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A Revision of the Genera *Carphoides*, *Paraphoides*, and *Galenara* (Lepidoptera, Geometridae)

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INTRODUCTION

The present paper is the third in a series covering some of the genera related to *Melanolophia* Hulst. The genera that have been previously discussed are *Melanolophia*, *Pherotesia* Schaus, *Melanotesia* Rindge, *Anavinemina* Rindge, and *Vinemina* McDunnough (Rindge, 1964a, 1964b). The three genera that are included in this paper are specialized groups that are found from the southwestern United States to Costa Rica. They are small to moderate-sized genera that are rather difficult to define satisfactorily, as the included species are so variable in their characters. This variability seems to indicate that the group is of fairly recent origin.

Carphoides McDunnough contains three species which occur in the southwestern part of the United States. The seven species of the new genus *Paraphoides* are found from the mountains of eastern Arizona to Costa Rica. The genus *Galenara* McDunnough includes nine species, and they range from the southwestern United States to central Mexico.

McDunnough described *Carphoides*, and he placed two species in this genus. A third species was placed in the genus by the present author in 1958. Of the seven species placed in *Paraphoides*, the three previously described species were described in *Tephrosia*, *Pherotesia*, and *Galenara*;

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the remaining four taxa are described as new in this paper. The species of *Galenara* were originally described in six different genera, one of these being the correct genus; only four taxa were properly placed here.

More work still needs to be done with these genera. The life histories of all the taxa are completely undescribed, even though one species has apparently been reared. Much more material is needed for virtually all the species, as their distribution is inadequately known, as is also the amount of individual variation within the various species.

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

MATERIALS STUDIED

During the preparation of this paper 1192 specimens and 166 genitalic dissections from the collections of several museums and private collectors were studied.

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Wherever possible the illustrated material has been taken from the collection of the American Museum of Natural History. In cases in which such choice was not possible, the source of other material is given. The following abbreviations have been used:

A.M.N.H., the American Museum of Natural History

C.N.C., the Canadian National Collection, Ottawa, Ontario

U.S.N.M., United States National Museum, Smithsonian Institution, Washington, D. C.

Some of the specimens used in the preparation of this paper were

collected by the author with the support of National Science Foundation Grants G-9037 and G-25134. This assistance is gratefully acknowledged.

GENUS *CARPHOIDES* MCDUNNOUGH

Carphoides McDUNNOUGH, 1920, p. 15; 1938, p. 163. RINDGE, 1958, p. 15.

Similar in most characters to *Melanolophia*, differing mainly as follows: Head with palpi either very short, scarcely attaining front, or longer and extending to middle of eye; antennae of male bipectinate, with pectinations extending almost to apex, of female simple. Fore tibia with moderate process in male, one-half of length of tibia, shorter in female; hind tibia with two pairs of spurs, and without hair pencil in male. Abdomen of male with simple third segment, and with weak, narrow double comb between seventh and eighth segments.

Forewings either narrow and with inwardly oblique outer margin, or broad with rounded, more erect outer margin; with 12 veins, and with elongate areole; R_1 and R_2 from top of cell, with origin variable, arising separately, from common point, or stalked; R_2 with small cross vein to R_{3+4} ; R_5 arising either basal or distal to cross vein; base of wing without fovea. Hind wings broad; outer margin rounded; with seven or eight veins; Sc paralleling cell for about one-half of length, branching before wing margin in some specimens; $m+ldc$ weakly angled.

MALE GENITALIA: Uncus triangular, apical portion attenuate, weakly bilobed; socius absent; gnathos strongly developed, slender, tapering to elongate point medially; valves large, symmetrical; costa simple; inner face of valve with elongate, sclerotized, raised process, terminating in rounded, setose process, and with raised, spinose harpe; anellus membranous or weakly sclerotized; cristae small, inconspicuous; aedeagus of moderate length, pointed posteriorly; vesica armed with either small, inconspicuous band or long row of large cornuti.

FEMALE GENITALIA: Apophyses posteriores approximately twice as long as apophyses anteriores; sterigma consisting of lightly sclerotized, elongate lateral plates; ductus bursae short, sclerotized for four-fifths of circumference, leaving narrow, membranous, dorsal strip, and joining corpus bursae posteriorly; ductus seminalis arising ventrally from posterior portion of corpus bursae; corpus bursae elongate, slender, with anterior end weakly swollen; signum absent, but anterior portion of corpus bursae with fine band of spicules.

Forewings with maculation of two types: broad-winged species pale greenish gray with t. a., median, t. p., and s. t. cross lines black, shortly dentate, in some cases geminate, and with black discal spot; more nar-

rowly winged species gray, with cross lines obsolescent or absent, some species with dark scaling along veins; hind wings of all species white or grayish white, without maculation or with weak subterminal line. Under side of wings in narrow-winged species white or gray, without maculation, in wider-winged species grayish brown, with weakly represented maculation.

EARLY STAGES: Unknown.

TYPE SPECIES: *Aethycta lineata* Hulst, by original designation (= *incopriaria* Hulst).

RANGE: The southern Rocky Mountain states of Colorado, Utah, Nevada, Arizona, New Mexico, and western Texas.

The species of *Carphoides* can be distinguished from the other genera related to *Melanolophia* by the lack of the hair pencil on the hind tibia of the male. Two species have very short palpi, which is another diagnostic character. In the male genitalia the shallowly bifurcate uncus and the flat costa are characteristic, while the simple third abdominal segment and the weakly developed double comb between the seventh and eighth segments are diagnostic. The sclerotized lateral plates of the ostium form a good recognition feature for the female genitalia.

This is a small genus of three species. Two of these are closely allied and have narrow gray wings. The third species has wider wings and has grayish green forewings above; it more closely resembles *Vinemina perdita* Guedet or several of the species in the following genus.

KEY TO SPECIES

BASED ON MACULATION

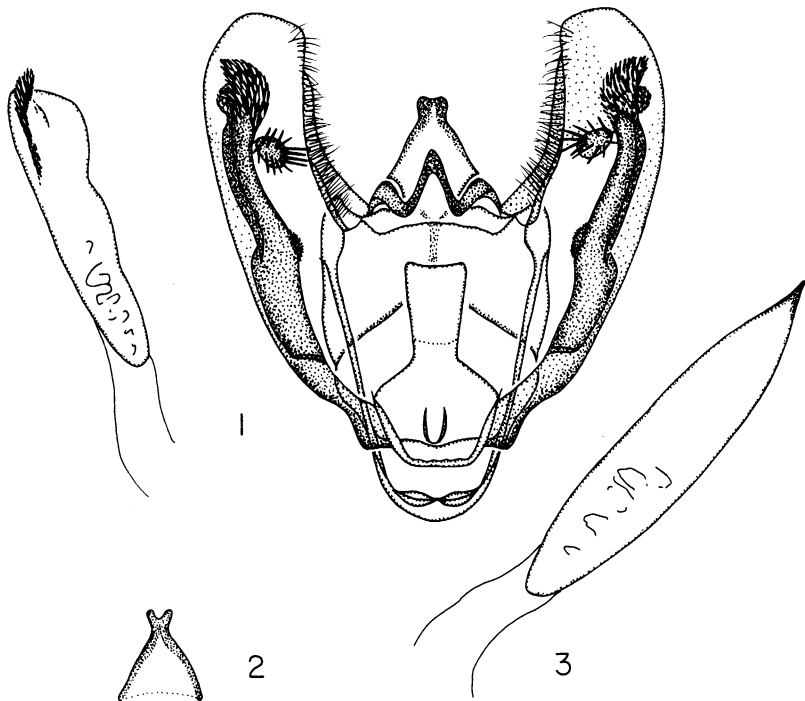
1. Upper surface of forewings greenish gray, with black, shortly dentate cross lines. *setigera*
Upper surface of forewings gray, with cross lines indistinct or absent. 2
2. Upper surface of forewings with prominent, longitudinal, black marking above cubital vein in lower part of cell and in cell M_2 *incopriaria*
Upper surface of forewings without longitudinal maculation; some specimens with t. a. and t. p. lines weakly indicated. *inconspicuaria*

BASED ON MALE GENITALIA

1. Vesica of aedeagus armed with inconspicuous, short, sclerotized band. . . *setigera*
Vesica armed with elongate, prominent row of spines. 2
2. Cleft in apex of uncus at least as deep as width of lateral lobes of uncus.
..... *inconspicuaria*
Apex of uncus with very shallow cleft. *incopriaria*

BASED ON FEMALE GENITALIA

1. Lateral plates of sterigma strongly convoluted. 2
Lateral plates of sterigma smooth or weakly striate. *inconspicuaria*



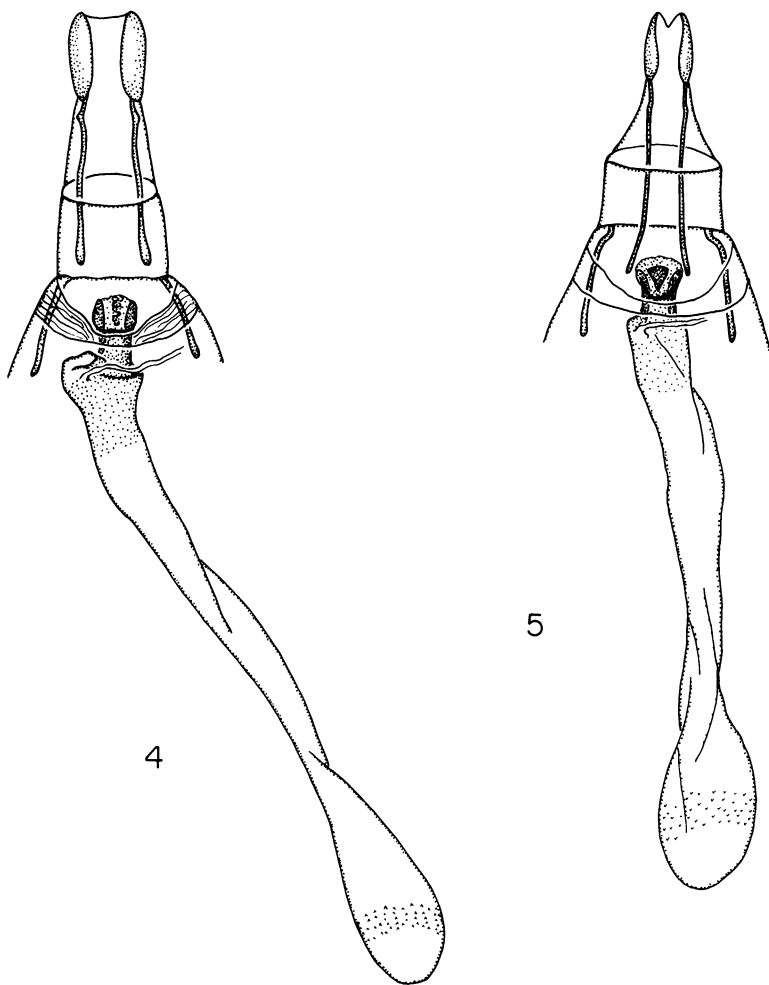
FIGS. 1-3. Male genitalia. 1. *Carphoides incopriaria* (Hulst), Mesa Verde National Monument, Colorado, July 9, 1959 (M. May; A.M.N.H.). 2. Uncus of *C. inconspicuaria* (Barnes and McDunnough), Southwestern Research Station of the American Museum of Natural History, Cochise County, Arizona, April 29, 1956 (Cazier and Ordway; A.M.N.H.). 3. Aedeagus of *C. setigera* Rindge, paratype, Pinery Canyon, Cochise County, Arizona, July 14, 1956 (C. W. Kirkwood; A.M.N.H.).

2. Posterior end of corpus bursae with area of sclerotization approximately twice as long as width of corpus bursae.....*incopriaria*
Posterior end of corpus bursae with area of sclerotization narrower than width of corpus bursae.....*setigera*

Carphoides setigera Rindge
Figure 3

Carphoides setigera RINDGE, 1958, p. 16, figs. 10 (paratype male), 27-29 (male and female genitalia).

This species is very distinct in facies from the other known species in the genus, resembling, instead, the members of the following genus and *Vinemina perdit*a Guedet. It can be distinguished from these species by the generic characters, by the greenish color of the primaries, by the



FIGS. 4, 5. Female genitalia. 4. *Carphoides incopriaria* (Hulst), Cedar Creek Camp, Lincoln County, New Mexico, July 1, 1961 (F., P., and J. Rindge; A.M.N.H.). 5. *C. inconspicuaria* (Barnes and McDunnough), Southwestern Research Station of the American Museum of Natural History, Cochise County, Arizona, July 29, 1959 (M. Statham; A.M.N.H.).

absence of the tibial hair pencil, by the bifurcate apex of the uncus, and by the lateral plates of the ostium. This taxon is distinctive in the genus *Carphoides* in that it has palpi that ascend to about the middle of the eye, whereas the other species have very short palpi. Most specimens of this species have seven veins in the secondaries, while the other two members

of this genus may have seven or eight. The length of the forewings of the males ranges from 15 to 18 mm., and the only known female measures 19 mm.

The genitalia of *setigera* are very similar to those of the other species of *Carphoides*. The male structures of this species can be recognized by the elongate, semicircular harpe and by the almost completely unarmed vesica. The female genitalia are characterized by the convoluted lateral plates of the sterigma, by the narrow area of sclerotization at the posterior end of the corpus bursae, and by the relatively wide band of spicules at the anterior end of the same structure.

No new material has been examined since the appearance of the original description, so no additional descriptive notes are given.

TYPES: Holotype, male, and allotype, female, in the collection of the Los Angeles County Museum.

TYPE LOCALITY: Upper camp, Pinery Canyon, Chiricahua Mountains, Cochise County, Arizona.

RANGE: This species is known only from Cochise County, Arizona. The moths have been captured in June and July.

REMARKS: Fourteen specimens and five genitalic dissections have been examined.

Carphoides incopriaria (Hulst), new combination

Figures 1, 4, 6

Tornos incopriarius HULST, 1887, p. 210. PEARSALL, 1908, p. 133.

Lepiodes incopriaria: SMITH, 1891, p. 71.

Glaucina incopriata: DYAR, "1902" [1903], p. 328. SMITH, 1903, p. 76.

Aethytera lineata HULST, 1898, p. 192. DYAR, "1902" [1903], p. 317. SMITH, 1903, p. 75. GROSSBECK, 1907, p. 341. PEARSALL, 1908, p. 134 (synonym of *incopriarius*). BARNES AND McDUNNOUGH, 1912, p. 35, pl. 16, fig. 14 ("type female"). RINDGE, 1955, p. 147.

Carphoides lineata: McDUNNOUGH, 1920, p. 16, pl. 2, fig. 2 (male genitalia); 1938, p. 163.

This species is very different in appearance from *setigera*, as it has narrower forewings that are grayish brown in color. In the present species the maculation is longitudinal, and the normal cross lines are obsolescent or absent.

MALE: Head, vertex, and front gray, some scales with pale gray borders; palpi very short, barely extending beyond front, light gray basally, tending to become darker gray terminally. Thorax with mixed pale gray and grayish brown scales above; paler below; legs pale grayish brown, variably marked with brownish gray scales. Abdomen pale grayish brown above and below, tending to have brown scaling posteriorly.

UPPER SURFACE OF WINGS: Forewings with ground color pale gray, more or less evenly overlain with dark brownish gray scales; normal cross lines absent or obsolescent, with longitudinal markings instead; t. p. line weakly indicated in some specimens as a series of dark cellular spots; terminal line represented by dark cellular spots, these connected by dark line to spots of t. p. line in some examples, particularly in cell M_1 ; cubital and anal veins, extending anteriorly on vein M_3 , tending to be brownish black; prominent brownish black band extending from posterodistal part of cell into cell M_2 , being preceded anteriorly by white band of variable thickness; fringe tending to be concolorous with wing. Hind wings pale grayish white, weakly marked with pale ochraceous scales distally; without maculation in most specimens, some with faint indication of partial subterminal line.

UNDER SURFACE OF WINGS: Forewings pale grayish white, with costa and veins tending to be weakly marked with pale ochraceous brown; hind wings white; all wings usually without maculation, a few specimens with dark bar of primaries showing through on lower surface.

LENGTH OF FOREWING: 13 to 16 mm.

FEMALE: Similar to male, but with maculation of upper surface of forewings tending to be more heavily represented, and upper surface of hind wings slightly darker.

LENGTH OF FOREWING: 14 to 17 mm.

MALE GENITALIA: Uncus with apical portion attenuate, apex slightly swollen, very shallowly indented medially; gnathos well sclerotized, tapering to elongate median point; valve with broad, sclerotized process extending from base, curving inwardly, then extending distally, terminating in setose, capitate process in outer part of valve; harpe round or elliptical, with numerous, thick setae; anellus with broad base, posteriorly sharply narrowing, with concave sides, the base medially having elongate, recessed area; aedeagus with row of cornuti posteriorly in vesica, curving to right side and becoming longer distally.

FEMALE GENITALIA: Sterigma with large, elongate, concave, lateral plates, their exterior surface longitudinally striate; ductus bursae approximately twice as long as wide, with sclerotized, dorsal surface extending farther posteriorly than narrower ventral margin, and with elongate, narrow, irregularly shaped sclerotized piece between postero-dorsal margins of ductus; ductus seminalis arising from ventral surface of small lobe on left side of ductus bursae; corpus bursae with posterior end weakly sclerotized and punctate for a distance about twice that of width of corpus bursae, and with narrow band of very small spicules anteriorly.

TYPES: Hulst described *incopriaria* from a single male specimen; this is U.S.N.M. No. 34265.

There was no indication of the number of specimens or of their sex in the original description of *lineata*. Hulst did mention the white, silky hind wings, thus indicating that the specimen was a male. Pearsall (1908) said that the type in the Hulst collection at New Brunswick was

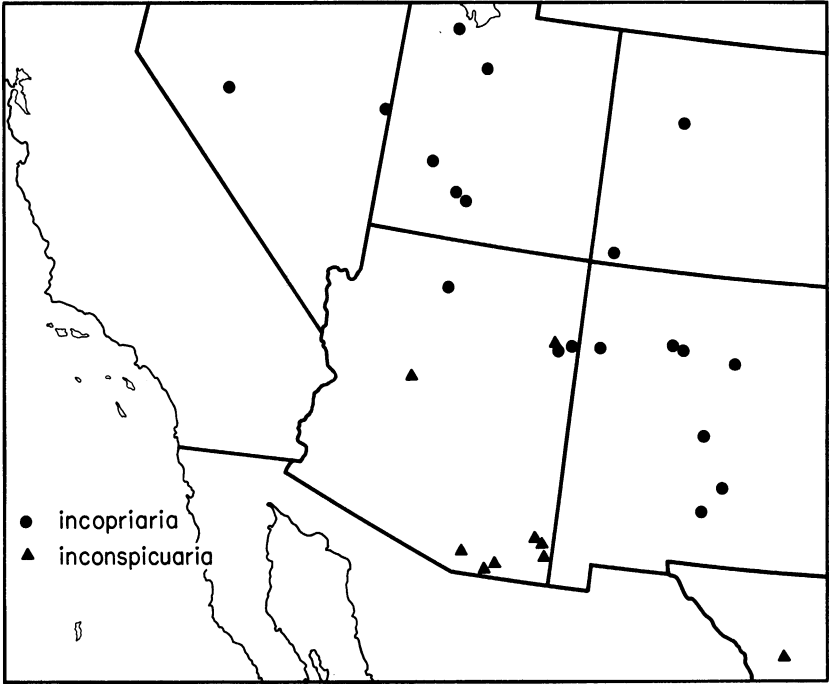


FIG. 6. Distribution of *Carphoides incopriaria* (Hulst) and *C. inconspicuaria* (Barnes and McDunnough).

mutilated and badly worn. This male specimen is now in the collection of the American Museum of Natural History (Rindge, 1955). Two additional specimens, a male and a female, bearing Hulst's type labels, have been examined. These are in better condition than the above-mentioned male from the Hulst collection. The male is hereby designated as the lectotype; the female is the one figured by Barnes and McDunnough (1912). Both of these specimens are in the collection of the United States National Museum.

TYPE LOCALITIES: Arizona (*incopriaria*); Glenwood Springs (misspelled

Glenmore Springs in the original description), Garfield County, Colorado (*lineata*).

RANGE: Western Colorado, Utah, Nevada, New Mexico, and north-eastern Arizona (see fig. 6). On the wing in June, July, August, and September.

REMARKS: Sixty specimens (including both types) and 16 genitalic dissections have been studied. This species is easily distinguished by the elongate gray forewings with longitudinal markings.

The branching of veins R_{1+2} was examined in 25 specimens, as this is a variable character. In five specimens the branching in the right forewing did not agree with that of the left wing; in one example it is possible to have R_{1+2} long-stalked in one wing, while these veins arise separately in the other. In 15 specimens the two veins arose separately in both wings, while in the remaining five the two veins were stalked for various distances. Hence it can be seen that the branching of R_{1+2} is too variable to be of diagnostic importance in this species.

A similar study was made, in the same 25 specimens, for the location of the small cross vein that closes the areole, and its relationship to the origin of vein R_5 . In three specimens this varied from one wing to the other; in 16 it was beyond the origin of R_5 ; four had the two veins at the same place; of the remaining two specimens, one had the cross vein basal to R_5 , and the other apparently did not have any cross vein at all. This character is also variable and should be used only with caution, if at all.

Carphoides inconspicuaris (Barnes and McDunnough)

Figures 2, 5, 6

Parexcelsa inconspicuaris BARNES AND McDUNNOUGH, 1916a, p. 30, pl. 2, fig. 18 (type male).

Carphoides inconspicuaris: McDUNNOUGH, 1920, p. 16, pl. 1, fig. 2 (male genitalia); 1938, p. 163.

This species has the upper surface of the narrow forewings an immaculate grayish brown, although in some specimens there are traces of the t. a. and t. p. lines.

MALE: Head, thorax, and abdomen similar to those of *incopriaria* but tending to be darker gray above.

UPPER SURFACE OF WINGS: Forewings with ground color gray, heavily and evenly overlain with dark brown scales; maculation absent or obsolescent; t. a., t. p., and s. t. lines weakly and incompletely indicated in some specimens; fringe concolorous with wing. Hind wings white, without maculation.

LENGTH OF FOREWING: 13 to 17 mm.

FEMALE: Similar to male, but with maculation of forewings tending to be more strongly represented, and with hind wings pale grayish white above and below.

LENGTH OF FOREWING: 14 to 18 mm.

MALE GENITALIA: Similar to those of *incopriaria*, differing mainly as follows: cleft in apex of uncus deeper, being at least as deep as width of lateral lobes of uncus; harpe tending to be larger and more elliptical in shape; terminal, capitate process of sclerotized arm of valve tending to be smaller; spines of vesica tending to be slightly smaller.

FEMALE GENITALIA: Similar to those of *incopriaria*, differing mainly as follows: lateral plates of ostium smoothly sclerotized; sclerotized piece between posterodorsal margins of ductus bursae larger, more heavily sclerotized, triangular in outline; corpus bursae with narrow band of very small spicules anteriorly.

TYPE: Holotype, male, in the collection of the United States National Museum.

TYPE LOCALITY: Paradise, Cochise County, Arizona.

RANGE: Arizona and western Texas (see fig. 6). On the wing from March through August.

REMARKS: One hundred seventy-eight specimens (including the type) and nine genitalic dissections have been studied. This species can be separated from *incopriaria* by its unicolorous gray primaries, and by the genitalic characters given above.

Apparently this species has two generations a year, as most of the specimens have been taken either in the months of April and May or in July and August. Examples caught in the spring months tend to be larger and to have more clearly defined maculation than those taken later in the year.

PARAPHOIDES, NEW GENUS

Similar in most characters to *Melanolophia*, differing mainly as follows: Head with palpi extending to middle of eye, rarely shorter; antennae of male bipectinate, with pectinations extending almost to apex, of female simple and with pair of setae at end of each segment. Fore tibia with moderate process in male, one-half of length of tibia, slightly shorter in female; hind tibia with two pairs of spurs and with hair pencil in male. Abdomen of male with third segment having both medioventral row of bristles and posterolateral hair pencil, and usually with large double comb between seventh and eighth segments.

Forewings broad, with 12 veins, and with elongate areole; R_1 and R_2

from top of cell, arising separately or stalked, R_2 with small cross vein to R_{3+4} , R_5 arising basal to cross vein; base of wing without fovea. Hind wings broad; outer margin weakly angled at M_3 , tending to be shallowly concave between veins; with seven veins, rarely eight; Sc paralleling cell for slightly less than one-half of length; $m+ldc$ weakly angled.

MALE GENITALIA: Uncus subtriangular, usually terminating in single point, rarely truncate; socius absent; gnathos well developed, of two types, one extending as two elongate, sclerotized points with outer margins parallel, the other with swollen median projection; valves large, symmetrical; costa with moderate to strong swelling and tuft of elongate setae at end; ornamentation of inner face of valve in form of either a wedge-shaped sclerotized piece, with dense row of spines on postero-medial margin, or with sclerotized outer margin with small median swelling and posterior harpe, and both with swollen, setose ridge in valvula; anellus elongate, membranous or weakly sclerotized; cristae varying from being absent or small and inconspicuous to very large and prominent; aedeagus of moderate length, slender, posterior portion with paired, lateral sclerotized projections, these being spinose in some species; vesica usually unarmed, rarely with sclerotized strip.

FEMALE GENITALIA: Apophyses posteriores approximately twice as long as apophyses anteriores; sterigma a transverse ellipse, with posterior margin more heavily sclerotized than anterior; ductus bursae short, weakly sclerotized, slightly longer than wide in most species, rarely elongate, joining corpus bursae posteriorly; ductus seminalis arising from ventral surface of corpus bursae near posterior end; corpus bursae relatively short and thick, laterally compressed, enlarged anteriorly; signum on right side, in form of two separate, sclerotized patches with spiculate surface, rarely absent.

Forewings of most species above pale gray or pale grayish brown, with single median and geminate t. a., t. p., and s. t. cross lines, and with small discal spot; hind wings pale gray, with partial, geminate, extradiscal line and complete, single, subterminal line. Under side pale gray, suffused with darker scales, usually without maculation except for dark apex of primary. One species very closely resembles one of *Galenara*.

EARLY STAGES: Unknown.

TYPE SPECIES: *Tephrosia bura* Druce.

RANGE: The mountains of eastern Arizona, Mexico, Guatemala, and Costa Rica.

The species of this genus usually can be recognized by the fact that the palpi extend to the middle of the eye, by the presence of the tibial hair pencil in the male, and by the presence of only seven veins in the hind

wings. One species has shorter palpi, and another has eight veins in the secondaries. The male abdomen has both the medioventral row of bristles and the lateral hair pencils on the third segment as well as the double comb between the seventh and eighth segments, although the last is absent in one species. The male genitalia of most taxa are distinctive in having the deeply bifurcate gnathos, the wedge-shaped sclerotized piece on the inner face of the valves, and the lateral, paired, sclerotized pieces on the aedeagus. Two species do not have this type of gnathos, but possess a swollen median projection; in these two, the posterior portion of the aedeagus has several prominent spines on each side. The broad, sclerotized, elliptoid sterigma and the two sclerotized patches of the signum are characteristic of the female genitalia, although the signum is lacking in one species.

This small genus consists of two species groups. The first includes a superspecies of five closely related species that closely resemble one another, but genitalic differences are present in both sexes. The second group has two, apparently less closely related, species. It is recommended that the genitalic structures be studied when identifications are attempted in this genus.

KEY TO SPECIES

BASED ON MALE GENITALIA¹

- 1. Gnathos deeply bifurcate. 2
- Gnathos with swollen median projection. 5
- 2(1). Gnathos with depth of area between elongate, sclerotized points slightly greater than distance between apices of points. *foeda*
- Gnathos with depth of area between points less than distance between apices of points. 3
- 3(2). Small swelling between distal portion of sclerotized, triangular process of sacculus and costal swelling with one or two setae. *vafra*
- This swelling in form of a tubercle, and having three to six setae from its end. 4
- 4(3). Paired, lateral projections of aedeagus tending to be asymmetrical, one of left side usually longer than right one. *stulta*
- Paired lateral projections of aedeagus symmetrical. *bura*
- 5(1). Large double comb present on abdomen between seventh and eighth segments. *dentata*
- No such comb present. *errantaria*

BASED ON FEMALE GENITALIA²

- 1. Signum present, in form of two separate, sclerotized patches. 2
- Signum absent. *dentata*

¹ The males of *largifica* are unknown.
² The females of *errantaria* are unknown.

- 2(1). Corpus bursae with raised pouch on dorsal surface posteriorly, near junction with ductus bursae. 3
 Corpus bursae without raised pouch on dorsal surface posteriorly. 4
 3(2). Raised pouch on dorsal surface of corpus bursae separated by its own width from ductus bursae. *bura*
 Raised pouch on dorsal surface of corpus bursae contiguous with ductus bursae. *largifica*
 4(3). Corpus bursae short and broad, approximately 2.4 mm. in length. . . . *foeda*
 Corpus bursae elongate and slender, approximately 3.0 to 3.5 mm. in length, with anterior end swollen. 5
 5(4). Ductus bursae with width approximately equal to length. *vafra*
 Length of ductus bursae twice that of width. *stulta*

***Paraphoides foeda*, new species**

Figures 7, 11

This species is unique in the genus in that it has veins R_{1+2} stalked. It occurs in Costa Rica.

MALE: Head, vertex pale grayish brown, with scattered brown scales; front light brown in upper portion, pale grayish brown below; palpi brown, with some light gray scaling below at base. Thorax light gray above, with scattered brown scales; paler below; legs light gray, variably marked with brown scaling and tending to become more concentrated distally. Abdomen light gray above and below.

UPPER SURFACE OF WINGS: Forewings with veins R_{1+2} stalked; ground color light gray, variably overlain with pale ochraceous brown scaling; cross lines pale brown, with t. a., t. p., and s. t. lines geminate, and with basal and median lines simple; all lines tending to be outwardly dentate on veins, except for s. t. line; s. t. area of ground color; basal one-half of s. t. line of cellular spots, tending to be heaviest in upper portion of wing, opposite cell, and above tornus, with distal part of line less prominent; discal spot small, elongate, situated on cross vein; terminal line of brownish black cellular spots; fringe of ground color, darkened opposite spots of terminal line. Hind wings light, shiny gray, sparsely overlain with pale brown and dark brown scales distally; median and extradiscal cross lines indicated along anal margin, with the latter being geminate; discal spot absent; s. t. line complete, more heavily represented in lower part of wing; terminal line of elongate, dark brown or brownish black cellular spots; fringe concolorous with wing.

UNDER SURFACE OF WINGS: Forewings pale gray, more or less heavily marked with pale brownish gray scales, approximating cross lines of upper surface; s. t. line in upper part of wing broadly dark grayish brown. Hind wings pale grayish white, sparsely overlain with pale brownish gray

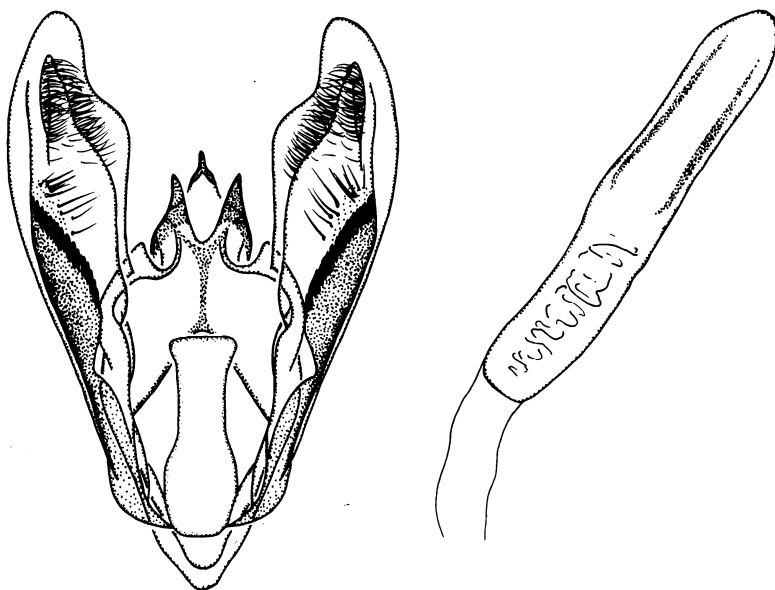


FIG. 7. Male genitalia of *Paraphoides foeda*, new species, paratype, Volcan Turrialba, Costa Rica, August (U.S.N.M.).

scales; maculation of upper surface weakly reflected; discal spot elongate, ochraceous brown; terminal line absent or weakly indicated anteriorly.

LENGTH OF FOREWING: 16 (holotype) to 17 mm.

FEMALE: Similar to male.

LENGTH OF FOREWING: 16 mm. (allotype).

MALE GENITALIA: Uncus subtriangular, with base slightly swollen and with terminal portion elongate and slender; gnathos with outer margins of elongate points weakly concave, with depth of area between points slightly greater than distance between apices of points; valves with moderate swelling on costa; saccus with elongate, triangular, sclerotized piece extending to middle or outer portion of uncus, with dense row of spines on posteromedial margin extending almost to tip; with weakly sclerotized, subtriangular area distal to row of spines, and having group of from three to five setae at apex; aedeagus equal in length to combined lengths of uncus, tegumen, and saccus, laterally with weakly sclerotized, paired projections extending for slightly more than one-half of length of aedeagus.

FEMALE GENITALIA: Sterigma elliptical, posterior margin broadly sclerotized, slightly enlarged medially; ductus bursae membranous, taper-

ing anteriorly; ductus seminalis arising at approximately three-fourths of length of corpus bursae; the latter short and broad, approximately 2.4 mm. in length, posterior end weakly striate and without raised pouch on dorsal surface; signa weakly sclerotized, elongate and slender, approximately 0.45 mm. in length.

Types: Holotype, male, Juan Vinas, [Cartago], Costa Rica, elevation 1400 meters; allotype, female, same data but without elevation, January. Paratypes, both from Costa Rica: "Vol. Turrialba," [Cartago], August, one male; same data as allotype (Schaus and Barnes), one female. All the type material is in the collection of the United States National Museum.

Range: The mountains of Costa Rica. The only known elevation for the occurrence of this species is about 4500 feet. The moths have been captured in January and August.

Remarks: Four specimens and four genitalic dissections have been studied.

Paraphoides bura (Druce), new combination

Figure 9

Tephrosia bura DRUCE, 1892 (1891-1900), p. 77; 1893 (1881-1900), pl. 48, fig. 14.

The moths of this species closely resemble those of the preceding species but can be distinguished from them by the fact that veins R_1 and R_2 arise separately. Differences are also found in the genitalic structures. This taxon occurs in Guatemala.

MALE: Head, thorax, and abdomen similar to those of *foeda*.

UPPER SURFACE OF WINGS: Forewings with veins R_1 and R_2 arising separately; similar to those of *foeda* but tending to be more heavily overlain with brown scaling, and with cross lines slightly darker. Hind wings like those of *foeda*.

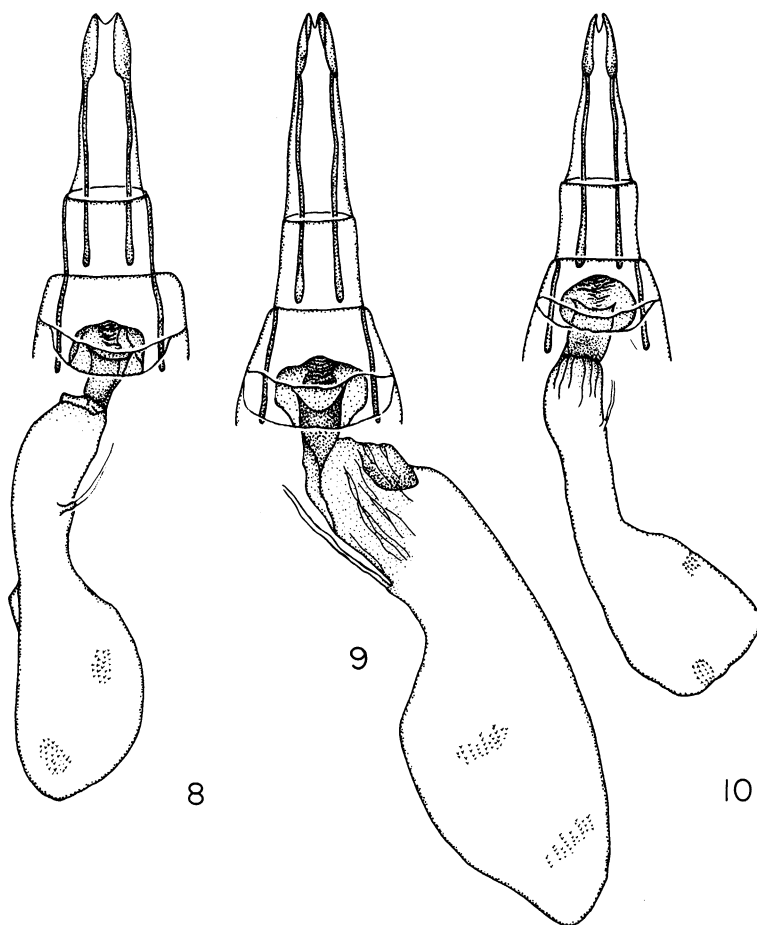
UNDER SURFACE OF WINGS: Similar to that of *foeda* but less heavily overlain with brownish gray scales.

LENGTH OF FOREWING: 14 to 15 mm.

FEMALE: Similar to male.

LENGTH OF FOREWING: 14 to 16 mm.

MALE GENITALIA: Similar to those of *foeda*, differing mainly as follows: uncus with terminal portion subtriangular; gnathos with depth of area between elongate points less than distance between apices of points; valves with slightly more definite tubercle on costa; triangular, sclerotized area of sacculus extending as far as posterior margin of tegumen or to basal part of uncus, with row of spines on posteromedial margin extending



FIGS. 8–10. Female genitalia. 8. *Paraphoides stulta*, new species, allotype, Mo Cuou, Oaxaca, Mexico, September 17, 1962 (E. C. Welling; A.M.N.H.). 9. *P. bura* (Druce), Volcan Santa Maria, Guatemala, July (Schaus and Barnes; U.S.-N.M.). 10. *P. vafra*, new species, paratype, Orizaba, Mexico (U.S.N.M.).

about two-thirds of length of margin; weakly sclerotized area posterior to row of spines with small tubercle having five or six setae at end.

FEMALE GENITALIA: Sterigma with median portion of posterior margin enlarged; ductus bursae lightly sclerotized, weakly tapering anteriorly, and from one and one-half to two times as long as wide; ductus seminalis arising at approximately two-thirds of length of corpus bursae; the latter moderately long and broad, ranging from about 3.4 to 4.6 mm., posterior

end with raised pouch on dorsal surface, separated from ductus bursae by approximately its own width; signa weakly sclerotized, elongate and slender, approximately 0.5 to 0.6 mm. in length.

TYPE: Druce described *bura* from "many specimens." The lectotype, hereby designated, is a male from Totonicanpan; it is in the collection of the British Museum (Natural History).

TYPE LOCALITY: Totonicanpan (given as Totonicanpam in the original description), Totonicanpan, Guatemala, elevation 8500 to 10,500 feet.

RANGE: The mountains of Guatemala. The moths have been captured in the months of April, June, July, and October.

REMARKS: Sixteen specimens and seven genitalic dissections have been studied. The moths of this species are smaller and have slightly darker forewings above than specimens of the preceding species.

The genitalia of the two species are also very similar. In the male structures of the present species the shorter triangular area of the sacculus and its less elongate spinose posterior margin are characteristic, as is the more bluntly pointed uncus. The female genitalia of *bura* are larger than those of *foeda*, and the ductus seminalis arises in a more medial position in this species.

Three males from Purulha, Baja Verapaz, have been studied; they are paler than are the remaining 13 specimens from Volcan de Santa Maria, Quezaltenango. The male genitalic structures have been examined from both localities and show very few differences. Neither females from Purulha nor any topotypical material has been studied.

***Paraphoides vafra*, new species**

Figure 10

This species is very similar to the preceding, but can be distinguished by means of the genitalic structures. The present taxon occurs in Veracruz, Mexico.

MALE: Head, thorax, and abdomen similar to those of *foeda*, but with apex of palpi tending to be grayish white.

UPPER SURFACE OF WINGS: Forewings with veins R_1 and R_2 arising separately; similar to those of *bura*. Hind wings like those of *foeda*.

UNDER SURFACE OF WINGS: Similar to that of *foeda* but with area of brownish black scales near apex of wing tending to be larger and darker, and with subterminal band of secondaries more strongly represented.

LENGTH OF FOREWING: 15 mm. (holotype).

FEMALE: Similar to male.

LENGTH OF FOREWING: 15 (allotype) to 16 mm.

MALE GENITALIA: Similar to those of *foeda*, differing mainly as follows: uncus with terminal portion elongate, the sides weakly convex; gnathos with depth of area between elongate points less than distance between apices of points; valves with broad swelling on costa; triangular, sclerotized area of sacculus extending to basal portion of uncus, with posteromedial margin rounded, and with row of spines closely appressed; weakly sclerotized area posterior to row of spines with minute tubercle having one or two setae at end.

FEMALE GENITALIA: Sterigma with median portion of posterior margin weakly enlarged; ductus bursae weakly sclerotized, square in outline; ductus seminalis arising at approximately three-fourths of length of corpus bursae; the latter elongate and enlarged anteriorly, approximately 3.4 mm. in length, and posterior end without raised pouch on dorsal surface; signa well sclerotized, slightly longer than wide, approximately 0.25 mm. in length.

TYPES: Holotype, male, and allotype, female, Jalapa, [Veracruz], Mexico. Paratype: Orizaba, [Veracruz], Mexico, one female. All the type material is in the collection of the United States National Museum.

RANGE: The mountains of the state of Veracruz, Mexico. There were no dates on any of the specimens examined, so the time of flight of this species is unknown.

REMARKS: Three specimens and three genitalic dissections have been studied. The moths of this species are almost identical with those of the preceding species. They agree in the branching of veins R_1 and R_2 with *bura*, but tend to have the terminal segment of the palpi paler.

The ornamentation and shape of the valves in the male genitalia in this species are slightly different from those of *bura*. In the present taxon the triangular sclerotized area is more rounded and the row of spines is shorter and more closely appressed, and the weakly sclerotized area posterior thereto is further reduced. The shapes of the corpus bursae and the signa are characteristic of this species.

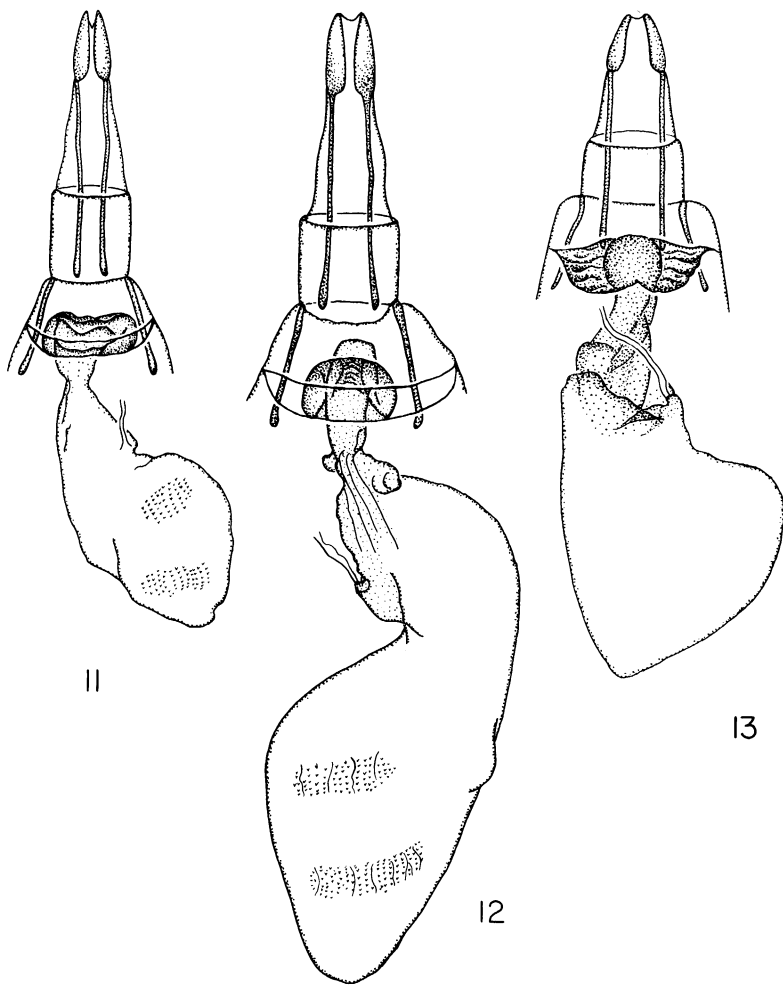
***Paraphoides largifica*, new species**

Figure 12

The single known female of this species is the largest known example of the genus, and the upper surface of the forewings are paler than those of the preceding species. Distinguishing characters are also to be found in the genitalia. This species is known from Chiapas, Mexico.

MALE: Unknown.

FEMALE: Head, thorax, and abdomen similar to those of *foeda*, but tending to be more contrastingly marked.



FIGS. 11-13. Female genitalia. 11. *Paraphoides foeda*, new species, paratype, Juan Vinas, Costa Rica, January (Schaus and Barnes; U.S.N.M.). 12. *P. largifica*, new species, holotype, Santa Rosa de Comitan, Chiapas, Mexico, May, 1937 (C. C. Hoffmann; A.M.N.H.). 13. *P. dentata* (Dyar), Guerrero, Mexico, June 28 (R. Muller; U.S.N.M.).

UPPER SURFACE OF WINGS: Forewings with veins R_1 and R_2 arising separately; similar to those of *foeda* but with ground color white and maculation appearing more contrasting. Hind wings like those of *foeda* but tending to be paler and with maculation more distinct.

UNDER SURFACE OF WINGS: Similar to that of *foeda* but with more

maculation of upper surface showing through, and with stronger sub-terminal lines and area below apex of forewing.

LENGTH OF FOREWING: 19 mm. (holotype).

MALE GENITALIA: Unknown.

FEMALE GENITALIA: Sterigma with rounded posterior margin broadly sclerotized and without median swelling; ductus bursae lightly sclerotized and tapering anteriorly, approximately one and one-half times as long as maximum width; ductus seminalis arising at anterior margin of lightly sclerotized and striate posterior portion of corpus bursae; the latter large, in length about 4.6 mm., enlarged anteriorly, posterior end with raised, rugose, pouch-like area on dorsal surface contiguous with ductus bursae; signa weakly sclerotized, elongate, approximately 1.0 to 1.1 mm. in length, and with several transverse folds or creases.

TYPE: Holotype, female, Santa Rosa de Comitán, Chiapas, Mexico, May, 1937 (C. C. Hoffmann); in the collection of the American Museum of Natural History.

RANGE: Known only from the type locality in the mountains of Chiapas, Mexico.

REMARKS: One specimen and one genitalic dissection have been studied. This species appears to be the largest one in the genus. The upper surface of the forewings is paler and has more contrasting maculation than does that of any of the preceding species.

In the female genitalia the very large corpus bursae and large, weakly sclerotized signa are characteristic. The raised, rugose area posteriorly on the dorsal surface contiguous with the corpus bursae is also a distinctive feature.

***Paraphoides stulta*, new species**

Figure 8

The adults of this species are similar to those of *foeda*, but have paler forewings. Differences are also found in the genitalic structures. This species occurs in the mountains of western Mexico.

MALE: Head, thorax, and abdomen similar to those of *foeda* but tending to have more scattered brown scales.

UPPER SURFACE OF WINGS: Forewings with veins R_1 and R_2 arising separately; similar to those of *foeda* but tending to have whiter ground color, and for cross lines to be grayish brown. Hind wings like those of *foeda*.

UNDER SURFACE OF WINGS: Similar to that of *foeda* but tending to have more grayish or grayish brown scaling on forewings, and to have heavier s. t. line and area below apex of primaries.

LENGTH OF FOREWING: 14 to 17 mm.; holotype, 17 mm.

FEMALE: Similar to male, but some specimens tending to have maculation slightly more prominent.

LENGTH OF FOREWING: 14 to 18 mm.; allotype, 17 mm.

MALE GENITALIA: Similar to those of *foeda* but differing mainly as follows: uncus with terminal portion subtriangular; gnathos with outer margins of elongate points straight, and with depth of area between elongate points shorter than distance between apices of points; valves with more definite tubercle on costa; triangular, sclerotized area of sacculus extending to base of uncus, with row of spines on postero-medial margin occupying about three-fourths of length of margin; weakly sclerotized area posterior to row of spines with small tubercle having from three to six setae at end.

FEMALE GENITALIA: Sterigma with median portion of posterior margin enlarged; ductus bursae lightly sclerotized, of even width or weakly tapering anteriorly, and approximately twice as long as wide; ductus seminalis arising at approximately three-fourths of length of corpus bursae; the latter elongate, about 3.0 to 3.5 mm. in length, anterior end swollen, posterior end weakly sclerotized and striate, without dorsal pouch; signa small, anterior one larger than posterior, the former approximately 0.3 to 0.4 mm. in length.

TYPES: Holotype, male, and allotype, female, Mo Cuou, Cerro Pelon, Municipio Yolox, Oaxaca, Mexico, September 17, 1962, elevation 7050 feet (E. C. Welling). Paratypes, all from Mexico: Same data as types, September 14, 17, 1962, four males and eight females; Cerro Pelon, Municipio Yolox, Oaxaca, September 12, 1961, elevation 7052 feet (E. C. Welling), one female; Vista Hermosa, Municipio Comaltepec, Oaxaca, September 29, 1962, elevation 4650 feet (E. C. Welling), one male. All the type material is in the collection of the American Museum of Natural History.

RANGE: The mountains of the state of Oaxaca, Mexico. The material studied was caught from about 4650 to 7000 feet in September.

REMARKS: Sixteen specimens and six genitalic dissections have been studied. The adults of this species closely resemble those of the preceding species but tend to have the ground color of the primaries paler and the maculation more of a grayish brown, possibly owing to the freshness of the series, as they were caught in 1961 and 1962. The examples of *foeda*, *bura*, and *vafra* are much older and may have become faded or slightly discolored.

The genitalia of this species are closely similar to the others in this genus. The male structures are characterized by the straight outer margins

of the gnathos and by the relatively short triangular areas of the sacculus. In the female genitalia, the elongate ductus bursae and the small signa are diagnostic.

Paraphoides dentata (Dyar), new combination

Figures 13, 14

Pherotesia dentata DYAR, 1918, p. 362.

This species can be separated from the preceding superspecies group by the more brownish gray color, the more strongly dentate cross lines, and by the shorter palpi. This taxon occurs in western Mexico.

MALE: Head, vertex, and front with mixed gray and dark brown scales, the latter tending to be concentrated near antennal bases; palpi with basal segment whitish gray, terminal segments brown. Thorax with mixed gray, dark brown, and blackish brown scales above; grayish white below; legs light grayish brown, variably marked with brown and dark brown scales. Abdomen above grayish brown, with scattered dark brown scales; below paler, with fewer dark scales.

UPPER SURFACE OF WINGS: Forewings with veins R_1 and R_2 arising separately; ground color light ochraceous gray or gray, heavily irrorate with brownish black scales; t. a., median, and t. p. cross lines brownish black, narrow, strongly outwardly dentate on veins, in cell, and in fold, the lines arising from costal spots about one-fourth, two-fifths, and two-thirds of distance from base, respectively; subterminal area light gray; s. t. line of brownish black spots, largest opposite cell; terminal line blackish brown, interrupted by veins, enlarged in cells and with basal row of sagittate spots; fringe pale gray, darkened medially, white opposite vein endings. Hind wings with seven veins; with numerous, elongate, silky, hair-like scales, more numerous basally; pale gray, sparsely overlain with pale brown and grayish brown scales, becoming more concentrated distally; discal spot small; median cross line incomplete, faint, sharply outwardly dentate on veins; extradiscal line more prominent, with band of pale gray basally, consisting of brownish gray intravenular spots; terminal line brownish black, either complete or weakly interrupted by veins; fringe creamy white.

UNDER SURFACE OF WINGS: Forewings pale gray, heavily overlain with dull gray and grayish brown scales; costa light ochraceous gray, with brownish gray scaling; discal dash small, dark brown; without definite maculation except for nebulous dark grayish brown costal mark at beginning of s. t. line; terminal line present, without basal sagittate spots of upper surface. Hind wings light gray, sparsely irrorate with pale

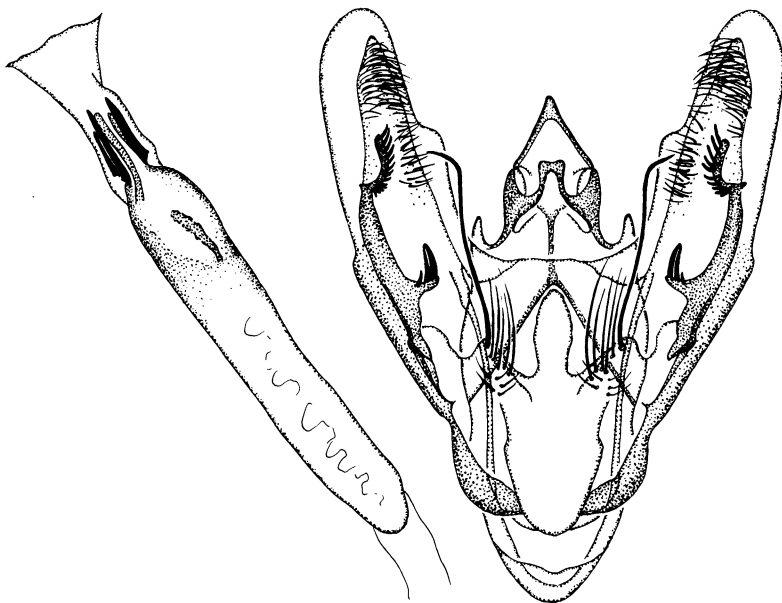


FIG. 14. Male genitalia of *Paraphoides dentata* (Dyar), Iguala, Guerrero, Mexico, May, 1932 (C. C. Hoffmann; A.M.N.H.).

brown scaling; discal spot prominent; cross lines weakly represented, with extradiscal line complete; terminal line present.

LENGTH OF FOREWING: 15 to 16 mm.

FEMALE: Similar to male.

LENGTH OF FOREWING: 15 mm.

MALE GENITALIA: Uncus subtriangular, with lateral margins slightly concave, apex bluntly pointed; gnathos very wide laterally, sharply constricted ventrolaterally, then extending posteroventrally as elongate, truncate process; costa of valves with small tubercle and tuft of elongate setae; valvula with elongate, slender, sclerotized, basal process extending posteriorly almost to base of uncus, with outer margin weakly rounded, with both ends pointed, and with large, setose protuberance from inner margin basal to middle; a second, more weakly sclerotized area of valvula extending posteriorly from near posterior end of basal process, with anterior, raised, lunate, setose harpe; saccus weakly sclerotized, with moderate median swelling; cristae consisting of one elongate, slender, posterior seta and approximately 18 shorter anterior setae on each side; transtilla incomplete; aedeagus longer than combined lengths of uncus, tegumen, and saccus, posteriorly with two or three heavy setae on each

side, situated at end of sclerotized strip, extending one-half of length of aedeagus on each side, and with single, dorsal, sclerotized bar; vesica armed with sclerotized strip, in length equal to width of aedeagus. Abdomen with median row of bristles and lateral hair pencils on third segment, and with double comb between seventh and eighth segments.

FEMALE GENITALIA: Sterigma small, elliptical, evenly sclerotized; ductus bursae elongate, two or three times as long as wide, weakly sclerotized and with punctate surface, enlarged on dorsal surface near anterior end; ductus seminalis arising ventrally near junction with ductus bursae; corpus bursae short and broad, approximately 2.4 mm. in length, anterior end as wide as length of corpus; signum absent.

TYPE: Dyar described *dentata* from a single male specimen; it is U.S.-N.M. No. 21288.

TYPE LOCALITY: Cuernavaca, Morelos, Mexico.

RANGE: The mountains of central Mexico (the states of Morelos and Guerrero). This species has been captured in the months of May and June at altitudes of between 2400 and 7400 feet.

REMARKS: Three specimens (including the type) and three genitalic dissections have been examined. This species can be recognized by the narrow and strongly dentate cross lines, by the presence of seven veins in the secondaries, and by the short palpi.

The male genitalia of *dentata* can be distinguished from those of the preceding superspecies group by the different gnathos, by the ornamentation of the valves, by the presence of the elongate cristae, and by the spinose posterior portion of the aedeagus. The female genitalia are similar to those of the preceding species, but are distinctive in not having any signum.

Paraphoides errantaria (McDunnough), new combination

Figure 15

Galenara errantaria McDUNNOUGH, 1940, p. 90, fig. 1 (male genitalia).

This is the only species in the genus that lacks the double comb between the seventh and eighth abdominal segments in the male, and that has eight veins in the secondaries. The present taxon is known only from Arizona.

MALE: Head, thorax, and abdomen similar to those of *dentata*, but paler.

UPPER SURFACE OF WINGS: Forewings with veins R_1 and R_2 arising separately; ground color light gray, heavily overlain with grayish brown and brownish black scales, particularly in median and terminal areas,

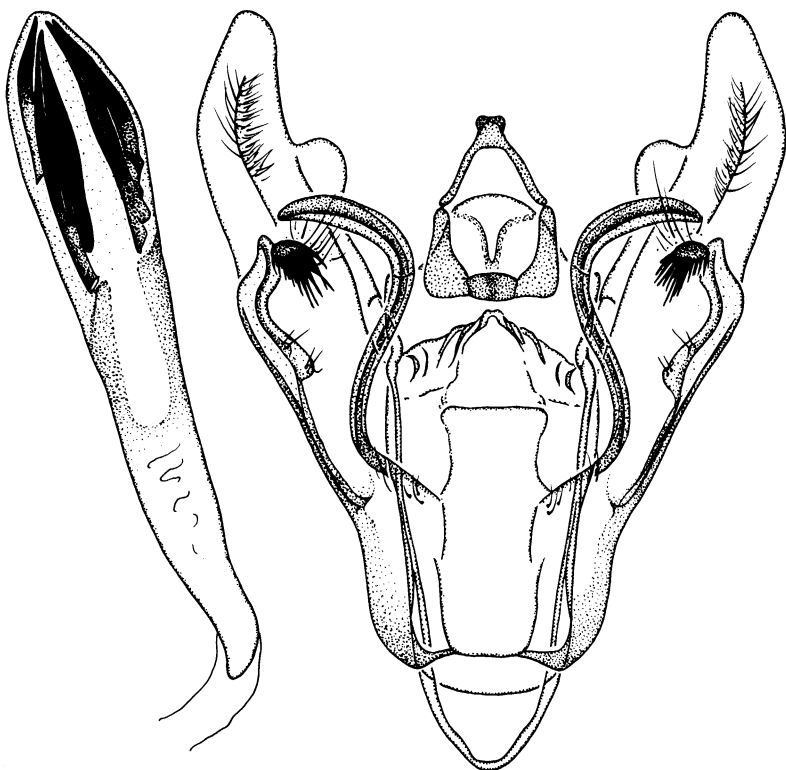


FIG. 15. Male genitalia of *Paraphoides errantaria* (McDunnough), South Fork Camp, White Mountains, Arizona, June 22, 1947 (G. H. and J. L. Sperry; A.M.N.H.).

and tending to have rather poorly defined bands of ground color on both sides of median area; t. a. line arising on costa just beyond one-fourth of distance from base, geminate from cell to fold, single to inner margin; median line arising slightly basal to middle of costa, extending more or less straight across wing, broadly shaded distally with brownish black scales; discal dash blackish brown, elongate; t. p. line arising two-thirds of distance from base, subparalleling outer margin to cell Cu_2 , then curving outward to anal vein, tending to be rather faintly represented in middle of wing, and broadly shaded distally in this area by grayish brown scales; s. t. line of large, outwardly pointed, brownish black spots, absent in cells M_3 and Cu_1 ; terminal line of elongate cellular spots, narrowly interrupted by veins; fringe concolorous with wing, tending to be narrowly white scaled at vein endings. Hind wings with eight veins, Sc

dividing near wing margin; pale gray, sparsely overlain with pale brown scales, becoming more concentrated distally; discal spot elongate, brownish gray; median cross line faintly represented; extradiscal line more prominent, interrupted by veins; terminal line complete, brownish black; fringe of ground color.

UNDER SURFACE OF WINGS: Forewings pale gray, broadly overlain with dull gray scales in basal two-thirds of wing, and with scattered grayish brown scales distally; costa ochraceous, with brownish black scaling; without definite maculation except for dark brown s. t. band in upper part of wing; terminal line present. Hind wings pale gray, sparsely irrorate with brown scaling; discal spot prominent; cross lines weakly represented.

LENGTH OF FOREWING: 17 to 18 mm.

FEMALE: Unknown.

MALE GENITALIA: Uncus with basal portion subtriangular, distal section broad, curved ventrally, concave anteroventrally; gnathos very wide laterally, tapering medially to broad, posteriorly flattened median process; costa of valves with prominent tubercle and large tuft of setae; valvula with transverse, sclerotized harpe, thickly set with anteriorly directed setae; sacculus narrowly sclerotized anteriorly, with two inwardly directed points posteriorly, the distal one extending under harpe; cristae consisting of single, very large, S-shaped seta on each side, extending posteriorly beyond process of valvula; transtilla present; aedeagus with a number of heavy setae on each side posteriorly, largest ventrally and becoming smaller dorsally; vesica unarmed. Abdomen with lateral hair pencils present on third segment, arising from sack-like processes, the setae on outer and posterior surfaces enlarged; without double comb between seventh and eighth segments.

FEMALE GENITALIA: Unknown.

TYPE: Holotype, male, C.N.C. No. 4957.

TYPE LOCALITY: Alpine, Apache County, Arizona.

RANGE: Known only from the White Mountains of eastern Arizona. The adults have been captured in June.

REMARKS: Two specimens and two genitalic dissections have been examined. Because of color, maculation, and the presence of eight veins in the secondaries, this species might be retained in *Galenara*. However, the presence of the lateral hair pencils on A_3 and the similarity of the male genitalia of this species to those of *dentata* indicate that *Paraphoides* is the correct genus for *errantaria*. Unfortunately the female of this taxon is unknown. The female genitalia of *Paraphoides* and *Galenara* are distinct; a knowledge of these structures for this species would be useful.

The male genitalia of *errantaria* are similar to those of the preceding species. The present taxon can be distinguished from *dentata* by the truncate uncus, by the more prominent harpe and cristae, and by the heavier and more numerous spines at the posterior end of the aedeagus.

GENUS *GALENARA* MCDUNNOUGH

Galenara McDUNNOUGH, 1920, p. 14, pl. 9, fig. 4 (male antenna), pl. 10, fig. 2 (venation of type species); 1938, p. 163.

Similar in most characters to *Melanolophia*, differing mainly as follows: Head with palpi moderate, extending to middle of eye; antennae of male bipectinate, with pectinations extending almost to apex, of female simple. Thorax with small posterior tufts. Fore tibia with moderate process in male, one-half of length of tibia, shorter in female; hind tibia with two pairs of spurs, males usually with hair pencil. Abdomen of male with third segment usually with medioventral row of bristles and without lateral hair pencil at posterior portion, and usually with large double comb between seventh and eighth segments.

Forewings broad, with 12 veins, and with elongate areole; R_1 and R_2 from top of cell, arising separately or stalked, R_2 with small cross vein to R_{3+4} , R_5 arising basal to cross vein; base of wing without fovea. Hind wings broad; outer margin rounded; with seven, eight, or nine veins; Sc paralleling cell for about one-half of length; $m+ldc$ weakly angled, rarely biangulate.

MALE GENITALIA: Uncus subtriangular, terminating either in single point or as truncate, weakly bipunctate projection; socius absent; gnathos well developed, with large median projection, usually lobate in outline; valves large, symmetrical; costa varying from flat to swollen, without tubercle and tuft of elongate setae from end; ornamentation of inner face of valve in form of sclerotized strip along sacculus and valvula, with raised, setose harpe near middle of valve; anellus weakly sclerotized or membranous; cristae small and inconspicuous; aedeagus of moderate length, usually weakly sclerotized posteriorly, in some species with paired, lateral, sclerotized projections or with sclerotized, hook-like process; vesica variably armed, varying from one large spine to a row of numerous, small spines.

FEMALE GENITALIA: Apophyses posteriores approximately twice as long as apophyses anteriores; sterigma usually membranous, rarely weakly sclerotized; ductus bursae short, sclerotized, joining corpus bursae posteriorly; ductus seminalis arising posteriorly, often from ventral surface of corpus bursae; the latter elongate, slender, membranous, weakly swollen anteriorly in some species, rarely short, sclerotized and curving

around on right side; signum either a small sclerotized piece or, more commonly, a band of small spicules near anterior end, rarely absent.

Forewings above dark gray or grayish brown, with dark cross lines, variable in course, and with discal spot varying from obsolescent to prominent; hind wings grayish white or gray, usually with obsolescent maculation. Under side pale gray or grayish brown, often suffused with darker scales, with reduced maculation.

EARLY STAGES: Undescribed, but the caterpillar of one species (*consimilis* Heinrich) feeds on Douglas fir, true fir, and spruce.

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

RANGE: The southwestern states of the Rocky Mountain region, extending south into central Mexico.

The species of *Galenara* have palpi that extend to about the middle of the eye, and most of the species have a tibial hair pencil on the meta-thoracic legs of the males. Most of the species have eight veins in the hind wing, although some have seven or nine; the one species with nine veins has a biangulate m+ldc cross vein, while all the other species have this vein angulate. The male abdomens of most of the species have the medioventral row of bristles but lack the lateral hair pencil of the third segment, and most species have the posterior double comb. The male genitalia are variable in many characters, but they do have a sclerotized sacculus and valvula with a raised, setose projection. The female genitalia of most species are characterized by the membranous sterigma, the elongate corpus bursae and the band of short spicules anteriorly.

At the present time nine species are included in *Galenara*. These are a somewhat diverse lot and perhaps should be further subdivided into additional genera. The taxa fall into several species groups, but it is felt that it is best to retain them in this one genus until additional information can be obtained. Data on the early stages are needed; a comparative study of the immature forms may aid in showing more clearly the relationships of these species.

KEY TO SPECIES

BASED ON MALE GENITALIA AND SECONDARY SEXUAL CHARACTERS

1. Large double comb present on abdomen between seventh and eighth segments. 2
- No such comb represented. *phyararia*
- 2(1). Apex of aedeagus with heavily sclerotized, hook-like process. *consimilis*
- Apex of aedeagus without hook-like process. 3
- 3(2). Vesica armed with single, large spine. 4
- Vesica armed with row of small spines. 6
- 4(3). Basal portion of spine in vesica very broad, occupying at least one-half of width of aedeagus. 5

- Basal portion of spine narrow, occupying not more than one-third of width of aedeagus. *lallata*
- 5(4). Uncus with apical portion swollen and with apex prominently concave. *cabira*
- Apical portion of uncus with parallel sides and with apex rounded. *glaucaria*
- 6(3). Third segment of abdomen with medioventral row of bristles. 7
- Third segment of abdomen without medioventral row of bristles. 8
- 7(6). Posterior section of spines in vesica four or five in number, large, arranged in single row. *lixaria*
- Posterior section of spines in vesica eight to 12 in number, slender, not arranged in a single row. *lixarioides*
- 8(6). Spines of vesica extending for about 45 per cent of length of aedeagus. *stenomacra*
- Spines of vesica extending for about 30 per cent of length of aedeagus. *olivacea*

BASED ON FEMALE GENITALIA

1. Sterigma with both lamella antevaginalis and lamella postvaginalis present; corpus bursae with single signum. *phyararia*
- Sterigma without separate lamellae; corpus bursae with band of spicules encircling anterior portion, or with signum absent. 2
- 2(1). Width of ductus bursae equal to, or greater than, length of same. 3
- Ductus bursae longer than wide. 5
- 3(2). Corpus bursae wider to left of junction with ductus bursae than to right. 4
- Posterior portion of corpus bursae symmetrical. *consimilis*
- 4(3). Corpus bursae with enlarged area to left of ductus bursae heavily sclerotized, with pitted surface. *glaucaria*
- Enlarged area to left of ductus bursae membranous, with smooth surface. *lallata*
- 5(2). Entire dorsal section of corpus bursae sclerotized, with membranous semi-circular ventral swelling. *olivacea*
- Corpus bursae not as above, with narrow posterior sclerotized area only. 6
- 6(5). Corpus bursae with anterior end enlarged into foot-like swelling. *stenomacra*
- Corpus bursae of equal width throughout, without noticeable anterior swelling. 7
- 7(6). Sterigma with pair of lateral, posteriorly diverging, sclerotized strips. *cabira*
- Sterigma without lateral strips. 8
- 8(7). Ductus bursae with sides extending posteriorly beyond caudal margin of same, going as far as middle of weakly sclerotized, ovate, median process of sterigma. *lixaria*
- Ductus bursae with sides not extending beyond caudal margin of same, and without median sclerotized area of sterigma. *lixarioides*

Galenara phyararia (Dyar), new combination

Figures 16, 26, 31

Melanolophia phyararia DYAR, 1926, p. 186.

This species is unique in this genus in that the secondaries have seven

veins and that the males lack the double comb between the seventh and eighth abdominal segments. This taxon is found in Mexico.

MALE: Head, vertex, and front with mixed gray and dark brown scales, the latter tending to be concentrated on front; palpi with brown and gray scales, ends of basal and second segments narrowly light gray. Thorax with mixed dark brown and gray scales above; paler below; legs light grayish brown, variably marked with brown and dark brown scales, fore tibiae and mid tibiae and all tarsi tending to be broadly banded with blackish brown and pale grayish brown; hair pencil present in hind tibia. Abdomen above light grayish brown, more or less heavily overlain with dark brown and grayish black scales, ends of segments tending to be pale gray or cream colored; below paler, with fewer dark scales.

UPPER SURFACE OF WINGS: Forewings with veins R_1 and R_2 arising separately; ground color light gray, heavily and evenly overlain with ochraceous, light brown, and brownish black scales; cross lines usually weakly represented, arising from costal dots; t. a. line arising about one-fourth of distance from base, going obliquely outward to cell, then angled posteriad, with outward bend in fold; median line arising in middle of costa, proceeding in irregular course posteriorly, becoming fainter above inner margin; discal spot small, dark; t. p. line arising about two-thirds of distance from base, tending to be outwardly dentate on veins, subparalleling outer margin; subterminal area narrow, tending to be of ground color; s. t. line formed of brownish black cellular spots, those opposite cell and above tornus tending to be larger than others and geminate; terminal line of brownish black intravenular spots; fringe concolorous with wing, marked with ground color opposite veins. Hind wings with seven veins; pale gray, sparsely overlain with pale brown and, distally, dark brown scales; discal spot small; median and extradiscal cross lines indicated along anal margin, the latter tending to be geminate and extending part way across wing; s. t. line complete or becoming obsolescent anteriorly; terminal line complete, narrow; fringe concolorous with wing.

UNDER SURFACE OF WINGS: Forewings pale gray except for ochraceous costa with brownish black scaling, the wings overlain with dull gray and grayish brown scales; without definite maculation except for dark brown s. t. band in upper part of wing; terminal line present. Hind wings pale ochraceous, more or less evenly overlain with brown scaling, the latter concentrated to form discal dot and s. t. band; terminal line present, interrupted by veins.

LENGTH OF FOREWING: 16 to 18 mm.

FEMALE: Similar to male.

LENGTH OF FOREWING: 16 mm.

MALE GENITALIA: Uncus large, sides of basal portion weakly concave, distal section constricted, laterally flattened and strongly curved ventrally, apex rounded; gnathos very wide laterally, narrowed to about one-half of that width ventrolaterally, then enlarged medially into rounded, lobate process; costa of valves with moderate swelling and with apex recurved; valvula with elongate, slender, sclerotized harpe, weakly constricted medially, outer margin thickly set with anteriorly directed setae; valvula with small, weakly sclerotized area between anterior portion of harpe and costal swelling bearing several slender setae; sacculus narrowly sclerotized anteriorly, increasing in width medially, with posteromedial extension under harpe; anellus weakly sclerotized anteriorly and posteriorly, membranous medially; cristae small, inconspicuous; aedeagus shorter than combined lengths of tegumen and saccus, posterior end weakly sclerotized, with paired, lateral, sclerotized areas; vesica unarmed. Abdomen without lateral hair pencils of third segment and without double comb between seventh and eighth segments.

FEMALE GENITALIA: Sterigma weakly sclerotized, convoluted, lamellae present, sclerotized; lamella antevaginalis consisting of two lateral, posteriorly directed, widely separated, digitate lobes; lamella postvaginalis large, extending well posteriad of lamella antevaginalis, widened distally, then tapered, with deep median cleft; ductus bursae with posterior portion lightly sclerotized, anterior portion more membranous, constricted medially, longer than apophyses anteriores; ductus seminalis arising near junction of ductus bursae and corpus bursae on right side; corpus bursae membranous, elongate, enlarged posteriorly; signum small, circular, smoothly sclerotized, anteriorly with raised rim and anteriorly directed point.

TYPE: Holotype, male, U.S.N.M. No. 40128. Dyar's type series did not consist entirely of this species. He described *phyararia* from 11 specimens; nine of these have been studied, and one was included in the type series of *Anavinemina promuraena* Rindge.

TYPE LOCALITY: Popocatepetl Park, Mexico, Mexico.

RANGE: The mountains of central Mexico (the state of Mexico and the Distrito Federal). The moths have been taken at elevations of from about 7300 to 8000 feet in the months of June and July.

REMARKS: Nine specimens (including the type) and five genitalic dissections have been studied. The maculation of this species is reminiscent of that of some species of *Anavinemina*. The present species can be distinguished from them by the venation of the secondaries, as it has seven veins, and by the angulate nature of vein 1dc; in *Anavinemina* the

secondaries have nine veins and a prominently biangulate ldc cross vein.

Within the genus *Galenara*, *phyararia* is the only species that lacks the double comb between the seventh and eighth abdominal segments of the male and has seven veins in the secondaries. The male genitalia of this taxon can be recognized by the very long and slender harpe of the valvula. The female genitalia are unique among the known species of *Galenara* in that they have both a well-developed sterigma, including both lamellae, and a small signum. These two characters are found in *Melanolophia*, but the over-all combination of structures for this species precludes placement in that genus.

Galenara consimilis Heinrich

Figures 17, 30

Galenara consimilis HEINRICH, 1931, p. 1, pl. 1, figs. 2-4 (male and female genitalia). McDUNNOUGH, 1938, p. 163. KEEN, 1952, p. 101, fig. 42 (adults, early stages).

This species is similar to *Paraphoroides errantaria* in color and maculation; it can be separated from that species by the presence of the double comb between the seventh and eighth abdominal segments of the male, by the genitalia, and by the lack of the tibial hair pencil in the male. This taxon is known from New Mexico.

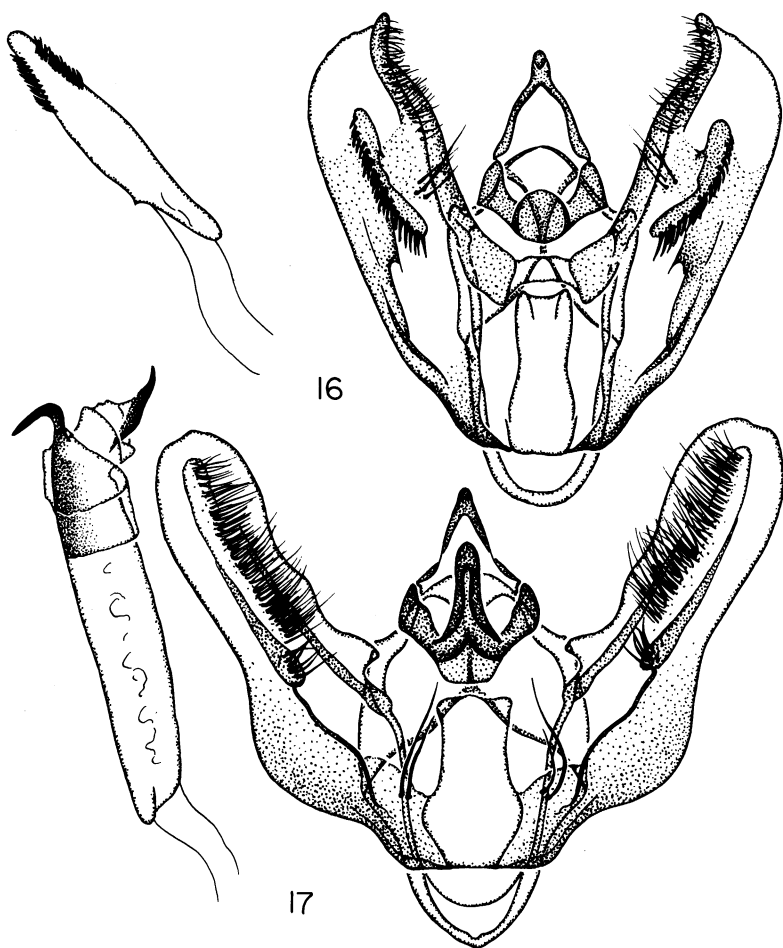
MALE: Head, thorax, and abdomen similar to those of *errantaria*; hair pencil absent on hind tibia.

UPPER SURFACE OF WINGS: Forewings with veins R_1 and R_2 arising from a common point or shortly stalked; ground color light gray, being most noticeable distal to both t. a. line and discal dash, and basal to s. t. line, otherwise heavily overlain with grayish brown and brownish black scales; maculation similar to that of *errantaria* but tending to have median area with less brownish black scaling; discal spot black, elongate, slender; s. t. line shaded distally by white scales; terminal line and fringe similar to those of *errantaria*. Hind wings with eight veins, Sc dividing near wing margin; pale gray, weakly overlain with pale brown scales; discal spot, median cross line, and extradiscal line obsolescent; terminal line complete, brownish black; fringe of ground color.

UNDER SURFACE OF WINGS: Forewings pale gray, broadly overlain with grayish brown scales; without definite maculation except discal spot and upper portion of s. t. line weakly indicated; terminal line present. Hind wings pale gray, sparsely irrorate with dull brown scaling; discal spot obsolescent; cross lines absent.

LENGTH OF FOREWING: 19 to 20 mm.

FEMALE: The only known female is somewhat deformed; it apparently



FIGS. 16, 17. Male genitalia. 16. *Galenara phyararia* (Dyar), San Angel, Distrito Federal, Mexico, July 19, 1913 (C. C. Hoffmann; A.M.N.H.). 17. *G. consimilis* Heinrich, paratype, Cloudcroft, New Mexico, emerged December 23, 1928 (H. E. Burke; U.S.N.M.).

has stronger maculation than does the male.

LENGTH OF FOREWING: 15 mm.

MALE GENITALIA: Uncus with lateral margins of basal portion concave, distal section tapering to bluntly rounded apex; gnathos heavily sclerotized, slightly tapering ventrolaterally, median process very long, digitate, extending to middle of uncus; costa of valves with weak swelling;

valvula with narrow sclerotized strip extending down center of valve from near apex to basad of middle, enlarging anteriorly and set with approximately nine setae; sacculus swollen, broadly sclerotized, with median and posterior margins more heavily sclerotized, the latter uniting with enlarged setose area of valvula; cristae consisting of one or two elongate, slender setae and several very short setae; aedeagus longer than combined lengths of tegumen and saccus, with heavily sclerotized, hook-like process on posterior end; vesica with single cornutus, in length about equal to width of aedeagus. Abdomen without median row of bristles but with small lateral hair pencils on third segment, and with double comb between seventh and eighth segments.

FEMALE GENITALIA: Sterigma membranous, weakly convoluted; ductus bursae sclerotized, wider than long, with rounded lateral margins; corpus bursae elongate, slender, sclerotized posteriorly, extending farther anteriorly on left side than on right; signum represented by anterior band of spicules.

EARLY STAGES: These, as well as the adults, were rather crudely illustrated by Keen (1952); apparently they have not been described.

FOOD PLANTS: The type series was reared on Douglas fir. Keen (1952) reported that true fir and spruce are also eaten.

TYPE: Holotype, male, U.S.N.M. No. 43250.

TYPE LOCALITY: Cloudcroft Reserve, Reservoir Canyon, Lincoln National Forest, Otero County, New Mexico.

RANGE: This species is known only from the type series from New Mexico (see fig. 30).

REMARKS: Six specimens (including the type) and three genitalic dissections have been studied. This species is similar to *errantaria* but can be recognized by the characters given above. The male genitalia can be distinguished by the hook-like process at the posterior end of the aedeagus, and by the nature of the valves.

This species is atypical for *Galenara* in several respects. The male genitalia are very much like those of some species of *Pherotesia* (Rindge, 1964a). However, *consimilis* apparently lacks the medioventral row of bristles on the third abdominal segment, and the lateral hair pencils at the posterior portion of that segment are vestigial. The female genitalia of *consimilis* are typical for *Galenara*. The males of *Pherotesia* have a tibial hair pencil, but this structure is absent in *consimilis*.

The description of the female genitalia was made from the same preparation as was Heinrich's figure 3. The genitalia are insufficiently stained, and all the characters cannot be seen; new dissections may necessitate some additions or corrections to the description of these organs.

Galenara lallata (Hulst)

Figures 18, 19, 27

Alcis lallata HULST, 1898, p. 193. DYAR, "1902" [1903], p. 320. SMITH, 1903, p. 76. RINDGE, 1955, p. 146.

Cleora lallata: BARNES AND McDUNNOUGH, 1916b, p. 184, pl. 13, fig. 12 (male); 1917, p. 118.

Galenara lallata: McDUNNOUGH, 1920, p. 15, pl. 1, fig. 7 (male genitalia); 1938, p. 163.

This is the first of three species that have a single prominent spine in the aedeagus. *Galenara lallata* is one of the largest species in the genus, and it can be recognized by the evenly curved, S-shaped t. p. line, by the dentate s. t. line, by the basal bend of the t. a. line on the anal vein, and by the tendency for the broad median shade to be more or less straight. This species occurs in the southern Rocky Mountain states.

MALE: Head, vertex with mixed brownish gray and gray scales, the dark scales usually with light gray apices; front black or blackish brown; palpi gray basally, terminal segments with mixed dark gray and brownish gray scales. Thorax above with mixed gray, brownish gray, and black scales, the dark scales often with light gray apices; below light gray; legs light gray, variably marked with light brown, dark brown, and black scales; hair pencil present on hind tibia. Abdomen above pale gray or pale grayish brown, with variable numbers of dark brown and black scales, posterior margins of segments tending to be narrowly light gray; paler below.

UPPER SURFACE OF WINGS: Forewings with veins R_1 and R_2 arising separately in most specimens; ground color pale gray, more or less heavily overlain with black, brownish black, and brownish gray scales; cross lines black, with median line much broader than others; t. a. line arising on costa between one-fifth and one-fourth of distance from base, outwardly curved in cell and in fold, inwardly dentate on anal vein, then outwardly angled to inner margin; median line broad, outer margin tending to fade out, arising about two-fifths of distance from base, with small outward angle in cell, then proceeding more or less straight across wing; discal spot black, elongate; t. p. line arising about three-fifths of distance from base, evenly curving in an S-shape, broadly rounded around end of cell, concave in cells Cu_1 and Cu_2 , swinging outwardly to anal vein, then basally to inner margin; subterminal area shaded with dark gray and black scales basally, becoming paler distally; s. t. line light gray, outwardly dentate in cells, paralleling outer margin, then curving toward tornus; terminal line black, narrowly interrupted by veins, with elongate cell spots; fringe concolorous with wing, narrowly paler opposite vein endings.

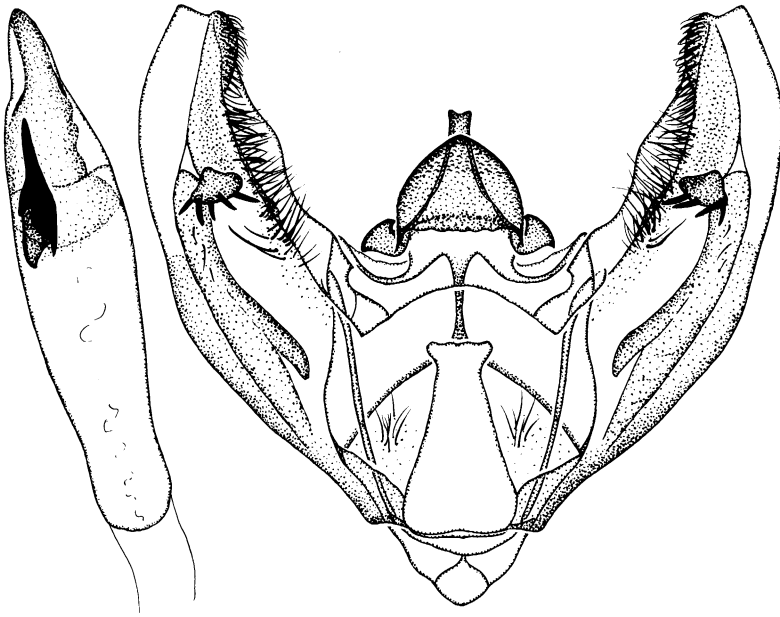


FIG. 18. Male genitalia of *Galenara lallata* (Hulst), lectotype, San Francisco Mountains, Arizona, elevation 8000–10,000 feet, July 26, 1897 (A.M.N.H.).

Hind wings with eight veins, Sc dividing near wing margin; light gray, variably overlain with light brown and grayish black scales; discal spot either absent or very small; median line weakly represented; extradiscal line tending to be broader and more diffuse than median line; terminal line dark, narrow, complete; fringe concolorous with wing.

UNDER SURFACE OF WINGS: All wings pale gray; forewings lightly overlain with grayish brown scaling; secondaries very sparsely overlain with darker scaling; discal spots present on all wings.

LENGTH OF FOREWING: 19 to 22 mm.

FEMALE: Similar to male but with veins R_{1+2} stalked.

LENGTH OF FOREWING: 19 to 23 mm.

MALE GENITALIA: Uncus tapering, lateral margins biconcave, distal section elongate, truncate at apex or with two weak lateral points; gnathos of even width laterally, median portion broadly enlarged, flattened, rounded or bluntly wedge-shaped medially, with rugose surface; costa of valves with small swelling and several elongate setae from end; valvula with posterior sclerotized area, terminating in raised, curved, transverse harpe, with row of short, heavy spines along ventral margin; saccus broadly sclerotized, occupying about one-half of width of valve,

and extending as far as process of valvula, with posterior end rounded; cristae inconspicuous, with approximately 10 or 12 small setae on each side; aedeagus broad, longer than combined lengths of uncus, tegumen, and saccus, with posterior end weakly sclerotized, slightly attenuate, bluntly pointed; vesica armed with single large spine, or some specimens with one or more small setae at base of spine, the latter as long as, or slightly longer than, width of aedeagus, base of spine about one-fourth as

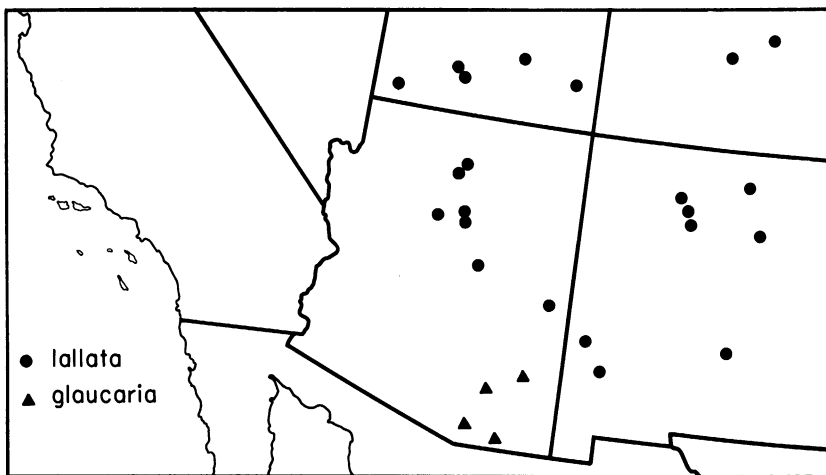


FIG. 19. Distribution of *Galenara lallata* (Hulst) and *G. glaucaria* (Grossbeck).

wide as length of spine. Abdomen without lateral hair pencil on third segment, with double comb between seventh and eighth segments.

FEMALE GENITALIA: Sterigma membranous except for three small sclerotized pieces, one median and a posterolateral pair, then weakly convoluted posterior to these; ductus bursae heavily sclerotized, square or rectangular in outline, with sclerotized area extending anteriorly on right side into enlarged area; ductus seminalis arising ventromedially near sclerotized area; corpus bursae membranous, extending posteriorly a short distance beyond junction with ductus bursae on left side, slender medially, broadly enlarged in foot-like projection anteriorly; signum in form of band of spicules around foot-like projection of corpus bursae.

TYPES: Hulst had at least three specimens before him when describing *lallata*. Unfortunately they were not all conspecific, as the specimens from Prescott and Senator, Arizona, are *lixaria* Grote; both of these females are in the collection of the United States National Museum. Barnes and

McDunnough (1916b, p. 184) restricted the type of this species to the male in the Hulst collection; this lectotype is now in the American Museum of Natural History collection (Rindge, 1955).

TYPE LOCALITY: San Francisco Mountains, Coconino County, Arizona, elevation 8000–10,000 feet.

RANGE: The southern Rocky Mountain states of Arizona, New Mexico, Utah, and Colorado (see fig. 19). The moths have been taken in late June, July, and August, thus indicating that the species is single brooded.

REMARKS: One hundred eighty-nine specimens (including the lectotype) and 22 genitalic dissections have been examined. This is the first species to be included in this revision that has the "typical" *Galenara* maculation. It can be recognized by its large size, by the relatively straight median shade, by the evenly S-shaped t. p. line, by the inward bend of the t. a. line on the anal vein, and by the markedly dentate s. t. line.

An interesting feature is the sexual dimorphism in the branching of the radial vein of the primaries. In most males R_1 and R_2 arise separately; these two veins are stalked in virtually all the females examined.

The male genitalia of *lallata* can be distinguished from those of all the preceding species by the single, large spine of the vesica. This spine is relatively long and has a narrow base. The female genitalia are distinguishable by the enlarged, foot-like anterior end of the corpus bursae, and by the asymmetrical ductus bursae.

Galenara cabira (Druce), new combination

Figures 20, 32

Boarmia (?) *cabira* DRUCE, 1892 (1891–1900), p. 73; 1893 (1881–1900), pl. 48, fig. 8.

This species is similar to *lallata* in that the radial venation of the forewings is dimorphic, and that there is a single, large spine in the aedeagus. It can be recognized by its smaller size, the paler coloration, and by the more angulate nature of the median shade of the forewings. This taxon occurs in Mexico.

MALE: Head, thorax, and abdomen similar to those of *lallata* but paler; hair pencil present on hind tibia.

UPPER SURFACE OF WINGS: Forewings with veins R_1 and R_2 arising separately; ground color pale gray, overlain with grayish brown, dark brown, and reddish brown scales; cross lines brownish black, similar to those of *lallata* but differing as follows: t. a. line tending to be more evenly rounded, but with outward projection below cubital vein; median line

prominent, sharply angled outward in cell and broadly shaded distally by reddish brown; t. p. line with broad, even curve around cell, then proceeding more or less straight to inner margin, the line outwardly dentate on veins; terminal line of brownish black cell spots; fringe concolorous with wing. Hind wings with seven or eight veins, as Sc divides in some specimens near wing margin; light gray, overlain with light brown scales, becoming more concentrated distally; discal spot and cross lines obsolescent; terminal line dark, narrow, complete; fringe concolorous with wing.

UNDER SURFACE OF WINGS: All wings pale gray, lightly overlain with grayish brown and light brown scaling; discal spots usually present on all wings, small, indistinct; maculation absent.

LENGTH OF FOREWING: 18 to 20 mm.

FEMALE: Similar to male, but with upper surface of primaries more heavily overlain with blackish brown scales, and with veins R_{1+2} stalked.

LENGTH OF FOREWING: 18 mm.

MALE GENITALIA: Similar to those of *lallata*, differing mainly as follows: apical portion of uncus wider at deeply notched apex than at median section; gnathos with median enlargement varying from subtriangular to broadly rounded in outline; costa of valves with very weak swelling; valvula with small raised harpe, anterior margin rounded, with five or six short, heavy spines from anteroventral margin; aedeagus subequal to combined lengths of uncus, tegumen, and saccus; vesica armed with single large spine, in length slightly longer than width of aedeagus, with base of spine large, globular, occupying between one-half and two-thirds of width of aedeagus. Abdomen like that of *lallata*.

FEMALE GENITALIA: Sterigma membranous except for pair of lateral, lightly sclerotized, posteriorly divergent pieces, weakly convoluted posteriorly; ductus bursae longer than wide, with lateral areas appearing more heavily sclerotized than median area; ductus seminalis arising ventromedially near ductus bursae; corpus bursae not inflated (specimen was not mated).

TYPE: Druce described *cabira* from two males. The one that bears the number U.S.N.M. No. 12476 is hereby designated the lectotype.

TYPE LOCALITY: Las Vigas, Veracruz, Mexico.

RANGE: Central Mexico (the state of Veracruz and the Distrito Federal). The localities indicate a range in elevation for this species from over 4000 feet to about 8000 feet. The only known dates of capture are March and November.

REMARKS: Five specimens (including the lectotype) and four genitalic dissections have been examined. This species is closely allied to *lallata*,

as they both have the dimorphic radial venation of the primaries and the large single spine in the aedeagus. The present species is smaller, paler, and has a pattern of cross lines different from that of *lallata*. The illustration by Druce gives a fair representation of the species. The picture is too pale and not contrastingly colored enough to represent a fresh specimen of this species.

The genitalia of this Mexican species are similar to those of *lallata*. Diagnostic characters for the male structures of this taxon are found in the enlarged apical section of the uncus and in the very large base of the spine of the vesica. The female genitalia also are similar to those of the preceding species. The present taxon differs in that it has a lateral pair of sclerotized pieces in the sterigma, and in the nature of the ductus bursae. Unfortunately the single female was unmated, so the corpus bursae was not inflated. Additional material is needed before the characteristics of this part of the genitalia can be described.

Galenara glaucaria (Grossbeck)

Figures 19, 21, 28

Cleora ? glaucaria GROSSBECK, 1912, p. 291.

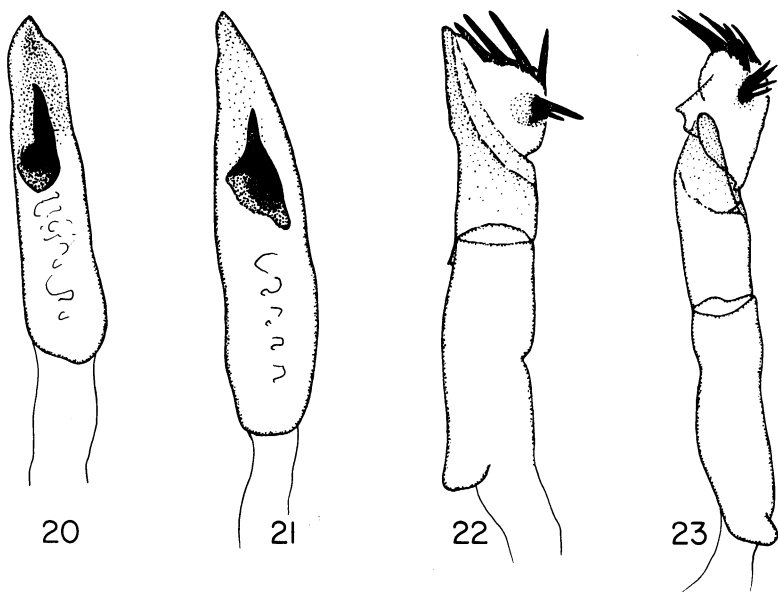
Cleora glaucaria: BARNES AND McDUNNOUGH, 1917, p. 118.

Galenara glaucaria: McDUNNOUGH, 1920, p. 15, pl. 2, fig. 1 (male genitalia), pl. 7, fig. 10 (adult male); 1938, p. 163.

This species is similar to the two preceding ones in that the male has a single large spine in the vesica. *Galenara glaucaria* is smaller than the other two, it has a sharp angle in the t. p. line opposite the cell, and the paler areas of the forewings have a grayish blue tint. This taxon occurs in Arizona.

MALE: Head, thorax, and abdomen similar to those of *lallata*, but vertex with narrow white band just below antennal bases contrasting with black front; hair pencil present on hind tibia.

UPPER SURFACE OF WINGS: Forewings with veins R_1 and R_2 either arising separately or stalked, in some specimens both conditions present; ground color pale gray, with lighter portions of median area appearing faintly grayish blue, heavily overlain with grayish brown, brown, and blackish brown scales; cross lines blackish brown, similar to those of *lallata* but differing as follows: t. a. line more deeply and evenly curved, shaded basally by line of ground color; median line with moderate outward angle in cell; t. p. line going obliquely outward from costa, straight to vein or cell M_2 , sharply angled and then evenly curved to inner margin; median and t. p. lines shaded distally with brown; s. t. line pale, tending to be rather poorly defined, outwardly dentate in cells; terminal



FIGS. 20–23. Aedeagus. 20. *Galenara cabira* (Druce), San Angel, Distrito Federal, Mexico, March (C. C. Hoffmann; A.M.N.H.). 21. *G. glaucaria* (Grossbeck), Wet Canyon, Graham Mountains, Arizona, September 14, 1950 (Gertsch and Cazier; A.M.N.H.). 22. *G. lixaria* (Grote), Prescott, Yavapai County, Arizona, May 16, 1961 (R. F. Sternitzky; A.M.N.H.). 23. *G. lixarioides* McDunnough, Globe, Arizona, August 18 (O. Buchholz; A.M.N.H.).

line blackish brown, narrow, with elongate cell spots, those in cells M_1 , M_2 , Cu_1 , and Cu_2 tending to have basal extensions as far as s. t. line; fringe concolorous with, or paler than, wing. Hind wings with eight veins, Sc dividing near wing margin; light gray, variably overlain with light brown and grayish black scales; discal spot obsolescent; cross lines weakly indicated, light brown, extending across wing; terminal line brownish black, narrow, complete; fringe concolorous with wing.

UNDER SURFACE OF WINGS: All wings pale gray; secondaries slightly lighter than forewings; a few scattered grayish brown scales along costa and at apex of forewings; discal spots present, small, usually inconspicuous; otherwise without maculation; fringe concolorous with wing.

LENGTH OF FOREWING: 16 to 19 mm.

FEMALE: Similar to male but with veins R_{1+2} usually stalked.

LENGTH OF FOREWING: 17 to 20 mm.

MALE GENITALIA: Similar to those of *lallata*, differing mainly as follows: uncus with apex tending to be narrower; costa of valves with very

weak swelling; valvula with raised, globular harpe having short heavy spines arising from surface; aedeagus subequal in length to combined lengths of uncus, tegumen, and saccus; vesica armed with single large spine, in length longer than width of aedeagus, with base of spine large, triangular, occupying about three-fifths of width of aedeagus. Abdomen like that of *lallata*.

FEMALE GENITALIA: Sterigma membranous except for small, rounded, central piece and pair of slender lateral strips, latter apparently lacking in some specimens; ductus bursae heavily sclerotized and with pitted surface, approximately twice as wide as long; ductus seminalis arising posteroventrally near anterior margin of sclerotized area; corpus bursae with posterior end sclerotized, with pitted surface, enlarged on left side of ductus bursae, sclerotized area slightly shorter than width of corpus bursae posteriorly, with remainder of corpus bursae elongate, membranous, slender medially, and with anterior end enlarged into long, foot-like projection; signum in form of band of spicules around foot-like projection of corpus bursae.

TYPES: Grossbeck described *glaucaria* from two females; the type is in the collection of the United States National Museum and the cotype is in the American Museum of Natural History.

TYPE LOCALITY: Redington, Pima County, Arizona.

RANGE: Southeastern Arizona (see fig. 19). On the wing in late May, June, July, September, and October. This span of dates indicates that the species is double brooded.

REMARKS: Thirty-four specimens (including the type) and 11 genitalic dissections have been studied. This species is similar to *lallata*, but it is smaller and lighter in color, as it has less blackish scaling and tends to have a faintly grayish blue tone on the pale areas of the forewings. The cross lines of *glaucaria* are distinctive in that the t. a. line is strongly rounded, and the t. p. line is sharply angled opposite the cell.

The branching of the radial veins in the males is more variable in this species than it is in *lallata*. Eight specimens of this sex have been examined for this character. Of these, four had R_1 and R_2 arising separately on both wings, one had the veins stalked on both wings, and three examples had one wing with the veins free and the other wing with the veins stalked.

The male genitalia of *glaucaria* are similar to those of the two preceding species. This taxon can be recognized by the large, triangular base of the single spine in the vesica. The female genitalia are like those of *lallata*. Both species have the corpus bursae extended to the left of the ductus bursae; in *glaucaria* this area is sclerotized while in *lallata* it is membranous. The anterior foot-like portion of the corpus bursae is also present in both

species. In *lallata* it tends to be shorter than in *glaucaria* and to project at more of a right angle.

Galenara lixaria (Grote)

Figures 22, 24, 29

Phigalia lixaria GROTE, "1881-1882" [1883], p. 52. SMITH, 1891, p. 73.

Cleora lixaria: DYAR, "1902" [1903], p. 325. SMITH, 1903, p. 77. BARNES AND McDUNNOUGH, 1916b, p. 185, pl. 13, fig. 11 (male); 1917, p. 118.

Galenara lixaria: McDUNNOUGH, 1920, p. 15 (*partim*, not illustration of genitalia); 1938, p. 163; 1945, p. 99, fig. 5 (aedeagus). HEINRICH, 1931, p. 2, pl. 1, fig. 1 (female genitalia).

Alcis lallata HULST, 1898, p. 193 (in part).

Cleora lallata: BARNES AND McDUNNOUGH, 1916b, p. 185 (in part).

This species is very similar in maculation to *lallata*. It can be distinguished from that species by the outward 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, and by the brown scaling in the subterminal area. The present species has a row of spines in the vesica of the aedeagus, while there is but a single large spine in this structure in *lallata*. The present taxon occurs in New Mexico and Arizona.

MALE: Head, thorax, and abdomen similar to those of *lallata*; hair pencil present on hind tibia.

UPPER SURFACE OF WINGS: Forewings with veins R_{1+2} stalked in most specimens; ground color light gray, heavily overlain with black, brownish black, and brownish gray scales; cross lines black, similar to those of *lallata* but differing as follows: t. a. line going strongly outward in cell, then sharply curved basad on cubital vein, proceeding outwardly to, and then outwardly projecting on, anal vein; median line with sharp, prominent, outward tooth at bottom of cell, then broadly concave to inner margin; t. p. line going more or less straight to vein M_3 , angled and then concave to inner margin, with small outward teeth on veins; subterminal area shaded with brown basally; s. t. line indistinct, subparallel-ing outer margin, tending to have small basal teeth on veins; terminal line and fringe similar to those of *lallata*. Hind wings similar to those of *lallata*, slightly darker in some specimens.

UNDER SURFACE OF WINGS: Similar to that of *glaucaria*.

LENGTH OF FOREWING: 17 to 21 mm.

FEMALE: Similar to male.

LENGTH OF FOREWING: 18 to 24 mm.

MALE GENITALIA: Similar to those of *lallata*, differing mainly as follows: uncus short, triangular, apex with projections laterally and medially;

gnathos with median process triangular, heavily sclerotized; valvula with shortly digitate, sclerotized, spinose harpe, slightly angled outwardly from posterior sclerotized area; aedeagus equal in length to combined lengths of uncus, tegumen, and saccus, with posterior end weakly sclerotized, attenuate; vesica armed with row of spines, posterior portion of four or five heavy spines in single row, anterior part consisting of one or two heavy spines surrounded by numerous smaller spines. Abdomen like that of *lallata*.

FEMALE GENITALIA: Sterigma membranous except for small, weakly sclerotized, ovate, median area, then weakly convoluted posteriad of

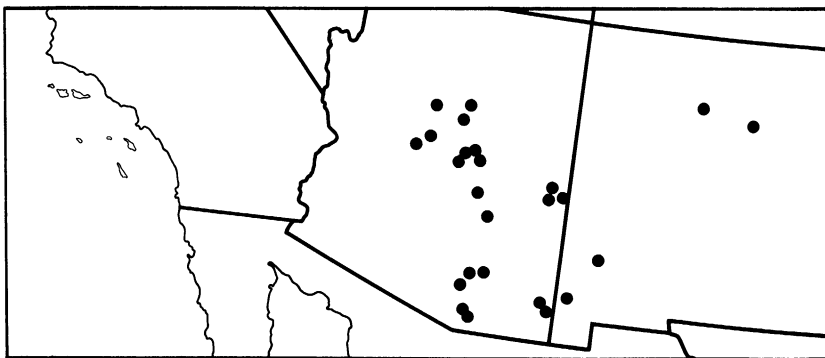


FIG. 24. Distribution of *Galenara lixaria* (Grote).

this; ductus bursae slightly longer than wide, heavily sclerotized, lateral area extending posteriad of caudal margin, extending to about middle of ovate area of sterigma; ductus seminalis arising posteromedially, near anterior portion of sclerotized area of corpus bursae; corpus bursae elongate, slender, very slightly S-shaped in many specimens, of equal width throughout or with weak anterior enlargement, posterior end lightly sclerotized and with pitted surface, gradually becoming membranous anteriorly; signum in form of band of spicules near anterior end of corpus bursae.

TYPE: In the collection of the United States National Museum.

TYPE LOCALITY: Near Las Vegas Hot Springs, San Miguel County, New Mexico.

RANGE: New Mexico and Arizona (see fig. 24). On the wing from May through September. Many of the specimens examined were captured in June, and a considerable number were taken in September, thus indicating that *lixaria* is double brooded.

REMARKS: Three hundred ninety-four specimens (including the type) and 32 genitalic dissections have been examined. This species closely resembles *lallata*, but it tends to be slightly smaller. Differences between the two species are found in the cross lines, with the median and t. p. lines of *lixaria* usually sharply angled at or below the cell, and the t. a. line outwardly angled on the anal vein. In addition, the basal part of the subterminal area in this species is shaded with brown in many specimens, while this area is grayish black or black in *lallata*.

The male genitalia of *lixaria* are easily distinguished from those of the *lallata* group by the presence of a row of heavy spines in the vesica. The female genitalia of this species can be recognized by the elongate and slender corpus bursae; it does not have the foot-like anterior end that is to be found in the species of the *lallata* group.

Unfortunately Grote's type is in very poor condition, as the wings on the right side, the abdomen, and both hind tibiae are lacking. As a result we may never know whether or not this type actually represents what has been known under the name of *lixaria* in recent years. Material from the type locality is badly needed. Two females have been examined from there, and they are both *lixarioides* McDunnough. It is quite possible that the species identified by McDunnough as *lixaria*, on the advice of Mr. H. W. Capps of the United States National Museum, would occur near Las Vegas Hot Springs (at least in July, 1882, when the type was collected by F. H. Snow, at 7000 feet elevation). *Lixaria* is known to occur at Frijoles Canyon, Sandoval County, which is about 60 miles almost due west of the type locality. Consequently, it is believed best to accept McDunnough's definition of *lixaria*.

Galenara lixarioides McDunnough

Figures 23, 25, 33

Galenara lixaria: McDUNNOUGH (*nec* Grote), 1920, p. 15 (*partim*), pl. 2, fig. 3 (male genitalia).

Galenara lixarioides McDUNNOUGH, 1945, p. 99, fig. 6 (aedeagus).

This species is very similar to *lixaria*. It can be recognized by its slightly smaller size, by the absence of the tibial hair pencil in the male, and by the male genitalia. This species occurs in the southern Rocky Mountain states.

MALE: Head, thorax, and abdomen similar to those of *lixaria*; hind tibia without groove or hair pencil.

UPPER SURFACE OF WINGS: Similar to those of *lixaria*, tending to differ as follows: median line slightly narrower; patch of ground color at end of cell more prominent; subterminal area with basal brown shading re-

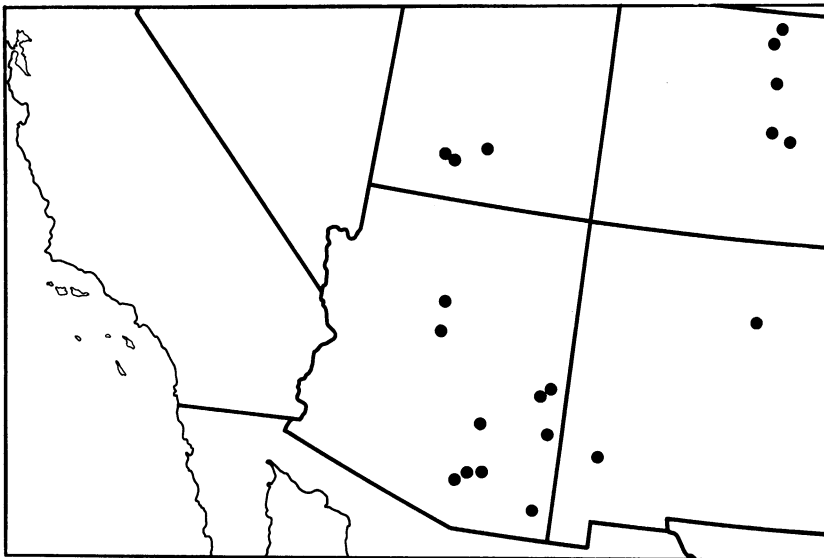


FIG. 25. Distribution of *Galenara lixarioides* McDunnough.

duced; s. t. line with complete, dark, basal shade. Hind wings similar to those of *lixaria*.

UNDER SURFACE OF WINGS: Similar to that of *lixaria*.

LENGTH OF FOREWING: 16 to 21 mm.

FEMALE: Similar to male.

LENGTH OF FOREWING: 17 to 20 mm.

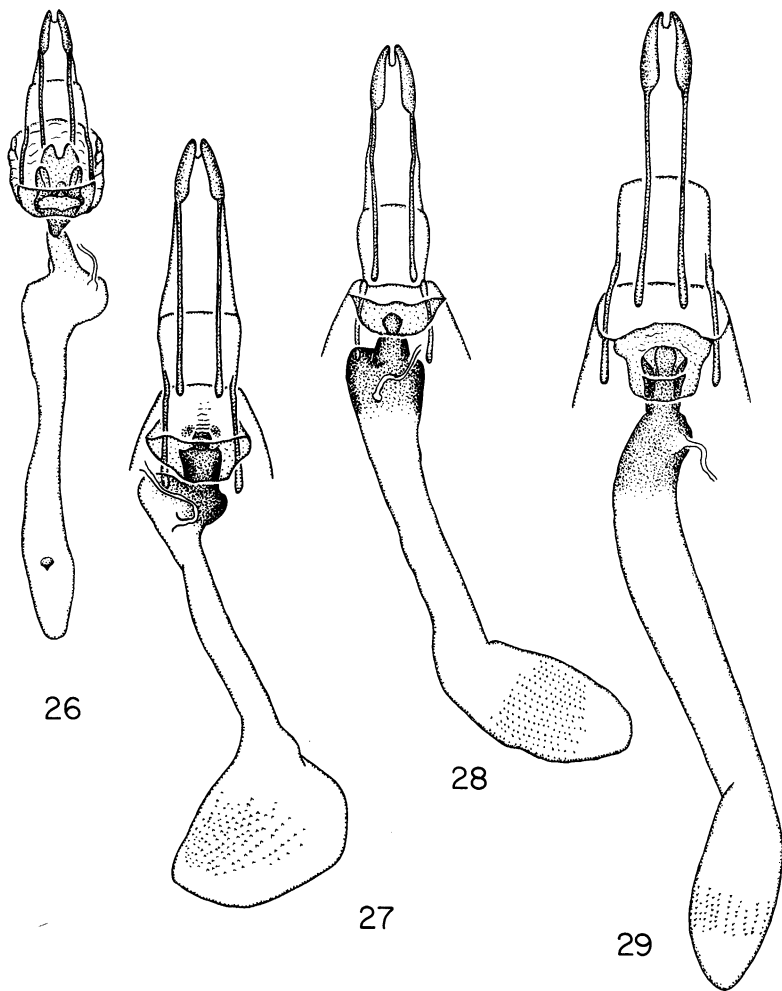
MALE GENITALIA: Similar to those of *lixaria*, differing mainly as follows: vesica armed with row of numerous spines, posterior portion of about eight to 12 slender spines, not set in single row, anterior part consisting of large number of spines of varying length, decreasing anteriorly.

FEMALE GENITALIA: Similar to those of *lixaria*, differing mainly as follows: sterigma membranous, tending not to have ovate median piece; ductus bursae with lateral areas not extending posteriorly beyond caudal margin.

TYPE: Holotype, male, C.N.C. No. 5585.

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

RANGE: The southern Rocky Mountain states (see fig. 25). The species occurs in central and eastern Arizona, southwestern and central New Mexico, southern Utah, and east of the continental divide in central and northern Colorado. One specimen has been examined with the data "Essex Dist., Calif., 24-9-40 (Hill)"; these should be verified before they



FIGS. 26-29. Female genitalia. 26. *Galenara phyararia* (Dyar), paratype, Popocatepetl Park, Mexico, June, 1906 (U.S.N.M.). 27. *G. lallata* (Hulst), Horseshoe Springs Camp, Sandoval County, New Mexico, July 30, 1961 (F., P., and J. Rindge; A.M.N.H.). 28. *G. glaucaria* (Grossbeck), Madera Canyon, Santa Cruz County, Arizona, June 22, 1955 (W. A. Rees; A.M.N.H.). 29. *G. lixaria* (Grote), Pine Camp Ground, Pine, Gila County, Arizona, June 24, 1957 (Martin, Ford, Rees; A.M.N.H.).

can be accepted. The moths have been captured in May, June, July, and August.

REMARKS: Two hundred specimens and 25 genitalic dissections have

been studied. This species almost exactly resembles small examples of *lixaria*. The males of the present taxon can be separated from those of that species by the absence of the tibial hair pencil and by the greater number of smaller spines in the vesica. The female genitalia are also very

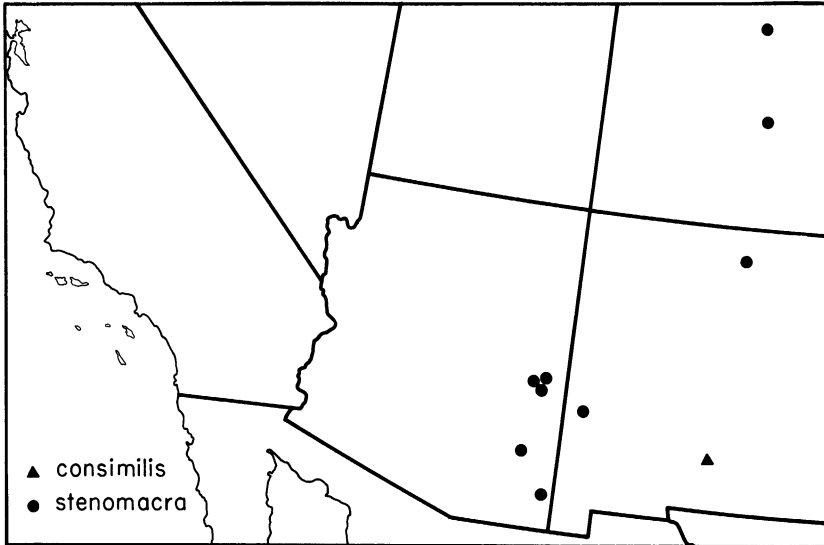


FIG. 30. Distribution of *Galenara consimilis* Heinrich and *G. stenomacra* Rindge.

much like those of *lixaria*, but can be recognized by the characters given in the description of these organs.

Galenara stenomacra Rindge

Figure 30

Galenara stenomacra RINDGE, 1958, p. 12, figs. 9 (paratype male), 24-26 (male and female genitalia).

This species is similar in color and maculation to the preceding species. It can be recognized by the absence of the hair pencil on the hind tibia of the male, by the fact that veins R_{1+2} of the forewings are stalked, by the broadly curved t. a. line, by the more or less straight median line, and by the prominent and elongate discal dash. In size, this species is one of the smaller taxa in the genus. The length of the forewing in the male ranges from 16 to 20 mm.; in the female, from 16 to 18 mm.

The male genitalia of *stenomacra* are similar to those of the preceding

species. The uncus and gnathos are like those of *lallata* in shape, while the armature of the vesica is more like that of *lixarioides*. In the present species the series of spines occupies almost one-half of the length of the aedeagus, and there are many more spines than are to be found in *lixarioides*.

The female genitalia also show similarities to both the *lallata* and *lixaria* groups of species. The present taxon has the anterior end of the corpus bursae enlarged into a short, foot-like process, something like that of *lallata*, and the ductus bursae is longer than wide, as is the case with *lixaria*.

This and the succeeding species are not redescribed in this paper, as the new material that has come to hand has not necessitated any additional descriptive notes.

TYPES: Holotype, male, in the American Museum of Natural History; allotype, female, in the collection of the Los Angeles County Museum.

TYPE LOCALITY: Coulters Ranch Camp, south fork of the Little Colorado River, White Mountains, Apache County, Arizona.

RANGE: Eastern Arizona, western and northern New Mexico, and east of the continental divide in central and northern Colorado. Our present knowledge of *stenomacra* indicates that this species seems to be found on or relatively near the continental divide in the southern Rocky Mountain states (see fig. 30). This taxon appears to be single brooded, as the adults have been captured in June and July.

REMARKS: Fifty specimens and nine genitalic dissections have been examined.

Galenara olivacea Rindge

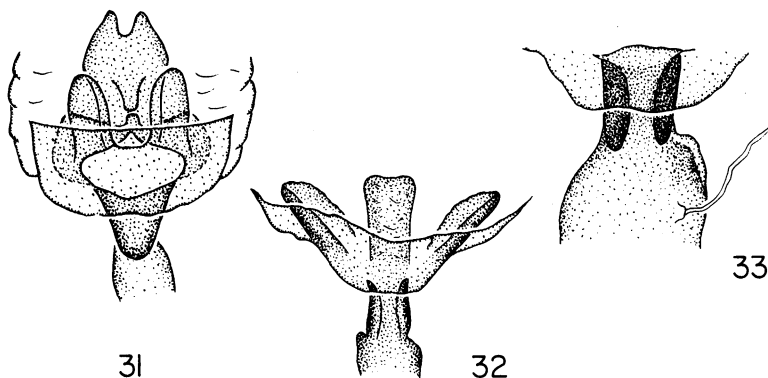
Galenara olivacea RINDGE, 1958, p. 10, figs. 8 (paratype male), 21–23 (male and female genitalia).

This species is similar to the preceding two taxa in that the hind tibia of the male does not have a hair pencil. *Galenara olivacea* is unique in this genus in that it has nine veins in the secondaries and a biangulate $m+ldc$ cross vein. Vein Sc divides a short distance before the wing margin, and vein M_2 is present. These venational characters are also found in the genus *Anavinemina* Rindge (Rindge, 1964b). The lack of the tibial hair pencil and the genitalia distinguish *olivacea* from the species of *Anavinemina*.

While the typical pattern of *Galenara* is present in *olivacea*, it is not strongly represented. The color of the upper surface of the forewings is more of a light gray or a seeming grayish green than that of the other species. The discal spots of the primaries are very small, the median line is obsolescent, and the s. t. line is strongly represented. In wing length the males range from 15 to 19 mm.; the females, from 15 to 17 mm.

The male genitalia of *olivacea* are closely similar to those of *stenomacra*, and can be separated therefrom by the shorter series of spines of the vesica. In the present species these occupy about 30 per cent of the length of the aedeagus.

The female genitalia of this species are completely different from those of any other known species in the genus. The ductus bursae is longer than wide, and the posterior margins are slightly flared outward. The corpus



FIGS. 31-33. Sterigma and ductus bursae. 31. *Galenara phyararia* (Dyar), para-type, Popocatepetl Park, Mexico, June, 1906 (U.S.N.M.). 32. *G. cabira* (Druce), Orizaba, Mexico (R. Muller; U.S.N.M.). 33. *G. laxarioides* McDunnough, McMillan Camp, Grant County, New Mexico, July 23, 1961 (F., P., and J. Rindge; A.M.N.H.).

bursae is heavily sclerotized for a much greater distance than in any other species. From the anterior portion of the sclerotized area the corpus bursae forms a large, membranous, semicircular area projecting ventrally. The ductus seminalis arises posteroventrally from a small protuberance on the right side.

TYPES: The holotype, male, and allotype, female, are in the collection of the Los Angeles County Museum.

TYPE LOCALITY: Upper camp, Pinery Canyon, Chiricahua Mountains, Cochise County, Arizona.

RANGE: This species is known only from the type series taken in Cochise County, Arizona. All the known specimens have been captured in July.

REMARKS: Thirty-four specimens and six genitalic dissections have been studied.

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