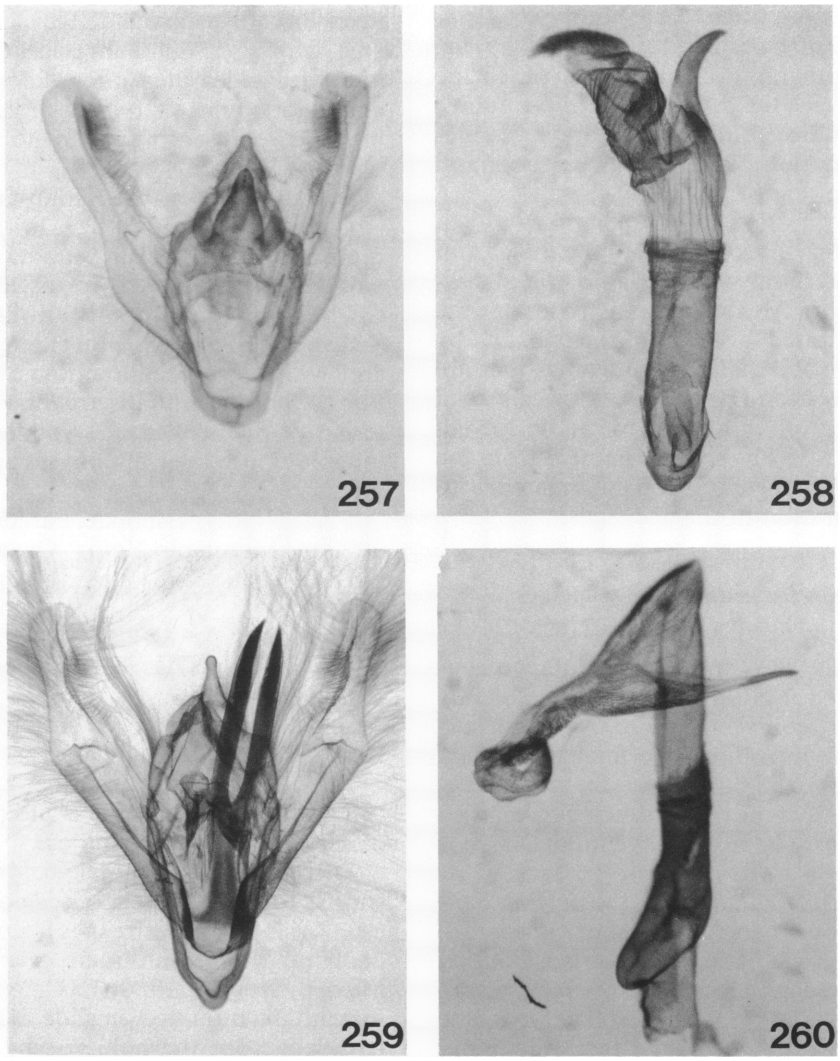
DISTRIBUTION: Known only from the type locality.

TIME OF FLIGHT: November.

REMARKS: One specimen and one genitalic dissection have been studied.

There is a second female before me that is similar to the holotype, but is not part of the type series. This specimen is from La Cabaña, 2800 m, Mpio. San Juan Atepec, Oaxaca, Mexico, Nov. 6, 1980 (E. C. Welling), with its genitalia mounted on slide FHR 19,309A. It differs from the holotype by lacking the band across the top of the front, by having thicker and darker cross lines, by the t. p. line not being geminate, and by a less clearly defined s. t. line; the under surface is less clearly and less contrastingly marked. The forewing length is 18.5 mm. The genitalia differ in that the corpus bursae appears to be more sinuate (an artifact of mounting?), with the anterior end having definite transverse striations. The apophyses posteriores are 2.0 mm long, and the apophyses anteriores 1.0 mm. Until more material comes to hand it will not been known whether the above differences are of individual or specific value.

Both of the above females, as well as the females of *garka*, differ from *supplanaria* in the genitalia not having the very broad ductus



Figs. 257–260. Male genitalia and aedeagi (not to same scale) of *Pherotesia*. **257**, **258**. *P. inhamata*, new species, holotype. **259**, **260**. *P. bifurca* Rindge; Chimaltenango, Guatemala.

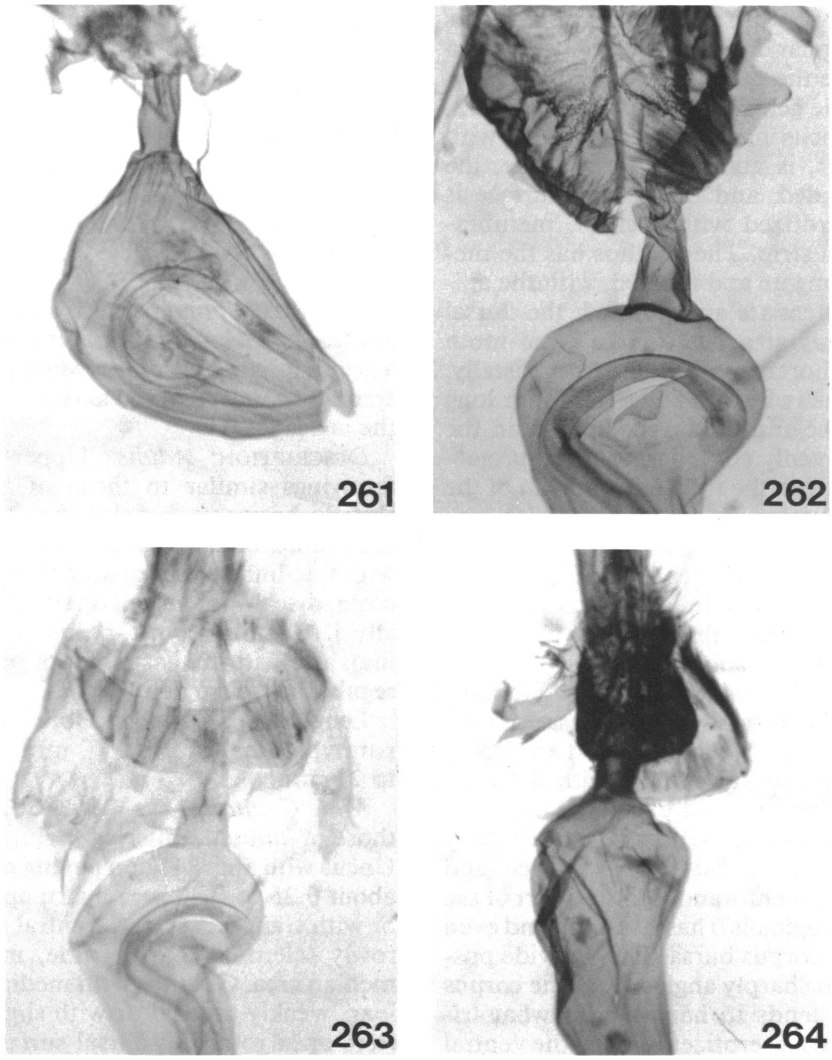
bursae and the constriction in the corpus bursae that are to be found in Dyar's species.

ETYMOLOGY: The specific name is from the Latin *pedarius*, meaning related to a foot, in reference to the shape of the corpus bursae.

Pherotesia hamata Rindge
Figures 242, 243, 253, 254, 269

Pherotesia hamata Rindge, 1964a: 378, pl. 9, fig. 4 (holotype male), text figs. 92, 160 (male, female genitalia).

I described *hamata* from a series of three males and seven females from the mountains of Oaxaca, Mexico; these specimens, plus two male and three female genitalic slides, are all in the AMNH. The original series was collected in 1961 and 1962; since then additional specimens have come to hand and these have about tripled the amount of material available for study. Additional dissections of male genitalia show without a doubt that a second species flies with *hamata*. The two are very similar to each other in general appearance and in the female genitalia; in fact, I included females of both species in my paratype series of *hamata*, with five of them being the new species, described below. (A third



Figs. 261–264. Female genitalia of *Pherotesia*. **261**. *P. ralla*, new species, holotype. 262–264. Sterigma, ductus bursae, and posterior portion of corpus bursae. **262**. *P. minuisca* Rindge; Puntarenas, Costa Rica. **263**. *P. malinaria* Schaus; Oaxaca, Mexico. **264**. *P. dystactos*, new species, holotype.

species in this same complex, from Guatemala, is also described below.)

Both Mexican species, and presumably the Guatemalan one, are sexually dimorphic in the color of the upper side of the forewings. The males tend to be rather unicolorous, with weakly developed cross lines and with the median area scarcely differentiated; the females tend to have more pale scaling, and to have a well defined, contrastingly colored median area outlined by prominent cross lines.

True *hamata* adults are larger, with the length of the forewings ranging from 21 to 23 mm in both sexes; the new species varies from 19 to 20 mm in the males and from 19 to 21 mm in the females. The males (fig. 242) of *hamata* tend to have the upper surface of the forewings varying from almost unicolorous, with practically no contrast, to having some paler scaling in the outer portion of the median and subterminal areas. The females (fig. 243) have more pale scaling and so tend to be more contrastingly colored than are the males. The t. a. line forms a right angle below the costa; the discal spot is angled and is usu-

ally 2 to 3 mm from the t. p. line; the last is usually irregular in course below the costa and opposite the cell.

In the male genitalia of *hamata* (figs. 253, 254), the uncus has the apical region with parallel sides, is about 0.15 mm wide, the apex is rounded, and the ventral surface is broadly sclerotized with a short, membranous median strip. The gnathos has the median area elongate and tapered, with the apical region attenuate and pointed; the dorsal surface of this area has a large basal tooth and often a short row of smaller teeth distally. The aedeagus is from 2.85 to 3.00 mm long and 0.3 to 0.5 mm wide; the apex is in the form of an evenly curved sclerotized projection arising from the right side, dorsad of the vesica. The vesica has an elongate, flat, spinose area, 1.2 mm long and about 0.3 mm wide, of very many spines of varying lengths; when exserted, the spinose area is recurved and has one margin that appears comblike, having the longest spines along the edge.

The female genitalia (fig. 269) tend to have an elongate sclerotized ductus bursae, its left margin being longer than the right and going straight to the corpus bursae, with the right margin curving outwardly to form the junction; the posteroventral rim tends to be evenly rounded, to have a flat ventral surface, and the encircling membranous tissue (part of the lamella antevaginalis?) has a smooth and even surface. The corpus bursae has the wide posterior margin sharply angled from the corpus bursae, and tends to have a somewhat triangular, lightly sclerotized area on the ventral surface; near the anterior end are several encircling shallow bands. The ductus seminalis arises dorsally on the right side of the angled portion of the corpus bursae.

All known specimens are from Mo Cuou, Cerro Pelon (the type locality) and Paradera de Mika, Municipio Yolox, Oaxaca, at elevations of from 2000 to 2150 m; the dates of capture are September and November.

Fourteen specimens (7 of each sex, including the holotype, allotype, and 2 male and 1 female paratypes), 10 genitalic dissections (5 of each sex), and 2 slide mounts of antennae and legs (1 of each sex) are before me.

I am tentatively placing one female (slide FHR 19,712A) as *hamata*; it has the posteroventral portion of the ductus bursae with a deep cleft, and the corpus bursae has the posterior margin only slightly angled, with the posterolateral portion on the left side concave rather than evenly rounded and projecting.

Pherotesia obunca, new species

Figures 244, 245, 255, 256, 270

Pherotesia hamata Rindge, 1964a: 378 (partim).

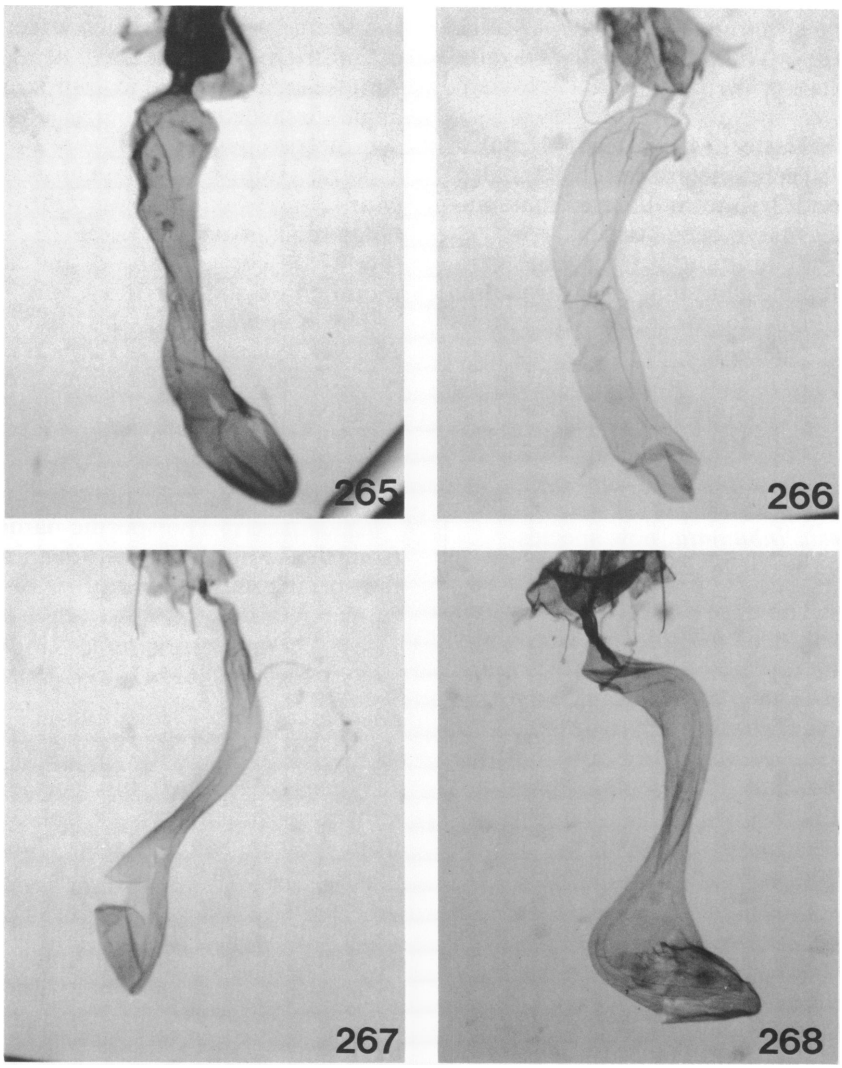
DIAGNOSIS: This species is smaller than *hamata*. The male genitalia have the vesica with a group of parallel spines; when exserted, the spines become recurved and are parallel with the aedeagus.

DESCRIPTION: *Adults*: Upper surface of forewings similar to those of *hamata* but slightly browner; females (fig. 245) tending to be more reddish brown in subterminal area, with t. a. line curved or shortly angled below costa, discal spot angled or elongate and usually 1 to 2 mm from t. p. line (rarely touching), and with the last smooth to slightly irregular in course below costa.

Length of Forewings: Holotype, 20 mm; paratypes, males, 19 to 20 mm, females, 19 to 21 mm.

Male Genitalia (figs. 255, 256): Similar to those of *hamata*, differing mainly as follows: Uncus with apical region having parallel sides about 0.25 to 0.30 mm apart; apex rounded or with transverse ridge; ventral surface narrowly sclerotized, with wide, membranous median area. Gnathos with median area very long, weakly tapered or with slight constriction; apex rounded; dorsal surface of apical region with row of short teeth. Aedeagus 2.5 to 2.8 mm long, 0.3 to 0.4 mm wide; apex with elongate, flat, sclerotized projection with slender base, arising from right side, with angled hooklike terminal portion. Vesica with group or clump of from three to five elongate spines, 0.75 to 0.90 mm long, 0.10 to 0.15 mm wide; when exserted, recurving to become more or less parallel with aedeagus.

Female Genitalia (fig. 270): Similar to those of *hamata*, differing mainly as follows: Ductus bursae shorter, left margin of various shapes, seldom straight, and extending on to ventral surface of corpus bursae; right margin curved or straight, enlarged basally at junction with corpus bursae; posteroventral rim with one or two indentations, tending to have



Figs. 265–268. Female genitalia of *Pherotesia*. **265**. *P. dystactos*, new species, holotype. **266**. *P. quadra*, new species, holotype. **267**. *P. garka*, new species, paratype. **268**. *P. pedaria*, new species, holotype.

ventral surface concave posteriorly; encircling membranous tissue often with encircling ridges. Corpus bursae with more rounded posterior margin; posterior end tending to be slightly more sclerotized and to have some longitudinal striations; anterior end without encircling shallow bands. Ductus seminalis arising nearer right margin of corpus bursae.

TYPES: Holotype, male, Río Guajolote, 2000 m, Municipio Suchixtepec, Oaxaca, Mexico, Nov. 9, 1980 (E. C. Welling) (fig. 244). The genitalia of the holotype are on slide FHR 19,669A, and one antenna and a set of legs are on slide FHR 19,669B. Paratypes, all from Oaxaca, and collected by E. C. Welling: Mo Cuou, Cerro Pelon, 7050 ft, Mpio. Yolox, Sept. 17, 1962, 3 females; Cerro Pelon, 7052 ft, Mpio. Yolox, Sept. 12, 1961, 1 female; Vista Hermosa, 4650 ft, Mpio. Comaltepec, Sept. 24, 1962, 1 female [all the preceding are paratypes of *hamata*]; same data as holotype, 1 male; Paradera de Mika, 2000 m, Mpio. Yolox, Nov. 5, 1980, 2 males, 5 females.

All the type specimens are in the AMNH.

DISTRIBUTION: The mountains of Oaxaca.

TIME OF FLIGHT: September and November.

REMARKS: Fourteen specimens (4 males, 10 females), 10 genitalic dissections (3 males, 7 females), and 3 slide mounts of male antennae and legs have been studied.

Because of the amount of individual variation in the female genitalia, these structures are more difficult to make determinations from than are the males.

ETYMOLOGY: The specific name is from the Latin *obuncus*, meaning hooked or bent inward, in regards to the process of the aedeagus.

Pherotesia inhamata, new species
Figures 248, 257, 258

DIAGNOSIS: The upper surface of the wings is similar to that of *hamata* but is slightly darker and the t. p. line is outwardly pointed on the veins. The male genitalia have the uncus with a very short apical region, and the vesica has a spinose area about one-half the size that of *hamata*. (The females have not been studied.)

DESCRIPTION: *Adults*: Upper surface of forewings similar to those of *hamata* but darker, and t. p. line with outward points on veins; hind wings darker and with only a trace of extradiscal line along anal margin.

Length of Forewings: Holotype, 23 mm.

Male Genitalia (figs. 257, 258): Similar to those of *hamata*, differing mainly as follows: Uncus with anterior portion extending farther ventrad, sides appearing convex; apical region short, one-half as long, slightly tapered; apex rounded, with transverse ridge indented medially; ventral surface membranous except for slender lateral margins. Gnathos with median area very long, margins weakly biconvex, tapering; apex bluntly pointed; dorsal surface of apical region with about four small teeth. Aedeagus longer, 3.1 mm in length, 0.5 mm wide; apex with elongate sclerotized projection on right side more apically curved; membranous portion beyond middle with longitudinal striations. Vesica with smaller spinose area, 0.7 mm long, 0.2 mm wide, longitudinally curved, transversely convex; when exserted, vesica extending posterolaterally, ventrally striate, spinose area extended at approximately right angle to aedeagus, having lateral margins symmetrically spinose.

TYPE: Holotype, male, Quisache, 1750 m, Municipio Acatenango, Chimaltenango, Guatemala, Aug. 30, 1966 (E. C. Welling) (fig. 248). The genitalia of the holotype are mounted on slide FHR 14,228.

The holotype is in the collection of the AMNH.

DISTRIBUTION: Known only from the type locality.

TIME OF FLIGHT: August.

REMARKS: One specimen and one genitalic dissection have been studied.

ETYMOLOGY: The specific name is formed from the Latin prefix *in-*, meaning not, plus the specific name *hamata*.

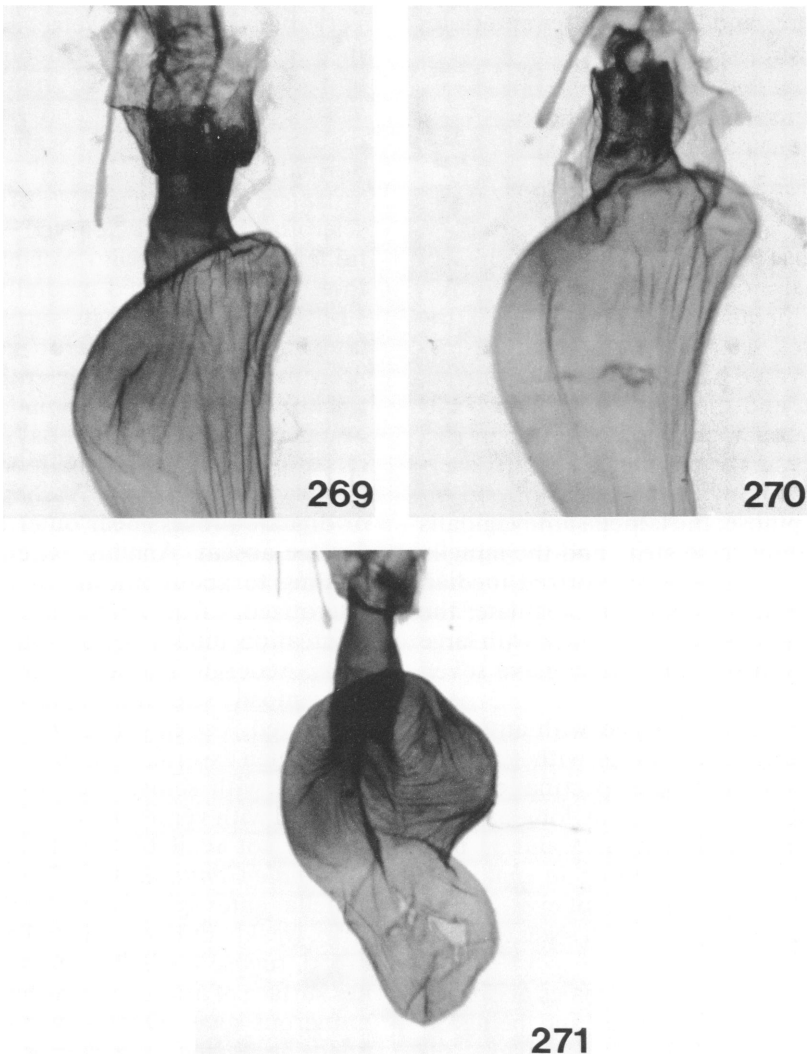
Pherotesia bifurca Rindge
Figures 246, 247, 259, 260, 271

Pherotesia bifurca Rindge, 1964a: 382, pl. 9, fig. 8 (holotype), text fig. 95 (male genitalia).

When I described this species, the only known specimen was the holotype, a male from Volcán Santa María, Quezaltenango, Guatemala, June; it is in the USNM. Since then additional specimens have come to hand from both Guatemala (Chimaltenango, 1650 m, in June) and southern Mexico (Chiapas, 450 m, in September and October). A total of nine moths (6 males, 3 females) are now before me; of these, I have dissected the genitalia of seven (5 males, 2 females), and have slide mounts of an antenna and legs of each sex.

In appearance, the moths are very similar to the other species of *Pherotesia* that occur in the same area. The males (fig. 246) tend to be darker and to have somewhat obscure maculation; the females (fig. 247) show a very similar type of dimorphism in color and pattern that is to be found in the *hamata-caeca* complex. The length of the forewings ranges from 17–21 mm in the males and 20–22 mm for the females.

Both sexes are most easily recognized by their genitalia. The males (figs. 259, 260) often can be identified without a microscope, as



Figs. 269–271. Female genitalia of *Pherotesia*. 269, 270. Sterigma, ductus bursae, and posterior portion of corpus bursae. **269**. *P. hamata* Rindge; Oaxaca, Mexico. **270**. *P. obunca*, new species, paratype. **271**. *P. bifurca* Rindge; Chimaltenango, Guatemala.

the extremely long bifurcate anellus is so obvious and characteristic, extending just posteriad of the uncus; this structure can usually be observed by removing some setae at the end of the abdomen in dried specimens. The exserted vesica is similar in shape to the number 4, with the aedeagus forming the upright portion, and the elongate sclerotized area, with its rugose surface and slender sclerotized point, forming the crossbar.

The female genitalia (fig. 271) have an elongate sclerotized ductus bursae, about 2.0 mm long and 0.8 mm at its widest; the ductus bursae joins the circular, heavily sclerotized posterior portion of the corpus bursae dorsally. The anterior part of the latter is membranous and narrower than the posterior portion, with both sections being of approximately equal length. The ductus seminalis arises from the right side of the corpus bursae at about its maximum width in the sclerotized area. The apophyses posteriores are 2.7

to 2.8 mm long, and the apophyses anteriores 1.2 to 1.4 mm.

Genus *Melanotesia* Rindge
Figures 249, 272–274

Melanotesia Rindge, 1964a: 383–385, pl. 9, figs. 9, 10, text figs. 96, 97.

DIAGNOSIS: The male abdomen has the secondary sexual modifications on segment A3, between segments A3-A4 and A7-A8; the gnathos is well sclerotized and enlarged medially; each valve has a broadly sclerotized, flat sacculus, and the harpe is produced laterally in either a V-shaped projection or as a digitate process; the anellus is heavily sclerotized, very long, with the posterior end bifurcate and spinose; the lamella antevaginalis is a slender transverse strip, and the lamella postvaginalis is a rugose sclerotized median area; the signum is small and angulate; the forewings are grayish black or black with large white spots, and the hind wings have seven veins.

DESCRIPTION: *Adults*: Head with antennae of about 68 segments; males with terminal 12 segments simple; longest pectinations 0.7 mm, being about 1.8 times as long as their basal segments. Palpi rising to about 33 percent height of eyes, extending in males 40 percent length of eyes in front of eyes, and in females 50 percent. Eyes of both sexes of equal size.

Forelegs with epiphysis of males arising at 50 percent length of segment and being 50 percent its length, of females arising at 60 percent length of segment and being 40 percent its length. Hind legs of males with tibial hair pencil.

Forewings with one accessory cell; vein R_1 free; mdc and ldc curved; outer margin of wing smoothly rounded. Hind wings with seven veins; Sc extending 50 percent length of cell; udc and ldc angled. Upper surface of forewings grayish black or black, with large and small white spots; hind wings partially white basally, with broad black terminal band. Under surface with similar colors and same basic pattern as above. Length of forewings, 21 to 27 mm.

Abdomen of males with median row of setae on ventral surface of A3, with prominent lateral tufts between A3 and A4, outer arising from short, swollen process, inner with very many, closely set setae, and with prominent comblike paired structure between A7 and A8 consisting of very many slender setae arising from broad row and invaginated area on each side of midline. Scaling of abdomen normal.

Male Genitalia (figs. 272, 273): Uncus well sclerotized, strongly curved ventrally, terminating in single point. Socius absent. Gnathos sharply recurved medially, with broad, straight median area, its surface finely dentate. Each valve with sclerotized costa having prominent setose swelling; ampulla elongate, thickly setose; sacculus broad, with median or inner longitudinal ridge having small distal raised portion; harpe broad, occupying middle of valve, with large V-shaped projection or digitate process near outer edge of valve. Cristae absent. Anellus extremely long, extending to about middle of uncus, heavily sclerotized, distally bifurcate and with each bifurcation thickly setose. Manica membranous. Aedeagus about 2.5 mm long, 0.6 mm wide; mostly sclerotized, posterior end bluntly pointed. Vesica with setose plate 0.75 mm long; when exserted, bulbous, extending posteriorly, with setose plate extending to left side and with ventral recurved tube (*siderata*; *intensa* not available for study).

Female Genitalia (fig. 274): Sterigma with lamella antevaginalis a slender transverse strip, weakly indicated; lamella postvaginalis broad, rugose medially, smooth laterally; inner surface of area enclosing lamellae bearing numerous setae. Ductus bursae scarcely defined, appearing as posterior end of corpus bursae. Corpus bursae asymmetrical; anterior portion membranous, rounded on one side, flat on opposite side; posterior portion with broad, sclerotized, subtriangular projection on right side, with posterior end wide, mostly sclerotized, and with some longitudinal striations. Ductus seminalis arising from end of subtriangular projection of corpus bursae. Signum small, angulate. Apophysis posteriores 3.4 to 3.7 mm long; apophysis anteriores 1.2 to 1.5 mm.

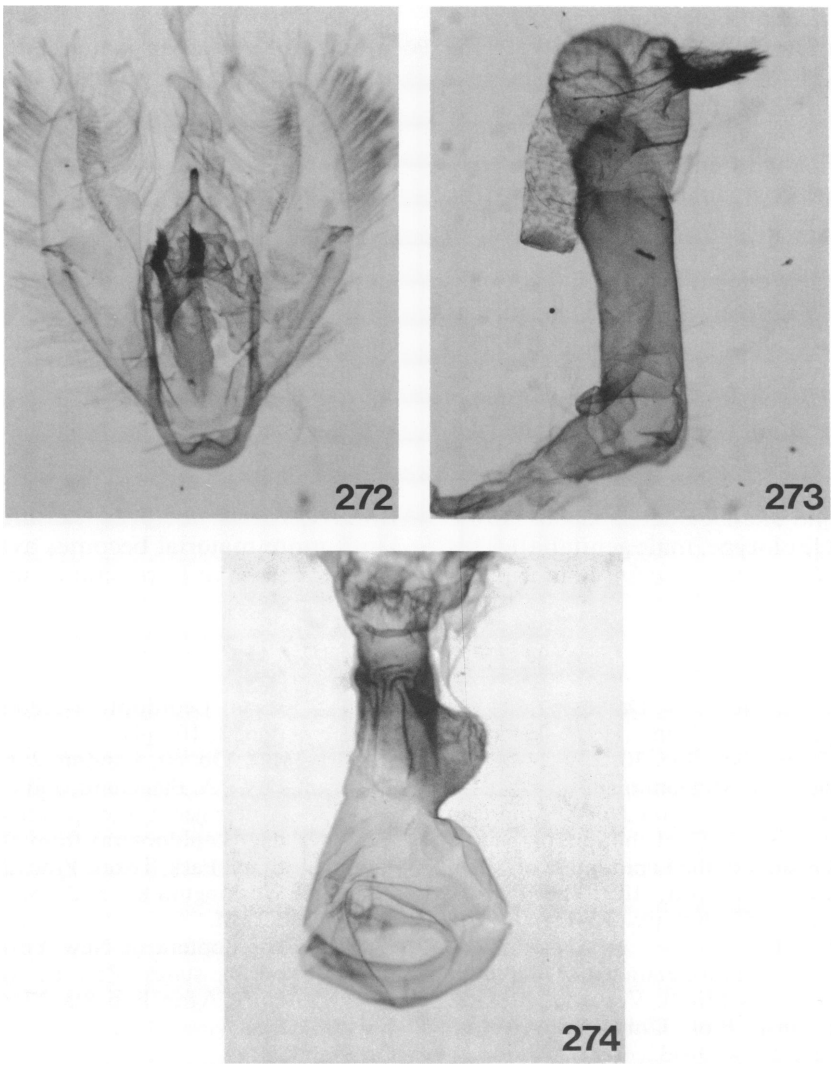
EARLY STAGES: Unknown.

FOOD PLANTS: Unknown.

TYPE SPECIES: *Calospila ? siderata* Dognin, 1901; by original designation.

DISTRIBUTION: The Andes Mountains, from Colombia into Bolivia.

TIME OF FLIGHT: January through April,



Figs. 272–274. Genitalia of *Melanoscia siderata* (Dognin); Yungas del Palmar, Bolivia. **272**. Male. **273**. Aedeagus (not to same scale). **274**. Female.

August, October, and November. Additional collecting will probably fill in some of the months that are not in this list.

REMARKS: Autapomorphic characters for *Melanotesia* are the dark upper surface of the forewings with white spotting, the very wide dark borders of the hind wings (fig. 249), the anellus with its two densely spinose-tipped arms, and by the corpus bursae being asymmetrical, with the posterior portion sclerotized, broad, striate, and being without an apparent ductus bursae.

Two species are included; they were described and illustrated when I named the genus.

SPECIES INCERTAE SEDIS

It is probable that the following two species belong in the Melanolophiini. Both are known only from their respective holotypes; both males were caught in the mountains of central Mexico, and have been deposited in the Instituto de Biología, UNAM. Neither has been examined by me; the original descriptions and accompanying illustrations are insufficient to place either species even to the generic level.

Galenara riverai Beutelspacher (1984: 217, figs. 1, 6 [holotype, male genitalia]). Using the description of *Galenara* in the present paper, it is unlikely that this species can be retained in this genus. All the included species have the vesica with either an elongate strip of short spines or a single large spine with a swollen base; no spines of any kind were noted in the original description or in the accompanying figure for this species. The maculation is also unlikely for a *Galenara*; it is more like some species of *Carphoides* or *Vinemina*. A study of the hind legs, the entire abdomen (just the tip of the holotype appears to have been cut off when removing the genitalia), and the genitalia is necessary to correctly place this species.

Hydriomena buenoi Beutelspacher (1984: 219, figs. 3, 8 [holotype, male genitalia]). This species and *Hydriomena delfini* Beutelspacher (see *Vinemina opacaria*, above, for the citation and synonymy of *delfini*) were described in the Larentiinae but obviously belong in the Ennominae. The upper surface of the forewings of *buenoi* are quite dark and apparently has but little maculation; some Mexican species of *Anavinemina* and *Vinemina* have dark forewings. As with *riverai*, the same group of characters will have to be studied to properly place this species.

In my previous revision of *Anavinemina* (1964b: 23, figs. 13, 14 [holotype, male genitalia]) I included *aequilibera* (Prout). As noted under Remarks for that genus, above, Prout's species can no longer be included. The single known male is labeled Jaragua do Sul, Santa Catarina, Brazil, and is in the BMNH; it has not been examined by me. Until more material becomes available, this species will have to remain as unplaced.

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