# The Moths of America North of Mexico

FASCICLE 13.2A

# PYRALOIDEA

## Pyralidae (Part)

EUGENE MUNROE

1976

E. W. CLASSEY LIMITED AND
THE WEDGE ENTOMOLOGICAL RESEARCH FOUNDATION

# THE MOTHS OF AMERICA NORTH OF MEXICO

# The Moths of America North of Mexico

INCLUDING GREENLAND

FASCICLE 13.2

# PYRALOIDEA

## PYRALIDAE (PART)

EUGENE MUNROE
BIOSYSTEMATICS RESEARCH INSTITUTE
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*Part* 2B *will contain the balance of this work, with color plates 5 to 9, monochrome plates J to U, literature and the indexes.*
*A complete paginated contents page will be issued with the second part,* 13.2B, *which may be substituted for this page.*

DEDICATED TO THE MEMORY OF

*GEORGE A. MOORE*

ENTOMOLOGIST, OF MONTREAL

# AUTHOR'S ACKNOWLEDGEMENTS

All the support and help acknowledged in Fascicle 13.1 applies in equal or greater measure to the present fascicle. In addition a number of colleagues have made substantial new material or information available. I would mention particularly Roy O. Kendall, Gayle T. Strickland, Joan Chapin, Annette F. Braun, Charles V. Covell, J. C. Schaffner, Richard Heitzman, Ron Leuschner, Don Frack, E. D. Cashatt, W. Donald Duckworth, in addition to individuals and institutions already named in earlier acknowledgements.

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To all I extend my renewed and sincere thanks.

While this fascicle was in press, Dick Dominick, our fellow editor, our photographer, co-founder of *The Moths of America North of Mexico*, and President of The Wedge Entomological Research Foundation, died unexpectedly on the grounds of The Wedge Plantation. A born leader, and a charming, capable, humorous and inspiring man, he transformed the lives of all who have participated in this project. He will be missed as a colleague and as a true friend.

A more adequate memorial will appear in an appropriate fascicle.

# The Moths of America North of Mexico

FASCICLE 13.2A

# PYRALOIDEA

## PYRALIDAE

COMPRISING THE SUBFAMILY

PYRAUSTINAE

TRIBE

PYRAUSTINI (PART)

EUGENE MUNROE
BIOSYSTEMATICS RESEARCH INSTITUTE
AGRICULTURE CANADA

LONDON 1976

# CONTENTS

# PREFACE

Because of the size of the subfamily Pyraustinae, the editors have decided to present it in several parts instead of one part as stated in the Preface to Fascicle 13.1A. Fascicles 13.2A and 13.2B deal with the tribe Pyraustini; Fascicle 13.3 will deal with the tribe Spilomelini, completing the treatment of the Pyraustinae.

Some changes in style and format have been made from those in Fascicle 13.1. The most important are the extensive use of telegraphic style and the adoption of the two-column page. The object has been to economize on costs and prices without sacrificing content or convenience to the reader.

The classification of the Pyraustinae given here is substantially changed from that previously current in North America, which was based primarily on Hampson (1898–99), as adapted in Dyar's catalogue and Barnes and McDunnough's and McDunnough's check lists. The new classification is in general compatible with those in current use in Europe and takes the genital structure as well as external characters into account. I have used relatively restricted genera, as did Marion (1952) and Bradley, Fletcher and Whalley (1972), rather than the broader ones used by such authors as Sylvén (1947); the latter obscure some of the main relationships and result in unwieldy and heterogeneous groupings when extended to the world fauna. Even the restricted genera are often large and widely distributed. *Loxostege*, *Pyrausta*, *Udea*, *Herpetogramma* and *Palpita*, among others, are well represented in our fauna and have large numbers of species in their world-wide ranges.

The editors have agreed to state their respective positions on the use of subspecies. I use the term subspecies for a subdivision of a species that is distinguished by observable characters from subdivisions from other geographical areas, provided it can reasonably be assumed that the differences are genetically based. As trinomials are available for subspecies under the *International Code of Zoological Nomenclature*, I use them. Various arguments have been advanced against the use of subspecies. Among the more important are: that subspecies cannot reflect the complex patterns of geographical variation in nature; that their use encourages unnecessary multiplication of names; that they tend to exaggerate the importance of geographical as compared to non-geographical variation; and that other systems of reference could codify geographical variation as well or better. About the first of these points there is no argument of principle. Everyone knows that the detailed patterns of geographical variation are more complicated than any system we could yet devise to record them; accurate representations would be possible only in quantitative multidimensional analytic mathematical models; neither the data nor the processing and storage facilities for these are likely to be available for some time to come. On the other hand, in some, though not all, species there are geographically separated clusters of phenotypic characters that appear to depend on some degree of geographical interruption of gene flow. This naturally tends to be most pronounced in populations confined to islands—either literal islands in bodies of water or ecological islands cut off by areas of uncongenial habitat—and least evident in species that are mobile occupants of wide continental habitats. Some of our

North American species belong to each of these extreme types; many are intermediate. Even in widely ranging continental species the ecotones between major habitat formations, as for instance between coniferous and deciduous forest, forest and prairie, or taiga and tundra, are apt to correspond to sharp differences in phenotypes and presumably in genetic structure of the respective populations. In geographically cut-up zones such as our western Cordillera, species tend to exist in many small, isolated, phenotypically different populations. In genera such as *Udea,* where several closely related species have this pattern of variation, it is literally easier to recognize subspecies than to group them into natural species. In my opinion, therefore, subspecies often do correspond to naturally differentiated populations, though in a simplified way in most cases. They serve a useful purpose in calling attention to such differentiation and in characterizing it for general purposes. Used judiciously, they are helpful in evolutionary and zoogeographical studies. There are of course risks of over-splitting or of forcing irregular or clinal variation into an inappropriate subspecies framework. The good sense of authors and readers should in the long run provide the corrective to these errors.

The idea that description of subspecies tends toward the multiplication of names mistakes the whole purpose of the concept, which was originally to reduce the proliferation of species names for geographically representative populations. The point about subspecies names is that their use is optional. If we wish to distinguish the Old World striped morning sphinx from ours we can do so as *Hyles lineata livornica* but we are not tempted to add it to the list of species. On the other hand if our interest is in the species as a whole we can ignore the subspecies and speak simply of *Hyles lineata.* As it is often uncertain whether geographically representative forms are really conspecific or not, subspecific names are made co-ordinate with specific ones for purposes of nomenclature. In this way they can be shifted from one level to the other as opinions change without major upsets to homonymy and synonymy.

Those who agreed to give special status to subspecies as opposed to other infraspecific variants did so because they represented populations with differentiated collective heredities, rather than mutant or genetically aberrant individuals or purely phenotypically different aspects of the same population. There is an implication that subspecies may be incipient species, and there is little doubt that differentiation of geographically isolated populations is an important mechanism of speciation in Lepidoptera.

It has been argued that geographically divergent populations might be distinguished by simple geographical designations, such as "southeastern population", "western Pennsylvania race" and the like; but in practice it is found that a sufficiently precise designation is apt to be longer, more cumbersome and more annoying to repeat than the subspecific name that it would replace. Numerical or letter coding would be confusing and would lack the useful feature of interchangeability with specific names. A more accurate representation of geographical variation in terms of gene and genotype frequencies is theoretically better, but, as noted above, would be too complex both for present knowledge to supply and for present information facilities to store and process. Subspecies provide a flexible and accessible notation for calling attention to the main facts of geographical variation when more refined analysis is either not required or not available.

Since finishing Fascicle 13.1 I have been able to visit or revisit a number of major public and private collections, and the present fascicle is consequently based on a better sample of material. Colleagues have also supplied useful seasonal, distributional and life history

information. In the last department the help of Annette Braun and Roy Kendall has been particularly useful. At the same time I am glad to report that, although some omissions from Fascicle 13.1 have been found or called to my attention, these are not as numerous or as serious as might have been feared, considering the important collections from which I have received supplementary information. A list of addenda and corrigenda to Fascicle 13.1 will be issued in due course. Meanwhile, anyone who has corrections or supplementary information relating to that fascicle or this one is urged to communicate it to the author, as some correspondents have already done.

It is hoped that the present fascicle will be found useful, and particularly that it will shed light on the higher classification of North American Pyraustinae, which has been in a confused state for so many years.

SUPERFAMILY
## PYRALOIDEA (continued)

FAMILY
## Pyralidae (continued)

SUBFAMILY
### Pyraustinae Meyrick

Type-genus: *Pyrausta* Schrank, 1802

NOTE—The name Pyraustinae is antedated by a number of others, but it has been in general use since 1890, and I think it best to retain it, disregarding priority. An application will be made separately to the International Commission on Zoological Nomenclature to support this use.

Botytes Duponchel, 1844, *Catalogue Méthodique des Lépidoptères d'Europe*, 205.
Type-genus: *Botys* Latreille, 1802.

Ennychites Duponchel, 1844, *Catalogue Méthodique des Lépidoptères d'Europe*, 196.
Type-genus: *Ennychia* Treitschke, 1828.

Scopulites Duponchel, 1844, *Catalogue Méthodique des Lépidoptères d'Europe*, 203.
Type-genus: *Scopula* Schrank, 1802, *sensu* Duponchel, 1844.

NOTE—This tribal name was based on a misuse of the generic name *Scopula* Schrank, 1802, which is now considered to apply to a genus of Geometridae, with type-species *Scopula paludalis* Schrank, 1802. See Prout, 1906, 1934, Covell, 1970.

Steniadae Guenée, 1854, *Species Général des Lépidoptères*, **8**: 146, 232.
Type-genus: *Stenia* Guenée, 1845.

Spilomelidae Guenée, 1854, *Species Général des Lépidoptères*, **8**: 146, 277.
Type-genus: *Spilomela* Guenée, 1854.

Margarodidae Guenée, 1854, *Species Général des Lépidoptères*, **8**: 146, 286.
Type-genus: *Margarodes* Guenée, 1854.

Pyraustidae Meyrick, 1890, *Trans. Ent. Soc. London*, 1890, 436.
Type-genus: *Pyrausta* Schrank, 1802.

Agroteridi Acloque, 1897, *Faune de France*, **3**: 249, 343–349.
Type-genus: *Agrotera* Schrank, 1802.

Hymeniinae Swinhoe, 1900, *Catalogue of the Eastern and Australian Lepidoptera Heterocera in the Collection of the Oxford University Museum*, **2**: 452.
Type-genus: *Hymenia* Hübner, [1825].

Pinaciinae Swinhoe, 1900, *Catalogue of the Eastern and Australian Lepidoptera Heterocera in the Collection of the Oxford University Museum*, **2**: 472.
Type-genus: *Pinacia* Hübner, [1827]–[1831].

NOTE—This subfamily name was based on a misuse of the generic name *Pinacia*, which is now considered to apply to a genus of Geometridae, with type-species *Pinacia molybdaenalis* Hübner [1827]–[1831].

Dichocrociinae Swinhoe, 1900, *Catalogue of the Eastern and Australian Lepidoptera Heterocera in the Collection of the Oxford University Museum*, **2**: 478.
Type-genus: *Dichocrocis* Lederer, 1863.

Syleptinae Swinhoe, 1900, *Catalogue of the Eastern and Australian Lepidoptera Heterocera in the Collection of the Oxford University Museum*, **2**: 488.
Type-genus: *Sylepta* Hübner, [1825].

Margaroniinae Swinhoe, 1900, *Catalogue of the Eastern and Australian Lepidoptera Heterocera in the Collection of the Oxford University Museum*, **2**: 498.
Type-genus: *Margaronia* Hübner, [1825].

Siginae Hampson, 1918, *Novit. Zoologicae*, **25**: 386.
Type-genus: *Siga* Hübner, [1820].
NOTE—Hampson intended this subfamily name to be used for the Schoenobiinae, but the type-genus is now known to be a member of the present subfamily.

Portentomorphini Amsel, 1956, *Boletín Ent. Venezolana*, **10**: 267.
Type-genus: *Portentomorpha* Amsel, 1956.

Lineodini Amsel, 1956, *Boletín Ent. Venezolana*, **10**: 269.
Type-genus: *Lineodes* Guenée, 1854.

The names listed are all subjective synonyms at the subfamily level, that is, their type-genera belong to this subfamily and they are potentially available as names for the subfamily as a whole. However, most of them were proposed as subdivisions and have never been used for the whole group.

The subfamily contains a very large number of genera and species, the majority tropical. The moths are varied in appearance, but mostly have slender bodies and rather delicate, fairly broad wings. They somewhat resemble Geometridae in aspect, but the forewings tend to be more narrowly triangular, and the abdomen usually is longer than in that family, typically extending behind the anal angles of the hindwings.

Labial palpus porrect, oblique or upturned; maxillary palpus and ocellus almost always well developed. Proboscis usually present. Chaetosema absent. Praecinctorium present, distally bilobed, often strongly so.

Forewing generally with all veins present. $R_2$ usually free, but sometimes stalked with $R_{3+4}$. $R_5$ generally free; rarely stalked with $R_{3+4}$. 3rd A forming a large and conspicuous loop with 2nd A.

Hindwing usually with $Sc+R_1$ and $R_s$ anastomosed. Cu not pectinate. Three anal veins present.

Male genitalia with gnathos usually rudimentary or absent, but in a few primitive genera well developed and fused basally to the tegumen as in Odontiinae and Evergestinae. Valve usually entire, armed with a variously shaped clasper, but occasionally the clasper lacking or the outline of the valve variously modified.

Female genitalia varying considerably, but usually with well-developed setose ovipositor lobes and well-defined ductus bursae and bursa, the latter generally with one or two well-developed signa.

Eggs various, often flattened and lens-shaped.

Larvae generally leaf-folders or stem- or fruit-borers, mostly fairly slender, tapering to the two ends. Primary setae and often pinacula conspicuous. Crochets of abdominal prolegs usually arranged in a triordinal penellipse.

Pupae generally formed in a light cocoon or in the larval burrow.

The group contains many serious pests of trees, crops and ornamental plants, including in North America the notorious European corn borer, the alfalfa webworm, the garden webworm, the beet webworm, the melonworm, the pickleworm and a number of others.

The subfamily is divisible into two tribes, distinguished in the following key.

## KEY TO TRIBES

1. Praecinctorium weakly bilobed, the lobes parallel and longitudinal, diverging at an angle ventrolaterad from tip of praecinctorium proper; forewing of male with strap-like frenulum-hook arising from costa near base, in addition to the retinaculum (a group of stiff scales arising farther back on the wing and also helping hold the frenulum in place) (Forbes, 1926: 331–332); valve of male genitalia almost always with basally directed clasper, one or more of its basally or dorsally directed lobes usually with conspicuous setae or erect scales; bursa of female genitalia almost always with rhomboidal or mouth-shaped, spinulose, transversely keeled signum.....Pyraustini

— Praecinctorium strongly bilobed, the lobes transverse and often projecting visibly beyond each side of base of abdomen; male with retinaculum but no frenulum-hook; valve of male genitalia with its clasper, when present, directed distad, rarely with any obvious basally directed lobe, and without conspicuous erect setae or scales; signum of female various, but not rhomboidal .....Spilomelini

TRIBE
**Pyraustini** Meyrick
Type-genus: *Pyrausta* Schrank, 1802.

Botytes Duponchel, 1844, *Catalogue Méthodique des Lépidoptères d'Europe*, 205.
Type-genus: *Botys* Latreille, 1802.

Ennychites Duponchel, 1844, *Catalogue Méthodique des Lépidoptères d'Europe*, 196.
Type-genus: *Ennychia* Treitschke, 1828.

Pyraustidae Meyrick, 1890, *Trans. Ent. Soc. London*, 1890, 436.
Type-genus: *Pyrausta* Schrank, 1802.

Portentomorphini Amsel, 1956, *Boletín Ent. Venezolana*, **10**: 267.
Type-genus: *Portentomorpha* Amsel, 1956.

This tribe is the more primitive of the two which constitute the subfamily Pyraustinae. It has probably evolved directly from the Evergestinae, which agree in most structures and in general appearance, but which always have a toothed beaklike gnathos in the male and paired depressed signa in the female. The retention of the frenulum-hook and the weak bilobing of the praecinctorium are primitive features as compared to the Spilomelini. The elaborate clasper found in most genera of Pyraustini might be considered specialized, but it is already foreshadowed in such evergestine genera as *Trischistognatha*. The clasper is complex in the genus *Munroeodes*, whose well-developed gnathos indicates a primitive position in the tribe Pyraustini.

The tribe is smaller and less diversified than the Spilomelini, but contains about 100 genera and several hundred species in the world and about 28 genera and 150 species in North America. The metropolis of the tribe is in temperate east Asia, where a great variety of species and genera occur, but the group is present on all continents; conversely, it is poorly represented on oceanic islands, only the genus *Uresiphita* extending as far as Hawaii. The species are in general of rather uniform appearance. Straw-yellow moths with rather vague markings are the most typical, but some species are strikingly colored and a few are mimetic. A number of life histories are known, but larval characters to differentiate this tribe from the Spilomelini have not been worked out.

The external characters are very uniform throughout the tribe; attempts to use the few tangible external differences, such as conical or flat frons, dilated or simple scaling of maxillary palpi and exposed or concealed third segment of the labial palpi, have led to completely artificial arrangements. The present generic classification is based primarily on characters of the male genitalia; the female genitalia also provide generic characters, but these have not yet been studied as fully or as systematically as those of the males.

## KEY TO NORTH AMERICAN GENERA OF PYRAUSTINI

1. Male genitalia with well-developed, ventrally directed gnathos, its median element slender and rodlike, its lateral arms broad and connecting with tegumen; female genitalia with anteroventral angles of eighth tergite obliquely cut off and heavily spinulose; anterior apophyses thick but much shorter than posterior apophyses, in our species only about five times as long as wide ..... *Munroeodes* p. 12

— Male genitalia with at most weak rudiments of the gnathos; eighth tergite and anterior apophyses of female normal or eighth tergite wrinkled and weakly spinulose ..... 2

2. Aedoeagus of male genitalia deeply cleft distally but without complex armature or strong spiral twisting, the clefts separating a narrower and a wider distal process, both usually finely serrate; female genitalia with a twisted spinulose sclerotized band in the ductus bursae near the bursa ..... 3

— Aedoeagus of male genitalia not conspicuously cleft distally or if so with complex, often spirally twisted armature in this area; ductus bursae of female genitalia without a twisted, spinulose, sclerotized band near the bursa, though sometimes with proximal sclerotization ..... 8

3. Forewing short and falcate, with rounded tornus and in male with a large quadrate fovea, contrastingly transparent against the blackish-gray ground; uncus of male genitalia narrowly bifid at tip ..... *Perispasta* p. 28

— Wings of normal proportions, if fuscous then forewing narrowly triangular and in male without a contrasting fovea; uncus of male genitalia not bifid at tip ..... 4

4. Wings white, with black spots and bands; male genitalia with juxta heavy, dorsally sharply pointed, ventrally with short lateral projections, and with a median keel throughout its length ..... *Eurrhypara* p. 29

— Wings gray, yellowish or brown, or black with white spots; juxta of male genitalia small, weakly sclerotized and not medially keeled, usually bifid dorsally.....5

5. Male genitalia with dorsal margin of sacculus serrate, at least in part....*Phlyctaenia* p. 30

— Male genitalia with dorsal margin of sacculus not serrate.....6

6. Male genitalia with a thumblike dorsally directed process from near the distal end of the sacculus, about at base of clasper....*Anania* p. 36

— Male genitalia without such a process on dorsal margin of sacculus; clasper with a rounded, scaled dorsal process and divergent, rodlike, basally and distally directed ventral process.....7

7. Male genitalia with uncus broadly rounded distally, about as wide as long.....*Mutuuraia* p. 34

— Male genitalia with uncus subtriangular, narrowly rounded distally, less than half as wide as long.....*Nealgedonia* p. 32

8. Uncus of male genitalia slender and rodlike, without strong dorsal setae; costa of valve of male genitalia with three conspicuous dorsal processes of diverse shapes; two processes arising from articulation of vinculum and tegumen, a boot-shaped one fitting into one of the costal processes of the valve, and a long slender process bearing a corema at its end.....*Portentomorpha* (Fascicle 13.2B) p.

— Uncus of male genitalia rarely slender and rodlike, often dorsally spinose or heavily setose near tip; valve usually with costa simple, if with elaborate processes then uncus wide and subtriangular.....9

9. Valve of male genitalia without clasper; juxta bifid, with strongly spinose arms; penis with branched, treelike deciduous cornuti .....*Saucrobotys* p. 12

— Valve of male genitalia with well-defined clasper; juxta usually without strongly spinose arms; deciduous cornuti, if present, sometimes barbed but not with treelike branches .....10

10. Uncus of male genitalia strongly bifid, each branch with the tip densely clothed dorsally with strong anteriorly directed spines or spinelike scales .....*Sericoplaga* p. 56

— Uncus of male genitalia simple or at most shallowly bifid or trifid; if divided then without strong dorsal spines at tips of branches .....11

11. Valve of male genitalia with an oblique ridge from near costa at base to near middle of ventral margin; this ridge with dense row of strong setae or narrow erect scales directed towards costa of valve; uncus broadly rounded or subtruncate, distal part dorsally densely setose or spinose....*Hahncappsia* p. 38

— Valve of male genitalia without such a ridge; if groups of scales present on or near clasper, then uncus narrowed at tip and subtriangular or weakly trifid, not broadly rounded or subtruncate.....12

12. Valve of male genitalia with prominent erect scales grouped on dorsal and/or distal part of a rounded, basally directed, padlike element of clasper; rounded scale-bearing element sometimes at end of a slender stalk...13

— Valve of male genitalia without erect scales on clasper, or such scales inconspicuous and confined to tip of a simple, triangular, or decurved basoventrally directed clasper.....19

13. Scale-bearing pad situated at end of a slender, rodlike stalk, extending well basad and dorsad of base of valve .....*Epicorsia* p. 16

— Scale-bearing pad much shorter, not reaching costa or base of valve.....14

14. Valve of male genitalia with outline irregular; a heavily sclerotized furcate process extending from base in costal region and a spinose process extending ventrodistally from padlike scaled element of clasper.....*Fumibotys* p. 26

— Valve of male genitalia with regular outline, not with processes as described for *Fumibotys*.....15

15. Valve of male genitalia with scaled pad arising near dorsal margin and accompanied by a prominent, hooked, pointed, sclerotized, spinulose process, arising ven-

trodistad of pad and curving dorsad then basad below it ..... *Crocidophora* p. 20

— Valve of male genitalia with scaled pad arising at or below middle and not accompanied by a prominent recurved process ..... 16

16. Valve of male genitalia with scaled pad arising near ventral margin and pointing directly or somewhat obliquely to costa, costal margin of pad flattened and with numerous scales; uncus short and wide, subtriangular, bifid or trifid, sparsely setose ..... *Ostrinia* p. 22

— Valve of male genitalia with scaled pad arising near middle, oval in outline and pointing to base of valve; uncus with or without a pair of accessory processes at base but not distally bifid or trifid ..... 17

17. Uncus of male genitalia flanked at its base by a pair of conspicuous slender, pointed, decurved processes ..... *Triuncidia* p. 19

— Uncus of male genitalia with at most small rudiments of such processes ..... 18

18. Male genitalia with scaled pad of valve bearing a small basally directed spine from its lower edge ..... *Oenobotys* p. 17

— Male genitalia with scaled pad of valve bearing a slender but fairly long spine extending distad from its lower edge ..... *Pseudopyrausta* p. 16

19. Clasper of male genitalia with two ventrally directed processes, connected at base ..... 20

— Clasper of male genitalia with one ventrally directed process ..... 24

20. Uncus of male genitalia broadly rounded or subtruncate distally; ventral processes of clasper slender, pointed, separated by a deep, broadly curved sinus; aedoeagus with a strongly sclerotized pointed process from one side ..... *Sitochroa* p. 52

— Uncus of male genitalia subtriangular, very narrowly rounded at tip or narrow and spatulate; aedoeagus with at most a short, slender terminal process ..... 21

21. Ventral processes of clasper similar to each other, short, narrow, distally rounded, arising close together or from a common base ..... *Helvibotys* p. 50

— Ventral processes of clasper unlike, arising far apart and separated by a shallow, broadly rounded sinus ..... 22

22. Male genitalia with uncus narrow and spatulate ..... *Xanthostege* p. 54

— Male genitalia with uncus subtriangular, narrowly rounded at tip ..... 23

23. Male genitalia with both ventral processes of clasper blunt, distal one narrower and longer than basal one and arising from a secondary fold underlying main oblique ridge across middle of valve ..... *Arenochroa* p. 53

— Male genitalia with basal ventral process of clasper truncate and spinulose, distal one short and sharp-pointed, arising from main oblique ridge across middle of valve .... *Nascia* p. 15

24. Uncus of male genitalia broadly rounded at tip and parallel-sided, not more than three times as long as wide, usually less; distal part densely setose or spinose dorsally ..... 25

— Uncus of male genitalia narrow at tip, generally triangular or subtriangular; if distal part parallel-sided or weakly expanded then this part much narrower than base and pointed or narrowly rounded at tip; dorsal vestiture of uncus variable but often sparse ..... 26

25. Penis with a long, heavy, spikelike cornutus, nearly as long as aedoeagus ..... *Uresiphita* p. 57

— Cornutus or cornuti not more than half as long as aedoeagus ..... *Loxostege* p. 57

26. Sacculus of valve of male genitalia ending in a dorsally directed thumblike process; clasper decurved; uncus narrow, its tip weakly expanded and setose ..... *Hyalorista* (Fascicle 13.2B) p.

— Sacculus of valve of male genitalia not ending in a thumblike process; clasper and uncus various ..... 27

27. Sacculus of valve of male genitalia with a

low, rounded, padlike process distad of clasper; this process bearing long, dorsally directed, weakly radiating setae.....*Achyra* p. 45

— Valve of male genitalia without such a process .....28

28. Valve of male genitalia with clasper consisting of two elements: a more dorsal, small, padlike, setose, basally directed process and a more ventral, ventrally directed, strongly sclerotized, often clawlike or spinelike process.....*Neohelvibotys* p. 48

— Valve of male genitalia with clasper consisting of a single basally directed or recurved, setose or scaled process.....*Pyrausta* (Fascicle 13.2B) p.

GENUS

*Munroeodes* Amsel

*Munroeia* Amsel, 1956, *Boletín Ent. Venezolana*, **10**: 282, not Marion, 1954, *Mémoires de l'Institut Français d'Afrique Noire*, **40**: 336.
Type-species: *Munroeia transparentalis* Amsel, 1956. Original designation and monotypy.

*Munroeodes* Amsel, 1967, *Boletín Ent. Venezolana*, **10** (3 & 4), "Berichtigung".
Type-species: *Munroeia transparentalis* Amsel, 1956.
NOTE—Though published as a "correction" this name was intended as a replacement for the preoccupied *Munroeia* Amsel and accordingly it automatically has the same type-species.

Medium-sized, rather narrow-winged, translucent yellow or yellowish-buff moths, with simple transverse lines and on forewing a simple cell-dot and discocellular bar. Like *Loxomorpha* Amsel (Tribe Spilomelini, Fascicle 13.3) in general appearance but larger and with discocellular bar of forewing single instead of double. With narrower and more rounded forewings than *Hahncappsia*, *Helvibotys* and *Neohelvibotys* and with the frons flat and oblique, not conical as in most species of those genera.

Male genitalia very distinctive, especially in the presence of a long, free, distally truncate or weakly bifid gnathos. Clasper with a basally directed, setose or scaled process and a distally directed spinose one. Penis with a strong curved cornutus and a bundle of barbed deciduous ones. Female genitalia with anterior corners of the eighth abdominal tergum modified and spinulose. Anterior apophyses abnormally short. Ductus bursae long, slender, coiled and membranous. Bursa membranous, with an almost cruciform signum and a membranous accessory sac.

Of the four known species only one occurs in our territory. For a more extended account see my paper on genera resembling *Epicorsia* (Munroe, 1964).

Larva a leaf-tier on fiddlewood, *Citharexylum*.

*Munroeodes thalesalis* (Walker)
PL. 1, FIGS. 15, 16; PL. A, FIG. 1; PL. L, FIG. 1.

*Botys thalesalis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **18**: 599.
Type-locality: Honduras. [BMNH]

The figures of moths and of genitalia should be sufficient for the identification of this insect. Comparison of genitalia is advisable because there are several other species of similar appearance in or near our territory.

Larva found by Roy Kendall on fiddlewood, *Citharexylum berlandieri* Robins.

Nicaragua north to southern Texas. Moth in March to October in Texas.

GENUS

*Saucrobotys* Munroe, NEW GENUS

Gender: feminine.
Type-species: *Botis fumoferalis* Hulst, 1886.

DIAGNOSIS: Moths large, rather slenderly built, with obscurely marked, powdery, orange, tan or fuscous forewing and whitish to brown or fuscous hindwing. External structure closely similar to that of *Munroeodes*. Male genitalia with clasper absent; juxta spined; cornuti curiously branched, looking like little leafless trees, resembling those of the neotropical genus *Chilochroma* Amsel; the genitalia differentiated from those of that genus by the absence of the clasper. Female genitalia without spining in basal part of ductus bursae as in *Munroeodes*; basal sclerotization of ductus bursae with a narrow diverticulum not found in *Chilochroma* and with membranous part of ductus longitudinally fluted.

DESCRIPTION: Moth with frons oblique, prominent. Labial palpus porrect, exceeding frons by a little less than length of head; scaling compressed, tapering distally; third segment largely concealed in scaling of second. Maxillary palpus

prominent, slightly dilated with scales distally. Eye large. Ocellus well developed. Antenna filiform, pubescent. Body and legs slender; outer tibial spurs considerably shorter than inner in both sexes; praecinctorium weakly bilobed.

Forewing fairly narrow; costa arched; outer margin oblique and somewhat excurved. Male with strong frenulum hook. $R_1$ from well before apex of cell. $R_2$ from somewhat before apex, closely approximated to $R_{3+4}$. $R_3$ and $R_4$ stalked for somewhat more than half their length. $R_5$ from anterior angle of cell, curved and briefly approximated to $R_{3+4}$. Discocellular incurved. $M_1$ from somewhat behind anterior angle of cell. $M_2$ from somewhat before posterior angle. $M_3$ from posterior angle. $Cu_1$ from somewhat basad of posterior angle. These three veins not approximated basally. $Cu_2$ from cell at three-fourths. Anal loop large and complete.

Hindwing rounded. $Sc+R_1$ and $R_s$ anastomosed for a short distance. $R_s$ and $M_1$ stalked. Discocellular bent at middle, posteriorly oblique. Cell less than half length of wing. $M_2$ and $M_3$ from posterior angle of cell, curved and approximated at base. $Cu_1$ from just basad of posterior angle. $Cu_2$ from cell at two-thirds from base. Three anals present.

Male genitalia with uncus long and rather wide, distally rounded and strongly setose dorsally. Gnathos a broad transverse band with a straplike subscaphium arising from it. Juxta long, V-shaped; the arms strongly spinose. Vinculum narrow and medially carinate. Valve broadly curved; costa subangulate, inflated basally; sacculus narrowly inflated; no armature on valve. Penis short, cylindrical, with a few spinelike fixed cornuti and a dendritic deciduous cornutus. Female genitalia with lobes of ovipositor soft, short-setose. Posterior apophysis weak. Anterior apophysis long, broad posteriorly, narrow anteriorly, with a slender dorsal process. Juxta with an unsymmetrical sclerotized zone at ostial end; remainder long, membranous and coiled. Bursa small, globular and membranous, with a large, subrhomboidal, spinulose signum, and a globular accessory sac.

Larva of *S. futilalis* social, in a conspicuous nest of leaves and silk on dogbane and Indian hemp, *Apocynum* species. That of *S. fumoferalis* recorded from spruce, most likely from a strayed or prepupal larva, a pupa recorded from under the bark of hickory, *Carya* species (Forbes, 1923); both records perhaps based on accidental associations.

There appear to be only two species, both widely distributed, though one is more southerly than the other. They are sometimes confused with *Ostrinia* species (see p. 22, below) and with *Diastictis* species (tribe Spilomelini), but the details of the wing markings as well as the structural characters will distinguish them. The known geographical range is mainly North American, but *S. futilalis* extends into Mexico.

## KEY TO NORTH AMERICAN SPECIES

1. Forewing above dark grayish fuscous, with distinct, though not contrasting, strongly dentate, black antemedial and postmedial lines; hindwing above fuscous, with darker terminal zone ..... *fumoferalis* this page

— Forewing above orange, tan, brown or brownish fuscous, generally somewhat powdery, often with bluish or greenish iridescence from membrane of wing; antemedial and postmedial lines indistinct or diffuse, brown or fuscous, weakly dentate; hindwing above whitish or light orange, sometimes with narrow terminal infuscation ..... *futilalis* p. 14

*Saucrobotys fumoferalis* (Hulst), NEW COMBINATION

PL. I, FIGS. 2–5; PL. A, FIG. 2b; PL. L, FIG. 2 (McD. 5602).

*Botis fumoferalis* Hulst, 1886, *Ent. Americana*, **13**: 154.

Type-locality: Siskiyou Co., California. [AMNH]

NOTE—The locality cited is that of the lectotype, a male form in the collection of the AMNH designated by Klots, 1942, *Bull. Amer. Museum Nat. Hist.*, **79**: 420.

Distinguished by dark wings and definite, black, very strongly dentate antemedial and postmedial lines of forewing from even the darkest specimens of *S. futilalis* and from other dark Pyraustinae. Genitalia almost exactly as in *S. futilalis*.

As noted above, the larva has been doubtfully recorded from spruce and hickory. More likely the usual hosts are low plants.

Common from Nova Scotia across southern Canada to British Columbia and south to Pennsylvania, Illinois, Montana, Idaho and Inyo County, California. In Ontario ranging as far north as Smoky Falls on the Mattagami River and in the

West extending north to Whitehorse, Yukon, and Fort Nelson, British Columbia.

One of the type-series is supposed to have come from Arizona, but I have not seen other specimens from there. Moth single-brooded in July in eastern Canada; collected from June to August in California.

*Saucrobotys futilalis* (Lederer), NEW COMBINATION

PL. 1, FIGS. 6–14; PL. A, FIG. 2a (McD. 5600, 5601).

*Botys futilalis* Lederer, 1863, *Wiener Ent. Monat.*, **7**: 372, 467, pl. 10, fig. 1.
Type-locality: Tennessee. [NHMV]

*Botys inconcinnalis* Lederer, 1863, *Wiener Ent. Monat.*, **7**: 372, 467, pl. 10, fig. 2. Subsp. NEW COMBINATION with *Saucrobotys*.
Type-locality: North America. [NHMV]
NOTE—The species was described from two syntypes, a male and a female, both in the NHMV.

*Botis erectalis* Grote, 1876, *Can. Ent.*, **8**: 99. NEW COMBINATION *with Saucrobotys*.
Type-locality: Albany, New York. [BMNH]
NOTE—The specimen marked "Type" in the BMNH is a female with Grote's red-bordered type-label "Botys Type/erectalis Grote". Though it has neither a locality label nor Lintner's number 1,310, I presume it is the authentic holotype.

*Botis crocotalis* Grote, 1881, *Papilio*, **1**: 167. Syn. of subsp. NEW COMBINATION with *Saucrobotys*.
Type-locality: Tucson, Arizona. [BMNH]
NOTE—I hereby designate as lectotype the only Grote specimen in the BMNH, a female without locality label, but with Grote's red-bordered label "Botis Grote/crocatalis [*sic*] Type"; also "Type" [round, red-bordered label], and "LECTOTYPE" [round, purple-bordered label]. Grote mentions having seen "several specimens", but I have not tried to trace the paralectotypes.

*Botis festalis* Hulst, 1886, *Trans. Amer. Ent. Soc.*, **13**: 153. Syn. of subsp. NEW COMBINATION with *Saucrobotys*.
Type-locality: [Prescott], Arizona. [AMNH]
NOTE—A lectotype was designated by Klots, 1942, *Bull. Amer. Museum Nat. Hist.*, **79**: 420.

Much more variable than *S. fumoferalis*, both individually and geographically. Forewing varying from powdery brownish fuscous to uniform orange and the hindwing from white to light orange. Ground color of forewing never grayish fuscous without brown tints, as in *S. fumoferalis*; hindwing never suffused with grayish fuscous as in that species. Transverse lines of forewing diffuse, brown or fuscous, or sometimes obsolete, never sharp and black, as in *S. fumoferalis*. Genitalia not materially different from those of *S. fumoferalis*.

Caterpillars social, and living in a conspicuous nest made of leaves spun together, usually on dogbane and Indian hemp, *Apocynum* species, but found by my colleagues T. N. Freeman and George Lewis on butterfly weed, *Asclepias tuberosa* L., in Kentucky. An Ottawa colony would not accept *Asclepias syriaca* L. The USNM has a series said to have been reared by Caffrey from corn stalks, but I think this is a mistake.

I recognize two subspecies. These have generally been listed as species, but there is nothing in the structure or biology to support this.

*Saucrobotys futilalis futilalis* (Lederer)

PL. 1, FIGS. 6–9, 11, 12; PL. A, FIG. 2a (McD. 5601).

*Botys futilalis* Lederer, 1863, *Wiener Ent. Monat.*, **7**: 372, 467.
Type-locality: Tennessee. [NHMV]

*Botis erectalis* Grote, 1876, *Can. Ent.*, **8**: 99.
Type-locality: Albany, New York. [BMNH]

Eastern, ranging from Quebec to Manitoba and Illinois and south to New Jersey, Pennsylvania and probably farther. Forewing powdery, ranging from brownish fuscous to orange brown. Transverse lines of forewing usually obvious. Hindwing whitish buff, sometimes narrowly infuscated at outer margin.

On the whole, northern and eastern specimens tend to be more fuscous and southern and western ones more tan, but the differences are not constant enough for the separation of subspecies. In the West the subspecies probably intergrades over a blend zone to the following, but no careful study has been made of the transition.

*Saucrobotys futilalis inconcinnalis* (Lederer), NEW STATUS

PL. 1, FIGS. 10, 13, 14 (McD. 5600).

*Botys inconcinnalis* Lederer, 1863, *Wiener Ent. Monat.*, **7**: 372, 467, pl. 10, fig. 2.
Type-locality: North America. [NHMV]

*Botis crocotalis* Grote, 1881, *Papilio*, **1**: 167
Type-locality: Tucson, Arizona. [BMNH]

*Botis festalis* Hulst, 1886, *Trans. Amer. Ent. Soc.*, **13**: 153.
Type-locality: [Prescott], Arizona. [AMNH]

Similar in size and general appearance to orange specimens of the nominate subspecies, but with markings of forewing much weaker and with hindwing usually orange-tinted, often almost as dark as the forewing. Genitalia like those of the nominate subspecies and larvae living socially on dogbane in the same way.

Alberta and British Columbia south to California, Arizona and Texas.

Moth in July and August in the Northwest, June to August in southern California.

GENUS
*Nascia* Curtis

*Nascia* Curtis, 1835, *British Entomology*, **12**, folio 559.
Type-species: *Pyralis cilialis* Hübner, 1796. Monotypy.

Moth of moderate size. Labial palpus fairly long, porrect, with the third segment hidden in the scaling of the second. Frons flat and oblique, not conical. Forewing triangular, with characteristic longitudinal reddish-brown streaks on a buff ground.

Male genitalia with uncus short and triangular, narrowly rounded at tip and weakly setose dorsally. Gnathos a narrow sclerotized bridge, without median element. Juxta small and heart-shaped. Vinculum rounded ventrally. Valve of moderate width, obliquely rounded distally; costa tubularly inflated; sacculus more widely inflated and dorsally densely spinulose; clasper long and ridgelike, with two ventrally directed processes: a wide, distally spinulose, basal one and a pointed, simple, distal one, the latter extending a little beyond the ventral margin of the valve. Penis simple and cylindrical, in our species with a somewhat curved spinelike cornutus. Female genitalia with ovipositor lobes rather weakly differentiated, soft and strongly setose. Posterior apophyses short, anterior apophyses about twice as long. Ostial chamber funnel-shaped and spinulose. Ductus bursae fairly long and membranous. Bursa pear-shaped and membranous, with a small rhomboidal signum and a membranous accessory sac.

Larva of the European *N. cilialis* on various sedges, eating large pieces from the leaves in the evening and resting by day on the underside of a leaf, dropping by a silk thread if disturbed; color bright yellow, with olive-green dorsal line and reddish-purple subdorsal lines. Larva wintering in a cocoon in an old reed stem, pupating in the spring.

The genus is small and has a holarctic range. The most closely related genera are palearctic. *Nascia* itself is an interesting example of disjunct geographical distribution. *N. cilialis* ranges from Europe to Japan with some geographical variation (see Munroe and Mutuura, 1968: 981, 982), whereas the single American species is confined to the eastern part of North America.

*Nascia acutella* (Walker), NEW COMBINATION
PL. 1, FIGS. 67–71; PL. A, FIG. 3; PL. L, FIG. 3 (McD. 5560).

*Crambus acutellus* Walker, [1866], *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **35**: 1753.
Type-locality: Orill[i]a, Ontario. [BMNH]
NOTE—The holotype is a male, not a female, as stated by Walker.

*Botis venalis* Grote, 1878, *Can. Ent.*, **10**: 24. NEW COMBINATION with *Nascia*.
Type-locality: [Evans Center, near] Buffalo, New York. [BMNH]
NOTE—Grote says "Not uncommon about Buffalo, N.Y., in June". The BMNH has three syntypes, two with red-bordered Grote "Type" labels and one with a blue-bordered Grote identification label. I hereby designate as lectotype a female with the following labels: "Botis Type/venalis Grote" [red-bordered label in Grote's hand], and on the reverse "81.116"; "Evans Center, N.Y./June, 1877./A. R. Grote, Coll."; "Type" [round, red-bordered label]; and "LECTOTYPE" [round, purple-bordered label]. The other two Grote specimens in the BMNH have been labelled paralectotypes.

Moth with forewing longitudinally striped as in many grass-feeders, but with detailed appearance different from that of Crambinae, Schoenobiinae, Noctuidae and other moths with the same general cryptic pattern.

Genitalia similar to those of the European *N. cilialis* but clasper of male valve with better developed, more coarsely spined, obliquely truncate, basal process, cornutus spinelike, and ductus bursae of female relatively longer.

The life history seems to be unknown, but the moths are common in grassy marshes in the

Northeast, and can frequently be flushed out of such habitats in considerable numbers in the daytime. The larva probably feeds on grasses or sedges like that of *N. cilialis*.

Nova Scotia to extreme western Ontario (One Sided Lake) south to Gainesville, Florida (Kimball, 1965: 215) and Colorado (Forbes, 1923: 561).

Moth in May and June in the Northeast.

GENUS

*Epicorsia* Hübner

*Epicorsia* Hübner, 1818, *Zuträge zur Sammlung Exotischer Schmettlinge* [sic], **1**: 24.
Type-species: *Epicorsia mellinalis* Hübner, 1818.
Designated by Munroe, 1958, *Can. Ent.*, **90**: 293.

Moths somewhat translucent, bright yellow, robust, mostly large. Frons flat and oblique. Labial palpus porrect. Mid-tibia inflated in male. Forewing with apex rather sharp.

Male genitalia very distinctive. Clasper developed into a long slender process, extending basad far past base of costa of valve, and ending in a small oval knob bearing a number of erect scales. Dorsal margin of sacculus with a thumblike, setose subbasal process and usually with a spinose process near base of clasper. Penis with a spiral apical armature, much as in *Loxostege*. Female genitalia with complex ostial sclerotization and long ductus bursae.

Larvae leafrollers on a variety of trees and shrubs.

A mainly tropical genus, with one species extending into southern Florida. Several other species, hardly distinguishable except on genitalia, occur in tropical America, and might be found in Florida or Texas (see Munroe, 1958).

*Epicorsia oedipodalis* (Guenée)
PL. I, FIG. 1; PL. A, FIG. 4; PL. L, FIG. 5
(McD. 5567, in part).

*Botys oedipodalis* Guenée, 1854, *Species Général des Lépidoptères*, **8**: 336.
Type-locality: Haiti.

*Botys butyrosa* Butler, 1878, *Proc. Zool. Soc. London*, 1878, 493.
Type-locality: Jamaica. [BMNH]
NOTE—Butler gives no details of his type-material. A single male in the BMNH, labelled: "Jamaica/78.19", and on the reverse "Botys/butyrosa/Type Butler"; "Type" [round red-bordered label]; and "Pyralidae/Brit. Mus./Slide No./1293♂", is taken to be the holotype.

*Epicorsia mellinalis*, of authors, in part, not Hübner, 1818.

*Pyrausta cerata*, Schaus, 1940, *New York Acad. Sci., Sci. Survey of Porto Rico and the Virgin Islands*, **12**: 372, in part, not Fabricius, 1795.

The only North American species with which this is likely to be confused is *Condylorrhiza vestigialis* (Guenée) (tribe Spilomelini), which is about the same size and in one of its forms about the same color, but that species has a fine but definite dark subterminal line on the hindwing and has the postmedial lines finer and more strongly sinuated. *E. oedipodalis* very closely resembles other species of its own genus and, as there is always a possibility of one of the tropical species being introduced into Florida, the identity of specimens should be verified by examining the genitalia. At least three species occur in Mexico and it is possible that one or other of these will be collected in Texas. The other species differ in strong characters of the sacculus armature and/or juxta spining, and there should be no difficulty in detecting additional species if the male genitalia are examined.

*E. oedipodalis* has been reared in Florida from fiddlewood, *Citharexylum* species, from sea-grape, *Coccolobis* species, and from lancewood, *Nectandra coriacea* (SW.) Griseb.

Jamaica, Hispaniola, Cuba, Cayman Islands and Bahamas; in Florida north to Charlotte Harbor and Palm Beach.

GENUS

*Pseudopyrausta* Amsel

*Pseudopyrausta* Amsel, 1956, *Boletín Ent. Venezolana*, **10**: 268.
Type-species: *Botys acutangulalis* Snellen, 1875.
Original designation.

Moths small with pale ground color and a contrasting pattern of narrow fulvous or fuscous lines. Labial palpus obliquely upturned, with short, blunt, porrect third segment. Maxillary palpus small and tapering. Antenna with narrow, rather bristly dorsal scaling. Species few, confusingly similar in appearance, most neotropical, but at least one in our area.

Male genitalia fairly simple; uncus subtriangular; valve fairly narrow, with padlike scaled clasper, bearing a spine extending ventrodistad from the ventrodistal corner.

The type-species was misidentified by Amsel: the species he figured as *P. acutangulalis* (Snellen) is not that species, but the species he figured as *P. craftsialis* (Dyar) is probably the true *P. acutangulalis*. In addition to these two nominal species the genus contains *Pseudopyrausta cubanalis* (Schaus), NEW COMBINATION, described in *Bocchoris*, *P. marginalis* (Dyar), NEW COMBINATION, from the Panama Canal Zone, described in *Nacoleia*, and *P. minima* von Hedemann, NEW COMBINATION, from the Island of St. Thomas, described in *Synclera*, as well as the North American species described below. The species will probably need revision when adequate material is available.

The relationships of the genus appear to be with the large Asian and African genus *Pagyda* Walker, whose species are somewhat similar in maculation and structure.

*Pseudopyrausta santatalis* (Barnes and McDunnough), NEW COMBINATION

PL. 5, FIGS. 33, 34; PL. A, FIG. 5; PL. L, FIG. 4 (McD. 5390).

*Blepharomastix santatalis* Barnes and McDunnough, 1914, *Contrib. Nat. Hist. Lep. N. Am.*, **2** (6): 226, pl. 1, fig. 5.
Type-locality: San Benito, Texas. [USNM]

*Blepharomastix acutangulalis*, of authors, in part, not Snellen, 1875.

This should not be confused with any other species known to occur in our fauna. However, the complex of species or forms that includes *P. minima* and *P. cubanalis* is widely distributed in the West Indies with a population as close as Nassau, Bahamas. This complex should be watched for in Florida. Its members have the subterminal line of the forewing broad and smudgy instead of narrow and distinct as in *P. santatalis*.

Early stages unknown.

Big Bend to San Benito, Texas, also fairly widely distributed in Florida, occurring at least as far north as Cassadaga. I can see no difference between Florida specimens and the Texan type series.

Moth in Florida from February to October, in Texas from April to September.

GENUS

*Oenobotys* Munroe, NEW GENUS

Gender: feminine.

Type-species: *Pionea vinotinctalis* Hampson, 1895.

DIAGNOSIS: Moth with external characters as in a number of allied genera. Frons flat and oblique. Labial palpus porrect, exceeding frons by about length of head. Maxillary palpus with weakly expanded distal scale tuft. Antenna filiform and pubescent in both sexes. Body and legs fairly robust. Outer tibial spurs shorter than inner. Wing venation with no unusual features. Male genitalia with the uncus broadly triangular, without basal accessory processes and with a sharp point at the apex. Juxta heart-shaped. Valve narrow, with a large, rounded, basally directed, padlike, scaled clasper. Penis cylindrical, with one large hooklike cornutus and a row of smaller straight ones. Female genitalia with ductus bursae long and wide, with a long sclerotized zone at base, followed by a twisted dilation and a coiled membranous portion; bursa with a large rhomboidal signum.

DESCRIPTION: Moth small but fairly robust, with broad forewing bearing simple fuscous transverse lines and ordinary spots on a reddish-brown ground. Frons flat and oblique. Labial palpus porrect, exceeding frons by about length of head; third segment hidden in compressed conical scaling of second. Maxillary palpus with weakly expanded distal scale tuft. Proboscis well developed, scaled at base. Eyes large. Ocellus present. Antenna filiform in both sexes, smoothly scaled above, pubescent beneath. Body robust. Praecinctorium weakly bilobed. Legs fairly stout; outer spurs about half as long as inner in male, somewhat shorter than inner in female.

Forewing short and wide, with arched costa, square apex and weakly curved termen. Vein $R_1$ arising well basad of end of cell. $R_2$ from anterior angle of cell, basally closely apposed to $R_{3+4}$. Cell rather narrow, about three-fifths as long as wing. Discocellular vein weakly curved. $M_1$ arising well behind anterior angle of cell. $M_2$, $M_3$ and $Cu_1$ spaced around posterior angle of cell, their basal parts not curved and approximated to one another. $Cu_2$ from the cell at three-fourths from base. 3rd A free, not making a definite closed loop with 2nd A.

Hindwing broadly rounded. $Sc+R_1$ anastomosed with $R_s$ for a considerable distance. $R_s$ distinctly stalked with $M_1$. Cell less than half as long as wing. Discocellular vein curved, its

posterior part strongly oblique. $M_2$, $M_3$ and $Cu_1$ from the posterior angle of the cell; basal parts of $M_2$ and $M_3$ curved and strongly approximated. $Cu_2$ from cell at three-fourths from base. Three anals present.

Male genitalia with uncus broadly triangular, with sharp or narrowly rounded apex and fine or coarse dorsal setae; at most rudimentary accessory processes at sides of base. Gnathos absent. Juxta heart-shaped or divided. Valve narrow, with costal and ventral margins parallel and end rounded, in *texanalis* with a ventral spine; costa tubularly inflated; sacculus more broadly inflated but without spines or processes; clasper large, rounded, basally directed, scale-bearing, padlike, with a basally directed spine. Penis cylindrical; cornuti various, partly deciduous.

Female genitalia with high narrow ovipositor, its lobes bearing dense, rather short setae. Posterior apophysis short and delicate but vertical crossbar rather strong. Anterior apophysis somewhat stronger, relatively wide, bent, and with a sharp dorsal spur at the bend. Ductus bursae long and wide, with a long sclerotized zone at ostial end, followed by a twisted and partly sclerotized dilation, then by a membranous coiled portion leading to bursa. Bursa small, globular and membranous, with a large rhomboidal signum.

This genus is closely related to *Triuncidia*, but lacks the accessory processes that flank the uncus in that genus and has a differently shaped clasper and sacculus. In the female the signum is of the usual rhomboidal form and not reduced and double as in *Triuncidia*.

The larva has been found on *Eupatorium* species in Florida, but I have not seen a description.

The two known species are found in the Caribbean and Gulf regions.

## KEY TO NORTH AMERICAN SPECIES

1. Distal half of fringe not contrastingly white ..... *vinotinctalis* this page
— Distal half of fringe contrastingly white ..... *texanalis* this page

### *Oenobotys vinotinctalis* (Hampson), NEW COMBINATION

PL. 5, FIGS. 41, 42; PL. A, FIG. 6; PL. L, FIG. 6.

*Pionea vinotinctalis* Hampson, 1895, *Ann. Mag. Nat. Hist.*, (6) **16**: 340.

Type-locality: Balthazar, Grenada, West Indies. [BMNH]

NOTE—The species was described from syntypes from two localities in Grenada. The locality cited is that of the lectotype, hereby designated, a male in the BMNH with labels: "Balthazar/ (Windward Side) / Grenada, W.I. / H. H. Smith"; "W. Indies 94–247"; "Type" [round, red-bordered label]; "LECTOTYPE" [round, purple-bordered label]; and "Pionea/vinotinctalis/type ♂ Hmpsn." [in Hampson's hand]. There are also three male and two female paralectotypes in the BMNH.

Moth small, with broad forewing and arched costa. Upperside of forewing purplish brown, with simple fuscous transverse lines, orbicular dot and reniform bar. Hindwing variable, but usually fuscous. Fringes with distal parts buff, not contrastingly white as in *O. texanalis*.

Common in Florida, ranging along the Gulf Coast to Brownsville, Texas, and southward through the West Indies and Mexico to Central and South America.

This is the species wrongly identified as *Phlyctaenia desistalis* (Walker) in McDunnough's list (McD. 5548). I have not seen the true *desistalis* from America north of Mexico.

### *Oenobotys texanalis* Munroe and A. Blanchard, NEW SPECIES

PL. A, FIG. 7; PL. L, FIG. 7.

*Oenobotys texanalis* Munroe and A. Blanchard. Type-locality: Fort Davis, Jeff Davis Co., Texas. [CNC]

DIAGNOSIS: Similar in general appearance to *O. vinotinctalis*, but larger; forewing wider, with apex sharper and termen less strongly convex; transverse lines of forewing finer and less blurred; both forewing and hindwing with basal part of fringe fuscous, distal part contrastingly white. Male genitalia with uncus distally narrowly rounded, dorsally strongly setose; valve with a short ventrally directed spine at end of sacculus; penis with a number of straight spinelike cornuti and with barbed deciduous cornuti, but without a hooklike cornutus. Female genitalia with anterior apophysis somewhat thicker and sclerotized collar of ductus bursae a little narrower than in *O. vinotinctalis*.

DESCRIPTION: Frons with dorsal surface reddish brown, a white line at each side; lateral surfaces fuscous. Vertex reddish brown. Labial palpus with

dorsal and distal parts fuscous; ventral part broadly and contrastingly white at base. Maxillary palpus fuscous. Proboscis with basal scaling whitish buff. Eye and ocellus fuscous. Antenna fuscous, ventrally ciliate, dorsally somewhat roughly scaled. Thorax above reddish brown. Abdomen above grayish fuscous. Body beneath and legs light buff; anterior surface of foreleg and dorsal surface of midtibia darker.

Forewing with apex sharp; termen somewhat oblique, weakly convex; tornus obtuse. Upperside with ground color smoothly reddish brown; some blackish-fuscous dusting, mainly in basal part of costal area and in and just beyond discal cell. Antemedial line fine, weak, blackish fuscous, oblique distad from R to Cu basad of middle of cell, much less strongly oblique to 3rd A, and again more strongly oblique to middle of posterior margin. Faint traces of a blackish-fuscous dot in cell and bar on discocellulars. Postmedial line fine, blackish fuscous, beginning at $R_3$, evenly convex and dentate on cell, shallowly retracted on $Cu_2$; weakly oblique distad to anal fold, erect to posterior margin at four-fifths from base. An even fuscous terminal line, fading out near tornus. Fringe with basal part fuscous, distal part contrastingly white.

Hindwing with upperside evenly somewhat shining gray. Faint traces of a fuscous postmedial line between $M_2$ and $Cu_2$. A fine fuscous terminal line, obsolete behind 1st A. Fringe as on forewing, but dark basal part weaker behind 1st A.

Wings beneath dull brown, disc and subcostal zone of forewing somewhat infuscated. Traces of a fuscous postmedial line on median parts of both forewing and hindwing. Fringes as on upperside.

Length of forewing 9 mm.

Male genitalia: uncus rather short and wide, sides converging to a narrowly rounded tip, dorsal surface heavily setose. Tegumen short and wide. Subscaphium strong but short. Juxta divided on midline into two separate strong sclerites. Vinculum with deep midventral section and bearing on each side a dorsal fingerlike process and a fairly strong corema. Valve of moderate length, fairly narrow, distally rounded, with a strong subcostal ridge, and with a spinelike projection from ventral margin at end of sacculus; sacculus with basal part strongly sclerotized, a number of long thick setae arising from prominent bases on mesal surface, a few short spinelike ones from dorsal margin; end of basal part abrupt and irregular, flanked ventrally by slender spines; distal part of sacculus much narrower, semimembranous, with a number of fine setae; clasper padlike, oblique dorsobasad and with a considerable number of strong, dorsally directed, distally strongly fringed scales; a short hooked spine at ventrobasal corner. Penis sinuate, with a number of straight spinelike cornuti. Female genitalia as described for the genus, almost exactly as in *O. vinotinctalis*, except as noted in the diagnosis, above.

Early stages unknown.

TYPES: Holotype: ♂. Fort Davis, Jeff Davis Co., Texas; 5 Oct. 1969; A. and M. E. Blanchard. Type no. 13,919, CNC. Allotype: ♀. Fort Davis Jeff Davis Co., Texas; 9 Oct. 1969; A. and M. E. Blanchard. AB. Paratypes: 2 ♂♂, 3 ♀♀. Green Gulch, Big Bend National Park, Texas; 11 Oct. 1966; A. and M. E. Blanchard (1 ♂). Fort Davis, Jeff Davis Co., Texas; 5 and 9 Oct. 1969; A. and M. E. Blanchard (2 ♀♀). Big Bend, Texas; 15–30 April 1936; O. C. Poling (1 ♂, 1 ♀). AB; type no. 13,919, CNC; Lyman Entomological Museum.

The moth will be figured in a later fascicle.

GENUS

*Triuncidia* Munroe, NEW GENUS

Gender: feminine.

Type-species: *Cybolomia* [sic] *ossealis* Hampson, 1899.

DIAGNOSIS: External structure closely similar to that of *Oenobotys* and a number of related genera. Labial palpus porrect and compressed, with third segment hidden in the scaling of second. Maxillary palpus with scaling strongly and triangularly dilated distally. Frons flat and oblique. Male genitalia immediately distinguished by the presence of a pair of slender, curved, pointed processes, one arising on each side of the base of the uncus. Female genitalia with paired thornlike signa, unique in the tribe.

DESCRIPTION: Frons flat and oblique. Labial palpus porrect, exceeding frons by more than length of head; scaling compressed, third segment hidden in conical scaling of second. Maxillary palpus with strongly expanded distal scale tuft. Proboscis well developed, basally scaled. Eye large. Ocellus present. Antenna ciliated beneath, scaled above, each scale-row distally raised. Body and legs slender; midtibia of male not dilated; outer tibial spurs shorter than inner, especially in male. Praecinctorium weakly bilobed.

Wings short and wide. Forewing with costa arched, apex weakly acute, termen weakly curved and somewhat oblique, tornus obtuse. $R_1$ arising before the end of the cell. $R_2$ from anterior angle of cell, closely apposed to $R_{3+4}$. $R_{3+4}$ longer than the free part of $R_4$. $R_5$ from the anterior angle of cell, straight, not basally approximated to $R_{3+4}$. Cell about half as long as wing. Discocellular vein weakly curved, its posterior part moderately oblique. $M_1$ from well behind anterior angle of cell. $M_2$, $M_3$ and $Cu_1$ well spaced around posterior angle of cell; their basal parts not approximated. $Cu_2$ from cell at two-thirds from base. Anal loop complete.

Hindwing with $Sc+R_1$ anastomosed with $R_s$ for a short distance. $R_s$ and $M_1$ stalked. Cell about half as long as wing. Discocellular vein strongly bent, with posterior part oblique. $M_2$ and $M_3$ from posterior angle of cell, their basal parts curved and strongly approximated. $Cu_1$ from just basad of posterior angle, its basal part not approximated to that of $M_3$. $Cu_2$ from cell at two-thirds from base. Three anal veins present.

Male genitalia with uncus triangular, pointed or very narrowly rounded at the tip and densely setose. A pair of slender, decurved, pointed processes arising from sides of base of uncus. Juxta ovate and weakly sclerotized. Valve fairly wide, distally rounded; clasper an ovate, basally directed pad, bearing scalelike setae and with ventrally directed angular flange and spikelike process. Penis fairly slender, vesica with a single larger spinelike cornutus and a group of numerous much smaller ones. Female genitalia with ovipositor lobes broad and membranous; apophyses short and weak. Ductus bursae slender and coiled, with a narrow sclerotized collar. Bursa large, oval and finely scobinated, armed with a pair of thornlike signa.

A small genus with a few neotropical species forming a group centering on the type-species and a second group with only a single species, this last being the only member of the genus known from our territory.

*Triuncidia eupalusalis* (Walker), NEW COMBINATION

PL. 2, FIGS. 2, 3; PL. A, FIG. 8; PL. L, FIG. 8.

*Botys eupalusalis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **18**: 605.
Type-locality: Venezuela. [BMNH]

NOTE—The species was described from two syntypes. I hereby designate as lectotype a male in the BMNH, with the following labels: "Venezuela", and on the reverse "47/9"; "Type" [round label with green border]; "LECTOTYPE" [round label with purple border]; and "BOTYS EUPALUSALIS". The paralectotype, also in the BMNH, has the same data; it has lost the abdomen and hindwings.

Moth small, resembling *Oenobotys vinotinctalis* in the even brown ground color and simple, slender, fuscous lines and ordinary spots of the forewing. Build slighter and color much paler than in that species; hindwing pale straw color, not fuscous; forewing a little darker straw color, not reddish or purplish brown. Smaller and browner than species of *Helvibotys*, *Neohelvibotys* and *Hahncappsia*, and with frons flat, not conical. Genitalia also very different in both sexes.

Life history apparently unknown. Larva probably a leafroller on low plants.

The species was not listed by Kimball, but it occurs in southern Florida as far north as Sarasota, where Kimball has collected it in April and May. Thence it ranges through the West Indies and Central and South America to Paraguay. It should be looked for in Texas, where it is to be expected near the Mexican border.

GENUS

*Crocidophora* Lederer

*Crocidophora* Lederer, 1863, *Wiener Ent. Monat.*, **7**: 386.
Type-species: *Crocidophora tuberculalis* Lederer, 1863. Designated by Hampson, 1896, *Fauna of British India, Moths*, **4**: 387.

This generic name was used by Hampson for a large number of mostly tropical species of very diverse relationships. Partly in association with Akira Mutuura, I have split off a number of the discordant elements, but some remain to be placed. To the best of my present knowledge the genus *Crocidophora* should be restricted to the three nearctic species that are dealt with here. These are fairly uniform in external structure and very similar indeed in genital characters.

Moths of slender build, with fairly broad wings (narrower in *C. pustuliferalis* than in the other two species). Frons flat and oblique or somewhat rounded. Labial palpus porrect, varying in length according to the species; third segment conically scaled and at least partly hidden in scaling of

second. Forewing with costa arched, apex blunt and termen convex. Male with a large fovea in and behind cell of forewing with an overlapping ridge of shining scales on underside. Wing-venation distorted in the discal area of forewing of male, normal in female.

Male genitalia with tegumen long and narrow. Uncus narrow and subtriangular, narrowly rounded at tip. Juxta small, dorsally bifid. Valve of moderate proportions, with narrowly tubular costa and inflated, dorsally angular sacculus. Clasper divided into two widely separated structures: a basal subcostal pad, with basally or dorsally directed scales, and a strongly sclerotized, more or less crescentic, recurved process, placed dorsad of end of the sacculus at about middle of valve. Penis straight or slightly curved, vesica with a small bundle of numerous small, spinelike fixed cornuti, as well as longer, barbed deciduous cornuti. Female genitalia with ovipositor lobes broad and membranous. Apophyses short, anterior ones somewhat thicker than posterior. Eighth tergite with a transverse ridge on each side anteriorly, preceded by a pouchlike structure. Ductus bursae long and slender; a thin sclerotized collar near ostial end, immediately followed by a short, coiled and dilated, somewhat sclerotized sub-basal zone; remainder membranous, except for a spinulose zone near junction with bursa. Bursa globular and spinulose, with a rhomboidal or cruciform signum and a round membranous accessory sac.

According to Kimball the larva of *C. pustuliferalis* occurs "in bamboo", but this apparently means bamboo-cane (*Arundinaria*).

Most of the close relatives of this genus occur in East Asia, where there are a number of more or less similar genera in both temperate and tropical zones.

## KEY TO NORTH AMERICAN SPECIES

1. Ground color of forewing above somewhat orange or pinkish brown; postmedial line strongly scalloped, with acute dentations basad, sometimes represented only by a series of fuscous dots or obsolescent. . *pustuliferalis* this page

— Ground color of forewing above straw yellow with moderately contrasting fuscous markings; postmedial line of forewing fuscous, continuous, not scalloped or dentate ..... 2

2. Subterminal line of forewing and hindwing strongly dentate ..... *serratissimalis* this page

— Subterminal line of forewing and hindwing broad and even ..... *tuberculalis* p. 22

### *Crocidophora pustuliferalis* Lederer

PL. 2, FIGS. 7–9 (McD. 5449).

*Crocidophora pustuliferalis* Lederer, 1863, *Wiener Ent. Monat.*, **7**: 386, 477, pl. 12, fig. 11.
Type-locality: North America. [NHMV]
NOTE—This species was described from two males in the NHMV. I hereby designate one of these as lectotype and it has been so labelled.

Forewing brown, with weakly contrasting, dotted or scalloped, inwardly dentate, evenly curved postmedial line. The species is more likely to be confused with *Saucrobotys futilalis inconcinnalis* or with *Ostrinia penitalis* than with other species of *Crocidophora*. Both of these species are larger and they often have much brighter orange tints. Neither has a fovea on the forewing of the male. *S. f. inconcinnalis* usually has no subterminal line on the forewing; at most there is a very diffuse and powdery series of deep indentations. In *O. penitalis* the subterminal line is present, though somewhat diffuse, and consists of relatively shallow, V-shaped dentations. In *C. pustuliferalis* the subterminal line is narrow though not contrasting and consists of deep acute dentations pointing basad on the veins and separated by U-shaped loops in the cells. The hindwings of *C. pustuliferalis* have small but distinct blackish dots at the termen; these are lacking in *S. f. inconcinnalis* and *O. penitalis*.

Male genitalia with spinelike sclerotized element of clasper shorter and more weakly curved than in the other two species of the genus.

Larva in "bamboo cane", *Arundinaria* spp. ?*tecta* (Walt.) Muhl., in USNM from Baton Rouge, La., also *Arundinaria macrosperma* Michx. in Florida.

Locally common from Norfolk, Virginia, to northern Florida, Louisiana and northwestern Arkansas. Common at ultraviolet light at the Wedge Plantation.

### *Crocidophora serratissimalis* Zeller

PL. 2, FIGS. 10–12; PL. B, FIG. 1; PL. L, FIG. 9 (McD. 5448).

*Crocidophora serratissimalis* Zeller, 1872, *Verh. K.-K. Zool.-Bot. Ges. Wien*, **22**: 521.

Type-locality: Massachusetts. [BMNH]

NOTE—The species was described from two syntypes: a male from Massachusetts collected by Packard and a female from Texas collected by Boll. I hereby designate the former, now in the BMNH, as lectotype. It has the following labels: "Crocidophora/*serratissimalis* Z/N. Am. Pack."; "Zell. Coll./1884"; "Type" [round, red-bordered label]; and "LECTOTYPE" [round, purple-bordered label].

*Botis subdentalis* Grote, 1873, *Bull. Buffalo Soc. Nat. Sci.*, **1**: 173.
Type-locality: [vicinity of Buffalo,] New York. [BMNH]

NOTE—Grote did not say how many specimens he had, but he mentioned variation of ground color, indicating that he had more than one. The BMNH has two females from Grote's collection, one with the label "Evans Center, N.Y./ June, 1877/A. R. Grote, Coll.", but with no determination label, the other with labels as follows: "Botis Type ♀/subdentalis Grote", in Grote's hand and with a red border; "Type" [round red-bordered label]; and "LECTOTYPE" [round purple-bordered label, newly affixed]. Grote's description is headed "♂", but in the text he expresses doubt as to the sex. I consider the first specimen to be a probable syntype and the second to be an undoubted syntype, which I hereby designate as lectotype.

Moth with about the same wing length as *C. pustuliferalis* but looking very different because of the broader and more rounded wings, pale straw-colored ground and contrasting fuscous markings. Hindwing colored and marked like forewing, not paler and almost unmarked as in *C. pustuliferalis*. General appearance rather like that of *Ostrinia obumbratalis*, but with only the subterminal line, not both the postmedial and the subterminal lines, dentate.

*Phlyctaenia quebecensis* also has the postmedial line dentate; its subterminal line is so weak as to be hardly visible. In *Phlyctaenia coronata* the postmedial line is without dentations or with only very weak dentations opposite the cell; however, it is much narrower-winged than *C. serratissimalis* and usually has the dark areas heavier and more extensive; its postmedial line has a strong loop distad in the middle, so that it approaches the middle of the termen much more closely than does that of *C. serratissimalis*.

Reared at Vineland, Ontario, from cut-grass, *Leersia oryzoides* (L.) Sw., by W. L. Putman.

Local but not uncommon from southern Quebec to Massachusetts, Maryland, Texas and Wisconsin.

*Crocidophora tuberculalis* Lederer
PL. 2, FIGS. 4–6 (McD. 5451).

*Crocidophora tuberculalis* Lederer, 1863, *Wiener Ent. Monat.*, **7**: 386, 476, pl. 12, fig. 9.
Type-locality: Tennessee.

Like *C. serratissimalis*, but smaller and with subterminal band broad, even and fuscous, not narrow and strongly dentate as in *C. serratissimalis*.

Male genitalia with uncus and tegumen shorter than in *C. serratissimalis*, sclerotized element of clasper shorter, thicker and more strongly curved, extending less than halfway across the valve and without the secondary spines on the inner curvature found in *C. serratissimalis*.

Early stages unknown.

Moderately common from Quebec to Missouri and northern Florida. Moth in June and July in Quebec, in May and August in Ohio and Pennsylvania, in March, April and June and probably other months in Florida.

GENUS
*Ostrinia* Hübner

*Ostrinia* Hübner, [1825], *Verzeichniss Bekannter Schmettlinge* [sic], 360.
Type-species: *Pyralis palustralis* Hübner, 1796. Monotypy.

*Micractis* Warren, 1892, *Ann. Mag. Nat. Hist.*, (6) **9**: 294.
Type-species: *Pyralis nubilalis* Hübner, 1796. Original designation.

*Eupolemarcha* Meyrick, 1937, *Exotic Microlepidoptera*, **5**: 108.
Type-species: *Eupolemarcha incensa* Meyrick, 1937, now considered a synonym of *Ostrinia erythrialis* (Hampson), 1913. Monotypy.

*Zeaphagus* Agenjo, 1952, *Faunula Lepidopterologica Almeriense*, 149.
Type-species: *Pyralis nubilalis* Hübner, 1796. Monotypy and original designation.

Moths variable in appearance and undistinguished in external characters. Frons rounded or somewhat flattened; labial palpus porrect, in our species exceeding frons by about length of head, smoothly scaled, with third segment hidden in scaling of second. Maxillary palpus fairly large, with compressed scaling. Some species with

mid-femur of male enlarged and with a groove containing a hair-pencil. Wing-venation without unusual features.

Male genitalia with uncus variable in shape, being simple and subtriangular, bifid or trifid in different species. Tegumen long and wide. Juxta either trifid or composed of an anterior and posterior layer, each bifid. Valve short and fairly wide; sacculus distinct and in most species with prominent spines along dorsal edge, these replaced by normal setae in *O. penitalis*. Clasper very characteristic, directed dorsad, short, wide, dorsally truncate, and bearing a considerable number of short strong spines or scales; confined to the dorsal part or extending over most of the surface. Penis short and cylindrical, tapering and weakly divided distally; vesica generally with a single stout, blunt, somewhat twisted cornutus and a number of fine, often very minute spines. Female genitalia with ovipositor lobes high and setose; apophyses short but fairly strong; anteroventral angles of eighth tergite thickened and wrinkled in some species, though not obviously so in ours; such species with anterior apophyses of normal length, not short and very wide as in *Munroeodes*. Ductus bursae long, slender and moderately coiled, with complex sclerotization at ostial end, the details characteristic of the species, and with a sclerotized collar distad of ostial sclerotization. Bursa globular, with a large, quadrate, spinulose signum, and with a globular, membranous accessory sac.

The life-histories of three of our four species are known. The larvae are borers in the stems and heads of a considerable variety of plants. One, the European corn borer, is one of the major agricultural pests of North America. Comparative descriptions of the early stages of this and two related species will be found in Heinrich (1919). Additional species are pests in temperate and tropical Asia.

Mutuura and I (Mutuura and Munroe, 1970) have recently revised this genus. We recognized 20 species, of which three occur naturally in North America and a fourth has been introduced to this continent. Biological studies may show that more should be separated. The largest number of species occur in temperate Asia, but the most primitive species is American.

## KEY TO NORTH AMERICAN SPECIES

1. Wings grayish fuscous, with light-gray powdering; postmedial line of forewing light gray, bordered basally by a blackish-fuscous line; these lines not dentate or only imperceptibly so ..... *marginalis* p. 25

— Wings buff or brown, in males of *O. nubilalis* extensively suffused with dark brown, but never grayish fuscous; both light and dark elements of postmedial line, if recognizable, strongly dentate ..... 2

2. Males ..... 3

— Females ..... 5

3. Costal margin of forewing straight to three-fourths from base; forewing above broadly suffused with brownish or somewhat olivaceous fuscous, a small patch between the reniform and orbicular spots and an outwardly dentate band immediately distad of the postmedial line pale yellowish; postmedial line broadly and shallowly retracted at $Cu_2$ but without a conspicuous dentation basad on that vein; hindwing above fuscous with yellowish postmedial patch and partly yellowish fringe; uncus shallowly trifid ..... *nubilalis* p. 26

— Costal margin of forewing arched from middle to apex and often throughout; forewing above varying from dull orange to pale straw color, at most with patchy fuscous suffusion; postmedial line not broadly and shallowly retracted at $Cu_2$, but with an acute dentation basad on that vein; hindwing above often pale, but sometimes fuscous with a yellowish postmedial patch; uncus simple, subtriangular, narrowly rounded at the tip ..... 4

4. Forewing narrow, costa nearly straight in basal half, curved in distal half; ground color of forewing above different from that of hindwing, the former varying from orange brown to somewhat pinkish buff, the latter pale straw color, orange yellow or infuscated; in genitalia juxta trifid and sacculus unarmed ..... *penitalis* p. 24

— Forewing broad, costa curved in basal half; ground color of hindwing above almost the same as that of forewing, pale straw color with grayish-fuscous suffusion or variegation, hindwing frequently a little paler than forewing; in genitalia juxta with two superimposed bifid layers and sacculus

with one or more strong, oblique, dorsal spines ..... *obumbratalis* p. 25

5. Postmedial line of forewing above with a broad shallow retraction at $Cu_2$ and right-angled or obtusely angled on that vein; in the genitalia the sclerite on each side of the ostium with anterior and posterior margins nearly parallel in their ventral parts and with the ventral margin weakly notched; this pair of sclerites not broadly joined anterior to the ostium..... *nubilalis* p. 26

— Postmedial line of forewing above without a broad shallow retraction at $Cu_2$ but with an acute dentation basad on that vein; in the genitalia the pair of sclerites flanking the ostium either broadly joined anteriorly or with anterior and posterior margins strongly converging throughout.....6

6. Forewing narrow, termen usually less than half as long as costa; ground color of forewing above orange brown to pinkish buff, darker than the yellowish-buff or pale-buff hindwing; in the genitalia the sclerite on each side of the ostium triangular, with oblique anterior margin strongly converging distad with the posterior margin, the ventral margin weakly sinuous, the two sclerites not broadly joined anteriorly ..... *penitalis* this page

— Forewing broad, termen usually at least half as long as costa; forewing and hindwing above with similar, pale straw-colored ground, the hindwing often a little paler than the forewing; the wings often with considerable grayish-fuscous suffusion and variegation; in the genitalia the sclerites flanking the ostium hooked and broadly fused anterior to the ostium..... *obumbratalis* p. 25

### *Ostrinia penitalis* (Grote)

PL. I, FIGS. 23–28; PL. B, FIG. 3; PL. M, FIG. 1 (McD. 5594).

*Botys penitalis* Grote, 1876, *Can. Ent.*, **8**: 98.
Type-locality: Lawrence, Kansas. [BMNH]
NOTE—The locality cited is that of the lectotype, designated by Mutuura and Munroe, 1970, *Memoirs Ent. Soc. Canada*, **71**: 10.

*Botis nelumbialis* Smith, 1890, *Ent. Americana*, **6**: 89.
Type-locality: Bordentown, New Jersey. [USNM]
NOTE—The locality cited is that of the lectotype, designated by Mutuura and Munroe, 1970, *Memoirs Ent. Soc. Canada*, **71**: 10.

*Pyrausta rubrifusa* Hampson, 1913, *Ann. Mag. Nat. Hist.*, (8) **12**: 29. Subsp.
Type-locality: Jamaica. [BMNH]
NOTE—Mutuura and Munroe, 1970, *Memoirs Ent. Soc. Canada*, **71**: 11, wrongly cited a holotype for this nominal species. Michael Shaffer has pointed out to me that there are actually two syntypes. I hereby designate as lectotype a female in the BMNH with labels as follows: "LECTOTYPE" [round purple-bordered label]; "Type" [round red-bordered label]; "Jamaica/ W. J. Kaye./1911–340."; "Pyralidae/Brit. Mus./ Slide No./8952"; "Pyrausta/rubrifusa/type ♀. Hmpsn" [in Hampson's hand]. The paralectotype, a female of the same species, has labels: "Jamaica/W. J. Kaye/ 1901.189"; "Pyralidae/ Brit. Mus./Slide No./14942"; "PARALECTOTYPE" [round, pale-blue-bordered label] and M. Shaffer's determination label.

*Tholeria pyraustalis* Dyar, 1925, *Ins. Insc. Mens.*, **13**: 8.
Type-locality: Altamont, Florida. [USNM]

*Ostrinia penitalis brasiliensis* Mutuura and Munroe, 1970, *Memoirs Ent. Soc. Canada*, **71**: 12, figs. 341–343. Subsp.
Type-locality: Fonte Boa, Amazonas, Brazil. [BMNH]

Diagnostic characters as given in the key. In general the moth narrow-winged, weakly marked, orange brown or pinkish buff, with paler or fuscous hindwing.

Though the adults resemble those of *O. obumbratalis* in external appearance, most specimens can be distinguished without difficulty. The genitalia are very different in the two species, and dissection is recommended if positive identification is desired.

Early stages described by Smith (1890) and Heinrich (1919). Larva boring in buds, fruits and stems of various waterlilies, family Nymphaeaceae. Head larger than in *O. nubilalis* or *O. obumbratalis* and with groups of small, distinct, dark dots rather than blotches or masses of dark brown. Ocellar puncture posterodorsal to ocellus VI, not directly posterior to it as in *O. nubilalis* and *O. obumbratalis*. Mandible heavier than in those species and oblong, not square; its median edge straight or very slightly concave, not outwardly angulated; its distal tooth concave. Pupa with a slightly produced front, more uneven than in *O.*

*nubilalis*, but not with a decided knob as in *O. obumbratalis*; dorsal abdominal spines nearly obsolete; abdominal spiracles large and broadly oval; cremaster wider than long.

Only the nominate subspecies occurs in North America. It ranges from southern Quebec to southern British Columbia and south to southern Florida, including the Dry Tortugas, and Brownsville, Texas. The Brownsville specimens are very orange and can be considered transitional to *O. p. rubrifusa* (Hampson).

This species might be confused with *Saucrobotys futilalis*; the differences are pointed out in the discussion of that species (p. 13).

*Ostrinia obumbratalis* (Lederer) (Smartweed Borer*; Pyrale de la Persicaire, f., Fr.)
PL. 1, FIGS. 29–32; PL. B, FIG. 4; PL. M, FIG. 2 (McD. 5464, in part, 5595, 5596).

*Botys obumbratalis* Lederer, 1863, *Wiener Ent. Monat.*, **7**: 372, 467, pl. 9, fig. 17.
Type-locality: North America. [BMNH]
NOTE—The locality is that of the lectotype male, designated by me (Munroe, 1958, *Can. Ent.*, **90**: 512).

*Botys obliteralis* Walker, [1866], *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **34**: 1392.
Type-locality: North America. [BMNH]

*Pyrausta ainsliei* Heinrich, 1919, *Jour. Agric. Research*, **18**: 175, pl. 7, fig. C, pl. 8, figs. E, F, pl. 9, fig. A, pl. 10, fig. G.
Type-locality: Knoxville, Tennessee. [USNM]

Moth generally rather small, broad-winged, with costa of forewing curved throughout; ground color pale buff; transverse lines in well-marked specimens fuscous and conspicuously and acutely dentate. Distinctive characters of the genitalia as given in the key.

Early stages characterized by Heinrich (1919). Larva closely similar in structure and habits to that of *O. nubilalis*, boring in smartweeds, *Polygonum* species, ragweeds, *Ambrosia* species, cocklebur, *Xanthium* species, bonesets, *Eupatorium* species, maize, *Zea mays* L., and a variety of other plants.

The species is a minor pest of maize and is often found associated with *O. nubilalis*. The early stages are distinguishable only with difficulty from those of *O. nubilalis*. In the larva the only reliable difference is in the anterior epicranial setae of the head. In *O. obumbratalis* seta $A^2$ is no closer to $A^1$ than to $A^3$; these three setae form almost a right angle and the puncture $A^a$ is posterodorsal to $A^2$, forming an obtuse angle with $A^2$ and $A^1$. In *O. nubilalis*, on the other hand, seta $A^2$ is approximated to $A^1$, and puncture $A^a$ is in nearly a straight line with setae $A^2$ and $A^1$ or is posteroventral to $A^2$.

New Brunswick and Manitoba south to Florida and Louisiana. Moth in June in the North, but with more extended flight season southward.

*Ostrinia marginalis* (Walker)
PL. 2, FIGS. 28, 31 (McD. 5645).

*Scopula marginalis* Walker, [1866], *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **34**: 1459.
Type-locality: St. Martin's Falls, Albany R., [Ontario]. [BMNH]

*Botis stenopteralis* Grote, 1878, *Can. Ent.*, **10**: 26.
Type-locality: Maine. [BMNH]
NOTE—Grote did not say how many specimens he had, but Michael Shaffer has pointed out to me that the BMNH has two specimens with Grote's red-bordered type labels, which must be considered syntypes. Mutuura and Munroe's citation of a holotype in 1970, *Memoirs Ent. Soc. Canada*, **71**: 19, was therefore wrong. I hereby designate as lectotype a female in the BMNH, with labels as follows: "LECTOTYPE" [round purple-bordered label]; "19/5/77" and on the reverse "sin" [apparently an irrelevant fragment]; a square orange label "33"; "Botis ♀ Type/stenopteralis Grote" [red-bordered label in Grote's hand], and on the reverse "82.54". The other Grote "type" becomes a paralectotype and has been so labelled.

In spite of its very different appearance this small moth is very closely related to *O. obumbratalis*. The short wings, robust body, dark color and reduced eyes are adaptations to a day-flying habit. The moths frequent boggy and marshy places, where they fly rapidly close to the ground, often in bright sunlight. The closest relative of the present species is *O. peregrinalis* (Eversmann) from Siberia, which is almost exactly similar in outward appearance, but which has strong differences in the genitalia.

The life-history of *O. marginalis* is unknown, but the larva should be looked for on species of *Rumex* and *Polygonum* growing in wet places.

The species will not be confused with any other *Ostrinia* in our territory, but it resembles some species of *Loxostege*, such as *L. ephippialis*. From these it can be distinguished by having the postmedial line of the hindwing straight across the

middle part of the wing, not curved more or less parallel to the termen, as in *Loxostege* species.

A northerly species, ranging from Maine to northern Newfoundland and west and north to Alberta, to Great Slave Lake and to Dawson, Yukon Territory.

*Ostrinia nubilalis* (Hübner) (European Corn Borer*; Pyrale du Maïs, f., Fr.)

PL. I, FIGS. 33–36; PL. B, FIG. 5; PL. M, FIG. 3.

NOTE—This species was accidentally omitted by McDunnough from his *Check List.*

*Pyralis nubilalis* Hübner, 1796, *Sammlung Europäischer Schmetterlinge, Sechste Horde, Die Zünsler,* pl. 14, fig. 94.
Type-locality: Europe.

*Pyralis silacealis* Hübner, 1796, *Ibid.*, pl. 18, fig. 116.
Type-locality: Europe.

*Ostrinia nubilalis mauretanica* Mutuura and Munroe, 1970, *Memoirs Ent. Soc. Canada,* **71**: 40. Subsp.
Type-locality: Sebdou, Prov. Oran, Algeria. [BMNH]

*Ostrinia nubilalis persica* Mutuura and Munroe, 1970, *Memoirs Ent. Soc. Canada,* **71**: 41. Subsp.
Type-locality: Astrabad, north Iran. [BMNH]

An abundant and economically important species, resembling *O. penitalis* and *O. obumbratalis* in general appearance, but distinguishable in the male by the dark-brown suffusion of the wings and by their triangular cut, and in both sexes by the shape of the postmedial line, as indicated in the key. Genitalia of both male and female distinctive, in the male by the trifurcate uncus, not found in other American species of the genus, and in the female by the parallel anterior and posterior margins of the sclerites flanking the ostium.

The larvae are often found in ears of corn (maize), as are the caterpillars of the corn earworm, *Helicoverpa zea* (Boddie), but the latter have the crochets of the prolegs in a single transverse band instead of in a broken triordinal ellipse, and differ in many additional characters. However, the European corn borer does more damage by boring in stalks and by cutting leaves at the bases. Not only is the actual productivity of the plants reduced but also harvesting problems are caused by the breaking of weakened stalks and dropping of ears. In addition to maize, a wide variety of other plants serve as food, though Asian and perhaps some European records refer to other species of *Ostrinia.* The early stages can easily be confused with those of the less abundant *O. obumbratalis.* The differential characters have already been described under that species (p. 25). The species overwinters only as a full-grown larva. The number of generations is under genetic control, with an allele for single-broodedness recessive in the material studied. As would be expected, single-brooded strains are in general more prevalent in the North and multiple-brooded ones in the South, but in any one area the proportion fluctuates from year to year.

The natural range of the species is Europe, western Asia and North Africa, though close relatives which have been confused with *O. nubilalis* occur throughout temperate and tropical Asia and as far east as Guam and Australia. The first definite report of the species from North America was published by Vinal (1917). It is believed to have been imported to Massachusetts between 1909 and 1914 in broom corn from Hungary or Italy, but there is some evidence for multiple introductions in the eastern United States and Canada. Its present range extends from Newfoundland to the Rocky Mountains and from Canada to Georgia and Mississippi. There have been up to 1973 only importation records for Florida (in Mead, personal communication).

An excellent summary of our knowledge of the species up to 1962 is given by Brindley and Dicke (1963). More recent information is reviewed by Brindley et al. (1975). Recent studies of female sex pheromones by Roelofs, Cardé and associates (personal communication) suggest that more than one biological species may be present in North America and that further subdivision of *O. nubilalis* may be necessary.

GENUS

*Fumibotys* Munroe, NEW GENUS

Gender: feminine.
Type-species: *Ebulea fumalis* Guenée, 1854.

DIAGNOSIS: External characters much as in *Ostrinia* but male antenna laminate and long-ciliate, not simply thickened. Forewing wider than in *Ostrinia,* costa strongly arched at base and discal cell relatively a little longer. Hindwing with apex of the cell more acute and veins $M_2$ and $M_3$ more strongly approximated than in *Ostrinia.*

Both male and female genitalia strikingly modified. Male with uncus hood-shaped, subtriangular in outline and dorsally naked. Valve

with a strong antler-shaped costal sclerotization, its distal part trifurcate and extending beyond body of the valve; the clasper somewhat as in *Ostrinia* but armed with serrate ventral flanges; sacculus very wide and dorsally spinulose. Female with the eighth abdominal sternite large, forming a wide sclerotized band behind the ostium and bearing a large pouchlike structure on each side. Anterior apophyses long, thick and bent, passing dorsad of the pouches.

DESCRIPTION: Frons rounded and smoothly scaled. Vertex short. Labial palpus porrect, exceeding frons by a little less than length of head; third segment hidden in scaling of second. Maxillary palpus long and obliquely porrect, reaching end of second segment of labial palpus, compressed, with slightly dilated distal scaling. Proboscis well developed, scaled at base. Eye large. Ocellus present. Antenna of male thickened and weakly laminate, with dense ciliations about as long as diameter of shaft; antenna of female more slender, less strongly ciliated. Body fairly robust. Praecinctorium weakly bilobed. Legs fairly thick; mid-femur of male with ventral groove and hair-pencil.

Forewing short and wide; costa arched at the base, straight in middle and near the blunt apex; termen straight anteriorly, curved posteriorly to the obtuse tornus; posterior margin somewhat convex near base. Subcostal area wide; discal cell rather narrow and about three-fifths as long as wing. $R_1$ from considerably basad of anterior angle of the cell. $R_2$ from anterior angle, basally approximated to $R_{3+4}$. $R_3$ and $R_4$ stalked more than halfway from cell to apex. $R_5$ from anterior angle of cell, not basally approximated to $R_{3+4}$. Discocellular straight. $M_1$ from well behind anterior angle of cell. $M_2$ and $M_3$ from posterior angle of cell, basally weakly curved and approximated. $Cu_1$ from basad of posterior angle; $Cu_2$ from still farther basad. Anal loop large and complete. Frenulum hook present in male.

Hindwing of moderate width; apex very sharp; termen rounded, with slightly accentuated curvature in the median area. $Sc+R_1$ and $R_s$ anastomosed for some distance. $R_s$ and $M_1$ stalked. Cell less than half as long as wing. Discocellular acutely angled basad in middle, with posterior angle extending only a little farther distad than anterior angle. $M_2$ and $M_3$ from posterior angle of the cell, basally somewhat curved and approximated. $Cu_1$ from a little basad of posterior angle, not basally curved or approximated to $M_3$. $Cu_2$ from cell at about two-thirds from base. Three anals present.

Male genitalia with uncus hood-shaped, subtriangular, not setose or spined dorsally. Tegumen fairly short. Transtilla composed of two wide, almost semicircular lobes, meeting but not fused in midline. Anal tube supported by a straplike subscaphium. Juxta of moderate size, subquadrate, with rounded corners. Vinculum strongly sclerotized, with narrow straight sides converging ventrad and with the ventral part wide, rounded and medially keeled. Valve fairly short, basal half wide, distal half tapering to a narrowly rounded tip; costa with a strong antler-shaped sclerotization, ending in a prominent, free, distal bifurcation, the dorsal branch with a short secondary bifurcation, the ventral branch simple and sharply pointed; sacculus very wide and strongly sclerotized, its dorsal edge armed with a row of spinules; clasper large and strongly sclerotized, its dorsal part curved basad, narrowing to a blunt tip, its dorsal surface with a dense crest of erect scales, and its ventrodistal end extending beyond the ventrodistal edge of the valve, wide and emarginated, with acute corners, serrate ventral and distal edges, and an oblique flange running from the ventral point to the middle of the dorsal margin and there bearing a rounded crest. Penis short, cylindrical and weakly curved; aedoeagus weakly divided distally, bearing some fine spines.

Female genitalia with ovipositor lobes rather narrow and weak, sparsely setose. Posterior apophysis with shaft slender and straight but not very long. Eighth tergite rectangular and of normal size. Eighth sternite enlarged and developed into a pair of lateral pouches. Anterior apophysis thickened, curved and closely apposed to the pouches dorsally. Ostium narrow; ductus bursae long and coiled, membranous, but with a sclerotized funnel-shaped collar near the ostial end. Bursa globular, membranous, with a rhomboidal, spinulose, carinate signum and a membranous accessory sac.

Larva on peppermint, *Mentha piperita* L., feeding on the leaves for a few days after hatching, then boring in the rhizomes (Berry, in press).

The only known species is North American.

The genus is probably as closely related to *Ostrinia* as to any other, but the modified valve and clasper of the male and eighth sternite of the female distinguish it immediately. The pouches of

the female eighth sternite perhaps receive the processes of the male valve in copulation, but this has not been confirmed by direct observation.

*Fumibotys fumalis* (Guenée), NEW COMBINATION

PL. 1, FIGS. 37–41; PL. B, FIG. 2; PL. P, FIG. 9 (McD. 5598).

*Ebulea fumalis* Guenée, 1854, *Species Général des Lépidoptères*, **8**: 358.
Type-locality: Georgia. [USNM]

*Scopula orasusalis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **18**: 784. NEW COMBINATION with *Fumibotys*.
Type-locality: Nova Scotia. [BMNH]

*Botis badipennis* Grote, 1873, *Bull. Buffalo Soc. Nat. Sci.*, **1**: 88. NEW COMBINATION with *Fumibotys*.
Type-locality: Maine. [BMNH]
NOTE—The type-locality cited is presumed to be that of the lectotype female, hereby designated, the only Grote specimen in the BMNH; it has labels as follows: "292"; "Botis Type/ badipennis Grote" [red-bordered label in Grote's hand]; "Botis/badipennis/Grote" [blue-bordered label in Grote's hand], and on the reverse "81.116"; "Type" [round red-bordered label]; and "LECTOTYPE" [round purple-bordered label]. There was also material from the White Mountains, New Hampshire, in the collection of A. S. Packard, Jr. If this material is still in existence it will be paralectotypical.

Moth medium-sized, foxy brown to smoky brown, unlike any other. Genital characters as given in the generic description.

Larva in rhizomes of peppermint and perhaps other mints, overwintering as prepupa in the ground, causing economic injury in Oregon.

Fairly common over a wide range from Nova Scotia to British Columbia and Washington and south to Florida, eastern Texas and Utah. Moth from June to September in the North, season lengthened in the South.

GENUS
*Perispasta* Zeller

*Perispasta* Zeller, 1875, *Verh. K.-K. Zool.-Bot. Ges. Wien*, **25**: 333.
Type-species: *Perispasta caeculalis* Zeller, 1875. Monotypy.

Easily distinguished by the combination of small size, very wide forewings with strongly arched costa and falcate apex, and blackish-fuscous color. Male with large, contrastingly pale fovea on forewing. Female something like *Pyrausta demantrialis*, but with much wider forewing and strongly curved costa.

Male genitalia with uncus subtriangular but divided into two sharp points at tip. Tegumen fairly long and laterally setose. Juxta oblong. Valve fairly narrow, rounded at tip, with tubular costa and basally inflated sacculus, the latter bearing a low, setose prominence dorsally; clasper composed of a basal subcostal knob with about ten dorsally directed erect scales and a ventrally directed spinose process extending past ventral margin of sacculus. Penis short and cylindrical, tapering somewhat distally; aedoeagus unequally divided longitudinally for about one-third of its length, the more slender part armed with two or more spines. Female genitalia with ovipositor lobes narrow and rather short-setose. Apophyses slender, short and irregularly curved. Ostial chamber funnel-shaped and sclerotized, its dorsal wall finely wrinkled; the chamber containing a valvelike structure; rest of ductus bursae rather short, tubular and membranous. Bursa round, membranous and finely spinulose, with a rather small rhomboidal signum and a membranous accessory sac.

Early stages unknown.

The only known species is North American.

*Perispasta caeculalis* Zeller

PL. 5, FIGS. 39, 40; PL. B, FIG. 6; PL. M, FIG. 4 (McD. 5545).

*Perispasta caeculalis* Zeller, 1875, *Verh. K.-K. Zool.-Bot. Ges. Wien*, **25**: 333, pl. 10, figs. 46 a, b.
Type-locality: Texas.

*Perispasta immixtalis* Grote, 1881, *Can. Ent.*, **13**: 232.
Type-locality: New York. [BMNH]

The figures should distinguish this from any other species. Differential characters are given in the generic description, above. The life history is unknown.

Not uncommon in North America from southern Quebec to the Fraser Valley of British Columbia and south to Manatee County, Florida, to Texas and to Colorado. Moth in June and August.

GENUS

*Eurrhypara* Hübner

*Eurrhypara* Hübner, [1825], *Verzeichniss Bekannter Schmettlinge* [sic], 360.
Type-species: *Phalaena Geometra urticata* Linnaeus, 1761, now considered a synonym of *Eurrhypara hortulata* (Linnaeus) 1758. Monotypy.

Moth slender in build, easily recognized by the contrasting pattern of dark spots and bands on a white ground, with extensive orange-yellow scaling on body and at base of forewing. Labial palpus rather short, with second segment oblique, third exposed and porrect, exceeding the high, rounded frons by only a short distance. Maxillary palpus short and inconspicuous. Proboscis strongly developed. Antenna somewhat thickened in male, filiform in female. Eye large. Ocellus well developed. Legs slender; mid-femur of male with a short groove on underside near the apex.

Forewing with discal cell less than half as long as wing; discocellular strongly angled basad in middle. $R_2$ stalked with $R_{3+4}$. $M_2$, $M_3$ and $Cu_1$ arising close together at posterior angle of cell, their basal parts curved and approximated. Hindwing with $Sc+R_1$ and $R_s$ anastomosed for a considerable distance. $R_s$ and $M_1$ stalked. Cell only about one-third length of wing; posterior angle acute, $M_2$, $M_3$ and $Cu_1$ arising together from it, their basal parts curved and approximated.

Male genitalia with uncus broadly triangular, sparsely setose dorsally. Transtilla complete. Juxta of a characteristic shield shape or anchor shape, with a dorsal point and strong longitudinal median and transverse ventral keels. Valve fairly long, with tip broadly rounded, costa narrowly inflated, sacculus more broadly so; clasper complex, with a basally directed padlike process, bearing a few erect dorsal scales, a median, ventrally directed, spinulose process, and beyond this an oblique ridge, ending in a sharp spine extending ventrad past margin of valve. Penis with aedoeagus deeply and unequally cleft, edges of both distal sections smooth; vesica with a bundle of deciduous cornuti.

Female genitalia with ovipositor and apophyses weak but normal. Ostial chamber narrow; ductus bursae long, spiralled and membranous, with a spiral spinulose sclerite in its distal part. Bursa globular and membranous, with a small rhomboidal signum and a membranous accessory sac.

Larva a leaf-tier on nettles, mints and other low plants.

This genus has only a few species, all of which are native to Europe or temperate east Asia. The specialized pattern appears to be developed in mimetic association with the geometrid moths of the genus *Abraxas*, which do not occur in North America. The closely related genus *Proteurrhypara* Munroe and Mutuura has a normal pyraustine pattern and color. Our single species is an introduction from Europe. It has done well in North America in spite of the absence of its presumed model.

*Eurrhypara hortulata* (Linnaeus)

PL. I, FIGS. 72, 73; PL. B, FIG. 7; PL. M, FIG. 5 (McD. 5724).

*Phalaena Geometra hortulata* Linnaeus, 1758, *Systema Naturae*, Ed. X, 529.
Type-locality: Sweden.

NOTE—Linnaeus gave no type-locality but cited nine references, of which the first is "*Fn. suec.* 846". Although no lectotype has been selected, I consider it reasonable to restrict the type-locality to Sweden and I hereby do so.

*Phalaena Geometra urticata* Linnaeus, 1761, *Fauna Suecica*, 340.
Type-locality: Sweden.

*Pyralis urticalis* [Denis and Schiffermüller], 1775, *Ankündung eines Systematischen Werkes von den Schmetterlingen der Wienergegend* [etc.], 121.
Type-locality: Sweden.

NOTE—This name is an unnecessary emendation of *Phalaena urticata* Linnaeus, and is consequently a junior objective synonym of that name, with the same type-specimen and type-locality.

This species can hardly be confused with anything else in our fauna, though there are Asian species of similar appearance. The genital characters are given in the generic description.

Moth flying at night, attracted to light, but also easily flushed in the daytime. Larva rolling leaves or spinning them together; whitish, becoming flesh-colored when full-grown, with a dull-green, white-edged dorsal line; head and prothoracic shield black. European food-plants including nettle, *Urtica dioica* L., white horehound, *Marrubium vulgare* L., woundwort, *Stachys* species, mint, *Mentha* species, greater bindweed, *Calystegia sepium* (L.) Br., currant, *Ribes* species, and other plants. Cocoon spun in a sheltered place in autumn,

hibernation as a prepupal larva, pupation in the spring.

The species ranges from Ireland to the Amur-Ussuri region and Manchuria. It is represented by related species in China but there is no species of the genus in Japan. It was introduced into Nova Scotia by 1907 and now has a wide range in the Northeast, extending from Newfoundland to Ontario and southward. It flies mainly in July.

GENUS

## *Phlyctaenia* Hübner

*Phlyctaenia* Hübner, [1825], *Verzeichniss Bekannter Schmettlinge* [sic], 359.
Type-species: *Pyralis sambucalis* [Denis and Schiffermüller], 1775, now considered a synonym of *Phlyctaenia coronata* [Hufnagel], 1767. Designated by Warren, 1892, *Ann. Mag. Nat. Hist.*, (6) **9**: 431.

General structure as in *Eurrhypara*, but frons somewhat more prominent, discal cell more than half as long as wing in both forewing and hindwing, and $R_2$ of forewing free, not stalked with $R_{3+4}$. Male genitalia with uncus subtriangular, narrowly rounded at tip and sparsely setose dorsally. Transtilla incomplete medially. Juxta lunular. Vinculum ventrally rounded. Valve of moderate width, tapering somewhat in distal half; costa narrowly inflated; sacculus inflated and variously spinulose dorsally; clasper a basally directed pad with a crest of dorsally directed scales, and with a more or less well-developed, spinulose, ventrobasally directed process from its ventrodistal angle. Aedoeagus deeply divided, with the larger division notched, serrate or deeply excavated. Female genitalia with ovipositor lobes weakly developed and short-setose. Apophyses short and weak. Ostial chamber wide and sclerotized, tapering into a narrower tube; rest of ductus long, slender and coiled, with a spinulose, spiral, ribbonlike sclerite in the distal part. Bursa globular and membranous, with a rhomboidal or cruciform signum and a globular membranous accessory sac.

Known larvae leaf-webbers or shoot borers on deciduous shrubs and low plants.

The genus contains a small number of species and is holarctic in distribution.

For the present I recognize three species in our territory, but *P. coronata* is variable in external appearance and in genital structure, and further work may show that more than one species have been included under this name.

## KEY TO NORTH AMERICAN SPECIES

1. Ground color of upperside of wings straw yellow; antemedial line of upperside of forewing as distinct as postmedial.... *leuschneri* p. 31

— Ground color of upperside of wings pale buff, more or less powdered or suffused with fuscous; antemedial line of upperside of forewing less distinct than postmedial line, often almost lost in fuscous suffusion.....2

2. Fuscous dusting of upperside of wings heavy in some areas, giving a variegated appearance; costal part of postmedial line of upperside of forewing not denticulate or much less so than median part of the same line..... *coronata* this page

— Fuscous dusting of upperside of wings weak, general appearance uniformly pale; postmedial line of upperside of forewing denticulate throughout..... *quebecensis* p. 31

### *Phlyctaenia coronata* (Hufnagel)

PL. 2, FIGS. 15–27; PL. B, FIG. 8; PL. M, FIG. 6 (McD. 5564).

*Phalaena coronata* Hufnagel, 1767, *Berlinisches Mag.*, **4**: 616.
Type-locality: Berlin. [Type lost]

*Pyralis sambucalis* [Denis and Schiffermüller], 1775, *Ankündung eines Systematischen Werkes von den Schmetterlingen der Wienergegend* [etc.], 122.
Type-locality: Vicinity of Vienna, Austria. [Type lost]

*Ebulea tertialis* Guenée, 1854, *Species Général des Lépidoptères*, **8**: 364. Subsp.
Type-locality: North America. [USNM]
NOTE—This nominal species was described from two female syntypes in Guenée's collection. I hereby designate as lectotype a female in the USNM, bearing the label "Tertialis Gn. Am. bor."

*Botys plectilis* Grote and Robinson, 1867, *Trans. Amer. Ent. Soc.*, **1**: 27, pl. 2, fig. 17. Syn. of subsp.
Type-locality: Pennsylvania. [AMNH]

*Botys syringicola* Packard, 1870, *Rept. Massachusetts Board Agric.*, 1870: 250. Syn. of subsp.
Type-locality: New York.

Easily distinguished in our fauna by the pattern of pale areas on an infuscated ground, though resembling in maculation several Old World species of this and related genera. Male genitalia without thumblike process near base of sacculus and with ventral process of clasper nearly as long as scaled part. Female genitalia with fairly well-developed pouchlike structures at sides of ostial chamber.

Larvae leaf-webbers or shoot borers on a considerable variety of shrubs and low plants, but especially on elder, *Sambucus* species.

This species or complex ranges from Britain through Europe and Asia to Japan and from coast to coast in North America. For the present I follow the classification proposed in my 1954 paper, placing the North American forms under a single subspecific name, but eventually more than one species or subspecies may have to be recognized.

*Phlyctaenia coronata tertialis* (Guenée)
PL. 2, FIGS. 15–27; PL. B, FIG. 8; PL. M, FIG. 6 (McD. 5564).

*Ebulea tertialis* Guenée, 1854, *Species Général des Lépidoptères*, **8**: 364.
Type-locality: North America. [USNM]

*Botys plectilis* Grote and Robinson, 1867, *Trans. Amer. Ent. Soc.*, **1**: 27, pl. 2, fig. 17.
Type-locality: Pennsylvania. [AMNH]

*Botys syringicola* Packard, 1870, *Rept. Massachusetts Board Agric.*, 1870: 250.
Type-locality: New York.

The American subspecies, although variable, consistently has paler fuscous areas and less strongly contrasting pale patches than its European counterpart. There are variations in genitalia, but the significance of these has not been fully analyzed.

The subspecies ranges from Newfoundland to British Columbia, northward to Bradore Bay, Quebec, Moose Factory, Ontario, and Fort Smith, Northwest Territories, and south to Mississippi, Louisiana, and southern Florida. In the North it flies from June to August; in the South its season is more extended.

*Phlyctaenia quebecensis* Munroe
PL. 2, FIGS, 13, 14; PL. C, FIG. 1; PL. M, FIG. 7.

*Phlyctaenia quebecensis* Munroe, 1954, *Can. Ent.*, **86**: 428, figs. 1–4.
Type-locality: Lac Mondor, near Ste. Flore, Quebec. [CNC]

Like *P. coronata tertialis*, but without the fuscous shading of that species, and with wings paler and more thinly scaled. Male genitalia with only a very short process on ventral surface of the clasper, but with a fingerlike dorsal process from basal part of sacculus. Female ostial chamber with slight lateral expansions, not pouchlike ones as in *P. coronata*.

The closest relative appears to be the palearctic *Phlyctaenia perlucidalis* (Hübner), discussed in some detail by Mere and Bradley (1957) under the name *Pyrausta perlucidalis*. Though very similar in pattern, *P. perlucidalis* differs in significant characters of the male genitalia.

The species might be mistaken for *Nealgedonia extricalis*, and especially its pale northern subspecies, but *N. extricalis* has a diffuse dark shade in place of the dentate subterminal band of *P. quebecensis*.

Early stages unknown; larva of *P. perlucidalis* reported by Lhomme (1935: 136) from cabbage thistle, *Cirsium oleraceum* (L.) Scop., in France, feeding on underside of leaf along a vein without silken threads.

Much less common than *P. coronata*, but with a moderately wide range, from Nova Scotia and Maine to the vicinity of Ottawa, Ontario, and south to Mountain Lake, Virginia.

*Phlyctaenia leuschneri* Munroe, NEW SPECIES
PL. 1, FIG. 46; PL. 2, FIG. 1; PL. C, FIG. 2.

*Phlyctaenia leuschneri* Munroe.
Type-locality: 15 mi W of Cocoa, Orange Co., Florida. [CNC]

DIAGNOSIS: Wings straw yellow, not pale buff as in other North American species, and without appreciable fuscous dusting. Transverse lines narrow and distinct; antemedial line of forewing as distinct as postmedial, the latter very weakly dentate. Closely similar in external appearance to the southwestern *Anania labeculalis*, but smaller, yellower and with the postmedial line of the hindwing differently shaped. Male genitalia like those of *P. quebecensis*, but with sacculus considerably deeper, especially basally, and with its dorsal flange wider and extending farther basad.

DESCRIPTION. Head, body and wings above bright shining straw yellow; legs and undersides of head, labial palpus, body and wings whitish buff. Eye and ocellus fuscous. Antenna of male with sensory surface finely and densely short-pilose,

with widely spaced rows of short and slender segmental setae.

Forewing above with costa weakly infuscated, some ferrugineous dusting on disc. Antemedial line fine, light fuscous, weakly dentate, oblique distad to anal fold, there obtusely angled and oblique basad to posterior margin. A light-fuscous dot in cell and bar on discocellular. Postmedial line fine, light fuscous, weakly dentate, excurved around cell to a shallow retraction in cell $Cu_1$, with a right-angled dentation distad on anal fold, followed by one basad on 2nd A. Fringe concolorous with wing.

Hindwing above with an oblique, diffuse, orange-fuscous antemedial band across median field of wing, obsolete anteriorly and posteriorly. Discocellular patch rather large, diffuse, and similarly colored. Postmedial line parallel to termen from costa to $M_1$, thence weakly convex distad around cell to a shallow indentation on $Cu_2$, then oblique to anal margin. Fringe concolorous with wing.

Underside with faint traces of cell and discocellular spots and postmedial lines of upperside, otherwise unmarked.

Length of forewing 8–10 mm.

Male genitalia: Uncus short, wide, subtriangular; tip rounded; dorsal surface weakly setose, especially laterally. Tegumen with sides somewhat bulbous. Subscaphium short and narrow. Transtilla with setose, triangular lateral elements, joined by a narrow, weakly sclerotized bridge. Juxta heart-shaped. Vinculum with broadly subtriangular saccus. Valve of moderate length, fairly narrow, distal fourth tapering to a rounded tip; subcostal ridge weak; sacculus wide, especially basally, and with a wide, serrate, heavily sclerotized dorsal flange running most of its length; a short, dorsally directed, fingerlike process from dorsal surface of sacculus inside flange; tip of this process with four short, rather thick setae; clasper oval, padlike, directed dorsobasad, its dorsal part with about 15 large, narrow, dorsally directed, distally deeply divided scales; ventral part with numerous basally directed setae. Aedoeagus deeply cleft; the longer process with lateral expansions, distal margin acutely pointed in middle and weakly serrate on each side of point; the shorter process truncate. Vesica finely spinulose and with a single small spinelike cornutus.

Female genitalia: ovipositor lobes well differentiated but of moderate size, densely clothed with short setae; apophyses short and slender, anterior apophysis somewhat longer than posterior. Eighth tergite short; sternite short, divided, spinulose. Ostium extending full width of sternite. Ostial chamber vase-shaped, sclerotized, mostly densely spinulose, but with a narrowly trapezoidal, more heavily sclerotized, unspined, midventral zone, narrowest posteriorly. Ductus bursae sclerotized and distorted at extreme base, then membranous; base of membranous zone unsymmetrically expanded, remainder of moderate length, a little longer than in *P. quebecensis*; a spinulose sclerotized band in ductus at distal end. Bursa globular, membranous, with fairly small, rhomboidal, spinulose signum and round membranous accessory sac.

Early stages unknown.

TYPES: Holotype: ♂. 15 mi W of Cocoa, Orange Co., Florida; 30 March 1966; R. H. Leuschner; genitalia slide EGM/GL 4410. CNC. Allotype: ♀. 25 mi W of Cocoa Beach, Brevard/Orange Co., Florida; 16 May 1967; R. H. Leuschner; genitalia slide EGM/GL 4411. CNC. Paratype: 1 ♂. Pensacola, Florida; 15 Sept. 1962; Shirley Hills; genitalia slide 4173, MS. CPK.

GENUS

*Nealgedonia* Munroe, NEW GENUS

Gender: feminine.

Type-species: *Botys extricalis* Guenée, 1854.

DIAGNOSIS: External characters and maculation much as in *Phlyctaenia*, but frons flattened and slightly prominent. Male genitalia with uncus longer and narrower; distal part of valve longer, wider and broadly rounded at tip; clasper with two ventrally directed, diverging, sclerotized processes in addition to the dorsal scaled pad; sacculus more broadly inflated than in *Phlyctaenia*, with dorsal margin simple and unarmed.

Female genitalia much as in *Phlyctaenia*, but with evenly conical, sclerotized ostial chamber, with a twisted valvelike structure at distal end; lateral pouches absent.

DESCRIPTION: Frons flat and somewhat prominent. Vertex short, with erect tufts of scales. Labial palpus porrect, exceeding frons by about length of head; third segment hidden or nearly so in scaling of the second. Maxillary palpus fairly prominent, somewhat dilated with scales distally. Proboscis well developed, basally scaled. Eye

large. Ocellus well developed. Antenna filiform, a little thickened in male, finely scaled above, densely short-pilose beneath. Body slender, abdomen somewhat exceeding anal angle of hindwing. Legs fairly slender; mid-femur of male distally grooved beneath; outer tibial spurs shorter than inner, especially in male. Praecinctorium weakly bilobed.

Forewing subtriangular; costa straight to well beyond middle, then curving to the weakly acute apex; termen weakly oblique, curving increasingly to the rounded tornus; posterior margin rounded near base. Vein $R_1$ from basad of anterior angle of cell. $R_2$ from anterior angle, basally apposed to $R_{3+4}$. $R_3$ and $R_4$ stalked a little more than halfway from base to apex. $R_5$ from a little behind anterior angle of cell, its basal part weakly curved and somewhat approximated to base of $R_{3+4}$. Discal cell about three-fifths as long as wing. Discocellular weakly curved and oblique. $M_1$ from somewhat behind $R_5$. $M_2$, $M_3$ and $Cu_1$ from posterior angle of cell; their basal parts weakly curved and approximated. $Cu_2$ from cell at about three-fourths from base. Anal loop large, strong and closed.

Hindwing of moderate width; apex rounded; termen evenly rounded. $Sc+R_1$ and $R_s$ anastomosed for a considerable distance. $R_s$ and $M_1$ stalked. Discocellular strongly incurved at middle; posterior part strongly oblique distad and posterior angle of cell acute. Cell about half as long as wing. $M_2$, $M_3$ and $Cu_1$ from posterior angle; their basal parts curved and approximated. $Cu_2$ from cell at about two-thirds from base. Three anals present.

Male genitalia with uncus rather narrowly triangular, somewhat decurved laterally and distally, and densely but finely setose above. Tegumen short. Transtilla composed of narrow, lateral, triangular elements, meeting at a point in the midline. Juxta small, dorsally bifid. Vinculum narrow, with a pair of mesally directed processes at junction with tegumen, and with a triangular saccus. Valve fairly long, parallel-sided and curved dorsad; tip broadly rounded; costa narrowly inflated; sacculus broadly so, with dorsal margin unarmed; clasper with small dorsal pad bearing numerous erect scales and with two diverging, ventrally directed, basally joined, sclerotized processes. Aedoeagus deeply divided, forming a broad, acutely pointed process and a long, narrow, straplike, curved, distally rounded one. Female genitalia with ovipositor lobes weak, membranous and finely setose. Apophyses short, slender and weak. Ostial chamber funnel-shaped, sclerotized, with a twisted valvelike structure at its opening into the long, slender, somewhat coiled, distal part of ductus; a weak, ribbonlike, spinulose sclerite near junction of ductus bursae with bursa. Bursa globular, membranous, with weakly cruciform signum and round membranous accessory sac.

Larvae leafrollers on trees of the birch and willow families, Betulaceae and Salicaceae.

The genus is nearctic, with only one known species. In pattern it resembles *Phlyctaenia*, but structurally it is closer to the palearctic *Algedonia* Lederer. In that genus the uncus is broadly truncate and the ostial chamber is not twisted at its junction with the membranous part of the ductus bursae.

*Nealgedonia extricalis* (Guenée), NEW COMBINATION

PL. I, FIGS. 60–66; PL. C, FIG. 3; PL. N, FIG. 1 (McD. 5562, 5579).

*Botys extricalis* Guenée, 1854, *Species Général des Lépidoptères*, **8**: 338.
Type-locality: North America.

*Pionea dionalis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **18**: 758. Subsp. NEW COMBINATION with *Nealgedonia*.
Type-locality: Nova Scotia. [BMNH]
NOTE—This species was based on two syntypes. I hereby designate as lectotype a female in the BMNH, with labels as follows: "N. Scotia, Redman"; "R" [small triangular label]; "LECTOTYPE" [round purple-bordered label]; and Michael Shaffer's determination label. The paralectotype has the same data labels and also "Type" [round, green-bordered label]; "Paralectotype" [round blue-bordered label]; and "PIONEA DIONALIS".

*Spilodes? nisoeecalis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **18**: 771. Synonym of subsp. NEW COMBINATION with *Nealgedonia*.
Type-locality: Nova Scotia. [BMNH]

*Botys intricatalis* Lederer, 1863, *Wiener Ent. Monat.*, **7**: 373, 469, pl. 10, fig. 9. NEW COMBINATION with *Nealgedonia*.
Type-locality: North America. [NHMV]

*Botis oppilalis* Grote, 1880, *Can. Ent.*, **12**: 36. NEW COMBINATION with *Nealgedonia*.
Type-locality: Amherst, Massachusetts. [BMNH]

NOTE—The species was described from specimens from Massachusetts and Maine. I hereby designate as lectotype a male in the BMNH, with labels as follows: "LECTOTYPE" [round purple-bordered label]; "Type" [round, red-bordered label]; "Extricalis?/Amherst/352/Dup."; "Botis Type/oppilalis/Grote" [red-bordered label in Grote's hand], and on the reverse "82.54". A paralectotype in the BMNH has labels "47X"; "Botis/oppilalis/Grote" [blue-bordered label in Grote's hand]; "Pyralidae/Brit. Mus./Slide No./1272 ♀"; and "Paralectotype" [round, light-blue-bordered label]. There were at least two other syntypes, whose present location I have not determined. The lectotype designation moves the name *oppilalis* from the synonymy of the subspecies *dionalis*, as given in Munroe, 1954, *Can. Ent.*, **86**: 429, to that of the nominate subspecies. I have selected this syntype as lectotype because it is the only one with definite locality information that I have seen.

*Pyrausta beddeci* Dyar, 1913, *Ins. Insc. Mens.*, **1**: 139. Synonym of subsp. NEW COMBINATION with *Nealgedonia.*
Type-locality: Codroy Valley, Newfoundland. [USNM]

The smooth, not dentate, subterminal shade distinguishes this moth from *Phlyctaenia* species; the more rounded wings and the different shape and strong dentation of the postmedial line separate it from pale specimens of *Mutuuraia terrealis.* Specimens of the southern subspecies might be confused with *Framinghamia helvalis* (Walker) (tribe Spilomelini, Fascicle 13.3), but that species has the discocellular bar of the forewings double instead of single and has very different genitalia (see Munroe, 1951).

Larvae leafrollers on alder, *Alnus* species, (Forbes, 1923; Prentice *et al.*, 1966), balsam poplar, *Populus balsamifera* L., and white birch, *Betula papyrifera* Marsh.

Newfoundland to Northwest Territories and south to Florida and Texas, in two fairly well-defined subspecies.

### *Nealgedonia extricalis extricalis* (Guenée)

PL. 1, FIGS. 60, 61.

*Botys extricalis* Guenée, 1854, *Species Général des Lépidoptères*, **8**: 338.
Type-locality: North America.

*Botys intricatalis* Lederer, 1863, *Wiener Ent. Monat.*, **7**: 373, 469, pl. 10, fig. 9.
Type-locality: North America. [NHMV]

*Botis oppilalis* Grote, 1880, *Can. Ent.*, **12**: 36.
Type-locality: Amherst, Massachusetts. [BMNH]

Characterized by relatively dense scaling and powdery, fulvous-brown ground color; southern, the northern limit coinciding fairly closely with that of the upper austral life-zone. Massachusetts and New Jersey west at least to Illinois and south to northern Florida and Texas.

### *Nealgedonia extricalis dionalis* (Walker)

PL. 1, FIGS. 62–66; PL. C, FIG. 3; PL. N, FIG. 1.

*Pionea dionalis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **18**: 758.
Type-locality: Nova Scotia. [BMNH]

*Spilodes? nisoeecalis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **18**: 771.
Type-locality: Nova Scotia. [BMNH]

*Pyrausta beddeci* Dyar 1913, *Ins. Insc. Mens.*, **1**: 139.
Type-locality: Codroy Valley, Newfoundland. [USNM]

Paler and grayer than nominate subspecies, wings often appearing more thinly scaled. Northern, from Newfoundland, Nova Scotia and Forestville and Cascapedia, Quebec, across the transition and Canadian zones of Ontario as far north as Ogoki, through Manitoba, Saskatchewan and Alberta to Fort Simpson, Northwest Territories. In the United States occurring in Maine, northern New York, and probably other northern areas.

## GENUS
## *Mutuuraia* Munroe, NEW GENUS

Gender: feminine.
Type-species: *Botys terrealis* Treitschke, 1829. NEW COMBINATION with *Mutuuraia.*

DIAGNOSIS: Similar in external characters to *Nealgedonia,* but frons more strongly flattened; maxillary palpus smaller and not distally dilated with scales; abdomen relatively longer, considerably exceeding anal angle of hindwing in male; apex of forewing more acute and termen more oblique; hindwing relatively small.

Male genitalia with uncus short and wide, distally very broadly rounded, almost truncate. Tegumen short. Subscaphium straplike. Trans-

tilla wide at each side but incomplete medially. Juxta X-shaped, dorsal arms longer than ventral. Clasper consisting of a small, padlike, dorsal, scaled lobe and two narrow, sclerotized, ventrally directed arms at an acute angle to each other, the more basal one almost in line with dorsal lobe. Aedoeagus deeply cleft. Female genitalia much as in *Nealgedonia*, but sclerite at junction of ductus bursae and bursa relatively stronger and signum with anterior and posterior corners rounded, not strongly produced.

DESCRIPTION: Frons flat and oblique, smoothly scaled. Vertex with rough erect scaling. Labial palpus porrect but rather short; third segment hidden in pointed anterior scaling of second. Maxillary palpus rather short, not distally dilated with scales. Proboscis strong, scaled at base. Eye large. Ocellus well developed. Antenna filiform, only slightly thickened in male, smoothly scaled dorsally and short-pilose ventrally. Body fairly slender. Legs slender, outer tibial spurs considerably shorter than inner, especially in male. Praecinctorium weakly bilobed.

Forewing moderately narrow and subtriangular. Costa straight to near apex, then curved; apex acute; termen oblique anteriorly, curving posteriorly to the rounded or obtuse tornus; posterior margin strongly convex near base. $R_1$ from before the anterior angle of cell. $R_2$ from anterior angle, apposed basally to $R_{3+4}$. $R_3$ and $R_4$ stalked more than halfway from anterior angle of cell to apex. $R_5$ from a little behind anterior angle, not perceptibly approximated to $R_{3+4}$ basally. Cell about three-fifths length of the wing, rather narrow. Discocellulars weakly curved and oblique. $M_1$ from somewhat behind $R_5$. $M_2$, $M_3$ and $Cu_1$ from at or near posterior angle of cell; $M_2$ and $M_3$ curved and approximated basally; $Cu_1$ not basally approximated to $M_3$. Anal loop large and complete.

Hindwing relatively small. $Sc+R_1$ anastomosed with $R_s$. $R_s$ stalked with $M_1$. Cell about half as long as wing. Discocellular incurved medially and strongly oblique distad posteriorly. $M_2$, $M_3$ and $Cu_1$ from posterior angle of cell, their basal parts curved and approximated. $Cu_2$ from some distance basad of posterior angle. Three anals present.

Male genitalia with uncus short, wide, distally broadly rounded, almost truncate. Gnathos a weak sclerotized bridge. Subscaphium straplike. Transtilla with two large lateral elements, widely separated in midline. Juxta small, X-shaped, dorsal arms considerably longer than ventral. Vinculum fairly narrow, its ventral part forming a weak triangular saccus. Valve of moderate width, curved dorsad, with tip rather broadly rounded; costa narrowly inflated; sacculus inflated, a short, setose, fingerlike process near base of its dorsal margin; clasper with a small, basally directed, padlike lobe, bearing erect scales, and two slender, sclerotized, ventrally directed processes, at a right angle or an acute angle to each other, the more basal one almost in line with dorsal pad. Aedoeagus deeply cleft, shape of lobes differing according to species. Vesica with a bundle of deciduous cornuti.

Female genitalia with ovipositor lobes weak and short-setose. Apophyses short and slender. Ostial chamber funnel-shaped and sclerotized, with a valvelike structure at junction with membranous distal part of ductus bursae; the latter fairly long and moderately coiled, with a prominent, spiral, ribbonlike, strongly spinulose sclerite at junction with bursa. Bursa globular and membranous, with a rhomboidal, keeled, spinulose signum; anterior and posterior corners of signum strongly rounded off; a globular membranous accessory sac.

Larva green, with dark-spotted head and dark-green longitudinal lines, on goldenrods, *Solidago* species, and asters, *Aster* species, making a web and eating leaves and flowers.

There appear to be several species, all very similar in structure and appearance. They are distributed through most of the Holarctic Region, with the greatest number in temperate east Asia. There is probably only one species in North America.

I take pleasure in naming this genus for my amiable colleague Akira Mutuura, who has worked with me on the Asiatic species, and to whom I am indebted for much help and many kindnesses.

*Mutuuraia mysippusalis* (Walker), NEW COMBINATION

PL. I, FIGS. 53–59; PL. C, FIG. 4; PL. N, FIG. 2 (McD. 5561).

*Botys terrealis* of authors, in part, not Treitschke, 1829.

*Botys mysippusalis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **18**: 564.
Type-locality: United States, E. Doubleday. [BMNH]

NOTE—The locality given is that of the lectotype, hereby designated. The species was described from three male syntypes, all in the BMNH. The lectotype has labels as follows: "46–110/U.S."; "BOTYS MYSIPPUSALIS"; "Type" [round green-bordered label]; and "LECTOTYPE" [round purple-bordered label]. One paralectotype is labelled "46–110/U.S."; the second is labelled: "S. Martin's Falls" and on the reverse "44–17"; and "610 or 909/Botys elevatus". The latter is a Barnston label and manuscript name.

*Botys humilalis* Lederer, 1863, *Wiener Ent. Monat.*, **7**: 371, 464, pl. 9, fig. 2. NEW COMBINATION with *Mutuuraia*.
Type-locality: North America. [NHMV]

Moth usually smoothly dark gray or grayish fuscous, with inconspicuous transverse lines, reniform bar and orbicular dot. Occasional individuals, especially in western part of range, brownish, resembling *Nealgedonia extricalis*, but distinguished by less dentate postmedial line of the forewing and more rounded postmedial line of the hindwing.

This species has generally been confused with the very similar *Mutuuraia terrealis* (Treitschke) the type-species of the genus, which occurs in Europe. In the present species the two processes of the divided aedoeagus are about equal in length, whereas in the European species the narrower process is substantially shorter than the broader one.

The life histories of these two species are similar as far as is known, but that of *M. mysippusalis* needs closer study.

Common from Nova Scotia and Bic, Quebec, south to Highlands, North Carolina and west to southern British Columbia and California.

At least two broods in the Northeast, in May to June and August. Moths sometimes found in winter in greenhouses and protected places.

GENUS
## *Anania* Hübner

*Anania* Hübner, 1823, *Zuträge zur Sammlung Exotischer Schmettlinge* [sic], **2**: 27.
Type-species: *Pyralis guttalis* [Denis and Schiffermüller], 1775, now considered a junior synonym of *Anania funebris* (Ström, 1758). Designated by Hannemann, 1964, *Die Tierwelt Deutschlands*, 50: 350–351.

NOTE—Almost all recent authors, including Hannemann, have attributed this genus to Hübner, [1825], *Verzeichniss Bekannter Schmettlinge* [sic], 360, where eight nominal species are listed; on this basis the designation by Westwood, 1840, *Synopsis of the Genera of British Insects*, 106, of *Phalaena Geometra 8maculata* Linnaeus, 1771, as type-species has been accepted. However, in the Zuträge only two species are cited. Of these, *guttalis* is generally considered a synonym of *8maculata* as well as of *funebris*, but Hannemann is the first author known to me who explicitly mentions this synonymy while at the same time citing *8maculata* as type-species. Under Articles 69 (a) (iv) and 67 (g) of the *International Code of Zoological Nomenclature* this constitutes a valid designation of a type-species, even though Hannemann cited the original publication inaccurately.

External structure almost as in *Mutuuraia*, but frons rounded, not flattened, and legs relatively thick. Male genitalia characteristic, with narrowly triangular, dorsally weakly setose uncus, with padlike clasper bearing a dorsal crest of erect scales, and with a slender dorsally directed process from distal part of the sacculus, crossing base of clasper. Aedoeagus deeply cleft, as in preceding genera. Female genitalia with funnel-shaped ostial chamber, with a valvelike structure at base of membranous part of ductus bursae; the latter long, slender and coiled, with no ribbonlike sclerite at junction with bursa. Bursa globular, membranous, with rhomboidal signum and globular membranous accessory sac.

The known larvae webbers and folders of leaves of various low plants, greenish in color with darker pinacula and longitudinal stripes.

The genus is of nearly worldwide distribution and has a considerable number of species, particularly in tropical America and temperate Asia. Our two species are very different in appearance but structurally they are rather similar.

### KEY TO NORTH AMERICAN SPECIES

1. Wings black; each wing with two large white spots; forewing often with a third smaller spot ..... *funebris* this page
— Wings buff, with narrow fuscous lines and spots ..... *labeculalis* p. 38

*Anania funebris* (Ström)
PL. 1, FIGS. 47–52; PL. C, FIG. 5; PL. N, FIG. 3 (McD. 5647).

*Phalaena Geometra funebris* Ström, 1768, *Skrifter Kongelige Norske Videnskabers Selskabs*, **4**: 339, pl. 16, fig. 17.
Type-locality: Norway.

*Phalaena Geometra 8maculata* [*octomaculata*] Linnaeus, 1771, *Mantissa Plantarum* [etc.] *Regni Animalis Appendix*, 540.
Type-locality: England.

*Phalaena atralis* Fabricius, 1775, *Systema Entomologiae*, 645.
Type-locality: England.

*Pyralis guttalis* [Denis and Schiffermüller], 1775, *Ankündung eines Systematischen Werkes von den Schmetterlingen der Wienergegend* etc., 124.
Type-locality: vicinity of Vienna, Austria.

*Noctua trigutta* Esper, 1791, *Die Schmetterlinge in Abbildungen nach der Natur mit Beschreibungen*, **4**: pl. 163, fig. 6.
Type-locality: [Germany].

*Ennychia octomaculalis* Treitschke, 1829, *Die Schmetterlinge von Europa*, **7**: 201.
Type-locality: England.

NOTE—This is an unnecessary emendation of *Phalaena octomaculata* Linnaeus, 1771; it consequently ranks as a junior objective synonym and has the same type-locality.

*Ennychia glomeralis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **17**: 330. Subsp.
Type-locality: St. Martin's Falls, Albany R., [Ontario]. [BMNH]

NOTE—The locality given is that of the lectotype, hereby designated, a female in the BMNH. This nominal species was based on 10 syntypes from the type-locality and from Nova Scotia. The lectotype has labels as follows: "St. Martins Falls" and on the reverse "44–17"; "606 or 905/ Botys crepuscularis" [Barnston label]; "Type" [round green-bordered label]; and "LECTOTYPE" [round purple-bordered label]; and "Ennychia / glomeralis / Walker 1859 / LECTOTYPE/*E. Munroe des.*/1976". Of the nine paralectotypes, there are still five in the BMNH, viz.: 1 ♂, 1 ♀, St. Martin's Falls; 1 ♂, 2 ♀♀, Nova Scotia, Redman.

Easily distinguished from any other pyralid in our fauna by the black wings with large white spots and the orange, rarely white, tegula. Agaristids of the genus *Alypia* are similar in color, though much larger. Remington has suggested that the present species is a mimic of *Alypia* species. This idea is supported by the fact that the coloration is abnormal for the present group and that the species is mainly a day flier. However, the present species is common and widespread in Europe, where *Alypia* does not occur, and there are several closely related and similarly marked species or subspecies in temperate east Asia, where there are no *Alypia*. An alternative interpretation is that this is a disruptive pattern, confusing in flight to potential predators. Black-and-white patterns are found in other diurnal or partly diurnal Lepidoptera such as *Desmia* species (Pyraustinae, tribe Spilomelini, see Fascicle 13.3) and *Trichodezia*, *Epirrhoe* and *Rheumaptera* (Geometridae, subfamily Larentiinae). Moths of this pattern are notoriously hard to follow when in motion.

The species ranges from Europe to the Amur region and through much of North America. It is replaced by probably specifically distinct forms in China and Japan. There is some geographical variation, which has not been fully analyzed. Over most of the North American range the white spots are larger than they usually are in western Europe, and I have consequently used the name *glomeralis* for the American populations. However in southern populations the spots tend to be reduced and in the southern Appalachians very large specimens are found. These variations are shown on our plate. There are also local and individual variations in spot size in Europe and Asia. The whole question of the variation of this species, of its relationship to its east-Asian relatives, and of the biological meaning of the black-and-white pattern would repay thorough study.

Larva in a web on underside of basal leaves or in flowerheads of goldenrods, *Solidago* species. In Europe also recorded from black broom, *Lembotropis nigricans* (L.) Griseb. and dyer's greenweb, *Genista tinctoria* L. (Hannemann, 1964).

For the present I include all North American populations in one subspecies.

*Anania funebris glomeralis* (Walker)
PL. I, FIGS. 47–52; PL. C, FIG. 5; PL. N, FIG. 3 (McD. 5647).

*Ennychia glomeralis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **17**: 330.
Type-locality: St. Martin's Falls, Albany R., [Ontario]. [BMNH]

Differing from the European subspecies in the much larger average size of the white spots of the wings.

Newfoundland, Nova Scotia and Prince Edward Island to Fort Smith and Fort Simpson, Northwest Territories, and Victoria, British Columbia, and southward at higher elevations at least to Highlands, North Carolina, and Gunnison County, Colorado. Moth in May and June in eastern Canada.

*Anania labeculalis* (Hulst), NEW COMBINATION
PL. 1, FIGS. 42–45 (McD. 5485).

*Botis labeculalis* Hulst, 1886, *Trans. Amer. Ent. Soc.*, **13**: 152.
Type-locality: Arizona. [AMNH]

Very different in appearance from *A. funebris* but closely similar structurally. In our fauna most closely resembling superficially *Phlyctaenia leuschneri* from Florida, but larger, less yellow, and more distinctly marked. Also resembling in a general way the species here placed in *Helvibotys*, *Neohelvibotys* and *Hahncappsia*, but differing in having the frons rounded, not conical, and in having the postmedial line of the hindwing more distinct and strongly sinuated. Genital characters immediately distinctive, especially in the male.

The closest relatives of the present species are the Mexican *Anania intinctalis* (Dyar), NEW COMBINATION, and *A. federalis* (Capps), NEW COMBINATION.

Early stages unknown.

Fairly common from southern Arizona to western Texas and in northern Mexico. Moth from July to September.

GENUS
*Hahncappsia* Munroe, NEW GENUS

Gender: feminine.
Type-species: *Botys marculenta* Grote and Robinson, 1867.

DIAGNOSIS: External characters much as in *Loxostege*; frons usually conical and prominent, but in a few species flat and oblique. Male genitalia with undivided, usually unarmed penis. Valve with broadly inflated sacculus, usually bearing well-developed dorsal armature; clasper a ventrally directed process, often complex and spinose, always arising from a conspicuous, straight, oblique ridge bearing a dense erect row of long setae or slender scales. Female genitalia with variably shaped sclerotized ostial chamber; ductus bursae and ductus seminalis arising from the left and right sides respectively of an archlike bifurcation immediately distad of ostial chamber; rest of ductus bursae long, coiled and membranous; bursa globular, membranous or spinulose, with small, more or less rhomboidal signum and globular membranous accessory sac.

DESCRIPTION: Frons usually conically projecting, sometimes flat, oblique and weakly prominent. Labial palpus porrect, not very long, third segment partly or completely hidden in scaling of second. Maxillary palpus without expanded distal scale tuft. Antenna filiform, its sensory surface pubescent or fasciculate. Body slender. Middle tibia of male dilated. Praecinctorium weakly bilobed.

Forewing usually short and wide. $R_1$ from well basad of anterior angle of cell. $R_2$ from anterior angle or near it, closely apposed to $R_{3+4}$. $R_3$ and $R_4$ long-stalked. $R_5$ from near anterior angle of cell, curved but not basally approximated to $R_{3+4}$. $M_1$ from a little behind $R_5$. Discocellular weakly curved, hardly oblique. $M_2$, $M_3$ and $Cu_1$ from posterior angle of cell, fairly well spaced, basally weakly curved and approximated to one another. $Cu_2$ from cell at about two-thirds from base. Anal loop complete.

Hindwing broad, with evenly convex termen. $Sc+R_1$ anastomosed with $R_s$ for a short distance. $R_s$ and $M_1$ short-stalked. Cell less than half as long as wing. Discocellular concave distad, posterior part oblique. $M_2$, $M_3$ and $Cu_1$ from posterior angle of cell, their basal parts curved and approximated. $Cu_2$ from cell at about three-fourths from base. Three anals present.

Male genitalia: uncus broadly rounded or truncate distally, densely and finely setose dorsally along distal margin. Juxta small and bicornuate. Valve of moderate width, distally rounded; clasper ventro-basally directed, usually stout, variable in shape, densely spinulose; an oblique ridge extending ventrodistad past base of clasper, bearing a prominent row of dorsally directed, often scalelike setae; dorsal margin of sacculus with variable, often prominent armature. Penis short, with inconspicuous, unsymmetrical distal cleft and lateral sclerites.

Female genitalia: Ovipositor broad, short-setose, with short slender apophyses. Ostium with variable margins; ductus bursae with a small collar at ostial end, deflected to form an archlike configuration with ductus seminalis, then long, slender, coiled and membranous. Bursa globular,

membranous or spinulose, with small quadrate signum and membranous globular accessory sac.

The larvae of a number of species have been described by Capps (1967), but diagnostic characters for the genus have not been worked out. They feed on a variety of herbaceous and climbing plants.

This genus contains a considerable number of species, all but a few mimetic ones being rather similar in color and maculation and some also having a confusing resemblance to species of *Helvibotys* and *Neohelvibotys*. Although some of the species can be recognized by external characters, genitalia are by far the best guide to identification.

The affinities of the genus appear to be neotropical. It is related to *Sarabotys* Munroe and other genera of the *Epicorsia* complex (see Munroe, 1964).

A number of additional species are known from Mexico, and more as yet undescribed species probably remain to be discovered. Material of this genus should therefore be scrutinized with great care, and genitalia should be examined if there is the slightest doubt as to the identification.

In addition to the species belonging to our fauna dealt with below, the following neotropical species referred by Capps (1967) to *Loxostege* belong here: *Loxostege potosiensis* Capps, *L. cayugalis* Capps, *Pachyzancla cynoalis* Druce, *Loxostege ecuadoralis* Capps, *L. neotropicalis* Capps, *L. sacculalis* Amsel, *L. jacalensis* Capps, *L. yucatanalis* Capps, *L. autocratoralis* Dyar, *L. corozalis* Capps, *L. marialis* Capps, *L. purulhalis* Capps, *Phlyctaenodes conisphora* Hampson, *Loxostege volcanensis* Capps, *L. venadialis* Capps, *L. entephrialis* Capps, *L. chiapasalis* Capps and *Psara nigripes* Schaus. All of these are NEW COMBINATIONS with *Hahncappsia*. They are mentioned here for the convenience of users of Capps' paper.

The following key to species should be used with reservations on two counts: first, the maculation varies and it is hard to make sharp and constant distinctions; and, second, several of the species, but especially those in couplet 6, are very similar in external appearance to species of *Helvibotys* and *Neohelvibotys*. The genital characters are relatively reliable and comparison with the figures of male and female genitalia is advisable.

## KEY TO NORTH AMERICAN SPECIES

1. Forewing with distinct, contrasting, fuscous orbicular dot, reniform bar and antemedial and postmedial lines ..... 2

— Forewing with the orbicular dot, reniform bar, and often also the antemedial and postmedial lines, weak or absent or not contrastingly fuscous ..... 4

2. Postmedial line of forewing strongly dentate behind $Cu_2$; forewing and hindwing with distinct dentate subterminal line; length of forewing over 14 mm..... *mellinialis* p. 45

— Postmedial line of forewing nearly straight or weakly angulate behind $Cu_2$; forewing with a row of subterminal spots or without subterminal markings; hindwing with continuous or broken, not or little dentate, subterminal line, or with none; length of forewing under 13 mm..... 3

3. Postmedial line of forewing strongly dentate in mediocubital area; that of hindwing convex; clasper of male genitalia with a strong, ventrally directed, spinulose process; sacculus with two strong but slender spines, directed dorsad at right angles to ventral margin of valve; female genitalia with a strong sclerite on each side of ostium ..... *huachucalis* p. 45

— Postmedial line of forewing weakly dentate in mediocubital area; that of hindwing straight; clasper of male genitalia without ventrally directed spinulose process, but with a recurved, dorsally directed, spinelike process basally and a ventrally directed spinelike process distally; dorsal margin of sacculus without slender spines but with a subbasal bidentate process; female genitalia without strong sclerites at sides of ostium ..... *mancalis* p. 43

4. Ground color of wings whitish; markings complex but very weak; clasper of male genitalia with a weak, ventrally directed, spinulose process; sacculus with two strong, slender, dorsally directed spines; anterior margin of ostium of female genitalia broadly concave, sclerotization at sides of ostium concave and granulose; bursa with a spinulose band from opening of ductus bursae to junction of accessory sac.... *coloradensis* p. 44

— Ground color of forewing yellow or buff..... 5

5. Ground color of wings yellow or orange yellow; transverse lines of forewing orange brown, hardly contrasting; antemedial line

evenly curved; postmedial line even, of the same width throughout, weakly and obtusely angled on $Cu_2$; postmedial line of hindwing straight; no subterminal markings; male genitalia with erect scales concentrated on basal part of oblique ridge of clasper; dorsal margin of sacculus rather even, with small spines or spinules concentrated in basal and distal groups.....6

— Ground color of wings yellow or buff; transverse lines of forewing dull brown or fuscous, though sometimes weak; antemedial line usually sinuated; postmedial line right-angled or acutely angled on $Cu_2$, its mediocubital part often dentate or broken on veins; postmedial line of hindwing usually convex; subterminal line or dots often present; male genitalia with erect scales or hairs on oblique ridge of clasper not concentrated on basal part, or dorsal margin of sacculus with conspicuous spines or processes or both.....7

6. Length of forewing 11 mm or less; markings on the average relatively strong; midtibia of male thickened and with a hair-pencil; outer spur one-fifth length of inner; dorsal edge of sacculus of male genitalia with a basal group of three stout spines and a distal patch of numerous short spines; in female genitalia sclerotization anterior to ostium crinkled, its median process narrow .....*fordi* p. 41

— Length of forewing 11 mm or more; markings often weak; midtibia of male without hair-pencil, outer spur half length of inner; dorsal edge of sacculus of male genitalia with a linear group of spines on its basal part, nearly reaching the relatively small distal group of spines; anterior margin of ostium not crinkled and with median process relatively wide.....*alpinensis* p. 41

7. Ground color of wings pale subhyaline yellow, hindwing sometimes paler; dorsal margin of sacculus of male genitalia with separate spines or processes, but not with an elongate median raised or sclerotized zone bearing a row of spines or spinules.....8

— Ground color of wings pale ochreous, more opaque; dorsal margin of sacculus of male genitalia with an elongate median raised or sclerotized zone, bearing a row of spines or a zone of spinules.....13

8. Sacculus of male genitalia with three strong but slender, separate, oblique spines from dorsal margin; female genitalia with sclerotized tube at ostial end of ductus bursae not extending forward beyond anterior edge of anterior marginal sclerite of ostium.....*jaralis* p. 43

— Sacculus of male not with three strong, slender, separate, oblique spines from dorsal edge; female genitalia with sclerotized tube at ostial end of ductus bursae extending forward well beyond anterior marginal sclerite of ostium.....9

9. Sacculus of male genitalia with two long, oblique, bladelike, sclerotized processes extending dorsomesad from dorsal margin; female genitalia with sclerotized tube at ostial end of ductus bursae widened by a short bulge on each side at one-third its length from ostium; anterior margin of ostium straight.....*ramsdenalis* p. 44

— Sacculus of male genitalia with various dorsal armature, but not with two long, oblique, bladelike, sclerotized processes extending dorsomesad; sclerotized tube at ostial end of ductus bursae of female genitalia not widened by a short bulge on each side at one-third its length from ostial margin.....10

10. Dorsal margin of sacculus of male genitalia with a long bifid spine arising near middle, followed distally by a triangular process; anterior margin of ostium of female genitalia with a pair of long spinelike processes .....*neomarculenta* p. 42

— Dorsal margin of sacculus of male genitalia without a bifid process near middle; anterior margin of ostium of female genitalia without a pair of long spinelike processes.....11

11. Sacculus of male genitalia with a single long slender spine basad of middle, reaching nearly to costa of valve, also a basal pointed and fingerlike process and a distal bluntly conical process; anterior margin of ostium of female genitalia concave....*marculenta* p. 41

— Sacculus of male genitalia without a long slender spine reaching nearly to costa of valve and without basal and distal processes; anterior margin of ostium of female genitalia straight or convex.....12

12. Oblique ridge of clasper of male genitalia straight and with a row of erect scales occupying most of its length; sacculus with a short compound spine basad of middle; anterior margin of ostium of female genitalia strongly convex, somewhat crinkled.... ..... *pseudobliteralis* p. 42

— Oblique ridge of clasper of male genitalia convex ventrad and with a small, acute, ventrally directed process; erect scales and hairs forming a patch on dorsal part of clasper; sacculus without a strong dorsal spine; anterior margin of ostium of female genitalia straight and smooth..... *neobliteralis* p. 42

13. Uncus of male genitalia with curved, converging sides and rather narrowly rounded apex; dorsal margin of sacculus with broad, raised, straight-edged, medial process, bearing an elongate dorsal zone of many small spines; in female genitalia anterior margin of sclerite anterior to ostium deeply concave medially..... *cochisensis* p. 44

— Uncus of male genitalia with convex sides and rather broadly rounded apex; sacculus with medial part of dorsal margin heavily sclerotized and bearing several oblique spines, the two or three nearest the base larger than the others; in female genitalia anterior margin of sclerite anterior to ostium evenly and strongly convex.... *pergilvalis* p. 43

*Hahncappsia fordi* (Capps), NEW COMBINATION

PL. 3, FIGS. 61, 68; PL. C, FIG. 6; PL. N, FIG. 5.

*Loxostege fordi* Capps, 1967, *Proc. United States Natl. Museum*, **120** (3561): 11, figs. 18, 84, 107.
Type-locality: Tucson, Arizona. [USNM]

A small species, length of forewing 9–11 mm. Antenna filiform, ciliations in male about half as long as width of shaft. Midtibia of male thickened and with hair-pencil. Outer spur of midtibia minute, about one-fifth as long as inner. Head and body ochreous above, whitish below. Forewing silky orange yellow above, with costa and termen orange brown. Transverse lines even in width, orange brown; antemedial evenly curved, postmedial gently sinuate. Hindwing little paler than the forewing, with postmedial line incomplete and almost straight. Fringes pale. Genitalia as characterized in key.

Externally remarkably similar in appearance to *Helvibotys helvialis*, but male with well-developed hair-pencil on midtibia, and with outer tibial spur minute.

Genitalia distinct in both sexes.

Early stages unknown.

Palm Springs, California, to southern Arizona and south into Sonora, Mexico. Moth from April to October.

*Hahncappsia alpinensis* (Capps), NEW COMBINATION

PL. 3, FIG. 63; PL. D. FIG. 7; PL. N, FIG. 4.

*Loxostege alpinensis* Capps, 1967, *Proc. United States Natl. Museum*, **120** (3561): 12, figs. 19, 83, 108.
Type-locality: Paradise, Arizona. [USNM]

A little larger on the average than *H. fordi* and tending to have ground color paler and markings weaker. Length of forewing from 11 to 12 mm. Genital characters as noted in key.

Early stages unknown.

White Mountains of Arizona to the southern part of the state and eastward to Brownsville, Texas; doubtless also in Mexico. Moth from March to September.

*Hahncappsia marculenta* (Grote and Robinson), NEW COMBINATION

PL. 3, FIGS. 69, 70; PL. C, FIG. 7; PL. N, FIG. 6 (McD. 5464, in part).

*Botys obliteralis*, of authors, in part, not Walker, [1866].

*Botys marculenta* Grote and Robinson, 1867, *Trans. Amer. Ent. Soc.*, **1**: 23, pl. 2, fig. 21.
Type-locality: Pennsylvania. [AMNH]
NOTE—Klots, 1942, *Bull. Amer. Museum Nat. Hist.*, **79**: 420, designated a lectotype.

Larger than *H. fordi* and *H. alpinensis*, forewing from 10 to 13 mm long and relatively wider, hindwing relatively larger. Antenna filiform, weakly ciliated in both sexes; ciliations in male about half as long as width of shaft. Midtibia slightly thickened, with weak hair-pencil. Outer tibial spur about one-fifth as long as inner. Head and body pale yellowish or buff above, whitish beneath.

Forewing pale yellowish buff, thinly scaled and semi-transparent. Costa weakly tinted with buff or orange, especially at base. Lines weak but distinct, grayish fuscous. Antemedial line sinuated,

oblique distad. A small orbicular dot and reniform bar. Postmedial line convex and weakly denticulate around cell, retracted on $Cu_2$ and weakly angulate to posterior margin. An even subterminal shade. Hindwing paler and more whitish, with traces of a discocellular bar. Postmedial line weak, incomplete and convex, often weakly serrate. Subterminal band wider and even, as on forewing. Termen somewhat deeper yellowish buff. Male genitalia with long, slender, curved spine and two dorsal processes on sacculus. Female genitalia with anterior margin of ostium concave.

Larva on great ragweed, *Ambrosia trifida* L., goldenrods, *Solidago* species, and probably other plants. Full-grown larva pallid, with greenish subdorsal stripes. Thoracic shield with black lateral margins and dorsal and subdorsal pinacula of mesothorax and metathorax strongly dark-margined.

Abundant from Maine through southern Quebec and Ontario west to Iowa and south to Alabama, Texas and New Mexico. In the North moth mainly in July but farther south from May to September.

*Hahncappsia neomarculenta* (Capps), NEW COMBINATION

PL. 3, FIG. 71; PL. C, FIG. 8; PL. O, FIG. 1.

*Loxostege neomarculenta* Capps, 1967, *Proc. United States Natl. Museum*, **120** (3561): 14, figs. 21, 71, 131.
Type-locality: Decatur, Illinois. [USNM]

Almost exactly like *H. marculenta* in external characters, but male and female genitalia both distinctive. Male with bifurcate spine and short conical distal process on sacculus and with narrow clasper pad. Female with pair of spinelike processes from anterior margin of ostium.

Early stages unknown.

Considerably less common than *H. marculenta*, known from Illinois, Maryland, Virginia and West Virginia, but doubtless ranging more widely. Moth from May to July.

*Hahncappsia pseudobliteralis* (Capps), NEW COMBINATION

PL. 3, FIG. 73; PL. D, FIG. 8; PL. N, FIG. 7.

*Loxostege pseudobliteralis* Capps, 1967, *Proc. United States Natl. Museum*, **120** (3561): 15, figs. 25, 88, 135.
Type-locality: Paradise, Arizona. [USNM]

Moth like *H. marculenta* and *H. neomarculenta* in color and pattern, but subterminal line of forewing usually indented at vein $Cu_2$. Midtibia of male thickened and with distinct hair-pencil; outer tibial spur minute, about one-sixth as long as inner.

Male genitalia with oblique ridge of clasper straight, with a row of erect scales; spine of sacculus short and spinulose, its base with a conical process bearing several slender setae. Female genitalia with anterior margin of ostium crinkled and strongly convex.

Larva on morning glory, *Ipomoea* species; whitish; head with amber reticulations and a small fuscous patch at lateral incision of posterior margin on each side, prothoracic shield whitish or yellowish buff, with narrow brown or brownish-fuscous margin, interrupted middorsally; body pinacula brown; those of setae D1 and D2 on first to eighth abdominal segments several times as wide as long; those of setae SD1 on the same segments subrectangular, longer than wide; pinacula ventral to spiracles oval and less strongly pigmented; ninth abdominal segment with posterior half of common pinaculum of setae D2 pigmented; common pinaculum of D1 and SD1 and pinaculum of L wholly pigmented; anal shield with a small pigmented patch at base of anterior lateral seta.

Baboquivari and White mountains, Arizona, to Kerrville and San Antonio, Texas, and south to Cuernavaca, Mexico.

Moth from July to September in the United States and as early as May in Mexico.

*Hahncappsia neobliteralis* (Capps), NEW COMBINATION

PL. 3, FIG. 82; PL. D, FIG. 1; PL. N, FIG. 8.

*Loxostege neobliteralis* Capps, 1967, *Proc. United States Natl. Museum*, **120** (3561): 16, figs. 26, 87, 132.
Type-locality: Hubberton, Vermont. [USNM]

Moth externally like *H. marculenta* and *H. neomarculenta*. Clasper of male genitalia with a denticulate, ventrally directed, subbasal process and a short acute process extending ventrad from convex distal part of ventral margin; a cluster of digitate setae near subbasal process; sacculus without conspicuous spines. Female genitalia with margins of ostium rather strongly sclerotized, the anterior margin nearly straight.

Larva on morning glory, *Ipomoea* species; similar to that of *H. pseudobliteralis*, but pro-

thoracic shield with marginal fuscous pigmentation interrupted laterally; pinacula below spiracles of abdomen unpigmented; ninth abdominal segment pigmentation of common pinaculum of setae D2 interrupted middorsally; pinacula of D1+SD1 and of L without dark pigment; no fuscous patch at base of anterior lateral seta of anal shield.

Southern Quebec to Iowa and Mississippi. Moth from May to September. Uncommon in collections.

*Hahncappsia jaralis* (Schaus), NEW COMBINATION

PL. 3, FIG. 75; PL. E, FIG. 1; PL. O, FIG. 2.

*Phlyctaenodes jaralis* Schaus, 1920, *Proc. Ent. Soc. Washington*, **22**: 220.
Type-locality: Guadalajara, Jalisco, Mexico. [USNM]

Moth like *H. pseudobliteralis* in color and pattern, but a little darker and with subterminal line of hindwing closer to termen. Length of forewing about 12 mm. Antenna filiform and pubescent. Midtibia of male thickened, with a well-developed hair-pencil; outer spur about one-third as long as inner. Male genitalia with strong spines on sacculus, a large median spine separating one to three outer spines from two to four inner ones. Female with sclerite anterior to ostium completely covering sclerotized base of ductus bursae.

Early stages unknown.

Southern Arizona south to Oaxaca and Puebla states in Mexico.

*Hahncappsia mancalis* (Lederer), NEW COMBINATION

PL. 3, FIG. 74; PL. D, FIG. 2; PL. O, FIG. 3 (McD. 5467).

*Botys mancalis* Lederer, 1863, *Wiener Ent. Monat.*, **7**: 371, 464, pl. 9, fig. 4.
Type-locality: North America. [NHMV]
NOTE—The locality cited is that of the lectotype, a male in the Naturhistorisches Museum, Vienna, designated by Capps, 1967, *Proc. United States Natl. Museum*, **120** (3561): 23.

Length of forewing from 11 to 13 mm. Moth like *H. marculenta* in general appearance, but pale buff rather than yellow and with markings fuscous and better defined. Subterminal band of forewing relatively strong, tending to be wider anteriorly; that of hindwing close to termen, and broader than intervening pale area. Antenna of male filiform, with ciliations about half as long as the width of the shaft. Midtibia of male thickened, with well-developed hair-pencil and with outer spur about one-third as long as inner.

Male genitalia with clasper setose but lacking scales, bearing ventrally a distal acute process extending ventrad beyond margin of valve, and a subbasal, distally rounded process, interlocking with a complex, twisted, flange-bearing, dorsal, spinelike process on sacculus. In female genitalia margins of ostium with only very small and weak sclerites.

Larva on amaranth pigweed, *Amaranthus retroflexus* L., on "mint", *Mentha* species (?), on morning glory, *Ipomoea* species, on tobacco, *Nicotiana* species, and on dock, *Rumex* species. Mature larva about 30 mm long, whitish buff; head pale amber, with weak reticulations; prothoracic shield with side margins brown or fuscous; dorsal and subdorsal pinacula of mesothorax and metathorax somewhat convex, rounded in outline, dark brown or fuscous; on first to eighth abdominal segments pinacula of D1 and D2 large, round and flat; pinaculum of SD smaller and kidney-shaped; these pinacula dark brown or fuscous; pinacula below level of spiracles at most slightly pigmented with brown or fuscous at rim; pinacula of ninth abdominal segment without dark pigmentation.

A common species, ranging from Maryland to Illinois and south to Florida, Texas and Arizona and thence to Costa Rica. Moth from March to September, exact period varying with locality.

*Hahncappsia pergilvalis* (Hulst), NEW COMBINATION

PL. 3, FIGS. 79–81; PL. D, FIG. 3; PL. O, FIG. 4 (McD. 5461, in part).

*Botis pergilvalis* Hulst, 1886, *Ent. Americana*, **13**: 151.
Type-locality: Arizona. [AMNH]
NOTE—A lectotype was designated by Klots, 1942, *Bull. Amer. Museum Nat. Hist.*, **79**: 421.

Moth like *H. mancalis* in color and pattern, but with transverse lines narrower and weaker. Subterminal band of forewing at most slightly widened anteriorly. Postmedial line of hindwing convex distad; postmedial and subterminal often reduced to a row of dots.

Male genitalia with scales of clasper from a relatively restricted zone somewhat basad of middle; sacculus with a heavily sclerotized zone

dorsally, bearing two strong spines near base and a variable number of smaller ones distad of these. Female genitalia with sclerite anterior to ostium covering entire basal sclerotization of ductus bursae; this sclerite characteristically wrinkled, its anterior margin evenly rounded.

Larva possibly on maize, *Zea mays* L.

Ottawa, Ontario, and Geneva, New York, to Illinois, Iowa, Delaware, Texas and Arizona, thence to southern Mexico.

Moth from May to September.

*Hahncappsia cochisensis* (Capps), NEW COMBINATION

PL. 3, FIG. 76; PL. E, FIG. 2; PL. O, FIG. 5.

*Loxostege cochisensis* Capps, 1967, *Proc. United States Natl. Museum*, **120** (3561): 27, figs. 39, 82, 121.

Type-locality: Palmerlee, Arizona. [USNM]

Moth much like *H. pergilvalis* externally but ground color usually more ochreous and transverse lines of forewing smoother. Postmedial line of hindwing often lacking; if present, smooth and rather diffuse. Termen concolorous with fringe. Male midtibia with no hair-pencil, its outer spur half as long as inner.

Male genitalia: uncus rather narrow, its sides curved and converging. Dorsal margin of sacculus with long dorsal zone of numerous short, inwardly directed spines. Female genitalia: sclerite anterior to ostium emarginated medially and with large, anteriorly directed, transversely wrinkled lobes on each side.

Early stages unknown.

Southern Arizona to western Texas and doubtless southward into Mexico.

Moth from June to September.

*Hahncappsia coloradensis* (Grote and Robinson), NEW COMBINATION

PL. 3, FIGS. 13, 14; PL. D, FIG. 4; PL. O, FIG. 6 (McD. 5461, in part).

*Botys coloradensis* Grote and Robinson, 1867, *Trans. Amer. Ent. Soc.*, **1**: 25.

Type-locality: Colorado. [AMNH]

NOTE—A female lectotype was designated by Capps (1967: 26).

Moth easily recognized in this genus by the pale creamy ground color and weak markings, with some orange suffusion at base of costa of forewing. Reniform and orbicular spots and traces of postmedial line visible as weak brown markings in many specimens. Midtibia of male thickened and with a strong hair-pencil; outer tibial spur about one-sixth length of the inner one. Externally more like *Sitochroa dasconalis* than like any other species of *Hahncappsia*, but without the dark suffusion and vein-lines on underside of forewing characteristic of *S. dasconalis*, and easily distinguished by genitalia.

In the male genitalia the oblique ridge of the clasper with long setae but no scales; a blunt, basoventrally directed, subbasal process present. Sacculus with two strong subbasal spines followed distally by a patch of spinules. Female genitalia with anterior margin of ostium gently concave. Bursa with a zone of spinules from opening of ductus bursae to junction of accessory sac.

Larva on wild sunflower, *Helianthus* species. Whitish buff. Head pale amber with weak reticulation and a small fuscous patch at lateral incision of posterior margin. Front and side margins of prothoracic shield with brownish patch at bases of setae XD1, XD2, SD1 and SD2, interrupted dorsally and between setae XD1 and XD2. Prespiracular and subventral pinacula brown. On mesothorax and metathorax pinacula of setae D1 and D2, SD1 and SD2, L1, L2 and SV1 rather large, with strong brown pigmentation, pinaculum of L3 smaller and paler. On abdomen, pinacula of D1 and D2 of first and eighth segments darker than those of second to seventh segments. Pinacula of SD1 dark brown and of about the same size on first eight segments; pinacula below spiracles, and all pinacula of ninth abdominal segment without dark pigment. Anal shield without conspicuous markings.

A moderately common species from Iowa to Utah, eastern Texas and Arizona.

Moth from June to August.

*Hahncappsia ramsdenalis* (Schaus), NEW COMBINATION

PL. D, FIG. 6; PL. P, FIG. 3.

*Phlyctaenodes ramsdenalis* Schaus, 1920, *Proc. Ent. Soc. Washington*, **22**: 219.

Type-locality: Santiago, Cuba. [USNM]

Moth generally similar in maculation to *H. mancalis*, but less distinctly marked; postmedial line of forewing more strongly angulate on anal fold. Midtibia of male thickened, with distinct hair-pencil.

The genitalia are distinctive in both sexes, as indicated in the key and figures.

Early stages unknown.

Not recorded from North America by Capps, but Charles Kimball has submitted a specimen taken at Key Largo, Florida, by Mrs. Spencer Kemp. Widely distributed in the Neotropics, ranging from Cuba, the Cayman Islands and southern Mexico to Brazil and Bolivia.

The moth will be figured in a subsequent fascicle.

*Hahncappsia huachucalis* (Capps), NEW COMBINATION

PL. 3, FIGS. 77, 78; PL. E, FIG. 3; PL. P, FIG. 1.

*Loxostege huachucalis* Capps, 1967, *Proc. United States Natl. Museum*, **120** (3561): 30, figs. 46, 75, 124.
Type-locality: Paradise, Cochise County, Arizona. [USNM]

Moth externally like *H. mancalis*, with markings somewhat more ferrugineous, the lines more strongly dentate and more sharply defined, and postmedial line of hindwing convex distad. Antenna of male weakly ciliated; midtibia of male thickened and with a weak hair-pencil; outer tibial spur one-fourth length of inner.

Male genitalia much like those of *H. coloradensis* but with subbasal process of clasper longer and more distinctly spinulose distally and distal group of spinules of sacculus stronger.

Female genitalia with eighth sternum heavily sclerotized and scobinated; ductus bursae strongly sclerotized from ostium to junction of ductus seminalis and abruptly constricted near middle of sclerotized zone.

Early stages unknown.

Known only from southern Arizona. Moth from June to August.

*Hahncappsia mellinialis* (Druce), NEW COMBINATION

PL. 3, FIGS. 83–85; PL. D, FIG. 5; PL. P, FIG. 2.

*Epichronistis mellinialis* Druce, 1899, *Biologia Centrali-Americana. Insecta. Lepidoptera-Heterocera*, **2**: 559; **3**, pl. 101, fig. 12.
Type-locality: Dueñas, Guatemala. [BMNH]

*Phlyctaenodes phrixalis* Dyar, 1914, *Proc. United States Natl. Museum*, **47**: 395. NEW COMBINATION with *Hahncappsia*.
Type-locality: Zacualpan, Mexico. [USNM]

Moth easily distinguished by its large size and well-defined, strongly dentate, transverse lines. Antenna of male weakly ciliated; midtibia thickened and with a strong hair-pencil; outer tibial spur one-third as long as inner.

In the male genitalia clasper with spinules on ventral process and with a distinct row of scales on its oblique ridge; dorsal margin of sacculus with a narrow, tapering, distally truncate, denticulate process. Female genitalia with a pair of shallow pouches beside ostium. Ostial end of ductus bursae narrowly and evenly sclerotized to a little beyond junction with ductus seminalis.

Early stages unknown.

Colorado and Arizona to Guatemala. Moth from July to September.

GENUS

*Achyra* Guenée

*Achyra* Guenée, 1849, *in* Lucas, *Exploration Scientifique de l'Algérie*, **3**: 404.
Type-species: *Pyralis interpunctalis* Hübner, 1796, now considered a synonym of *Achyra nudalis* (Hübner, 1796). Original designation.

*Eurycreon* Lederer, 1863, *Wiener Ent. Monat.*, **7**: 376.
Type-species: *Pyralis nudalis* Hübner, 1796. Designated by Shibuya, 1928, *Jour. Faculty Agric., Hokkaido Imperial University*, **22**: 267.
NOTE—This was proposed as a subgenus of *Botys* "Treitschke".

*Tritaea* Meyrick, 1884, *Trans. Ent. Soc. London*, 1884: 341. NEW SYNONYMY.
Type-species: *Scopula ustalis* Walker, [1866], now considered a synonym of *Botys (Eurycreon) affinitalis* Lederer, 1863. Both NEW COMBINATIONS with *Achyra*. Monotypy.

Closely similar in external structure to *Hahncappsia*, but differing in wing pattern. Frons conical; midtibia of male not strongly thickened and without well-developed hair-pencil; outer preapical spur of hindtibia about half as long as inner.

Male genitalia characteristic. Uncus narrowly triangular, with fairly dense dorsal coating of fine setae. Tegumen long and narrow, its dorsal part tapering posteriorly. Juxta small, divided into a pair of lateral sclerites connected subventrally by a weak and narrow bridge. Vinculum narrow. Valve narrow, with parallel, weakly dorsally curved, costal and ventral margins and with rounded, finely setose apex. Costa narrowly

inflated. Clasper various but always with a narrow, ventrally directed, spinulose process opposite middle or base of sacculus. Sacculus long, with blunt process or one or more dorsally directed spines from extreme base and a humplike process with radiating dorsally directed setae beyond the clasper; this process perhaps homologous with the oblique, scaled or setose ridge of *Hahncappsia*, or with its distal part. Penis cylindrical, usually with a number of slender spinelike cornuti. Female genitalia much like those of *Hahncappsia*, but with ostial chamber longer and narrower than in most species of that genus, and with arch at junction of ductus seminalis tending to be wider.

Larvae on a variety of low plants; some species important pests. Structure in most respects as in *Hahncappsia*, but with posterolateral angle of prothoracic shield extended under spiracle to fuse with prespiracular pinaculum; dorsal and subdorsal pinacula of mesothorax and metathorax long and narrow.

The genus contains more than a dozen species, distributed in the warm-temperate and tropical regions of all continents. The European *Achyra nudalis* (Hübner) is also a crop pest, as is the Australian *A. affinitalis* (Lederer). In addition to our three species, the following neotropical species, referred by Capps (1967) to *Loxostege*, should be transferred to *Achyra*, forming NEW COMBINATIONS: *Nymphula similalis* Guenée, with its synonyms *Tritaea ferruginea* Warren and *Pyralis garalis* Schaus; *Loxostege brasiliensis* Capps; *L. piuralis* Capps; *Tritaea protealis* Warren; and *Pyrausta eneanalis* Schaus. The immediate relatives of our species are neotropical.

## KEY TO NORTH AMERICAN SPECIES

1. Forewing above with a dark, inwardly oblique shade in subterminal area from apex to convexity of postmedial line; this shade almost always indicated, even in very weakly marked specimens..... *bifidalis* this page

— Without such a shade; dark shade in subterminal area, if any, parallel to termen.....2

2. Sacculus of male genitalia with three slender spines; basal spine of basal pair more than half as long as distal spine of same pair; in female genitalia ostial chamber subconical and evenly tapering; moth smaller and more slender; wings orange, brown or fuscous; widely distributed.... *rantalis* p. 47

— Sacculus of male genitalia with three rather short, stout, curved spines; basal spine of basal pair less than half as long as distal spine of same pair; in female genitalia ostial chamber expanding very slightly from ostium, abruptly narrowed at a pair of shoulderlike prominences and thence funnel-shaped to opening into ductus bursae proper; moth larger and more robust; wings grayish or olivaceous fuscous; common in California but not known from elsewhere..... *occidentalis* p. 48

### *Achyra bifidalis* (Fabricius), NEW COMBINATION

PL. 3, FIGS. 31, 32 (McD. 5469).

*Phalaena bifidalis* Fabricius, 1794, *Entomologica Systematica Emendata et Aucta*, **3** (2): 232.
Type-locality: "Americae Insulis" (islands of America).

*Phlyctaenodes inornatalis* Walker, [1866], *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **34**: 1456. NEW COMBINATION with *Achyra*.
Type-locality: St. Domingo. [BMNH]

*Eurycreon evanidalis* Berg, 1875, *Deutsche Ent. Zeits.*, **19**: 134. NEW COMBINATION with *Achyra*.
Type-locality: Buenos Aires, Argentina. [MNSA]

*Eurycreon obsoletalis* Berg, 1875, *Deutsche Ent. Zeits.*, **19**: 135. NEW COMBINATION with *Achyra*.
Type-locality: Buenos Aires, Argentina. [MNSA]

*Loxostege stolidalis* Schaus, 1940, *New York Acad. Sci., Scientific Survey of Porto Rico and the Virgin Islands*, **12** (3): 368. NEW COMBINATION with *Achyra*.
Type-locality: Ensenada, Puerto Rico. [USNM]

Moth distinguished by the oblique dark shade extending inward from the apex of the forewing; this shade sometimes very faint but apparently always discernible. Ground color light brown, without the range of variation found in *A. rantalis*.

Male genitalia with a basal subtriangular process from sacculus; distal prominence with dorsal margin oblique, though in the opposite direction to the ridge of *Hahncappsia*; setae of this prominence divided into two groups, a basal row

of bent, somewhat scalelike setae on the oblique edge and a distal group of straight, fine setae. Vesica with numerous setae. Female genitalia with anterior part of ostial chamber bulbous and posterior part parallel-sided.

Larva on cotton, *Gossypium* species, purslane, *Portulaca* species, and probably a variety of other hosts. An economic pest in the tropics. Structurally similar to *A. rantalis* but with pigmentation of sclerotized areas weaker and somewhat differently distributed. For a detailed description see Capps (1967: 53).

Arizona to Texas, straying north to Alberta; in the tropics from Mexico and West Indies to Argentina. Moth in almost every month of the year, even in North America, the flight time varying with locality.

*Achyra rantalis* (Guenée), NEW COMBINATION (Garden Webworm*; Tisseuse des Jardins, f., Fr.)

PL. 3, FIGS. 20–25; PL. E, FIG. 4; PL. P, FIG. 4 (McD. 5471, in part).

*Nymphula rantalis* Guenée, 1854, *Species Général des Lépidoptères*, **8**: 405.
Type-locality: "Montevideo" [erroneous], probably North America or Cuba, most likely the former (see Capps, 1967: 50). [USNM]

*Nymphula similalis*, of authors, not Guenée, 1854.

*Botys siriusalis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **18**: 563. NEW COMBINATION with *Achyra*.
Type-locality: United States. [BMNH]

*Botys licealis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **18**: 563. NEW COMBINATION with *Achyra*.
Type-locality: United States. [BMNH]

*Ebulea murcialis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **18**: 746. NEW COMBINATION with *Achyra*.
Type-locality: St. Domingo. [BMNH]

*Scopula nestusalis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **18**: 784. NEW COMBINATION with *Achyra*.
Type-locality: United States. [BMNH]

*Scopula diotimealis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **18**: 785. NEW COMBINATION with *Achyra*.
Type-locality: St. Domingo. [BMNH]
NOTE—A lectotype was designated by Capps (1967: 49).

*Scopula crinisalis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **18**: 798. NEW COMBINATION with *Achyra*.
Type-locality: unknown. [BMNH]
NOTE—A lectotype was designated by Capps (1967: 49).

*Nephopteryx intractella* Walker, 1863, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **27**: 55. NEW COMBINATION with *Achyra*.
Type-locality: United States. [BMNH]

*Botys* (*Eurycreon*) *crinitalis* Lederer, 1863, *Wiener Ent. Monat.*, **7**: 376. NEW COMBINATION with *Achyra*.
Type-locality: unknown. [BMNH]
NOTE—This is an unnecessary emendation of *Scopula crinisalis* Walker, 1859, and ranks as a junior objective synonym, with the same type-specimen and type-locality.

*Botys posticata* Grote and Robinson, 1867, *Trans. Amer. Ent. Soc.*, **1**: 22. NEW COMBINATION with *Achyra*.
Type-locality: Pennsylvania. [AMNH]

*Botys subfulvalis* Herrich-Schäffer, 1871, *Korrespondenz-Blatt des Zoologisch-Mineralogischen Vereines in Regensburg*, **25**: 20. NEW COMBINATION with *Achyra*.
Type-locality: unknown.

*Botis communis* Grote, 1876, *Can. Ent.*, **8**: 99. NEW COMBINATION with *Achyra*.
Type-locality: New York. [BMNH]
NOTE—A lectotype was designated by Capps (1967: 49).

*Eurycreon collucidalis* Möschler, 1890, *Abhandl. Herausgegeben von der Senckenbergischen Naturforschenden Ges.*, **16**: 290. NEW COMBINATION with *Achyra*.
Type-locality: Puerto Rico. [HUMB]

*Pyrausta caffreii* Flint and Malloch, 1920, *Bull. Illinois Nat. Hist. Survey*, **13**: 304. NEW COMBINATION with *Achyra*.
Type-locality: Bloomington, Illinois. [INHS]

Variable in color, the forewing being various shades of orange, brown or fuscous. Unlike any other North American species except *A. occidentalis*; separable by the characters given in the key.

Larva on a wide variety of low plants, including crop species such as alfalfa, clover, beans, soybeans, cowpeas, sugarbeets, peas, strawberries, maize and cotton, as well as many weeds and wild plants. Injurious to alfalfa, clover and other crops, webbing leaves and eating them under cover of the webs; in autumn living in silk-lined tunnels on or in ground, and emerging to feed. Several generations a year—as many as five in Oklahoma—generally overwintering in pupal stage, in the extreme south perhaps also as larvae.

Structural characters of larva described and figured by Capps (1968: 48, fig. 1), color and general appearance by Metcalf and Flint (1939: 428, fig. 268). Living larva about 25 mm long, greenish to nearly black, with a light middorsal stripe and with black spots on the thoracic shield and certain pinacula. Head pale, with netlike amber markings and a fuscous patch on each side at incision of the posterior margin. Prothoracic shield with two dark bars on each side, one at level of seta XD2, the other at ventral margin of prothoracic shield proper and cutting across extreme base of postspiracular extension. Pinacula dark brown or black; the dorsal pinacula solidly black or with a small pale central area; those ventral to spiracles with longer pale centers, appearing ringlike. Setae D2 of ninth abdominal segment on a common dark pinaculum, widely separated from dark pinaculum of D1 and SD1.

The variability and wide range of this species have given rise to an extensive synonymy. Walker, with his poor knowledge of generic classification and his system of separating descriptions by country of origin, was particularly unfortunate. As late as 1920, the respected economic entomologist W. B. Flint, in association with the dipterist J. R. Malloch, redescribed the species yet once more, under the name *Pyrausta caffreii*, a warning against underestimating the difficulties of classifying even common pest species.

Maine through southern Quebec and Ontario to Iowa, Colorado and California, south to Florida, the West Indies and southern Mexico. Sporadic in the North but abundant in the southern and central states. Moth from February to September in Texas, April to September in Arizona, May to September in southern California.

*Achyra occidentalis* (Packard), NEW COMBINATION

PL. 3, FIGS. 26–30; PL. E, FIG. 5; PL. P, FIG. 5 (McD. 5471, in part).

*Scopula occidentalis* Packard, 1873, *Ann. Lyceum Nat. Hist. New York*, **10**: 260.
Type-locality: California. [MCZ]
NOTE—Capps, 1967, *Proc. United States Natl. Museum*, **120** (3561): 51, selected a lectotype.

On the average larger and more robust than *A. rantalis*. Moths like fuscous variants of that species, but tending to be more grayish or olivaceous and of a rather evenly powdery tone, with the markings crisper and more distinct. Genital characters more reliable (see key and figures).

Early stages apparently undescribed; probably similar to those of *A. rantalis*.

California, from Siskiyou to San Diego counties, and from the coast to the Sierra Nevada; probably of economic importance in this area, but in the past confused with *A. rantalis*. Moth from March to October.

GENUS

*Neohelvibotys* Munroe, NEW GENUS

Gender: feminine.
Type-species: *Loxostege neohelvialis* Capps, 1967.

DIAGNOSIS: External characters as in *Hahncappsia*. Male genitalia without oblique ridge or erect scales or setae as in *Hahncappsia*; uncus narrowly triangular, not broadly rounded or truncate. Clasper single, not double as in *Helvibotys*. Female genitalia with ostial chamber large, ductus bursae arising as a direct continuation of it; ductus seminalis entering from the side, not forming a broad arch with ductus bursae as in *Hahncappsia* and *Achyra* or enlarged and spirally sclerotized toward junction as in *Helvibotys*. Because of the similarity in most characters to *Hahncappsia*, no detailed description is given.

Early stages unknown.

The genus ranges from the southern United States to Argentina. In addition to the three species known from our fauna, the following neotropical species are referable to *Neohelvibotys*: *Loxostege nayaritensis* Capps, *L. pelotasalis* Capps, *L. boliviensis* Capps, and *L. saltensis* Capps. All these form NEW COMBINATIONS with *Helvibotys*. The moths superficially resemble species of *Hahncappsia* and the non-mimetic species of *Helvibotys*.

## KEY TO NORTH AMERICAN SPECIES

1. Terminal shading of wings usually weak;

clasper of male genitalia blunt and spinulose at tip; ductus bursae of female membranous for some distance proximad of junction with ductus seminalis; basad of this a narrow ringlike expansion and basad of the expansion a short ostial chamber with weakly defined, rounded lateral pouches. . *polingi* this page

— Terminal shading of wings strong; clasper of male genitalia sharply pointed ventrally; ductus bursae sclerotized from ostium to junction of ductus seminalis. . . . . 2

2. In male genitalia penis with a thin, rounded, basal keel and a dense cluster of spinelike cornuti distally; female genitalia with short, wide ostial chamber, followed by a wide, funnel-shaped, sclerotized zone tapering rather evenly to junction of ductus seminalis . . . . . *arizonensis* this page

— In male genitalia penis with a small cluster of spinelike cornuti arising from a narrow straplike sclerotization, in addition to the distal patch of slender spines; female genitalia with ductus bursae distinctly sclerotized and longitudinally rugose at junction of ductus seminalis. . . . . *neohelvialis* this page

*Neohelvibotys neohelvialis* (Capps), NEW COMBINATION

PL. 3, FIG. 67; PL. E, FIG. 6; PL. P, FIG. 6.

*Loxostege neohelvialis* Capps, 1967, *Proc. United States Natl. Museum*, **120** (3561): 7, figs. 12, 66, 111.
Type-locality: Plano, Texas. [USNM]

Moth externally resembling several other species of this genus and of *Helvibotys* and *Hahncappsia*, reliably identifiable only by examination of the genitalia. Male genitalia with valve rather large. Basal lobe of clasper triangular, with numerous short setae; ventral process of clasper slender, sharp and curved basad at tip. Penis with a cluster of strong spinelike cornuti arising from a straplike sclerotization, as well as a dense distal patch of small spines. Female genitalia with anterior margin of ostium strongly emarginated; sclerites flanking ostium somewhat folded; ductus bursae with longitudinal sclerotized ridges near junction of ductus seminalis.

Early stages unknown.

Georgia and Florida west to Arizona, south to the West Indies and Panama. Moth from June to September.

*Neohelvibotys arizonensis* (Capps), NEW COMBINATION

PL. 3, FIGS. 59, 60; PL. E, FIG. 7; PL. P, FIG. 7.

*Loxostege arizonensis* Capps, 1967, *Proc. United States Natl. Museum*, **120** (3561): 6, figs. 11, 64, 112.
Type-locality: Oracle, Arizona. [USNM]

Moth similar in external characters to *N. neohelvialis*, but average size a little larger (length of forewing 10–13 mm, as compared with 10–12 mm for *N. neohelvialis*). Male genitalia with process of clasper rounded and with a few radiating setae; ventral process thicker than in *N. neohelvialis*. Penis with thin, rounded, basal keel and dense distal cluster of spinelike cornuti. Female genitalia with anterior margin of ostium only weakly emarginated; ostial chamber broad and trapezoidal, opening into a wide, funnel-shaped, sclerotized, basal region of ductus bursae; no series of longitudinal ridges at junction of ductus seminalis.

Early stages unknown.

Southern Arizona, from the Chiricahua to the Baboquivari mountains, thence south to southern Mexico. Moth from July to September in Arizona, in May and June in Mexico.

*Neohelvibotys polingi* (Capps), NEW COMBINATION

PL. 3, FIG. 62; PL. E, FIG. 8; PL. P, FIG. 8.

*Loxostege polingi* Capps, 1967, *Proc. United States Natl. Museum*, **120** (3561): 9, figs. 14, 67, 109.
Type-locality: Lakeland, Florida. [USNM]

Moth externally like *N. neohelvialis* and *N. arizonensis*, but with ciliations of male antennae very short, less than half width of shaft; transverse lines usually less contrasting and terminal shading less distinct. Male genitalia with ventral process of clasper turned distad; its distal part rounded and fimbriate. Penis with very small basal keel and with distal patch of slender cornuti. Female genitalia with ostial chamber rather small, almost semicircular in outline; immediately distad of it a narrow, ringlike expansion of ductus bursae; the latter membranous beyond the expansion as far as junction of ductus seminalis; the region of this junction without longitudinal sclerotized ridges.

Early stages unknown.

Southern Florida to Texas, Arizona, and southern Mexico. Moth from April to October, the dates varying with locality.

GENUS

*Helvibotys* Munroe, NEW GENUS

Gender: feminine.

Type-species: *Spilodes helvialis* Walker, 1859.

DIAGNOSIS: External characters as in *Neohelvibotys* and *Hahncappsia*. Male genitalia most like those of *Neohelvibotys*, but clasper of valve with ventral process strongly bifid; vesica of penis bearing a spinelike distal cornutus and a blunt transversely ringed one, as well as a cluster of small spines. Female genitalia with ostial chamber unsymmetrical; ductus bursae sclerotized well into first coil beyond junction of ductus bursae with ductus seminalis; both ductus bursae and ductus seminalis enlarged and coiled at junction; rest of ductus bursae long, slender, coiled and membranous; bursa globular and spinulose, with very small, rhomboidal to cruciform signum and small, globular, membranous accessory sac. Because of the similarity of most characters to *Neohelvibotys* and *Hahncappsia*, no detailed description is given.

Larvae webbers on plants of the amaranth and goosefoot families, Amaranthaceae and Chenopodiaceae, and perhaps other plants; structurally like those of *Hahncappsia*, the prothoracic shield not extended around the spiracle as in *Achyra*.

Canada to Central America, with several species.

In addition to the species discussed below, *Loxostege sinaloensis* Capps belongs to this genus, becoming *Helvibotys sinaloensis* (Capps), NEW COMBINATION. *H. sinaloensis* is identical with *H. subcostalis* in structure, and very similar to it in color, but differs in having the third segment of the labial palpus yellowish, like the other segments, not contrastingly black, and the middle and back tarsi partly yellowish. Preliminary study of series from southern Mexico suggests that these characters may intergrade and that *H. sinaloensis* may fall into synonymy.

## KEY TO NORTH AMERICAN SPECIES

1. Wings above uniformly orange or orange yellow, with or without a fuscous terminal band, but without transverse lines or cell spots ..... 2
— Wings above orange yellow, with evident transverse lines and cell spots; termen without contrasting fuscous band, at most weakly suffused with brown ..... 3

2. Wings above orange, with contrasting fuscous terminal band ..... *freemani* p. 51
— Wings above unicolorous orange yellow, without terminal band ..... *subcostalis* p. 51

3. Midtibia of male without hair-pencil; termen of wings concolorous with ground color ..... *helvialis* this page
— Midtibia of male with well-developed hair-pencil; termen of wings darker than ground color, concolorous with transverse lines ..... *pseudohelvialis* p. 51

*Helvibotys helvialis* (Walker), NEW COMBINATION

PL. 3, FIGS. 57, 58; PL. F, FIG. 2; PL. Q, FIG. 1 (McD. 5468).

*Spilodes helvialis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **18**: 772.
Type-locality: United States. [BMNH]

*Botys thycesalis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **19**: 981. NEW COMBINATION with *Helvibotys*.
Type-locality: United States. [BMNH]

*Botys apertalis* Walker, [1866], *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **34**: 1393. NEW COMBINATION with *Helvibotys*.
Type-locality: North America. [BMNH]

*Botys citrina* Grote and Robinson, 1867, *Trans. Amer. Ent. Soc.*, **1**: 23. NEW COMBINATION with *Helvibotys*.
Type-locality: Philadelphia, Pennsylvania. [AMNH]
NOTE—Capps (1967: 4) designated a lectotype.

Moth relatively small, length of forewing about 10 mm. Ground color yellowish; costa, transverse lines and cell spots of forewing and postmedial line of hindwing fine, reddish brown; termen not perceptibly darkened. Male genitalia with uncus bluntly triangular; clasper rather thick, the distal processes rounded at their tips. Female genitalia with anterior margin of ostium at most weakly sclerotized; basal part of ductus bursae, between ostium and ductus seminalis, relatively wide and only weakly unsymmetrical.

Larva on amaranths, *Amaranthus* species, and beet, *Beta vulgaris* L. Head pale, with amber reticulations, incision of posterior margin not conspicuously marked with fuscous. Prothoracic shield pale, with weak pale-amber mid-dorsal markings and with ventral margin dark nearly to seta XD2. Pinacula of setae D1–D2 and SD1–SD2 of mesothorax separate but slightly elevated. SD pinacula of mesothorax, metathorax and abdominal segments 1 to 8 more heavily sclerotized and darker colored than the pinacula above or below them. Ninth abdominal segment with dark area of D2 pinaculum small and adjacent to seta base; on the same segment the pinaculum of D1 and SD1 mostly dark and the L pinaculum pale.

Massachusetts and Chatham, Ontario, south to the Florida Keys and Brownsville, Texas. Moth from March to October.

*Helvibotys pseudohelvialis* (Capps), NEW COMBINATION

PL. 3, FIGS. 65, 66; PL. F, FIG. 3; PL. Q, FIG. 2.

*Loxostege pseudohelvialis* Capps, 1967, *Proc. United States Natl. Museum*, **120** (3561): 5, figs. 9, 63, 106.
Type-locality: Baboquivari Mts., Pima Co., Arizona. [USNM]

Moth closely similar to *H. helvialis*. Midtibia of male thicker, with a well-developed hair-pencil. Termen of forewing and hindwing dark, about the same color as transverse lines.

Male genitalia with uncus more sharply pointed at tip; distal processes of clasper narrower and relatively sharp distally; vinculum narrower and more attenuate midventrally. Female genitalia with anterior margin of ostium forming a narrow, somewhat crinkled sclerite; sclerotized part of ductus bursae between ostium and ductus seminalis narrow and strongly displaced to the left.

Early stages unknown.

Western Texas to San Diego, California, north to Utah and south into Sonora, Mexico. Moth from June to September.

*Helvibotys freemani* Munroe, NEW SPECIES

PL. 3, FIG. 64; PL. F, FIG. 4.

*Helvibotys freemani* Munroe
Type-locality: Brownsville, Texas. [CNC]

DIAGNOSIS. Immediately distinguishable from all other North American pyralids by the uniformly bright-orange wings with contrasting blackish-fuscous terminal bands. Male genitalia like those of *H. helvialis*, but with processes of clasper more widely divergent.

DESCRIPTION. Moth with ground color of head, antenna, body, wings and legs light yellowish orange. Eye, ocellus, foretibia, foretarsus, dorsal surface of forefemur, and a contrasting terminal band on both surfaces of forewing and hindwing blackish fuscous. Anal tuft light buff. Length of forewing 10 mm.

Male genitalia with uncus triangular, about twice as long as wide, laterally and dorsally setose, constricted at base. Transtilla with wide lateral elements, interrupted in middle. Juxta horseshoe-shaped. Vinculum narrow, medially carinate. Valve of medium width, curved dorsad, rounded at tip; costa and sacculus inflated; clasper with two dorsomesal and two longer, blunt, divergent ventral processes. Penis cylindrical; aedoeagus weakly sclerotized; distal knob and spine united; three groups of fine, possibly deciduous, cornuti.

Female genitalia unknown.

Early stages unknown.

TYPES: Holotype; ♂. Brownsville, Texas; March 1937; T. N. Freeman. CNC. Paratypes: 5 ♂♂. Same date as for holotype (4♂♂); San Antonio, Texas; 30 Aug. 1973; A. and M. E. Blanchard (1 ♂). CNC; AB.

*Helvibotys subcostalis* (Dyar), NEW COMBINATION

PL. F, FIG. 1.

*Lygropia subcostalis* Dyar, 1912, *Proc. United States Natl. Museum*, **42** (1885): 104.
Type-locality: Orizaba, Mexico. [USNM]

Moth with wings uniformly orange yellow, except costa of forewing narrowly margined with black on underside. Head, body and legs orange yellow, except eye and ocellus fuscous, third segment of labial palpus contrastingly black; all tarsi blackish fuscous. Midtibia of male only weakly thickened; hair-pencil absent or nearly so.

Length of forewing 8–10 mm.

Male genitalia: valve rather narrow; clasper with two flattened, distally rounded, ventrally directed processes; Capps' figure (1967, fig. 13) of *H. sinaloensis* is misleading, in that it shows the more distal of these two processes with the tip twisted edgewise, so that it appears sharp and

clawlike; penis with a group of fine spines distally. Female genitalia unknown.

Early stages unknown.

Dallas, Texas, south to Costa Rica. Moth from May to August.

As noted in the generic discussion, the Mexican *H. sinaloensis* (Capps) is doubtfully distinct. It is interesting that both the mimetic species found in our fauna, viz., *H. subcostalis* and *H. freemani*, are known only from males. It is possible that the females will prove to be different in appearance.

The moth will be figured in a later fascicle.

GENUS

*Sitochroa* Hübner

*Sitochroa* Hübner, [1825], *Verzeichniss Bekannter Schmettlinge* [sic], 356.
Type-species: *Pyralis palealis* [Denis and Schiffermüller], 1775. Designated by Marion, 1957, *L'Entomologiste*, **13**: 83.

*Spilodes* Guenée, 1854, *Species Général des Lépidoptères*, **8**: 379. NEW SYNONYMY.
Type-species: *Phalaena Pyralis verticalis* Linnaeus, 1758. Designated by Shibuya, 1928, *Jour. Faculty Agric., Hokkaido Imperial University*, **22**: 267.

External structure of moth as in *Hahncappsia*, *Loxostege* and related genera. Frons strongly conical; labial palpus porrect, conically scaled, exceeding frons by not much less than length of head. Maxillary palpus not greatly dilated with scales. Midtibia of male thickened, bearing a hair-pencil; outer preapical spur of male hindtibia considerably reduced.

Male genitalia characteristic. Uncus rather narrow, tapering to a rounded tip; distal part of its dorsal surface thickly clothed with strong short setae or spines. Valve fairly wide, with a large, arched, sclerotized clasper, two ventrally directed, basally curved, thornlike processes and with some dorsal setae on the crown of the arch. Aedoeagus with a prominent thumblike process from one side of tip. Vesica with strong fixed and deciduous cornuti. Female genitalia with complex ostial armature and a twisted sclerite near base of the rather short ductus bursae. Bursa membranous, with fairly small rhomboidal signum.

Larvae pale, with dark head, shields and pinacula, making webs on leaves or flowers of low plants.

This genus is easily recognized by the characteristic wing pattern of weakly dentate or crenulate bands parallel to the termen and often connected along the veins. The pattern is recognizable even in *S. dasconalis*, where it is weakly developed.

This is a holarctic genus of very homogenous aspect and structure. The species are few but some are common and widely distributed. Three species occur in North America, all confined to this continent.

## KEY TO NORTH AMERICAN SPECIES

1. Ground color of wings orange yellow ..... *aureolalis* this page
— Ground color of wings pale buff ..... 2

2. Wings above with markings obsolescent; base of costa of forewing orange-tinted ..... *dasconalis* p. 53
— Wings above with markings obvious, though rarely contrasting; base of costa of forewing not orange-tinted ..... *chortalis* p. 53

*Sitochroa aureolalis* (Hulst), NEW COMBINATION

PL. 3, FIGS. 54–56 (McD. 5463).

*Eurycreon aureolalis* Hulst, 1886, *Trans. Amer. Ent. Soc.*, **13**: 156.
Type-locality: Arizona. [AMNH]

*Pyrausta cyralis* Druce, 1895, *Biologia Centrali-Americana. Insecta. Lepidoptera-Heterocera*, **2**: 204; **3**, pl. 60, fig. 15. NEW COMBINATION with *Sitochroa*.
Type-locality: Northern Sonora, Mexico. [BMNH]
NOTE—The locality cited is that of the lectotype, hereby designated, a male in the BMNH, with labels as follows: "LECTOTYPE" [round purple-bordered label]; "No Sonora,/Mexico/Morrison."; "Pyrausta/cyralis/Type Druce" [in Druce's hand]; "Godman-Salvin/Coll. 1904.–1/B.C.A. Lep. Het./Pyrausta/cyralis,/Druce." There are in the BMNH 1 ♂ and 2 ♀♀ with the same locality and collection labels that are definitely paralectotypes and 2 ♂♂ from Sonora, Mexico, and 1 ♂ from Arizona, collected by Morrison, all from the Paravicini collection, that may also be paralectotypes. Only the first three have paralectotype labels attached.

Moth easily recognized by the characteristic *Sitochroa* maculation and the strongly orange-yellow ground color of the wings.

Early stages unknown.

Southern California to Arizona and northern Mexico. Uncommon in collections. Moth in June to August in southern California.

*Sitochroa dasconalis* (Walker), NEW COMBINATION

PL. 3, FIGS. 45, 46; PL. Q, FIG. 3 (McD. 5460).

*Spilodes? dasconalis* Walker, 1859, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **18**: 773.
Type-locality: unknown. [BMNH]

Moth decidedly paler and less distinctly marked than the other two North American species; easily confused with *Hahncappsia coloradensis* (p. 44; plate 3, figures 13, 14), but with fundamentally different wing pattern (best seen on underside) and genital structure.

Larva on wild indigo, *Baptisia tinctoria* (L.) R. Br.

Massachusetts to Illinois, south to central Florida and eastern Texas, not very common. Moth from June to August in the North, probably throughout the year in Florida.

*Sitochroa chortalis* (Grote), NEW COMBINATION

PL. 3, FIGS. 47–53; PL. F, FIG. 5 (McD. 5462).

*Eurycreon chortalis* Grote, 1873, *Bull. Buffalo Soc. Nat. Sci.*, **1**: 89, pl. 2, fig. 13.
Type-locality: not fixed.
NOTE—This species was described from an unknown number of syntypes from Albany, New York; Massachusetts "in May"; and Alabama. The BMNH has three Grote specimens, one with the labels "68" and "May", with "Eurycreon/chortalis Grote" in an unidentified hand, and two with blue-bordered Grote determination labels from "Col." and "Soda Sp.", respectively. Only the first of these can be a syntype. Though I think it likely that it is a syntype from Massachusetts, I consider the evidence insufficient to prove this, and I do not feel in a position to designate a lectotype.

A common and widespread moth, easily recognized by the greenish-gray transverse lines on a whitish-buff ground and by the absence of orange suffusion at the base of the costa. One of the most abundant moths of open grasslands over a large part of the continent. Moths nocturnal, but easily flushed by day and often seen along with Crambinae and other moths in summer meadows and pastures.

Larva on pigweed, *Amaranthus retroflexus* L., and probably on other low plants. Full-grown larva pale, with dark setal sockets; pinacula pale, but at least dorsal, subdorsal and lateral pinacula with prominently dark margins, sometimes interrupted to form U-shaped or parenthesislike markings. Eggs flat, oval, laid in a regularly shingled pattern and covered with a creamlike jelly.

Nova Scotia to southern British Columbia and south to New Jersey, Arizona and northern California. Double-brooded in Ontario, the moths flying from late May to early July and again in August.

GENUS

*Arenochroa* Munroe, NEW GENUS

Gender: feminine.
Type-species: *Loxostege flavalis* Fernald, 1894.

DIAGNOSIS: Like *Loxostege* in external structure. Male genitalia very different, with uncus rather broadly triangular, almost naked above. Valve with sacculus dorsally serrate; clasper consisting of an elongate curved ridge above sacculus, with a second ridge between this and surface of valve; the latter ridge denticulate, ending distally in a somewhat decurved denticulate process. Penis short and cylindrical; tip of aedoeagus pointed; vesica with a small sharp cornutus. Female genitalia with symmetrical ostial chamber and inconspicuous ductus seminalis, much as in *Xanthostege* and *Loxostege*; eighth sternite not wrinkled as in *Xanthostege*; base of ductus bursae not obviously sclerotized, distal end without sclerotized band.

DESCRIPTION: Frons flattened, with a small conical prominence in front. Labial palpus porrect and conically scaled, third segment hidden in scaling of second; exceeding frons by a little less than length of head. Maxillary palpus well developed, distal scaling only slightly expanded. Proboscis strong, scaled at base. Eye large. Ocellus present. Antenna weakly annulated; in male its ventral surface with ciliations somewhat longer than diameter of shaft; in female short-pubescent; dorsal surface scaled in both sexes. Body fairly robust; abdomen slightly exceeding anal angle of hindwing. Midtibia of male without hair-pencil. Praecinctorium weakly bilobed.

Forewing of moderate width; costa arched, most strongly near apex; apex acute; termen

rather strongly oblique and convex; tornus obtuse; posterior margin weakly convex. Discal cell narrow, about two-thirds length of wing. $R_1$ from well basad of anterior angle of cell; $R_2$ from near anterior angle, weakly approximated to $R_{3+4}$ for some distance. $R_3$ and $R_4$ stalked more than halfway from cell to apex. $R_5$ and $M_1$ straight and separate from near anterior angle of cell. Discocellular strongly concave. $M_2$, $M_3$ and $Cu_1$ rather widely spaced around posterior angle of cell, their basal parts very slightly curved and approximated. $Cu_2$ from cell at about three-fourths from base. Anal loop large and closed.

Hindwing relatively small and narrow. Apex, termen and anal angle rounded. $Sc+R_1$ and $R_s$ anastomosed for a considerable distance. $R_s$ and $M_1$ stalked. Cell less than half as long as wing. Anterior part of discocellular vein weakly concave; posterior part strongly oblique distad. $M_2$ and $M_3$ from the acute posterior angle of cell; their basal parts curved and approximated or sometimes stalked. $Cu_1$ arising some distance from $M_3$, not basally curved or approximated to it. $Cu_2$ from cell at about middle. Three anal veins present.

Male genitalia with uncus rather broadly triangular, almost naked above. Tegumen short, expanded laterally into rounded lobes. Transtilla medially incomplete. Juxta small, dorsally bifid. Vinculum narrow; its ventral part somewhat triangular. Penis cylindrical; aedoeagus tapering abruptly to a sharp point distally; vesica with a small cornutus. Valve of moderate width, rounded distally. Sacculus high and distinct, with sinuate and denticulate dorsal margin. Clasper consisting of two ridges, one lying mesad of the other and joining on their inner margins. The mesal ridge simple, with free ventral margin denticulate; the second ridge, lying between the first one and the mesal surface of the valve, produced distally into a ventrally directed, denticulate process. Female genitalia with high, narrow, strongly setose ovipositor lobes. Apophyses short and weak. Ostial chamber symmetrical; dorsal wall spinulose; a funnel-shaped section with a sclerotized band at its narrow distal end leading into a long, narrow, coiled, membranous ductus bursae; ductus seminalis narrow and membranous joining ductus bursae near ostial end. Bursa globular, finely denticulate, with rhomboidal, transversely keeled, denticulate signum and globular membranous accessory sac.

Early stages unknown.

The single species occurs in the southwestern United States.

The genus is perhaps related to *Loxostege* and *Achyra*, but the armature of the valve is more reminiscent of that of the palearctic genus *Psammotis* Hübner.

*Arenochroa flavalis* (Fernald), NEW COMBINATION

PL. 3, FIGS. 15–17; PL. F, FIG. 6; PL. Q, FIG. 4 (McD. 5466, 5470).

*Loxostege flavalis* Fernald, 1894, *Insect Life*, **6**: 255. Type-locality: Argus Mts., California. [USNM]

*Loxostege unipunctalis* Walter, 1928, *Proc. Ent. Soc. Washington*, **30**: 140. NEW SYNONYMY, NEW COMBINATION with *Arenochroa*.
Type-locality: Tempe, Arizona. [USNM]

This species is easily recognized by the wing-shape, the small fuscous patch near the posterior margin of the cell of the sand-brown forewings and by the white or whitish hindwings. I can see no ground for separating *L. unipunctalis*, of which the holotype is figured on the plate.

Genitalia described above, under the generic heading.

Early stages unknown.

Common in southern California and Arizona. Moth in April, May and probably other months.

GENUS

*Xanthostege* Munroe, NEW GENUS

Gender: feminine.
Type-species: *Prothymia plana* Grote, 1883.

DIAGNOSIS: External characters much as in *Loxostege*, but frons very flat above, produced in a horizontal wedge with vertical sides rather than in a cone as in *Loxostege*; easily distinguished by the plain yellow forewing with contrasting pink termen. Male genitalia with narrow, spatulate uncus, bearing only a few minute dorsal setae; valve with basal and sometimes distal, ventrally directed, sclerotized processes on clasper and with sclerotized dorsal margin of sacculus, bearing a row of spines or narrow basal and wider distal sclerotized processes. Penis short, cylindrical; vesica with a few inconspicuous setalike cornuti. Female genitalia with wide, poorly differentiated but strongly setose ovipositor lobes, very short, weak apophyses, broad, wrinkled eighth sternum, long ductus bursae with at most a short tubular sclerotization at ostial end, and globular bursa

with rhomboidal or mouth-shaped spinulose and transversely carinate signum.

DESCRIPTION: Frons prominent, very flat dorsally, with vertical sides; produced in front into a horizontal wedge, its anterior margins on the two sides converging to an obtuse angle marked by an inconspicuous vertical carina; scaling smooth. Vertex with rough erect scaling. Labial palpus porrect, exceeding frons by less than length of head; scaling fine, smooth, anteriorly pointed; third segment hidden in scaling of second. Maxillary palpus prominent, with an expanded, forward-directed tuft of scales at tip, continuing plane of frons. Proboscis well developed, scaled at base. Eye large. Ocellus well developed, somewhat separated from dorsal margin of eye. Antenna filiform in both sexes, ciliated beneath, scaled above.

Forewing fairly wide; costa nearly straight; apex narrowly rounded; termen evenly convex, oblique; tornus rounded; posterior margin convex. $R_1$ from somewhat basad of anterior angle of cell; $R_2$ from near anterior angle; $R_3$ and $R_4$ stalked about halfway from anterior angle of cell to apex of wing; $R_5$ from somewhat behind anterior angle, not curved and approximated to $R_{3+4}$; $M_1$ from distinctly behind $R_5$ and almost as close to $M_2$. Discocellular very short, almost straight, very weakly concave distad. $M_2$, $M_3$ and $Cu_1$ widely spaced around posterior angle of cell, their basal parts not approximated. $Cu_2$ from cell at three-fourths. 1st A represented by a fold only. 2nd A strong, somewhat convex forward. 3rd A forming a large closed loop with 2nd A.

Hindwing of moderate proportions, with rounded apex, termen and anal angle. $Sc+R_1$ anastomosed for a considerable distance with $R_s$ beyond cell. $R_s$ and $M_1$ stalked for some distance. Discal cell about half as long as wing. Discocellular abruptly angled at middle of cell; anterior part straight and erect; posterior part strongly oblique distad. $M_2$ and $M_3$ arising together from posterior angle of cell, their basal parts curved and approximated. $Cu_1$ from a little basad of posterior angle, its basal part not approximated to that of $M_3$. $Cu_2$ from cell at about three-fifths from base. Three anals present.

Male genitalia: Uncus short, narrow, parallel-sided, distally narrowly rounded, dorsally flattened and almost naked, bearing only a few scattered fine setae. Gnathos and subscaphium absent. Tegumen long. Transtilla narrow but complete. Juxta small and V-shaped. Vinculum U-shaped, rather narrow. Valve of moderate length, curved dorsad, rounded at tip; costa inflated, more widely so near base; clasper complex, consisting of a weak setose pad and a sclerotized part bearing basal and distal, widely separated, ventrally directed spinose processes; sacculus with dorsal sclerotization bearing a narrower basal spinulose process and a wider distal one; these processes interlocking with those of sacculus. Penis cylindrical; vesica with fine setalike cornuti.

Female genitalia: Ovipositor with poorly defined but densely setose lobes. Posterior apophysis with vertical bar short and weak; shaft short, irregularly bent, its anterior part narrow. Eighth sternite transversely wrinkled; ostial chamber wide, cup-shaped and sclerotized. Ductus bursae long, coiled, membranous except at ostial end. Bursa globular, very finely spinulose, with mouth-shaped or rhomboidal signum.

Early stages unknown.

The genus is known from two species that occur in the southwestern United States and probably in adjacent parts of Mexico.

## KEY TO NORTH AMERICAN SPECIES

1. Upperside of forewing with inner edge of pink terminal border diffuse; Texas..... ..... *roseiterminalis* this page

— Upperside of forewing with inner edge of pink terminal border sharp and distinct; Arizona .....*plana* p. 56

*Xanthostege roseiterminalis* (Barnes and McDunnough), NEW COMBINATION

PL. 5, FIGS. 37, 38; PL. F, FIG. 7; PL. Q, FIG. 5 (McD. 5476, in part).

*Loxostege roseiterminalis* Barnes and McDunnough, 1914, *Contrib. Nat. Hist. Lep. N. Am.*, **2**(6): 233, pl. 1, fig. 8.

Type-locality: San Benito, Texas. [USNM]

NOTE—The locality given is that of the lectotype, hereby designated, a specimen in the USNM labelled "*Loxostege roseiterminalis* B. & McD. Type ♂".

Moth with bright-yellow forewing with pink terminal band and fringe, and with whitish hindwing. Length of forewing 7–10 mm. Distinguished from *X. plana* by the slightly larger size and the diffuse inner margin of the pink terminal band.

In male genitalia clasper with both basal and distal ventrally directed processes; dorsal sclerotized ridge of sacculus with spinose basal and distal processes, unspined between. Female genitalia with narrow tubular sclerotized zone at base of ductus bursae.

Early stages unknown.

Texas, mostly in the south, from Brownsville to Zavalla County and Sinton, San Patricio County; but taken by André Blanchard at Paducah, Cottle County. Moth from March to October, with little interruption.

*Xanthostege plana* (Grote), NEW COMBINATION

PL. 5, FIGS. 35, 36: PL. F, FIG. 8; PL. Q, FIG. 6 (McD. 5476, in part).

*Prothymia plana* Grote, (1883), *Papilio*, **2**: 184. Type-locality: Arizona.

Moth closely similar to *X. roseiterminalis*, but a little smaller (length of forewing 6–8 mm), and with inner edge of pink terminal band of forewing sharply defined.

Male genitalia with only a basal process on clasper and with whole dorsal margin of sclerotized part of sacculus spined. Female genitalia without tubular sclerotized zone in ductus bursae adjacent to ostium.

Early stages unknown.

Southern Arizona, from Douglas to the Baboquivari Mountains and north to Yavapai County. Moth in June, August and probably other months.

This moth was described as a noctuid by Grote and was so listed for many years. Barnes and Benjamin (1926) transferred it to *Loxostege*, but wrongly synonymized *L. roseiterminalis* with it. Hahn W. Capps many years ago made slides that showed that the two species had different genitalia, but he never published his finding. The species of *Xanthostege* can hardly be confused with any other North American pyralids. The structural family characters distinguish them from noctuids of somewhat similar appearance.

GENUS

*Sericoplaga* Warren

*Sericoplaga* Warren, 1892, *Ann. Mag. Nat. Hist.*, (6) **9**: 295.

Type-species: *Sericoplaga externalis* Warren, 1892. Monotypy and original designation.

A genus of uncertain relationships though clearly belonging to the present tribe; placed here because of some structural resemblances to genera of the *Loxostege* group. Frons flat and oblique, not conically produced; other external characters much as in *Loxostege*. Labial palpus porrect, conically scaled, exceeding frons by less than length of head. Maxillary palpus prominent, weakly dilated with scales distally. Antenna filiform and short-ciliate in both sexes. Midtibia of the male thickened and provided with a hair-pencil. Outer preapical spur of the male hindtibia about one-fifth length of inner.

Male genitalia unusual. Uncus deeply divided into two long, slender, weakly divergent, distally narrowly expanded parts, with dorsal spining near tips. Transtilla incomplete medially. Juxta small and dorsally bifid, as in the *Loxostege* group. Vinculum narrow, ventrally angulate and keeled, bearing a pair of prominent coremata. Valve long and slender, distally rounded and setose; costa strongly inflated; sacculus basally inflated but with no special armature or processes; clasper consisting of a somewhat lunular, padlike, densely spinulose structure, overlain by a sclerotized ridge, somewhat as in *Arenochroa* in this respect. Penis short, curved and tapering, with a bundle of barbed deciduous cornuti. Female genitalia with ovipositor lobes soft and strongly setose. Posterior apophysis very short and weak; anterior apophysis longer but weak and crooked. Ostium narrow, without special armature. Ductus bursae long, slender, membranous. Bursa globular, with a very large, kite-shaped signum, the posterior part longer than the anterior.

Larva on osage orange, *Maclura pomifera* (Raf.) Schneid.

Only one species is known.

*Sericoplaga externalis* Warren

PL. 3, FIGS. 33, 34; PL. G, FIG. I; PL. Q, FIG. 7 (McD. 5497).

*Sericoplaga externalis* Warren, 1892, *Ann. Mag. Nat. Hist.*, (6) **9**: 296.
Type-locality: Texas [labelled "Boll, 4/75" and "16.VI"]. [BMNH]

*Loxostege maclurae* Riley, 1893, *Insect Life*, **5**: 158. Type-locality: Kirkwood, Missouri. [USNM]

Moth brownish gray, somewhat like *Mutuuraia mysippusalis*, but distinguished by the sinuated termen and falcate apex. Fringe distally whitish, not concolorous as in *M. mysippusalis*.

Genitalia and larva as described for the genus

Fairly common from Maryland to Illinois and south to southern Florida and Texas.

Forbes (1923) in his *Lepidoptera of New York* cited the synonymy correctly, but McDunnough (1939) in his *Check List* wrongly sank the senior synonym to the junior one.

GENUS

*Uresiphita* Hübner

*Uresiphita* Hübner, [1825], *Verzeichniss Bekannter Schmettlinge* [sic], 353.
Type-species: *Pyralis limbalis* [Denis and Schiffermüller], 1775. Designated by Pierce and Metcalfe, 1938, *The Genitalia of the British Pyrales with the Deltoids and Plumes*, 64.

This genus has gone in North American lists under the name *Tholeria* Hübner, but the type-species of *Tholeria* is a neotropical schoenobiine or crambine and has nothing to do with *Uresiphita*. In older European literature it has generally been called *Mecyna* Guenée, 1854, but, as Pierce and Metcalfe showed, *Mecyna* was actually proposed in 1849 by Doubleday and its type-species belongs to the tribe Spilomelini.

Moth with frons strongly flattened as in *Sericoplaga*; labial palpus longer, exceeding frons by more than length of head; third segment exposed, often drooping rather than porrect. Maxillary palpus strongly dilated with scales distally. Mid-tibia of male greatly thickened and with a strong hair-pencil. Termen of forewing convex, not sinuated; apex not falcate. Wing-venation much as in *Sericoplaga*, but with $M_2$, $M_3$ and $Cu_1$ arising somewhat closer together.

Male genitalia with uncus slender, distally rounded and dorsally spined. Tegumen long. Anal tube supported by a subscaphium. Transtilla incomplete. Juxta small, dorsally emarginate. Vinculum rounded ventrally, keeled in midline. Valve long, fairly slender, curved dorsad, with rounded tip; costa narrowly inflated, basal part of sacculus more widely so; clasper a short, wide, somewhat clawlike, ventrally directed process in middle of basal third of valve, with sparse vestiture of slender dorsally directed setae. Penis cylindrical, with a slightly bent cornutus nearly as long as aedoeagus. Female genitalia much as in *Sericoplaga*, but with posterior apophysis relatively stronger, anterior relatively weaker; signum transversely ovate rather than kite-shaped.

Larvae bright-colored, gregarious, active and very hungry; in webs on various shrubs, but especially broom, *Genista* species, and other legumes.

A small genus, widely distributed in the Old World, as far east as Hawaii and the Marquesas. One species in North America.

*Uresiphita reversalis* (Guenée), NEW COMBINATION

PL. 3, FIGS. 35–44; PL. G, FIG. 2; PL. Q, FIG. 8 (McD. 5515).

*Mecyna reversalis* Guenée, 1854, *Species Général des Lépidoptères*, **8**: 409.
Type-locality: North America.

Moth unlike any other in our fauna. Forewings varying from reddish brown to dull brown; width of dark terminal markings of hindwing somewhat variable. Several of the Old World species are similar in appearance, but they have either the dark border of the hindwing considerably more extensive or the ground color of the hindwing brown or extensively suffused with brown. As foreign species might be introduced to North America on nursery stock, economic entomologists should submit atypical specimens for authoritative identification.

Larva gray with extensive orange or yellow and black mottling, feeding not only on leaves but also on tender bark and shoots; on broom, *Genista* species, lupines, *Lupinus* species, wild indigo, *Baptisia tinctoria* (L.) R. Br., necklace pod, *Sophora tomentosa* L., honeysuckle, *Lonicera* species, and other plants and shrubs, especially legumes. An occasional pest of nursery stock and ornamental plantings.

Southern Canada to southern Florida and west to California. In the northern part of the range with sporadic years of abundance, possibly sustained by migration from the south. Moth from February to November in Texas.

GENUS

*Loxostege* Hübner

*Loxostege* Hübner, [1825], *Verzeichniss Bekannter Schmettlinge* [sic], 352.
Type-species: *Pyralis aeruginalis* Hübner, 1796. Designated by Hampson, 1918, *Ann. Mag. Nat. Hist.*, (9) **2**: 189.

*Boreophila* Guenée, 1844, *in* Duponchel, *Catalogue Méthodique des Lépidoptères d'Europe*, 195. NEW SYNONYMY.

Type-species: *Pyralis manualis* Geyer, [1828–1832]. Designated by Guenée, 1854, *Species Général des Lépidoptères*, **8**: 156.

*Cosmocreon* Warren, 1892, *Ann. Mag. Nat. Hist.*, (6) **9**: 433.
Type-species: *Botis albiceralis* Grote, 1878. Original designation.

*Maroa* Barnes and McDunnough, 1914, *Contrib. Nat. Hist. Lep. N. Am.*, **2**: 237. NEW SYNONYMY.
Type-species: *Maroa unicoloralis* Barnes and McDunnough, 1914. Monotypy and original designation.

*Polingia* Barnes and McDunnough, 1914, *Contrib. Nat. Hist. Lep. N. Am.*, **2**: 239. NEW SYNONYMY.
Type-species: *Polingia quaestoralis* Barnes and McDunnough, 1914. Monotypy and original designation.

*Parasitochroa* Hannemann, 1964, *Die Tierwelt Deutschlands*, **50**: 356. NEW SYNONYMY.
Type-species: *Pyralis sticticalis* Linnaeus, 1761. Monotypy and original designation.

A fairly large genus of medium-sized to small moths, mostly of rather slender build and with triangular forewing and rounded hindwing. Frons usually conical, but in a few species rounded (*Boreophila*, in part) and in one species with accessory lateral points (*Maroa*). Labial palpus porrect and of moderate length; in a few species more or less bushy (*Polingia*, *Boreophila* in part), but more often conically scaled. Maxillary palpus fairly well developed, at most moderately dilated with scales distally. Eye usually large, but reduced in a few species. Midtibia thickened and provided with a hair-pencil in the males of some species.

There is some variation in the male genitalia; though it is possible to recognize species groups differing in genital characters, the differences are not large enough or constant enough to make generic separation desirable. Uncus usually with broadly rounded end and with coarse setae or short spines on dorsal surface. Juxta dorsally bifid. Valve more or less uniform in width, somewhat curved dorsad, and rounded at tip; costa tubularly inflated; sacculus with short basal inflation but rarely with specialized armature; clasper simple, directed ventrobasad, usually bearing spinules and often flanges, varying in shape from species to species. Penis variable according to species and group; cylindrical, with a twisted distal cornutus or rarely a group of spinelike cornuti; if single, the cornutus slender and hooklike (*Parasitochroa*), spatulate (*Boreophila*) or serrate (*Loxostege*). These names correspond to fairly well-defined species groups and may be used subgenerically by those who so desire. Distal part of aedoeagus often with a spiral arrangement of spinules. Female genitalia with ostial chamber funnel-shaped and fairly symmetrical; the slender ductus seminalis entering the coiled and usually sclerotized base of the ductus bursae without obvious distortion. Ductus bursae long and coiled; often but not always with a spinulose band at base of bursa. Bursa globular, membranous or finely spinulose, with small quadrate signum and membranous accessory sac.

Larvae leaf-tiers and webmakers on leaves, flowers and stems of a wide variety of mostly low plants. At least two major North American pests, the alfalfa webworm, *Loxostege cereralis* (Zeller), and the beet webworm, *L. sticticalis* (Linnaeus), belong here. Hasenfuss (1960) was unable to find consistent differences between *Loxostege* and a wide range of species of the same tribe which he included in the comprehensive genus *Pyrausta*; however, I have little doubt that further study will reveal diagnostic characters.

A mainly holarctic genus, but with a few species in the tropics of the Old World; well represented in North America.

## KEY TO NORTH AMERICAN SPECIES

1. Forewing cream-colored, without or with only faint indication of transverse bands or cell spots; fringe and termen concolorous ..... *unicoloralis* p. 62
— Forewing with evident, though not necessarily contrasting, transverse lines and cell spots; ground color often dark ..... 2

2. Hindwing red, orange or salmon-tinted, with narrow fuscous border ..... 3
— Hindwing brown with broad fuscous border, or otherwise colored ..... 6

3. Hindwing bright red or orange, without postmedial line ..... 4
— Hindwing salmon-tinted, with obvious, though incomplete, fuscous postmedial line .... 5

4. Build robust; length of forewing under 11 mm ..... *immerens* p. 69

— Build slender; length of forewing over 12 mm ..... *annaphilalis* p. 68

5. Forewing above with postmedial line distinct; hindwing above with base not infuscated ..... *mojavealis* p. 66

— Forewing above with postmedial line diffuse; hindwing above with basal area somewhat infuscated ..... *kingi* p. 67

6. Forewing above with orbicular spot represented or replaced by a narrow, longitudinally elongate dark-brown or black line or dash; reniform indistinct or prolonged toward apex ..... 7

— Forewing above with orbicular spot small and round or at most slightly elongate; reniform spot distinct and not conspicuously prolonged toward apex ..... 10

7. Forewing above largely yellowish or grayish buff; reniform spot indistinct; postmedial line strongly indented at anterior angle of cell, and with a prominent rounded bulge opposite end of cell ..... 8

— Forewing above gray, with a contrasting buff costal patch occupying most of the cell; reniform spot large and conspicuous, prolonged anterodistad to approach or meet costal end of postmedial line; postmedial line fairly evenly convex and denticulate ..... 9

8. Forewing above light grayish buff, with inconspicuous and restricted dull-brown shades on distal half of wing ..... *oberthuralis* p. 63

— Forewing above light yellowish buff, with extensive warm-brown shades on distal half of wing ..... *egregialis* p. 64

9. Forewing above bluish gray, with extensive contrastingly light-buff costal patch; orbicular and reniform spots with dark elements usually weak; western and southwestern states ..... *albiceralis* p. 61

— Forewing above brownish gray, with smaller, darker buff, weakly contrasting costal patch; orbicular and reniform spots with conspicuous dark-brown elements; Florida ..... *floridalis* p. 61

10. Hindwing above light gray or light brownish gray; usually with a weak darker subterminal shade and a fine blackish terminal line or series of dashes ..... 11

— Hindwing above dark gray or brown or light gray or brown with terminal area evenly, though not necessarily strongly, infuscated and without a subterminal shade separated by a pale area from the terminal line ..... 14

11. Forewing above with costa tan as far as postmedial line ..... *lepidalis* p. 61

— Forewing above with costa gray ..... 12

12. Length of forewing over 15 mm; antemedial line of forewing above obsolescent ..... *indentalis* p. 61

— Length of forewing under 15 mm; antemedial line of forewing above distinct ..... 13

13. Forewing above with area distad of antemedial line weakly suffused with fuscous to middle of wing; area from middle of wing to beyond postmedial line lighter and bluish gray; orbicular and reniform spots blackish, contrasting, close together, orbicular round, reniform distinctly lunular; hindwing above whitish, with subterminal gray band very faint, the pale zone separating it from termen very narrow ..... *kearfottalis* p. 62

— Forewing above powdery ash gray, variegated with whitish gray; reniform and orbicular spots small, far apart, blackish but inconspicuous, orbicular a short longitudinal dash, reniform variable in shape but normally not a conspicuous black lunule; hindwing above brownish gray, with a fairly distinct subterminal shade, well separated from the termen ..... *terpnalis* p. 62

14. Forewing above mostly light gray or light brown ..... 15

— Forewing above mostly dark gray, dark brown or dark fuscous ..... 16

15. Wings above brownish; orbicular and reniform spots of forewing indistinct ... *typhonalis* p. 63

— Wings above gray; orbicular and reniform spots of forewing distinct.....*allectalis* p. 63

16. Frons rounded or slightly flattened; color dark grayish fuscous; pattern obscure; northern and montane.....*ephippialis* p. 72

— Frons conically produced.....17

17. Labial palpus bushy; color of moth dark fuscous; forewing and hindwing each with a diffuse pale postmedial band; a winter species of southwestern deserts.....*quaestoralis* p. 69

— Labial palpus with smooth conical scaling....18

18. Forewing above unicolorous dark brown, with fine black transverse lines and cell spots; hindwing above a little grayer, with yellowish-buff fringe; British Columbia to northern California.....*thallophilalis* p. 72

— Forewing above not unicolorous dark brown.....19

19. Forewing above somewhat olivaceous gray with fine blue-gray dusting; orbicular and reniform spots of forewing inconspicuous, a little darker than ground color; forewing with a yellowish subterminal band with an expansion basad at about $M_1$; generally distributed.....*sticticalis* p. 65

— Forewing above with orbicular and reniform spots usually black and well defined; subterminal yellowish band, if present, rather evenly narrowing anteriorly and posteriorly and with no distinct expansion basad at vein $M_1$.....20

20. Forewing above rather uniformly dark grayish fuscous, often with some light-gray dusting on medial area and just distad of postmedial line; postmedial line fuscous, rather gently convex around cell, rarely with angulate expansions on veins; hindwing above blackish fuscous, with narrow and indistinct light-gray postmedial line and often with white fringe; or else medial area of hindwing more or less broadly and contrastingly white or light gray, the margins dark; boreal and montane.....*anartalis* p. 70

— Forewing above brownish or bluish gray, variegated with fuscous or black and often with yellowish areas; postmedial line generally expanded into small triangular black spots on veins; hindwing above brownish or grayish, rarely dark grayish fuscous and never with the medial area white and contrasting.....21

21. Forewing above with bluish-gray or gray ground, rarely extensively tinged with light brown; hindwing above gray or grayish fuscous, rarely light brownish gray; fringe generally white.....22

— Forewing above with dark-brown or brownish-fuscous ground; hindwing above dark brown with fuscous terminal band, or brownish fuscous; fringe generally yellowish buff.....24

22. Length of forewing generally over 12 mm; postmedial line with strong triangular expansions on veins, the costal end of the line erect or nearly so, the part opposite the cell parallel to termen or at only a moderate angle to it; hindwing above gray or brownish gray, not much darkened terminally; primarily night-flying moths widely distributed in meadows and cultivated fields..*cereralis* p. 77

— Length of forewing generally under 12 mm; postmedial line generally with weak triangular expansions on veins or of even width, the costal end often strongly oblique basad, the part opposite cell generally curved and strongly oblique basad; hindwing above fuscous or with a fuscous terminal band; primarily day-flying moths of northern bogs and taiga and of montane meadows.....23

23. Hindwing above gray, with postmedial line separated by a curved pale band from the fuscous terminal zone; northern.....*commixtalis* p. 77

— Hindwing above fuscous, without distinct postmedial line, pale band without dark terminal border; Cordilleran.....*sierralis* p. 75

24. Wings narrow; length of forewing under 10 mm, its apex, termen and tornus rounded, termen strongly oblique; southern California.....*offumalis* p. 75

— Wings wide; length of forewing more than 10 mm, its apex fairly sharp, termen only moderately convex and only slightly oblique; British Columbia to Utah and the Sierra Nevada of California.....*brunneitincta* p. 73

*Loxostege albiceralis* (Grote)
PL. 4, FIGS. 69–72 (McD. 5483).

*Botis albiceralis* Grote, 1878, *Bull. U.S. Geol. Geog. Surv. Terr.*, **4**: 678.
Type-locality: Colorado Rio. [BMNH]

Large (length of forewing 13–18 mm). Forewing bluish gray with contrasting buff costal patch and oblique discocellular lunule. Larger and grayer than the closely related *L. floridalis*, with more extensive and brighter costal patch and less strongly dark-shaded orbicular and reniform spots. Resembling in general coloration certain Epipaschiinae, but different in structure and pattern.

Male genitalia: uncus fairly long, distally broadly rounded, dorsally spinose; valve rather wide, tip broadly and evenly rounded, sacculus basally broadly inflated, clasper strong and rod-like, with a narrow serrate flange on basal side; penis with tip of aedoeagus obliquely serrate, vesica with a distal brush of spinelike cornuti. Female genitalia: ostial chamber broad and cup-shaped; a short, somewhat unsymmetrical, sclerotized tube leading to junction of ductus seminalis and ductus bursae, with a short sclerotized process extending at right-angles into the latter; ductus bursae long, coiled and membranous; bursa globular, spinulose, with concentric rings; signum large, rhomboidal, transversely keeled, anterior part longer than posterior part; accessory sac large, membranous.

Larva found by Roy Kendall on Carolina wolfberry, *Lycium carolinianum* var. *quadrifidum* (Maq. & Sesse *ex* Dunal) C. L. Hitche.

Mojave and Imperial deserts of California to southeastern Texas and south into northern Mexico. Moth from April to November, sometimes common at light.

*Loxostege floridalis* (Barnes and McDunnough), NEW STATUS
PL. 4, FIGS. 73, 74 (McD. 5483a).

*Loxostege albiceralis floridalis* Barnes and McDunnough, 1913, *Contrib. Nat. Hist. Lep. N. Am.*, **2** (4): 173, pl. 2, fig. 3.
Type-locality: Everglade, Florida. [USNM]
NOTE—I hereby designate as lectotype the specimen in the USNM labelled "Loxostege albiceralis var. floridalis B. & McD. Type ♂".

Moth like *L. albiceralis*, but smaller (length of forewing 10–11 mm); ground color of forewing brownish gray, not bluish gray; dark cell spots better defined.

Male genitalia as in *L. albiceralis*, but with uncus, valve and aedoeagus relatively narrower and clasper shorter. Female genitalia like those of *L. albiceralis*, but with ostial chamber relatively much smaller and narrower; signum smaller and relatively longer, with fewer denticulations.

Larva according to Barnes and McDunnough on a shrub with narrow, very fleshy leaves, called locally "Florida cranberry", but according to John Heppner (personal communication), on the same food plant as *L. albiceralis*, namely, Carolina wolfberry, *Lycium carolinianum* var. *quadrifidum*.

Central and southern Florida. Moth from March to November.

*Loxostege lepidalis* (Hulst)
PL. 4, FIGS. 79–81 (McD. 5474).

*Prorasea lepidalis* Hulst, 1886, *Trans. Amer. Ent. Soc.*, **13**: 146.
Type-locality: Colorado. [AMNH]
NOTE—The locality cited is that of the lectotype, a male in the AMNH designated by Klots, 1942, *Bull. Amer. Museum Nat. Hist.*, **79**: 420.

Moth distinguished by strong yellowish-buff tints along costa and termen of forewing; cell patch pale buff; reniform and orbicular spots small, lunular and round respectively, not distorted as in *L. albiceralis* and *L. floridalis*.

Male genitalia: uncus much shorter than in *L. albiceralis*; clasper wider; aedoeagus with a long, twisted, serrate, pennantlike flange distally; vesica with a blunt cornutus. Female genitalia: ostial chamber complex; the tube leading out of it wider than long; a longer, narrow, sclerotized band in adjacent proximal part of ductus bursae; signum mouth-shaped, coarsely spinulose.

Early stages unknown.

Alberta prairies and dry interior of Washington to southern California and New Mexico. Moth from June to August in the North, and from March to July farther south, often common at light.

*Loxostege indentalis* (Grote)
PL. 4, FIGS. 75–78 (McD. 5482).

*Prorasea indentalis* Grote, 1883, *Ann. Mag. Nat. Hist.*, (5) **11**: 57.
Type-locality: Washington Territory.

Moth large, gray, easily recognized. Male genitalia much like those of *L. lepidalis*, but clasper

and its flange even wider and ridge on valve beyond clasper with an angular ventral prominence; cornutus longer and sharper than in *L. lepidalis*. Female genitalia: ostial chamber large and bulbous, a short tube leading obliquely out of it as in *L. lepidalis*, and with a similar sclerotized continuation in proximal part of the long membranous ductus bursae. Signum larger and with more spinules than in *L. lepidalis*, and with acute anterior and posterior median processes.

Early stages unknown.

Not well represented in most collections, but often common in dry areas, particularly in southern California, Nevada and Utah; rarer northward to Washington and Montana. Moth recorded from March to June in southern California, in May in Washington and Oregon, from June to September in Nevada, and in June and July in Utah. California specimens a little darker on the average than those from the Great Basin, but not constantly different.

*Loxostege kearfottalis* Walter
PL. 3, FIGS. 1, 2 (McD. 5465).

*Loxostege kearfottalis* Walter, 1928, *Proc. Ent. Soc. Washington*, **30**: 140.
Type-locality: Tempe, Arizona. [USNM]

A rather striking species, similar in general pattern to *L. lepidalis* and *L. indentalis*, but easily recognized by the brownish basal area, the blackish suffusion on the basal half of the disc, and the approximated, contrastingly blackish-fuscous orbicular and reniform spots.

Male genitalia like those of *L. albiceralis*, but uncus somewhat shorter and process of aedoeagus very large and flaglike. Female genitalia with ostial chamber cup-shaped, smaller than in *L. albiceralis*, with a pair of round, widely separated sclerites in the dorsal wall; oblique tube leading from ostial chamber short, but its continuation into ductus bursae long and narrow; signum rhomboidal, symmetrical, with numerous spinules, its corners not produced.

Early stages unknown.

Southern California to Colorado and western Texas. Moth from April to August, variable in size and in extent and intensity of dark markings. Not really rare, but less common than *L. albiceralis*, *L. lepidalis*, or *L. indentalis*.

*Loxostege terpnalis* Barnes and McDunnough
PL. 3, FIGS. 3, 4 (McD. 5475).

*Loxostege terpnalis* Barnes and McDunnough, 1918, *Contrib. Nat. Hist. Lep. N. Am.*, **4**: 160, pl. 22, fig. 20.
Type-locality: Olancha, Inyo Co., California. [USNM]
NOTE—The locality given is that of the lectotype ♂, hereby designated, collected "16–23 Apr." and labelled "Type ♀" [*sic*]. See plate 3, figure 3.

Moth sometimes confused with *L. kearfottalis*, but with plain gray forewing, without basal brownish area, and with small and remote orbicular and reniform spots; hindwing brownish.

Male genitalia with uncus more strongly tapered than in related species; clasper wide, with evenly rounded tip but no flange; distal process of aedoeagus flaglike but rather small. Female genitalia with ostial chamber oblique, cylindrical, not much wider than sclerotized tube leading out of it; the latter shorter than wide, with short, pointed, sclerotized band extending into ductus bursae; signum shaped as in *L. indentalis*, but enclosed in a differentiated square in wall of bursa.

Early stages unknown.

The rarest and most geographically restricted species of its group. Nevada and eastern Inyo County, California. Moth from April to July.

*Loxostege unicoloralis* (Barnes and McDunnough), NEW COMBINATION
PL. 3, FIGS. 18, 19; PL. Q, FIG. 9 (McD. 5525).

*Maroa unicoloralis* Barnes and McDunnough, 1914, *Contrib. Nat. Hist. Lep. N. Am.*, **2** (6): 237, pl. 1, fig. 15.
Type-locality: Phoenix, Arizona. [USNM]

Moth more likely to be confused with *Cylindrifrons succandidalis* (subfamily Evergestinae, Fascicle 13.1C, p. 287, plate 13, figures 62, 63) than with any other species of its own genus. Frons with central conical tubercle and with a short, truncate lateral process in front of each eye, instead of the large, median, cylindrical process of *Cylindrifrons*. Distinguished from certain Noctuidae of similar aspect by the family characters (presence of maxillary palpi; scaling of base of proboscis; ventral abdominal, not dorsal thoracic, ears; and $R_s$ of hindwing anastomosed with $Sc+R_1$, not long-stalked with $M_1$).

Male genitalia very similar to those of *L. albiceralis*; clasper somewhat more narrowly tapered to a narrowly truncate tip bearing four or five

spinules; basal side of clasper without flange. Female genitalia with a pair of twice-curved ribbonlike sclerites converging toward ostium; ostial chamber large; ductus bursae coiled, with a ribbonlike sclerotization in its basal part.

Early stages unknown.

Southeastern California, Arizona. Moth from May to September.

In spite of its very different appearance, *L. unicoloralis* is closely related to *L. albiceralis* and the series of similar species just described. The small lateral processes of the frons are the only character with any semblance of generic importance.

*Loxostege allectalis* (Grote)

PL. 3, FIGS. 5, 6 (McD. 5473).

*Botis allectalis* Grote, 1877, *Can. Ent.*, **9**: 107.
Type-locality: Bosque Co., Texas. [USNM]

*Eurycreon perplexalis* Fernald, 1885, *Can. Ent.*, **17**: 57.
Type-locality: Texas. [USNM]

Forewing of moth with finely powdered, rather bluish-gray ground; reniform and orbicular spots dark gray, the former lunular, the latter elongate and oblique; postmedial line gently curved. Length of forewing 10–12 mm.

Male genitalia differing appreciably from those of the species of the genus so far described. Clasper narrow and spikelike, weakly denticulate at tip; sacculus with a large, somewhat angular, finely spinose process on dorsal margin at base; aedoeagus smoothly and obliquely cut off at tip; vesica with a compact group of small spinelike cornuti and also an ample bundle of slender, barbed, deciduous cornuti. Female genitalia with sclerotized ostial chamber relatively long, subcylindrical, expanded basally, medially and distally, and with a weak extension into ductus seminalis and base of ductus bursae; signum large, almost square, coarsely spinulose.

Larva found by Roy Kendall at Presidio, Texas, on Berlandier wolfroot or wolfberry, *Lycium berlandieri* Dunal.

Southern California to Texas and northern Mexico. Moth from March to September, fairly common.

*Loxostege typhonalis* Barnes and McDunnough

PL. 3, FIGS. 7, 8 (McD. 5472).

*Loxostege typhonalis* Barnes and McDunnough, 1914, *Contrib. Nat. Hist. Lep. N. Am.*, **2** (6): 233, pl. 1, fig. 7.
Type-locality: Redington, Arizona. [USNM]
NOTE—The locality cited is that of the lectotype, hereby designated, a male in the USNM.

Moth with markings somewhat like those of *L. allectalis*, but smaller (length of forewing 8–11 mm); color light brown, not blue gray; maculation less distinct than in *L. allectalis*; reniform and orbicular spots smaller; an obvious darker shade in distal part of medial area. Sometimes mixed in collections with *Achyra rantalis*, but less robust in build, with forewing maculation different, especially in the very indistinct, but straight and oblique, antemedial line and the differential darkening of the distal part of the medial area.

Male genitalia rather like those of *L. allectalis*, but with clasper stronger and hooked basad at its tip; basal process of sacculus small and acute; fixed cornuti finer and more numerous. Female genitalia like those of *L. allectalis*, but with anterior and posterior parts of ostial chamber wider and sharply marked off from the less expanded middle part, and without extensions into ductus seminalis or ductus bursae; sides of signum somewhat concave.

Early stages unknown.

Fairly common in southern Arizona and northern Mexico. Moth from January to September.

*Loxostege oberthuralis* Fernald

PL. 3, FIGS. 9, 10; PL. G, FIG. 4; PL. R, FIG. 1 (McD. 5484).

*Loxostege oberthuralis* Fernald, 1894, *Insect Life*, **6**: 255.
Type-locality: Arizona, Morrison. [USNM]
NOTE—The locality given is that of the lectotype, hereby designated, in the collection of the USNM.

Moth large (length of forewing 12–16 mm); forewing narrow, with streaky maculation and sinuous and dentate postmedial line; resembling only the closely related *L. egregialis*, but ground color of forewing ash gray, without the conspicuous yellow and orange-brown tones of that species, and with the dark streaking stronger.

Male genitalia: uncus prominent and slightly expanded distally, tip broadly rounded, subtruncate; juxta fairly large; valve large, somewhat constricted medially; sacculus with angular, sparsely setose process from base, somewhat as in

*L. allectalis*; clasper strong, rodlike, curved, finely spinulose; distad of it a prominent longitudinal ridge dividing valve into a wider, strongly sclerotized, dorsal part and a narrow, distally tapering, weakly sclerotized, ventral part; aedoeagus deeply divided distally, with one of the lobes produced into a serrate flange; vesica with a fairly numerous group of well-spaced spinelike cornuti. Female genitalia: ostial chamber tubular, sclerotized, about four times as long as distal width, unsymmetrically widened basally, and with sclerotized straps running transversely into ductus seminalis and ductus bursae; ductus bursae long, coiled, fluted, membranous; signum square, keeled and finely denticulate.

Early stages unknown.

Southern California, southern Arizona, and the southern tip of Nevada. Moth from April to June.

*Loxostege egregialis* Munroe, NEW SPECIES
PL. 3, FIGS. 11, 12; PL. G, FIG. 5; PL. R, FIG. 2.

*Loxostege egregialis* Munroe.
Type-locality: Cave Creek Canyon, 5400′, Chiricahua Mts., Cochise Co., Arizona. [JGF]

DIAGNOSIS: Closely resembling *L. oberthuralis*; forewing with ground color yellow, not gray, and with warm brown tints in bend of postmedial line and in terminal and subterminal areas; dark streaks of forewing weaker and postmedial line finer than in *L. oberthuralis*; hindwing creamier and with slightly stronger pinkish luster.

Male genitalia like those of *L. oberthuralis*, but with uncus considerably longer; basal prominence of sacculus sharper; penis shorter, with fewer and thicker cornuti. Female genitalia as in *L. oberthuralis*, but basal expansion of ostial chamber occupying whole basal half, gradually tapering to middle; ductus bursae somewhat narrower.

DESCRIPTION: Frons brown; vertex creamy yellow, with a ferrugineous dorsolateral stripe behind each antenna. Labial palpus exceeding frons by about length of head, rather slender; dorsally warm brown, contrastingly yellowish buff at base beneath. Maxillary palpus prominent, moderately dilated with scales distally; dark brown basally, lighter brown at tip. Proboscis prominent, with pale-buff basal scaling. Eye and ocellus fuscous. Antenna filiform in both sexes; ciliations in male about half as long as diameter of shaft, in female somewhat shorter; dorsal scaling yellowish buff, ventral surface brown. Thorax above yellowish buff, with ferrugineous anterior border and with narrow, dark-brown, laterally ferrugineous-bordered, middorsal stripe. Abdomen above dull creamy buff, with some gray suffusion, especially posteriorly. Body beneath and legs whitish buff; foreleg and middle and hind coxae and femora anteriorly suffused with brown. Midtibia of male without thickening or hair-pencil; outer preapical spur of male hindtibia about one-third length of inner.

Forewing rather narrow, subtriangular, length about 15 mm; costa straight from base to postmedial line, thence arched to the rectangular apex; termen evenly convex, weakly oblique; tornus obtuse; posterior margin convex near base. Ground color above yellowish buff. Narrow yellowish-brown longitudinal streaks extending from base to postmedial area behind costa, in posterior part of cell and behind anal fold. Behind Cu a slender, somewhat curved, mixed blackish-fuscous and orange-brown, longitudinal antemedial streak. A similar but straighter and more distal streak in cell. A third, more diffuse, similarly colored streak adjoining the longitudinal yellowish-brown streak postmedially on anal fold. Antemedial line and orbicular and reniform spots unrecognizable, probably represented by parts of the pattern elements already described. Postmedial line narrow, distinct, pale buff, defined basally by a distally sharp, basally diffuse, dark zone in distal part of medial area; this zone fuscous distally, shading to orange brown basally. Postmedial line from costa at about three-fourths from base; convex distad and dentate to $R_5$; deeply and acutely indented on that vein, then strongly, unsymmetrically produced in a convex curve to near termen, approaching it most closely between veins $M_2$ and $M_3$; deeply retracted basad to $Cu_2$, then obsolescent; part of its posterior section probably represented by the dark streak on anal fold. Subterminal area with brown and fuscous wedges of varying lengths in the cells, separated by light yellowish-buff streaks on the veins, those on $M_2$, $M_3$ and $Cu_1$ interrupting postmedial line and extending basad into medial area. A pale-buff adterminal line, tapering to a point anteriorly and also posteriorly, not reaching either anterior or posterior margin. Terminal line dark brown, margined proximally with orange brown. Fringe dark brown basally with paler midline and reddish-brown distal portion.

Hindwing with apex narrowly rounded; termen rather evenly convex; anal angle rounded. Upperside creamy buff with silky pinkish luster, yellower near termen, and with a weak grayish-fuscous terminal line. Fringe creamy buff, with a wide brownish band basad of middle. Some specimens with faint traces of a darker postmedial line.

Forewing beneath creamy buff, with faint grayish suffusion on costa and beyond end of cell. Orbicular spot represented by a longitudinal fuscous line in cell, reniform spot by a transverse bar. Postmedial line very faint. Terminal line fine, fuscous. Fringe buff, with a grayish line basad of middle and with distal edge brown.

Hindwing beneath pale whitish buff, with a faint gray bar on anterior part of discocellular. Fringe almost white.

Male genitalia: uncus nearly three times as long as wide; tip broadly rounded, densely spined dorsally. Tegumen short. Transtilla wide and complete. Juxta small, heart-shaped. Valve with tip subtruncate, slightly irregular, ventral angle sharp; two longitudinal ridges, one subcostal, the other submedian, the latter finely spinulose; sacculus with large, depressed, coarsely setose, subtriangular basal flange. Penis about nine times as long as wide, with a blunt flange and a small tooth at distal end of aedoeagus, and with about 30 fixed spinelike cornuti in a single line, as well as a small group of narrower deciduous ones. Female genitalia: ovipostor with broad, soft, finely and densely setose lobes. Posterior apophysis with very short, straight shaft. Eighth sternite a very narrow, setose band. Anterior apophysis about twice as long as posterior, somewhat sinuate. Ostium wide. Ostial chamber narrowly funnel-shaped, forming a T-junction with ductus seminalis and membranous part of ductus bursae, and with sclerotized straps extending into each. Ductus bursae long, slender, coiled and fluted. Bursa globular and membranous, with square, finely keeled, finely spinulose signum, and membranous accessory sac.

Early stages unknown.

TYPES: Holotype: ♂. Cave Creek, Chiricahua Mts., Cochise Co., Arizona, 5400′; 18 Aug. 1966; J. G. Franclemont. JGF. Allotype: ♀. Silver Creek Wash, 0.7 mi W of Portal, Cochise Co., Arizona, 4880′; 24 Aug. 1966; J. G. Franclemont. JGF. Paratypes: 6 ♂♂, 7 ♀♀. Cave Creek Canyon, 5400′, Chiricahua Mts., Cochise Co., Arizona; 4 Sept. 1966; J. G. Franclemont (1 ♂). Silver Creek Wash, 4880′, 0.7 mi W of Portal, Cochise Co., Arizona; 13 Aug. 1966; J. G. Franclemont (2 ♀♀). Douglas, Arizona; 16–23 May, Aug.; *ex* Barnes coll. (2 ♂♂). Paradise, Cochise Co., Arizona; 8–15 May; genitalia slides 3601, DK, 7190 and 7192 HWC (2 ♂♂, 2 ♀♀). Arizona; Morrison; "197"; genitalia slide 7793 HWC (1 ♀). Deming, New Mexico; 1–7 Sept.; genitalia slide 3600, DK (1 ♂, 1 ♀). 35 mi NW of Reeves, Pecos Co., Texas; 15 June 1937; George Willett (1 ♀). JGF; type no. 13,922, CNC; USNM; LACM.

*Loxostege sticticalis* (Linnaeus) (Beet Webworm*; Diamond-spot Pearl, Br.; Tisseuse de la Betterave, f., Fr.)

PL. 4, FIGS. 1–5; PL. H, FIG. 5; PL. Q, FIG. 10 (McD. 5478).

*Phalaena Pyralis sticticalis* Linnaeus, 1761, *Fauna Suecica*, 352.
Type-locality: Upsala, Sweden.

*Pyralis lupulina* Clerck, 1764, *Icones Insectorum Rariorum cum Nominibus eorum Trivialibus* [*etc.*], pl. 9, fig. 4.
Type-locality: Sweden.

*Pyralis fuscalis* Hübner, 1796, *Sammlung Europäischer Schmetterlinge, Sechster Horde, Die Zünsler*, 29, pl. 7, fig. 45.
Type-locality: [Augsburg, Germany].
NOTE—This name is a primary homonym of *Pyralis fuscalis* [Denis and Schiffermüller], 1775, and therefore permanently unavailable.

*Pyralis tetragonalis* Haworth, 1811, *Lepidoptera Britannica*, 385.
Type-locality: Coomb Wood, England.

*Botys lupulinalis* Guenée, 1854, *Species Général des Lépidoptères*, **8**: 331, in part.
Type-locality: Sweden.
NOTE—This name is an unjustified emendation of Clerck's *Pyralis lupulina* and consequently has the same type-specimen and type-locality, even though Guenée used the name for *Ostrinia nubilalis*, with which he wrongly identified Clerck's figure.

*Nymphula sordida* of authors, not Butler, 1886. Misidentification.
NOTE—Examination of type-material in the BMNH shows that this name refers to an Australian species, probably belonging to *Achyra* Guenée, and certainly different from *Loxostege sticticalis*.

Moth sometimes confused with the alfalfa webworm moth, *Loxostege cereralis* (*L. commixtalis* of

authors), but easily distinguished by the following differences: upperside of forewing without black streaking and wedges in *L. sticticalis*, with conspicuous streaking and wedges in *L. cereralis*; yellowish subterminal stripe distinctly expanded near $R_1$ in *L. sticticalis*, evenly curved in *L. cereralis*; underside of forewing and hindwing with postmedial line continuous on anterior part of each wing in *L. sticticalis*, but broken into spots in *L. cereralis*.

Male genitalia: uncus fairly slender, distally rounded, dorsally densely spinose; transtilla represented by broad lateral sclerites, each with a long, slender, acute process pointed ventrad, juxta weak and bifid; vinculum pointed anteroventrally; valve rather wide, sacculus with setose dorsal process at base, clasper spinelike and spinulose, with a very small flange at base; penis short and cylindrical, tip of aedoeagus obliquely truncate, with a deep incision laterally; vesica with a strong, hooklike fixed cornutus and a number of barbed deciduous cornuti. Female genitalia: ovipositor with lobes soft and short-setose; apophyses short and weak; junction of ductus bursae and ductus seminalis sclerotized, somewhat arched; rest of ductus bursae slender, membranous, coiled; bursa globular and membranous; signum rhomboidal, with produced angles; accessory sac membranous, globular.

Larva on a wide variety of plants, including many forage and truck crops, preferring broad-leaved hosts to grains and other grasses. Destructive by webbing and eating foliage, sometimes causing total loss of sugar-beet, alfalfa and vegetable crops, and at times migrating like armyworms from devastated fields. Eggs flat, laid in a single row, end to end. Larva skeletonizing and later completely consuming leaves; often making a silk tube leading from the web to a retreat on the ground or in a protected place. Larva yellowish, greenish or nearly black, with dark middorsal stripe; in dark individuals this stripe separated by a narrow pale stripe from a broad and irregularly patterned dark dorsolateral stripe, extending on each side nearly down to the spiracles; spiracular and infraspiracular pale lateral bands connected by intersegmental pale zones; infraspiracular band often interrupted at middle of each segment by the uppermost of two intersegmentally broken dark ventrolateral bands. Head capsule dark, with irregular lighter pattern. Dark dorsal and dorsolateral bands continuous over prothoracic shield, fusing and ending on anal shield. General structure much as in *Achyra*, but ventrolateral angle of prothoracic shield not extended; pinacula considerably larger and with dark centers; on meso- and metathorax D2 and SD2 a little posterodorsad of D1 and SD1, respectively; on abdominal segments 1–8, D2 closer to level of D1 than to that of SD1. Pupa in a silk-lined earthen cell about an inch underground; cremaster with eight bristlelike projections. Hibernation in last larval instar in cells or tunnels in the ground. Two or more generations in most areas.

The variation in the larvae is appreciable. The description given by Beirne (1952) of the British larva does not agree well with the above, which was based on the North American economic literature and on specimens from around Ottawa, Canada. More study is desirable.

Abundant and widely distributed in the Nearctic and Palearctic Regions, and a significant pest in both, particularly in drier areas. Moths sometimes migrating in immense swarms in the U.S.S.R. The earlier American authors regarded it as a primarily western species; Forbes (1923) suggested it was probably introduced in the East. Now common in the Northeast, ranging across Canada and the United States, from Nova Scotia and Massachusetts to the southern Northwest Territories and Yukon, British Columbia and Arizona. Moth throughout the summer, usually with two to several generations a year.

### *Loxostege mojavealis* Capps

PL. 4, FIGS. 63, 64; PL. G, FIG. 6; PL. R, FIG. 3.

*Loxostege mojavealis* Capps, 1967, *Proc. United States Natl. Museum*, **120** (3561): 45, figs. 172, 175. Type-locality: Mojave Desert, near Phelan, California. [USNM]

Moth with narrow, gray, obscurely marked forewing and salmon-colored hindwing, much as in *L. kingi*. Distinguished from *L. annaphilalis* and *L. immerens* by the much duller colored hindwing, bearing distinct traces of the postmedial and subterminal fuscous lines, absent on the brighter hindwings of *L. annaphilalis* and *L. immerens*. Midleg of male not sexually modified; outer preapical spur of hind tibia about half length of inner.

Male genitalia: uncus subtriangular, nearly equilateral, distally rounded; transtilla complete, with narrow ventral extensions; juxta lyre-shaped; vinculum narrow, ventrally forming a

short, triangular, medially keeled saccus; valve short, of moderate width, curved dorsad, costa narrowly inflated, sacculus inflated, its dorsal margin weakly toothed and with broad, rounded subbasal prominence, clasper fairly wide, narrowing to the incurved spinose tip; penis of moderate length; aedoeagus with twisted, spinulose distal process; one distally bifid cornutus. Female genitalia: ovipositor with large, well-formed, strongly setose lobes; apophyses short and weak; ostial chamber fairly wide, tapering anteriorly; ostial end of ductus bursae with a small sclerotized collar; ductus bursae long, slender, coiled, with a short, curved, sclerotized band in ostial end; bursa globular; signum medially constricted and weakened.

Early stages unknown.

Known only from the Mojave Desert, California. Moth in April.

*Loxostege kingi* Munroe, NEW SPECIES
PL. 4, FIGS. 65, 66; PL. G, FIG. 7; PL. R, FIG. 4.

*Loxostege kingi* Munroe.
Type-locality: Las Vegas, Nevada. [LACM]

DIAGNOSIS: Moth closely resembling *L. mojavealis*, but larger (length of forewing 11–12 mm); duller in color; orbicular and reniform spots of forewing more distinct and separated by a pale area; postmedial line of forewing less distinct and posterior part less strongly dentate. Hindwing with dark markings stronger, and usually with perceptible basal fuscous suffusion, absent in *L. mojavealis*.

Male genitalia with uncus subquadrate, not subtriangular, posterior corners rounded. Dorsal margin of sacculus with subbasal prominence narrower than in *L. mojavealis*, subtriangular, setose; distal part of dorsal margin not toothed, but with a second subtriangular prominence. Distal process of aedoeagus longer and more strongly sclerotized than in *L. mojavealis*, cornutus thicker and deeply bifid. Female genitalia with ovipositor lobes reduced and bearing short sparse setae; ostial chamber narrower than in *L. mojavealis* and ending unsymmetrically; signum smaller, relatively wider, more heavily sclerotized and keeled.

DESCRIPTION: Frons smoothly scaled, dark gray, flecked with light gray and with a whitish line at each side. Vertex with mixed blackish and whitish erect scales; whitish line of each side of frons continued to back of head. Occiput white behind eye, but with spreading blackish scales posteriorly, curving forward over whitish area. Labial palpus conically scaled, exceeding frons by about length of head; blackish above, dull gray at base beneath. Maxillary palpus long, not distally dilated with scales, blackish gray, somewhat paler at tip. Proboscis well developed, its basal scaling light gray. Eye brown, reduced, bordered posteriorly and ventrally by an unscaled zone. Ocellus well developed, dark brown. Antenna black, filiform; ventral ciliations in male about two-thirds as long as diameter of shaft, in female somewhat shorter. Dorsal scaling of thorax mostly removed in the types, apparently light gray or grayish fuscous; integument very dark brownish fuscous. Abdomen above powdery gray. Body beneath and legs mixed grayish buff and fuscous.

Forewing subtriangular, of moderate proportions, length 11–13 mm; costa weakly convex at base, straight for some distance, and again convex near apex; apex narrowly rounded; termen somewhat rounded, weakly oblique; tornus obtuse; posterior margin weakly convex near base. Ground color of upperside grayish fuscous with blue-gray dusting, strongest on distal part of wing, the general effect rather evenly powdery dark gray. Antemedial line obsolete. Orbicular spot a fuscous dot, reniform a short fuscous bar; between them a diffuse grayish-buff patch. Postmedial line very obscure; pale grayish buff; stronger near costa, and with traces of a fuscous line on basal side; origin of postmedial line on costa at five-sixths from base, following origin an even convexity around cell, finely dentate in this section, a shallow retraction on $Cu_2$, followed by weak dentation to posterior margin. A weak, grayish-buff subterminal band, tapering to points postapically and pretornally, interrupted on veins by bars of the ground color. Termen and fringe fuscous.

Hindwing of moderate proportions, with rounded apex, termen and posterior margin. Ground color of upperside light buff with a salmon tint, paler toward costa. Basal and anal areas weakly infuscated. A definite grayish-fuscous bar on anterior part of discocellular. Postmedial line weak, diffuse, fuscous, finely dentate, parallel to termen, with an indentation on $Cu_2$. Subterminal band matching in shade, but wider and stronger, tapering to a point near anal angle. A fine fuscous terminal line. Fringe somewhat lighter fuscous.

Forewing beneath dull grayish buff. Costa weakly dusted with gray. Orbicular spot a definite longitudinal bar in cell and reniform a similar but transverse bar at end of cell. Postmedial line fuscous, finely dentate, evenly convex distad anteriorly, obsolete posteriorly. Traces of a diffuse fuscous subterminal band. Terminal line grayish fuscous. Fringe grayish fuscous.

Hindwing beneath a little brighter and more pinkish than forewing. A distinct fuscous bar on anterior part of discocellular. Postmedial and subterminal lines grayish fuscous, both very weak, of about equal width, following the same course as on upperside. Terminal line and fringe grayish fuscous.

Male genitalia: uncus rather short, broadly rounded, densely spinose distally. Transtilla incomplete. Juxta moderately bifid dorsally, its sides sinuated. Ventral part of vinculum shallowly triangular, with a median keel. Valve short and fairly wide, curved dorsad and distally rounded; costa tubularly inflated; sacculus inflated, with a low subtriangular prominence near base, rest of dorsal margin not dentate, but with another subtriangular prominence on distal part; clasper rather wide, densely spinulose. Penis cylindrical; tip of aedoeagus obliquely truncate, produced into a short, narrow, distally denticulate process; vesica with a curved and deeply divided cornutus. Female genitalia: ovipositor with small, soft lobes, with rather sparse, short setae. Apophyses weak, posterior about half as long as anterior. Ostium wide, ostial chamber sclerotized, tapering gradually distad, with a twisted sclerotized prolongation into basal part of the long, coiled, slender, membranous ductus bursae. Bursa globular, membranous; signum short and wide, with sides concave and angles acutely produced. Accessory sac small, membranous.

Early stages unknown.

TYPES: Holotype: ♂. Las Vegas, Nevada; 1 Feb. 1939; L. V. King. LACM. Allotype: ♀. Same data as for holotype. LACM. Paratypes: 2 ♂♂. Mesquite Spr., Death Valley, Inyo Co., California, 2000′; 19–23 April 1943; George Willett (2 ♂♂). LACM; type no. 13,923, CNC.

The reduced eyes suggest that this species flies by day.

*Loxostege annaphilalis* (Grote)
PL. 4, FIGS. 67, 68; PL. G, FIG. 8; PL. R, FIG. 5 (McD. 5486).

*Botis annaphilalis* Grote, 1881, *Can. Ent.*, **13**: 34. Type-locality: Havilah, California. [BMNH]

Male moth easily distinguished from other species with red or orange hindwings by the large size (length of forewing 12–16 mm or more), slender build, broad dark-gray forewing with well-marked brown patch behind end of cell, and brick-red, narrowly dark-bordered hindwing. Female more like *L. immerens* in size (length of forewing 10–11 mm) and in the robust build, but with forewing variegated with light gray on a dark-fuscous ground, and with prominent light-gray elements in ante- and postmedial lines; hindwing with narrower black terminal border than in *L. immerens*, and with at most a row of dashes forming a broken adterminal continuation of the fine terminal line, not with a row of basally directed wedges as in lightly marked specimens of *L. immerens*.

Male genitalia: uncus narrowly subtriangular, rounded at tip, distal half dorsally densely clothed with bifid spines; tegumen long and wide; transtilla wide, setose, interrupted along midline; juxta small, dorsally bifid, ventrally expanded; vinculum ventrally forming a short, broadly triangular, medially keeled saccus; valve of moderate width, curved dorsad, rounded at tip; costa narrowly inflated and with a subcostal ridge; sacculus broadly inflated for a short distance from base, without special armature; clasper wide at base and with strong flange, tapering to a narrow, weakly expanded and incurved, dentate tip; penis short and cylindrical, with very weak distal flange; vesica with a sheaf of short, spine-like, possibly deciduous cornuti. Female genitalia: ovipositor with small but well-formed, weakly setose lobes; apophyses slender, moderately short, anterior somewhat longer than posterior and with a slender, acute, ventral process and a short, triangular, dorsal one at subbasal flexure; eighth segment with a pair of quadrangular tergites, separated in midline; ostial chamber evenly funnel-shaped, sclerotized; basal part of ductus bursae curved and sclerotized for a short distance, the rest moderately long and thin, membranous; bursa small, globular, membranous; signum rhomboidal, weakly denticulate, hardly keeled; accessory sac globular, membranous.

Early stages unknown.

Southwestern California, from northern Kern County to San Diego County; rare in collections. Moth in March and April.

*Loxostege immerens* (Harvey), NEW COMBINATION

PL. 4, FIGS. 55–58; PL. H, FIG. 1; PL. R, FIG. 6 (McD. 5536, 5537).

*Annaphila immerens* Harvey, 1875, *Can. Ent.*, **7**: 160. Type-locality: California. [USNM]

*Loxostege triumphalis* Grote, 1902, *Can. Ent.*, **34**: 295. NEW SYNONYMY.
Type-locality: San Luis Obispo, California. [USNM]
NOTE—The locality cited is that of the lectotype, hereby designated, a male in the USNM, bearing the label "Loxostege/triumphalis/Type Grote".

Moth resembling *L. annaphilalis* in general coloring; sexes similar, smaller and more robust than male of *L. annaphilalis*, closely similar to female of that species, but with ground of forewing fairly uniformly dark gray or with diffuse light-gray suffusion, not variegated with light gray and with light-gray ante- and postmedial lines as in female of *L. annaphilalis*; hindwing with dark terminal border either with triangular basally directed projections or distinctly wider than in *L. annaphilalis*. Length of forewing 10–11 mm.

Male genitalia: uncus subtriangular, with weak dorsal vestiture; transtilla medially narrowed, laterally with rather short, sharp, ventrally directed processes; juxta small, dorsally bifid; vinculum forming a blunt saccus with midventral keel; valve short, distally expanded, rounded and curved dorsad; costa narrowly inflated; sacculus expanded and inflated, with strong dorsal ridge, with an angular dorsal prominence basad of clasper; clasper short, wide and flat, strongly toothed along ventral margin; penis with aedoeagus cylindrical, about seven times as long as wide, distal flange serrate, not very long; vesica with a pair of small cornuti. Female genitalia: ovipositor with well-formed, moderate-sized lobes, with dense vestiture of short setae; apophyses as in *L. annaphilalis*, but a little thicker, and slightly clubbed distally; eighth segment with paired tergites, separated middorsally; ostial chamber broadly funnel-shaped, sclerotized and finely spinulose; basal parts of ductus bursae and ductus seminalis weakly sclerotized; rest of ductus bursae relatively short, membranous; bursa globular, membranous; signum lacking; accessory sac small and membranous.

Early stages unknown.

California: Mojave Desert and Death Valley to Los Angeles and San Diego counties; a long series was taken on the El Segundo dunes by Lloyd Martin and R. L. Ford. An old record from Plumas County requires confirmation. Moth flying by day in March, April and May.

There is considerable variation in the depth of color of the forewing, as shown on the plate. An aberration is known with the hindwing yellow instead of red. The small day-adapted eye and hairy palpi account for the traditional placement of the species in *Titanio*, but the resemblance to Odontiinae is purely superficial. The species should be differentiated from *Pogonogenys proximalis* (Fernald) (Fascicle 13.1, p. 165, plate 8, figures 37–39) and from *Pyrausta dapalis* (Grote) and *P. coccinea* Warren (Fascicle 13.2B, p. , plate 7, figures 38–42), as well as from noctuids of the genus *Annaphila* Grote.

*Loxostege quaestoralis* (Barnes and McDunnough), NEW COMBINATION

PL. 4, FIGS. 61, 62; PL. H, FIG. 2 (McD. 5544).

*Polingia quaestoralis* Barnes and McDunnough, *Contrib. Nat. Hist. Lep. N. Am.*, **2** (6): 239, pl. 1, fig. 19.
Type-locality: Southern Arizona. [USNM]

Forewing wider and with apex more acute than in most species of the genus; costa somewhat arched at base; length of forewing 11–12 mm. Palpi with very bushy scaling.

Male genitalia: uncus fairly short and wide, distally rounded, dorsally densely spinose on distal part; transtilla incomplete, with short, acute, ventrally directed processes; juxta small, dorsally bifid, ventrally with lateral processes; vinculum with ventral part rather narrow, medially keeled; valve fairly narrow, distally rounded and weakly curved dorsad; costa narrowly inflated; sacculus weakly inflated, dorsal margin nearly even; clasper narrow, tapering nearly to a point, curved basad, its tip weakly spinulose; penis cylindrical, aedoeagus about six times as long as wide, with blunt spinulose distal process; vesica unarmed or perhaps with deciduous cornuti. Female genitalia not seen.

Early stages unknown.

Southern California to Albuquerque, New Mexico. A winter moth of deserts, flying by day in January and February.

Barnes and McDunnough suggested that the species was related to *Titanio* Hübner (Odontiinae), but the genital structure shows that the resemblance is superficial. The dark wings of

unusual shape, with their pallid postmedial lines, the desert habitat and the winter flight period will together separate this from other North American species.

*Loxostege anartalis* (Grote)

PL. 4, FIGS. 41–54; PL. G, FIG. 3 (McD. 5487, 5488, 5489).

*Eurycreon anartalis* Grote, 1877, *Can. Ent.*, **10**: 27. Type-locality: Soda Sprs., California. [BMNH]

NOTE—I hereby designate as lectotype a male in the BMNH. It has the following labels: "LECTOTYPE" [round purple-bordered label]; "Type" [round red-bordered label]; "Soda Sp"; "Eurycreon ♂/Type anartalis Grote" [red-bordered label in Grote's hand], and on the reverse "82.54". The paralectotype male, also in the BMNH, has the same locality label and Grote's blue-bordered determination label, as well as a round light-blue-bordered paralectotype label.

*Botis lulualis* Hulst, 1886, *Trans. Amer. Ent. Soc.*, **13**: 150. Subsp.
Type-locality: Anticosti Island, Quebec. [AMNH]

NOTE—The locality cited follows the restriction by Barnes and McDunnough, 1916, *Contrib. Nat. Hist. Lep. N. Am.*, **3**: 191. The particulars of the two syntypes are given and the name is assigned to the Anticosti specimen. I consider that this fulfils the requirements of a lectotype designation. The later designation by Klots, 1942, *Bull. Amer. Museum. Nat. Hist.*, **79**: 420, is consequently invalid.

*Loxostege albertalis* Barnes and McDunnough, 1918, *Contrib. Nat. Hist. Lep. N. Am.*, **4**: 160, pl. 22, fig. 17. Subsp. NEW STATUS.
Type-locality: Gleichen, Alberta. [USNM]

NOTE—The locality cited is that of the lectotype female, hereby designated, the specimen labelled by Barnes and McDunnough as "♀ type" and now in the USNM. Their "♂ type" had no locality label, though they thought it came from the same place.

*Loxostege saxicolalis* Barnes and McDunnough, 1918, *Contrib. Nat. Hist. Lep. N. Am.*, **4**: 160, pl. 22, fig. 16. Subsp. NEW STATUS.
Type-locality: Stockton, Utah. [USNM]

Moth with forewing much as in *L. immerens*, but usually with considerable blue-gray dusting on distal half of medial area and proximal half of subterminal area; postmedial line standing out more or less distinctly on this dusting as a fine blackish line, outlined distally by a paler zone. Hindwing with base and termen fuscous; medial area varying from white through shades of gray to dark fuscous of same tone as base and termen, depending on individual and locality; fringe always contrastingly pale. Underside white or grayish, with weak dark lines and spots and with dark suffusion, the latter geographically and individually variable. Length of forewing 10–12 mm.

Male genitalia: uncus fairly narrow, distally rounded; dorsal surface finely spinose toward tip; valve moderately narrow, heavily sclerotized, distally rounded; clasper narrow and spikelike; penis with a large, thick, blunt fixed cornutus and a group of numerous, fine, probably deciduous cornuti. Female genitalia: ovipositor with well-developed, relatively wide, strongly setose lobes; posterior apophysis with short, slender shaft; eighth segment with a pair of tergites, divided in middorsal line; anterior apophysis longer than posterior, with low, rounded, sub-basal, dorsal prominence and an acute ventral process opposite it; ostium wide, its posterior lip with a narrow ribbonlike sclerotization; ostial chamber proximally semimembranous and rapidly tapering, then cylindrical and sclerotized, and again narrowing distally; basal coil of ductus bursae enlarged, fluted, sclerotized and finely denticulate, rest of ductus bursae moderately long, slender, coiled, membranous; bursa globular, membranous; signum rhomboidal, strongly keeled and denticulate; accessory sac globular, membranous.

Early stages unknown.

An inhabitant of heaths, prairies and mountain meadows. Anticosti to Alaska, south to the southern Prairie Provinces and in the mountains to Utah and northern California. Five more or less well-marked subspecies.

*Loxostege anartalis lulualis* (Hulst)

PL. 4, FIG. 51 (McD. 5487a).

*Botis lulualis* Hulst, 1886, *Trans. Amer. Ent. Soc.*, **13**: 150.
Type-locality: Anticosti Island, Quebec. [AMNH]

NOTE—The identity of the lectotype is discussed under the species synonymy, above.

Moth with upperside of forewing dark, of hindwing with white disc contrasting strongly with black base, margins and postmedial row of dots. Underside of forewing heavily suffused with gray, of hindwing whitish with fuscous terminal band. Length of forewing 10 mm.

Apparently very rare. Anticosti (lectotype); Rivière aux Ecorces, Laurentide Park, Quebec, 27 June 1947, flying over blueberry-*Ledum-Kalmia* barrens in bright sunshine.

More material will be needed to show whether this subspecies is really distinct from *L. a. albertalis*. Specimens of the latter with hindwings as contrasting as those of *L. a. lulualis* are fairly common, but normally they have the underside of the forewing concolorous with that of the hindwing, and not differentially darkened as in the present form. If it proves that the populations are not distinguishable, then the name *albertalis* will fall to *lulualis* as a junior synonym.

*Loxostege anartalis albertalis* Barnes and McDunnough

PL. 4, FIGS. 46–50 (McD. 5488).

*Loxostege albertalis* Barnes and McDunnough, 1918, *Contrib. Nat. Hist. Lep. N. Am.*, **4**: 160, pl. 22, fig. 17.
Type-locality: Gleichen, Alberta. [USNM]
NOTE—A lectotype was designated in the species synonymy, above.

Moth as in *L. a. lulualis*, but in most individuals the forewing much more heavily dusted beyond middle of upperside with light blue gray, and hindwing with upperside some shade of gray with weakly contrasting fuscous or dark-gray terminal zone; occasional specimens with black-and-white hindwing as in *L. a. lulualis*. Underside of wings gray or whitish, forewing and hindwing concolorous, but not necessarily matching upperside of hindwing. Length of forewing 9–11 mm.

Manitoba to the southern interior of British Columbia, north to Sawmill Bay and Cameron Bay, Northwest Territories, Dawson, Yukon, and Alaska. Moth in May and June in southern Canada, in June and July in the North.

*Loxostege anartalis saxicolalis* Barnes and McDunnough

PL. 4, FIGS. 52, 53 (McD. 5489).

*Loxostege saxicolalis* Barnes and McDunnough, 1918, *Contrib. Nat. Hist. Lep. N. Am.*, **4**: 160, pl. 22, fig. 16.
Type-locality: Stockton, Utah. [USNM]

Moth closely similar to the darkest specimens of *L. a. albertalis*, but perhaps a little more robust and with wings even darker. Upperside of hindwing dark fuscous, with traces of a narrow, pale postmedial line. Underside heavily suffused with dark gray. Length of forewing 10.5–11.5 mm.

Described from the holotype from Stockton and a short series of paratypes from Eureka, Utah. Also seen from Twogwotee Pass, Wyoming. Possibly forming a cline through the Cordillera to intergrade with *L. a. albertalis*. Moth in May to July.

*Loxostege anartalis rainierensis* Munroe, NEW SUBSPECIES

PL. 4, FIGS. 44, 45; PL. G, FIG. 3.

*Loxostege anartalis rainierensis* Munroe.
Type-locality: Mt. Rainier, Washington. [CNC]

Moth relatively constant in maculation, resembling *L. a. lulualis* and the lightest specimens of *L. a. albertalis*, but with discal white area of hindwing more extensive than in either; terminal blackish border narrow and tapering posteriorly; basal infuscation fairly extensive, but costa not infuscated and anal margin only very weakly so. Underside of wings light gray, hindwing lighter than forewing; both pairs with dark terminal band as in many specimens of *L. a. albertalis*; cell of forewing sometimes with a dark patch, but this never as strong as in *L. a. anartalis*. Length of forewing 10–11 mm.

TYPES: Holotype: ♂. Mt. Rainier, Washington; 2 Aug. 1942; E. C. Johnston. Type no. 13,924, CNC. Allotype: ♀. Sunrise Park, Mt. Rainier, Washington; 17 July 1949; E. C. Johnston. Type no. 13,924, CNC. Paratypes: 5 ♂♂, 2 ♀♀. Same data as holotype (4 ♂♂). Paradise Valley, Mt. Rainier, Washington, 6000–8000′; 1 Aug. 1919; C. L. Fox (1 ♀). Berne, Washington; 2 May 1947; E. C. Johnston (1 ♂). Crater L., Oregon, 5000–7000′; 21–26 July 1959; L. G. Higgins (1 ♀). Type no. 13,924, CNC; CAS; BMNH.

*Loxostege anartalis anartalis* (Grote)

PL. 4, FIGS. 41–43, ?54 (McD. 5487).

*Eurycreon anartalis* Grote, 1877, *Can. Ent.*, **10**: 27.
Type-locality: Soda Sprs., California. [BMNH]

Slightly larger and more robust than the other subspecies; length of forewing 11–12 mm; upperside of forewing heavily suffused with black on basal half and in terminal area; upperside of hindwing black and white, basal area broadly suffused with black, black terminal band broad; in some specimens the pale medial area suffused with gray or fuscous. Underside of wings with ground color

whitish or light gray, terminal area broadly blackish fuscous, a prominent patch of the same shade filling cell of forewing, sometimes extending over whole wing.

Shasta and Siskiyou counties, California, in the general vicinity of Mount Shasta. Most of the few specimens known were collected in the 1800's. The BMNH has three specimens labelled San Juan Mountains, Colorado, that seem identical; I think the locality information is wrong.

The specimen from Cobb, Lake County, California, figured on plate 4, figure 54, is perhaps referable to this subspecies, though it is smaller and very dark. On the underside of the forewing the fuscous suffusion occupies most of the wing, but neither it nor the terminal infuscation is as intense as in topotypical material.

*Loxostege ephippialis* (Zetterstedt), NEW COMBINATION

PL. 2, FIGS. 29, 30; PL. 4, FIGS. 59, 60; PL. H, FIG. 3 (McD. 5531).

*Botys ephippialis* Zetterstedt, [1839], *Insecta Lapponica*, 972.
Type-locality: Dovrefjeld, Norway. [Lund Museum]

*Psodos dubitaria* Zetterstedt, [1839], *Insecta Lapponica*, 955. NEW COMBINATION with *Loxostege* and NEW SYNONYMY.
Type-locality: Dovrefjeld at Drivstuen, Norway. [Lund Museum]
NOTE—Michael Shaffer has kindly called my attention to this synonymy, established in a joint examination by him and by D. S. Fletcher of the "type". As Zetterstedt referred to two specimens in his description, the specimen examined by Shaffer and Fletcher is actually a syntype, but I hereby designate it as lectotype. *Psodos dubitaria* has page precedence over *Botys ephippialis*, but it has never been used for this species; indeed it seems to have had little or no currency in any sense whatever; it is not even cited in either part of Staudinger and Rebel, 1901, *Catalog der Lepidopteren des Palaearctischen Faunengebietes*. Therefore, as first reviser, under Article 24 (a) of the *International Code of Zoological Nomenclature*, I choose *ephippialis* Zetterstedt in preference to *dubitaria* Zetterstedt as the name to be used for the species.

*Boreophila scandinavialis* Guenée, 1854, *Species Général des Lépidoptères*, **8**: 156. NEW COMBINATION with *Loxostege*.
Type-locality: Norway.

*Boreophila frigidalis* Guenée, 1854, *Species Général des Lépidoptères*, **8**: 157, pl. 7, fig. 7. NEW COMBINATION with *Loxostege*.
Type-locality: Norway. [BMNH]
NOTE—The holotype has a modern label saying Dovrefjeld, but Guenée does not cite this locality, and there is no label from his time confirming it.

Moth dark bluish gray; smaller than dark forms of *L. anartalis* (length of forewing under 9 mm); upperside of forewing with ground even and silky, not dull and powdery; basal half often suffused with brown; antemedial line oblique distad, nearly straight, not strongly dentate as in *L. anartalis*. Superficially somewhat like *Ostrinia marginalis* (c.f. plate 2, figures 28–31), but with postmedial line of forewing sinuate and inconspicuous, not evenly curved parallel to termen and conspicuous as in *O. marginalis*; that of hindwing curved parallel to termen, not running straight across anterior part of wing as in *O. marginalis*.

Male genitalia like those of *L. anartalis*, but uncus shorter, clasper placed a little farther distad and the blunt cornutus relatively smaller. Female genitalia generally like those of *L. anartalis*, but with ostial chamber thistle-shaped; basal part of ductus bursae only slightly expanded and hardly sclerotized; ductus relatively longer and with more coils; signum narrower, fusiform.

Early stages unknown.

A low-arctic-alpine species; Norway, Sweden, Finland; in North America common in Labrador and northern Quebec; scarcer west of Hudson Bay in the low Arctic, known from Churchill, Manitoba, and the Northwest Territories; ranging south in the Rockies (Nordegg, Alberta; Snowy Range, Wyoming, 11,200 feet) to Colorado; common there in the 11,700–14,000-feet zone. Moth in July, flying by day.

There is surprisingly little geographical variation and I see no basis for separating subspecies.

*Loxostege thallophilalis* (Hulst)

PL. 4, FIGS. 39, 40; PL. H, FIG. 6; PL. R, FIG. 7 (McD. 5481, 5490).

*Botis thallophilalis* Hulst, 1886, *Trans. Amer. Ent. Soc.*, **13**: 154.
Type-locality: California. [AMNH]
NOTE—The locality cited is that of the lectotype, a female in the AMNH designated by Klots, 1942, *Bull. Amer. Museum Nat. Hist.*, 79: 422. The specific name was spelled "*thrallophilalis*" by

Hulst on p. 154, but this was an inadvertent error which he corrected on p. 168. The name seems to have been fated to be misspelled. Barnes and McDunnough in the 1917 *Check List* spelled it "*thallophyllalis*", and McDunnough in the 1939 *Check List* gave it as "*thrallophyllalis*".

*Noctuelia flavifimbrialis* Warren, 1892, *Ann. Mag. Nat. Hist.*, (6) **9**: 174. NEW SYNONYMY.
Type-locality: California. [BMNH]

Moth with forewing evenly brown; antemedial line outwardly oblique, black; orbicular and reniform a black dot and bar; postmedial line black, excurved, posteriorly dentate. Upperside of hindwing fuscous with contrasting yellowish fringe. Underside of wings buff, with faint markings. Length of forewing 10–12 mm.

Male genitalia much like those of *L. ephippialis*; uncus longer; valve relatively wider; clasper bent basad at its tip; juxta smaller; penis thick; tip of aedoeagus divided and spinulose; the blunt cornutus rather slender, strongly bent distally. Female genitalia as in *L. anartalis*, but ovipositor with weaker, sparsely setose lobes; basal coil of ductus bursae larger and more strongly sclerotized; rest of ductus longer and with more coils.

Early stages unknown.

Southern British Columbia to Montana and northern California, in the mountains; apparently more common in the vicinity of Mount Rainier, Washington, than in most areas. Moth in July.

*Loxostege brunneitincta* Munroe, NEW SPECIES

PL. 4, FIGS. 25–27, 32; PL. H, FIG. 4; PL. S, FIG. 1.

*Loxostege brunneitincta* Munroe.
Type-locality: Mt. Shasta, California. [CNC]

DIAGNOSIS: Moth like *L. commixtalis*, *L. sierralis* and *L. cereralis* in general pattern and structure, but with upperside of forewing rather variegated, and with upperside and underside of forewing and hindwing strongly tinted with chestnut brown, not grayish as in related species.

DESCRIPTION: Frons and vertex fuscous in middle, buff at sides; scaling of frons smooth, that of vertex rough and erect. Labial palpus porrect, smoothly and conically scaled, exceeding frons by less than length of head, fuscous dorsally, broadly light brown at base beneath. Maxillary palpus prominent, its distal scaling weakly expanded; color fuscous. Proboscis well developed, its basal scaling fuscous, sometimes partly buff. Eye rather small, but not margined by a scaleless zone; color brownish fuscous. Ocellus prominent, brownish fuscous. Antenna filiform, in male short-pilose and slightly thickened. Body robust. Thorax above brownish fuscous. Abdomen above brownish fuscous, posterior margins of segments chestnut brown. Body beneath brown, abdominal segments infuscated except on posterior margins. Legs robust, brown; midtibia of male thickened and with a short hair-pencil; outer preapical spur of hindtibia minute.

Forewing wide and subtriangular; costa weakly arched, more strongly so near base and apex; apex bluntly angled; termen weakly convex and only very slightly oblique; tornus obtuse; posterior margin convex near base. Ground color of upperside brownish fuscous, variegated with blackish fuscous and buff and dusted with bluish gray, the general effect somewhat mottled dark brown or fuscous. Basal area with obscure blackish-fuscous longitudinal dashes. Antemedial line usually obscure and somewhat diffuse, light brown or bluish gray, beginning at costa about one-fifth from base, oblique distad to 2nd A, there obtusely angled and erect to posterior margin at one-third from base; occasionally with dentations and angulations superimposed on this general course. Orbicular spot elongate in axis of cell, brownish or blackish fuscous, annular or dashlike. A light-buff patch in cell between reniform and orbicular spots. Reniform spot fairly large, strongly lunular, outlined in brownish or blackish fuscous, with brown or sometimes grayish center. Postmedial line usually poorly defined, light gray, strongly scalloped, accentuated by blackish triangular or sagittate spots pointing basad on veins; erect or weakly oblique distad from costa at four-fifths from base, angled at $R_5$, convex around end of cell to a blunt retraction on $Cu_2$, thence erect and strongly dentate to posterior margin at two-thirds from base. Veins beyond cell often fuscous-lined as far as postmedial line. Subterminal band yellowish buff, fusiform, continuous or interrupted, sometimes absent. Fringe basally checkered with darker and lighter brown, distally uniformly brown.

Hindwing above dull chestnut brown, often more or less suffused with fuscous or with veins infuscated; terminal area always fuscous, forming a rather definite band in specimens with paler ground color. Fringe basally dark brown, distally light brown.

Forewing beneath dull chestnut brown, somewhat paler than upperside of hindwing, the disc sometimes suffused with grayish fuscous. Orbicular dot and reniform lunule fuscous. Traces of a fuscous postmedial line, strongest at middle of wing. Terminal line fuscous, continuous or broken. Fringe dark brown, weakly checkered at base with lighter brown.

Hindwing beneath of same shade of brown as forewing, but without infuscation, or with only a weak fuscous terminal band. Traces of a narrow fuscous postmedial line. Terminal line weak, brownish fuscous. Fringe as on upperside.

Male genitalia as in *L. thallophilalis*, but with uncus and tegumen longer and narrower; juxta higher; clasper longer, narrower, and arising closer to base of valve; penis with distal spining strong and cornutus basally thick but distally tapering. Female genitalia with ostial chamber larger than in *L. thallophilalis*, widest posteriorly, not anteriorly; basal part of ductus bursae narrower but longer, forming a complete whorl; ductus bursae longer and narrower, with many more coils.

Early stages unknown. The specimen labelled "*Isatis tinctoria*" and taken at Buck Creek Ranger Station, Modoc County, California, by Paul Opler, (see below), was presumably collected on the plant as an adult and not reared.

TYPES: Holotype: ♂. Timberline, Mt. Shasta, California; 20 July 1936; E. C. Johnston. Type no. 13,925, CNC. Allotype: ♀. Mt. Lassen, California, 7000′; 14 July 1934; E. P. Van Duzee; genitalia slide 4413, DK. CAS. Paratypes: 37 ♂♂, 28 ♀♀. Crater L., Oregon; 2 Aug. 1923; (1 ♂, 1 ♀). Same locality; 13 July 1934; E. C. Van Duzee (1 ♂). Hoodoo Ski Bowl, Linn Co., Oregon; 25 July 1966; J. Powell (1 ♀). Baker, Oregon; 7 May 1957; J. H. Baker (2 ♂♂). W U.S.A. [California], Walsingham, Camp 37 and Camp 43–45 (2 ♀♀). Mt. Shasta, California, 7000′; 16–23 July (1 ♂). Mt. Shasta, California; 24 May 1936; Grace H. and John L. Sperry (1 ♂). Timberline, Mt. Shasta, California; 20 July 1936; E. C. Johnston (1 ♂). Mt. Shasta, Siskiyou Co., California, 8000–9000′; 21 July 1966; J. Powell, P. A. Rude (2 ♂♂, 2 ♀♀). Mt. Shasta Ski Lodge, Siskiyou Co., California, 8900′; 28 July 1966; P. Opler (4 ♂♂). Mt. Shasta Bowl, Siskiyou Co., California, 8000′; 21 July 1969; P. Opler (1 ♂). 5 mi E of Pine Creek, E of Rock L., Modoc Co., California, 6200′; 7 June 1970; P. Opler (1 ♀). Fandango Pass, Modoc Co., California, 6100′; 12–13 July 1970; R. E. Dietz (1 ♀). 5 mi N of Davis Creek, Modoc Co., California; 3 June 1971; J. A. Chemsak (1 ♀). Buck Creek Ranger Station, Modoc Co., California, 5150′; 5–7 June 1970; at light and "*Isatis tinctoria*"; J. A. Powell, P. Opler (3 ♂♂, 3 ♀♀). Lassen Co., California; Otto Buchholz (2 ♂♂). Nelson Creek, Plumas Co., California; 8 July 1937; William R. Bauer (1 ♂, 1 ♀). Lassen Co., California; Otto Buchholz (2 ♂♂). Gold L., Sierra Co., California; 12 July 1934; Guedet (2 ♀♀). Norden, California; 8 Aug. 1935; E. C. Johnston (1 ♂). Truckee, California; 14 June and 5 July 1927; E. C. Van Duzee (1 ♂, 1 ♀). Summit, Placer Co., California; June 1903; Koebele (1 ♂, 2 ♀♀). Placer Co., California; July; Koebele (1 ♂). Mt. Tallac, El Dorado Co., California, 8700′; 19, 20 July 1909; F. X. Williams (1 ♂, 1 ♀). Ebbetts Pass, Alpine Co., California, 8730′; 30 June 1960; J. A. Chemsak (3 ♂♂, 2 ♀♀). Same locality; 21 June 1962; J. Powell (1 ♂). Mammoth Camp, Mono Co., California; 25 July 1940; Don Meadows (1 ♂). Mammoth, Mono Co., California; 6 Aug. 1937; C. W. Kirkwood (1 ♂). Near Mammoth, California; 16 July 1922 (1 ♂). Minaret Summit, Mono Co., California; 14 July 1938; C. W. Kirkwood (1 ♂). Sheep Mt., Mono Co., California, 11,200′; 5, 6 July 1961; G. I. Stage, J. Powell (1 ♂, 2 ♀♀). Crooked Creek Lab., White Mts., Mono Co., California, 10,150′; 23–28 June 1961; J. Powell (3 ♂♂, 1 ♀). Bishop, California; 31 May 1937; M. L. Walton (1 ♀). Saugus, California; 11 Nov. 1927 (2 ♀♀). 30 mi NW of Gerlach, Washoe Co., Nevada; 11 June 1970; P. A. Rude (1 ♀). Charleston Mts., Nevada; 14 May 1937; Lloyd M. Martin (1 ♂). Hall Valley, Colorado; 25 June 1928 (1 ♀). Type no. 13,925, CNC; AMNH; USNM; UCB; LACM; CAS; CPK; BMNH.

The Hall Valley specimen has a label in the same hand as the Saugus specimens and two of the Crater Lake specimens. The Hall Valley label is probably wrong. The Crater Lake locality is confirmed by an independent collection.

This species overlaps *L. sierralis* in its geographical range. Both are closely similar to *L. commixtalis* and *L. cereralis*. The biological relationships of these four entities should be studied in the field; this project would be of particular interest because of the economic importance of *L. cereralis* (see below, p. 77). On the basis of present material there appear to be two distinct series of

populations whose ranges overlap in the Sierra Nevada, viz., brown-winged and brown-fringed specimens, which I refer to the present species, and often somewhat smaller, gray-winged, pale-fringed specimens which I refer to *L. sierralis*. In British Columbia and Washington occur montane specimens which I would regard as conspecific with either of these species in the absence of the other, but they are closer to *L. sierralis*, and I so classify them. These in turn will perhaps prove to intergrade with *L. commixtalis* in the north, but that form is smaller and has paler, better marked hindwings, so I separate it for the present. Some at least of the populations of *L. sierralis* are day-fliers like *L. commixtalis*. *L. brunneitincta* is a high-altitude species; it has been taken at light at least once, but I do not know its habits. *L. cereralis* has a different biology, being a night-flying species of plains and cultivated fields. *L. offumalis* and *L. thallophilalis* are also closely related to the present complex, in fact *L. brunneitincta* looks as though it had a few *thallophilalis* genes in it, but both species are more distinct in appearance than those previously mentioned.

*Loxostege offumalis* (Hulst)
PL. 4, FIGS. 37, 38; PL. H, FIG. 7 (McD. 5480).

*Botis offumalis* Hulst, 1886, *Trans. Amer. Ent. Soc.*, **13**: 150.
Type-locality: San Diego, California. [AMNH]

Moth similar to *L. commixtalis* and *L. cereralis* in color and pattern, but distinguished by the relatively narrow wings, the forewing with oblique, rounded termen and obtuse tornus, the hindwing with apex, termen and anal angle rounded. Hindwing above somewhat brownish, with diffuse fuscous postmedial line and terminal band, the latter much more diffuse than that of *L. brunneitincta*. Length of forewing under 10 mm.

Male genitalia closely similar to those of *L. brunneitincta*. Female genitalia with ostial chamber narrower than in *L. brunneitincta*, more nearly parallel-sided; large sclerotized coil following junction of ductus seminalis not as long or as thick as in *L. brunneitincta*; membranous part of ductus bursae shorter, thicker and with fewer coils; signum not as wide and with lateral angles decked over for a short distance.

Early stages unknown.

Southern California: Los Angeles and western Riverside counties to San Diego. Moth in February and March.

*Loxostege sierralis* Munroe, NEW SPECIES
PL. 4, FIGS. 20–24, 28–31, 33–35; PL. H, FIG. 8; PL. S, FIG. 2.

*Loxostege sierralis* Munroe.
Type-locality: 7 mi WSW of Lee Vining, California, 9600′. [CNC]

DIAGNOSIS: A montane species of the western Cordillera, closely resembling *L. commixtalis*. Moth on the average larger (length of forewing 10–12 mm). Forewing darker and with maculation less contrasting; postmedial line generally not strongly indented behind costa. Hindwing above dark grayish fuscous, with only a weak brown tinge, and with whitish fringe, not variegated gray as in *L. commixtalis*, and not brown with dark terminal band and brown fringe as in *L. brunneitincta*.

Male genitalia like those of *L. brunneitincta*, but tegumen and uncus relatively shorter, valve relatively longer and wider and somewhat expanded distally; clasper and penis as in *L. brunneitincta*, but juxta smaller. Female genitalia like those of *L. offumalis*.

Early stages unknown.

Southern British Columbia to the southern Sierra Nevada of California; also in Utah and probably elsewhere in the western mountains. A diurnal species of bogs and alpine meadows at high elevations.

There appear to be a number of more or less disjoined populations, and there is evidently significant geographical variation; to emphasize this I recognize four subspecies, but additional sampling and field study is desirable to work out the population structure and the full pattern of variation.

The type material is listed under the nominate subspecies, below.

*Loxostege sierralis internationalis* Munroe, NEW SUBSPECIES
PL. 4, FIGS. 20–24.

*Loxostege sierralis internationalis* Munroe.
Type-locality: Blackwall, Manning Park, British Columbia, 6000′. [CNC]

Moth relatively large (length of forewing 10–12 mm). Forewing above rather dark, in most specimens with a brownish cast, and with rather heavily dark-lined veins. Orbicular and reniform spots relatively far apart and separated by a fairly well defined pale-buff patch. Orbicular an oblique black bar. Hindwing above brownish

fuscous, sometimes diffusely darker terminally, and with the fringe whitish.

TYPES: Holotype: ♂. Blackwall, Manning Park, British Columbia, 6000′; 11 Aug. 1953; J. R. McGillis. Type no. 13,926, CNC. Allotype: ♀. Same locality, collector and type number; 10 Aug. 1953. CNC. Paratypes: 12 ♂♂, 2 ♀♀. Same locality as holotype: 5 and 10 Aug. 1953; J. E. H. Martin (2 ♂♂). Pinewoods, Manning Park, British Columbia, 4000′; 5 Aug. 1953; J. R. McGillis (1 ♀). Lihumption Park, near Cultus L., British Columbia, 5000′; 4 Aug. 1927; C. H. Young (1 ♂). Blackwall Mt., Manning Park, British Columbia; "8/7/61"; genitalia slide 3962, DK (1 ♂). Hope Mts., British Columbia, 6000′; 2 Aug. 1932; A. N. Gartrell (1 ♂). Mt. Rainier, Washington; 25 July 1942; E. C. Johnston (1 ♂, 1 ♀). Mt. Rainier, Washington; 13 July 1919; C. L. Fox (1 ♂). Mt. Rainier, Washington, 5000–6000′; 6 Aug. 1923; C. L. Fox (1 ♂). Vantage, Washington; 11 April 1942; E. C. Johnston (1 ♂). Forest Reserve, Upper Skagit, Washington; 18 July 1905; Mrs. Nicholl (1 ♂). Mt. Hood, Oregon; 16 Aug. 1939; E. C. Johnston (2 ♂♂). Type no. 13,926, CNC; CAS; BMNH.

*Loxostege sierralis sierralis* Munroe
PL. 4, FIGS. 28, 33, 34.

*Loxostege sierralis sierralis* Munroe.
Type-locality: 7 mi WSW of Lee Vining, California, 9600′. [CNC]

Moth somewhat smaller than *L. s. internationalis* (length of forewing about 10 mm). Forewing above lighter and more uniformly grayish fuscous, with dark markings relatively more restricted and pale subterminal band a little more distinct; hindwing generally more brownish.

TYPES: Holotype: ♂. 7 mi WSW of Lee Vining, California, 9600′; 13 Aug. 1967; D. F. Hardwick. Type no. 13,927, CNC. Allotype: ♀. Tuolumne Meadows, California; 21 July 1938; E. C. Johnston. Type no. 13,927, CNC. Paratypes: 13 ♂♂, 5 ♀♀. Mill Creek, Tehama Co., California; 31 July 1937; C. W. Kirkwood (1 ♂). Tioga Sprs., Tuolumne Co., California; 24 July 1940; Don Meadows (2 ♂♂, 2 ♀♀). Tuolumne Meadows, California; 8–14 July, 14 July 1935, 21 July 1938; *ex* Barnes coll. and E. C. Johnston (9 ♂♂). Camp High Sierra, Mammoth Lakes, Mono Co., California; 19 July 1944; R. Mattoni (1 ♀). Humphreys Basin, Fresno Co., California, 10,500′; 14–15 Aug. 1945; R. Mattoni (1 ♂, 1 ♀). Carson City, Nevada; 29 July 1929; E. P. Van Duzee (1 ♀). Type no. 13,927, CNC; USNM; LACM; CAS; BMNH.

*Loxostege sierralis tularealis* Munroe, NEW SUBSPECIES
PL. 4, FIGS. 35; PL. H, FIG. 8; PL. S, FIG. 2.

*Loxostege sierralis tularealis* Munroe.
Type-locality: Big Meadows, Tulare Co., California. [LACM]

Moth generally similar to the nominate subspecies, but with forewing more bluish gray and more distinctly marked: in particular the antemedial line outlined with bluish gray and usually plainly evident. Hindwing darker fuscous and with less brown tint.

TYPES: Holotype: ♂. Big Meadows, Tulare Co., California; 27 July 1954; R. J. Ford. LACM. Allotype: ♀. Same locality and collector as for holotype; 26 July 1954; R. J. Ford. LACM. Paratypes: 9 ♂♂, 5 ♀♀. Same locality as for holotype; 9 July 1940 and 25–27 July 1954; *ex* Rindge coll. and R. J. Ford (9 ♂♂, 4 ♀♀). Mineral King, Tulare Co., California; 21 July 1936 (1 ♀). LACM; AMNH; type no. 13,928, CNC.

*Loxostege sierralis sanpetealis* Munroe, NEW SUBSPECIES
PL. 4, FIGS. 29–31.

*Loxostege sierralis sanpetealis* Munroe.
Type-locality: 17 mi E of Mayfield, Sanpete Co. Utah, 10,200′. [AMNH]

Moth most like *L. s. internationalis*, but with forewing paler and with contrasting dark maculation, especially on distal part of wing; pale areas brownish gray and not bluish gray as in *L. s. tularealis*. Hindwing dark fuscous, with whitish fringe.

TYPES: Holotype: ♂. 17 mi E of Mayfield, Sanpete Co., Utah, 10,200′; 19 July 1960; F., P. and B. Rindge; collected on NSF Grant G 9037. AMNH. Allotype: ♀. Same data as for holotype. AMNH. Paratypes: 14 ♂♂, 29 ♀♀. Same data as for holotype (13 ♂♂, 29 ♀♀). Southern Utah; July 1900 (1 ♂). AMNH; USNM; type no. 13,929, CNC.

*Loxostege commixtalis* (Walker)

PL. 4, FIGS. 13–19; PL. J, FIG. 1; PL. S, FIG. 3 (McD. 5479, in part).

*Scopula commixtalis* Walker, [1866], *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **34**: 1459.
Type-locality: St. Martin's Falls, Albany R., Hudson's Bay. [BMNH]

*Crambus indotatellus* Walker, [1866], *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **35**: 1752.
Type-locality: St. Martin's Falls, Albany R., Hudson's Bay. [BMNH]

*Botys septentrionalis* Tengstrom, 1869, *Acta Societatis pro Flora et Fauna Fennica*, **10**: 358.
Type-locality: Finland. [Zool. Mus. Helsinki?]

Moth closely similar to *L. sierralis* in general appearance, but smaller in average size (length of forewing 8–12 mm). Forewing above extensively dusted with light bluish gray, as in *L. sierralis tularealis*, but even more strongly so. Antemedial line rather distinct, with a sharp angle pointed distad on 2nd A. Postmedial line with fuscous element continuous, in some specimens of almost even width, but in others with points extending basad along the veins; sharply angled at $M_1$, thence strongly oblique basad and only slightly curved to the angular retraction on $Cu_2$, not rather evenly curved in this general area as in *L. sierralis* or nearly parallel to termen for some distance as in most specimens of *L. cereralis*. Hindwing above medium gray, with darker veins, postmedial line and diffuse terminal band; fringe of hindwing light gray.

Male genitalia like those of *L. sierralis*, but with narrower valve and relatively larger clasper. Female genitalia much like those of *L. sierralis*, but with ostial chamber relatively smaller, its cylindrical portion shorter and narrower, and more strongly sulcate in midline; succeeding constriction longer but not as narrow relative to ostial chamber; sclerotized first coil of ductus bursae relatively larger.

Early stages unknown.

A boreal species of the taiga zone. Nova Scotia, Newfoundland and Labrador to the Yukon Territory; also in Fennoscandia and to be expected in Alaska and the northeastern part of the USSR. Occurring southward as isolated populations in bogs: Klondike Bog on Mount Katahdin, Maine; Laurentide Park, Quebec; Mer Bleue, near Ottawa, Ontario; etc. Moth in June and July, flying low by day over heaths and sphagnum.

This species has generally been confused with the alfalfa webworm, *L. cereralis*, but in Ontario these two species are different in appearance and biology. *L. cereralis* is a relatively large night-flying moth, which occurs sporadically as a pest of crops, apparently migrating from the South and West in particularly favorable years; whereas *L. commixtalis* is a resident day-flying species, which remains closely associated with its bog habitat.

*Loxostege cereralis* (Zeller) (Alfalfa Webworm*; Tisseuse de la Luzerne, f., Fr.)

PL. 4, FIGS. 6–12, 36; PL. J, FIG. 2; PL. S, FIG. 4 (McD. 5479, in part).

*Eurycreon (Spilodes) cereralis* Zeller, 1872, *Verh. K.-K. Zool.-Bot. Ges. Wien*, **22**: 517.
Type-locality: Texas, Boll. [BMNH]
NOTE—The species was described from three syntypes from Texas, collected by Boll. I hereby designate as lectotype a male in the BMNH, with labels as follows: "Eurycreon/cereralis Z./ Texas H[altun]g. 71" [in Zeller's hand on violet paper]; "Cotype" [round yellow-bordered label]; "LECTOTYPE" [round purple-bordered label]; and "Zell. Coll./1884". The two paralectotypes have the additional labels "Dallas, Texas"; and genitalia preparation numbers 1947/423 and British Mus. Pyr. Slide Number 1418.

Moth larger than other members of its immediate group (length of forewing 13–16 mm). Forewing less bluish on upperside than in *L. commixtalis*; middle part of postmedial line less oblique, often nearly parallel to termen for some distance, and less regular in width, being expanded into basally directed wedges on veins and often interrupted or nearly so between them; subterminal band yellowish buff, evenly tapering anteriorly and posteriorly, conspicuous and sharply defined. Hindwing above browner and more nearly unicolorous than in *L. commixtalis*.

Male and female genitalia not greatly different from those of *L. commixtalis*, except blunt cornutus of male generally larger and more broadly spatulate at tip; female with shorter ostial chamber and longer and more pronounced constriction.

Life history much like that of the beet webworm, *L. sticticalis* (see above, p. 65); range of foodplants and type of injury similar. Eggs laid in overlapping rows instead of in a single row. Full-grown larva

with a broad light-colored stripe down middle of back; no black middorsal stripe as in *L. sticticalis*. Cremaster of pupa with eight spoon-shaped setae on cremaster instead of the bristle-shaped setae of *L. sticticalis*.

The moth is frequently confused by economic entomologists with that of *L. sticticalis*. The latter species has the upperside of the forewing much less variegated, and the yellowish subterminal band has a projection near the front of its basal edge, instead of having the basal edge of the band regularly curved as in *L. cereralis*. On the underside of the hindwing the dark postmedial band is represented by a row of spots in the present species, whereas it is a continuous dark line in *L. sticticalis*.

Quebec to British Columbia and south to Mexico; in the South ranging from western Texas to California, but absent in the Southeast. A distinctly migratory species, more southern and western than *L. sticticalis*, invading the Northeast only in favorable years, but then sometimes breeding in economic numbers. Unknown from the Old World.

PLATE 1

# Pyraloidea

## PYRALIDAE

figs. 1–77

NATURAL SIZE 1:1

1. *Epicorsia oedipodalis* (Gn.), ♀. Florida, Mrs. Slosson (USNM). (p. 16).
2. *Saucrobotys fumoferalis* (Hulst), ♀. Smiley Brook Prov. Park, near Brooklyn, Hants Co., N.S., 20 July 1970, Douglas C. Ferguson (USNM). (p. 13).
3. *Saucrobotys fumoferalis* (Hulst), ♂. Montreal, Que., 26 June 1948, A. C. Sheppard (CNC). (p. 13).
4. *Saucrobotys fumoferalis* (Hulst), ♀. Montreal, Que., 26 June 1948, A. C. Sheppard (CNC). (p. 13).
5. *Saucrobotys fumoferalis* (Hulst), ♂. Hardy W.C., T3N, R1E, S30, S.D., 30 June 1965, R. W. Hodges (USNM). (p. 13).
6. *Saucrobotys futilalis futilalis* (Led.), ♂. Grand Bend, Ont., 21 Aug. 1939, T. N. Freeman, bred from Indian hemp, larva no. 84 (CNC). (p. 14).
7. *Saucrobotys futilalis futilalis* (Led.), ♀. Queens Park, Aylmer, Que., 13 June 1922, C. B. Hutchings (CNC). (p. 14).
8. *Saucrobotys futilalis futilalis* (Led.), ♂. Point Pelee, Ont., 5 Aug. 1927, F. P. Ide, *ex* larva on dogbane (CNC). (p. 14).
9. *Saucrobotys futilalis futilalis* (Led.), ♀. Point Pelee, Ont., 9 July 1927, F. P. Ide (CNC). (p. 14).
10. *Saucrobotys futilalis inconcinnalis* (Led.), ♀. Scandia, Alta., 9 July 1956, E. E. Sterns (CNC). (p. 14).
11. *Saucrobotys futilalis futilalis* (Led.), ♂. Decatur, Ill., 1–7 Aug., *ex* larva, *ex* Barnes coll. (USNM). (p. 14).
12. *Saucrobotys futilalis futilalis* (Led.), ♀. Decatur, Ill., 24–31 July, *ex* larva, *ex* Barnes coll. (USNM). (p. 14).
13. *Saucrobotys futilalis inconcinnalis* (Led.), ♂. Wawawai, Wn., 22 June 1934, J. F. Clarke, reared from *Apocynum* sp., genitalia slide 18 March 1936 CH no. 1 (USNM). (p. 14).
14. *Saucrobotys futilalis inconcinnalis* (Led.), ♂. Glenwood Sprs., Colo., 24–30 July, *ex* Barnes coll. (USNM). (p. 14).
15. *Munroeodes thalesalis* (Wlk.), ♀. Brownsville, Tex., 23 Oct. 1938, Grace H. and John L. Sperry, genitalia slide 4067 MS (CNC). (p. 12).
16. *Munroeodes thalesalis* (Wlk.), ♀. Brownsville, Tex., 13 March 1937, T. N. Freeman, genitalia slide 4068 MS (CNC). (p. 12).
17. *Loxomorpha flavidissimalis* (Grt.), NEW COMBINATION, ♂. Brownsville, Tex., 21–22 Oct. 1938, on prickly pear, Brownsville, Tex., No. 27672, Lot No. 38–16332, genitalia slide 1911 DK (USNM). (Fascicle 13.3).
18. *Loxomorpha flavidissimalis* (Grt.), ♀. San Antonio, Tex., genitalia slide 1912 DK (USNM). (Fascicle 13.3).

19. *Loxomorpha flavidissimalis* (Grt.), ♂. Brownsville, Tex., 8–15 March, *ex* Barnes coll. (USNM). (Fascicle 13.3).
20. *Loxomorpha flavidissimalis* (Grt.), ♂. Brownsville, Tex., *ex* Barnes coll. (USNM). (Fascicle 13.3).
21. *Loxomorpha flavidissimalis* (Grt.), ♀. San Benito, Tex., 16–23 May, *ex* Barnes coll., genitalia slide 1913 DK (USNM). (Fascicle 13.3).
22. *Loxomorpha flavidissimalis* (Grt.), ♂. No locality, 10 July 1909, "pup. on cage", Hunter No. 1612–105, genitalia slide 1914 DK (USNM). (Fascicle 13.3).
23. *Ostrinia penitalis penitalis* (Grt.), ♂. Oliver, B.C., 12 Oct. 1923, C. B. Garrett, genitalia slide EGM 1641 (CNC). (p. 24).
24. *Ostrinia penitalis penitalis* (Grt.), ♂. Buena Vista L., Calif., 1 July 1920 (USNM). (p. 24).
25. *Ostrinia penitalis penitalis* (Grt.), ♂. Buena Vista L., Calif., 11 July 1920 (USNM). (p. 24).
26. *Ostrinia penitalis penitalis* (Grt.), ♀. Hardy W.C., T3N, R1E, S30, S.D., 30 June 1965, R. W. Hodges (USNM). (p. 24).
27. *Ostrinia penitalis penitalis* (Grt.), ♀. Sarasota, Fla., 4 March 1953, C. P. Kimball (CPK). (p. 24).
28. *Ostrinia penitalis penitalis* (Grt.), ♀. Wedge Plantation, McClellanville, S.C., 21 Sept. 1968, R. B. Dominick, at light (WPC). (p. 24).
29. *Ostrinia obumbratalis* (Led.), ♂. Ottawa, Ont., 17 June 1952, E. G. Munroe (CNC). (p. 25).
30. *Ostrinia obumbratalis* (Led.), ♀. Aweme, Man., 8 June 1922, N. Criddle, bred from wild parsnip stem (CNC). (p. 25).
31. *Ostrinia obumbratalis* (Led.), ♂. Rockcliffe, [Ont.], 22 June 1908, genitalia slide Py 2a, photograph no. 4910 MS (CNC). (p. 25).
32. *Ostrinia obumbratalis* (Led.), ♂. Bobcaygeon, Ont., 19 June 1931, J. McDunnough, genitalia slide U.S. 923♂ A.M. (CNC). (p. 25).
33. *Ostrinia nubilalis nubilalis* (Hbn.), ♂. Martha's Vineyard, Mass., June 1929, F. M. Jones, photograph no. 4875 MS (CNC). (p. 26).
34. *Ostrinia nubilalis nubilalis* (Hbn.), ♂. Wedge Plantation, McClellanville, S.C., 17 Sept. 1967, R. B. Dominick, at light (WPC). (p. 26).
35. *Ostrinia nubilalis nubilalis* (Hbn.), ♀. Bred at Ottawa, Ont., from larva from St. Thomas, Ont., April 1921 (CNC). (p. 26).
36. *Ostrinia nubilalis nubilalis* (Hbn.), ♀. Wedge Plantation, McClellanville, S.C., 8 Aug. 1968, D. C. Ferguson (WPC). (p. 26).
37. *Fumibotys fumalis* (Gn.), ♂. Butler, Pa., 1945, Preston trapping experiments (CM). (p. 28).
38. *Fumibotys fumalis* (Gn.), ♂. Squalicum L. Whatcom Co., Wash., 14 Aug. 1930, T. C. Clarke (USNM). (p. 28).
39. *Fumibotys fumalis* (Gn.), ♀. Annapolis, N.S., 8 Aug. 1946, D. Ferguson (CNC). (p. 28).
40. *Fumibotys fumalis* (Gn.), ♀. Near Baddeck Bridge, Victoria Co., N.S., 29 July 1970, D. C. Ferguson (USNM). (p. 28).
41. *Fumibotys fumalis* (Gn.), ♀. Norway Bay, Que., 24 June 1938, G. A. Hobbs (CNC). (p. 28).
42. *Anania labeculalis* (Hulst), ♂. Cave Creek Canyon, 4880′, Chiricahua Mts., Cochise Co., Ariz., 11 Aug. 1967, J. G. Franclemont (JGF). (p. 38).
43. *Anania labeculalis* (Hulst), ♂. Arizona, 15 July 1935 (USNM). (p. 38).
44. *Anania labeculalis* (Hulst), ♀. Paradise, Ariz., Poling, Acc. 5439 (AMNH). (p. 38).
45. *Anania labeculalis* (Hulst), ♀. Cave Creek Canyon, 4880′, Chiricahua Mts., Chochise Co., Ariz., 7 Aug. 1967, J. G. Franclemont (JGF). (p. 38).
46. *Phlyctaenia leuschneri* Mun., ♂. Paratype. 25 mi W of Cocoa Beach, Brev'd/Orange Co., Fla., 16 May 1967, R. H. Leuschner, genitalia slide 4411 DK (CPK). (p. 31).
47. *Anania funebris glomeralis* (Wlk.), ♂. Harmon Field, Nfld., 27 June 1949, F. G. DiLabio (CNC). (p. 37).
48. *Anania funebris glomeralis* (Wlk.), ♀. Meach L., Que., 17 June 1901, C. H. Young (CNC). (p. 37).
49. *Anania funebris glomeralis* (Wlk.), ♂. Hamden, New Haven Co., Conn., 6 June 1966, D. C. Ferguson (USNM). (p. 37).
50. *Anania funebris glomeralis* (Wlk.), ♀. Hamden, New Haven Co., Conn., 4 June 1965, D. C. Ferguson (USNM). (p. 37).
51. *Anania funebris glomeralis* (Wlk.), ♂. Richland Balsam Mt., 6000′, Jackson-Haywood Co. line, N.C., 3 July 1967, D. C. Ferguson, collected at light in forest of *Abies fraseri* (USNM). (p. 37).
52. *Anania funebris glomeralis* (Wlk.), ♀. Richland Balsam Mt., 6000′, Jackson-Haywood Co. line, N.C., 3 July 1967, D. C. Ferguson, collected at light in forest of *Abies fraseri* (USNM). (p. 37).
53. *Mutuuraia mysippusalis* (Wlk.), ♂. West Rock Park, New Haven, Conn., 24 May 1966, D. C. Ferguson (USNM). (p. 35).
54. *Mutuuraia mysippusalis* (Wlk.), ♀. Armdale, Halifax Co., N.S., 9 Aug. 1967, D. C. Ferguson (USNM). (p. 35).
55. *Mutuuraia mysippusalis* (Wlk.), ♂. Christopher L., Sask., 21 June 1939, A. R. Brooks (CNC). (p. 35).
56. *Mutuuraia mysippusalis* (Wlk.), ♂. Trenton, Ont., 17 May 1906, Evans (CNC). (p. 35).
57. *Mutuuraia mysippusalis* (Wlk.), ♀. Rampart House, Yukon, 17 July 1951, C. C. Loan (CNC). (p. 35).
58. *Mutuuraia mysippusalis* (Wlk.), ♂. Butler, Pa., 1945, Preston trapping experiments (CM). (p. 35).
59. *Mutuuraia mysippusalis* (Wlk.), ♂. L. Arrowhead, Calif., 29 Aug. 1940, H. Buckwalter (CNC). (p. 35).
60. *Nealgedonia extricalis extricalis* (Gn.), ♂. New York, N.Y. and vicinity, S. L. Eliot (AMNH). (p. 34).
61. *Nealgedonia extricalis extricalis* (Gn.), ♀. New York, N.Y. and vicinity, S. L. Eliot (AMNH). (p. 34).
62. *Nealgedonia extricalis dionalis* (Wlk.), ♂. Herring Cove, Halifax Co., N.S., 20 June 1968, D. C. Ferguson (USNM). (p. 34).
63. *Nealgedonia extricalis dionalis* (Wlk.), ♂. Cat-tail swamp near Aylesford, Kings Co., N.S., 20 June 1963, D. C. Ferguson (USNM). (p. 34).
64. *Nealgedonia extricalis dionalis* (Wlk.), ♀. L. Kejimkujik, Queens Co., N.S., 3 July 1968, D. C. Ferguson (USNM). (p. 34).
65. *Nealgedonia extricalis dionalis* (Wlk.), ♂. S. Milford, N.S., 29 June 1939, J. McDunnough (CNC). (p. 34).
66. *Nealgedonia extricalis dionalis* (Wlk.), ♀. Brulée Maisonville, Que., 18 June 1928, W. J. Brown (CNC). (p. 34).
67. *Nascia acutella* (Wlk.), ♂. Bog, Prospect Road, Halifax Co., N.S., 19 June 1957, McDunnough and Ferguson (USNM). (p. 15).
68. *Nascia acutella* (Wlk.), ♀. L. Kejimkujik, Queens Co., N.S., 14 July 1961, D. C. Ferguson (USNM). (p. 15).
69. *Nascia acutella* (Wlk.), ♀. S. Milford, N.S., 7 July 1934, J. McDunnough (CNC). (p. 15).
70. *Nascia acutella* (Wlk.), ♀. Wedge Plantation, McClellanville, S.C., 24 July 1967, James W. Porter (WPC). (p. 15).
71. *Nascia acutella* (Wlk.), ♀. Wedge Plantation, McClellanville, S.C., 2 Aug. 1967, James W. Porter, at peach bait (WPC). (p. 15).
72. *Eurrhypara hortulata* (L.), ♂. Montreal, Que., 13 July 1946, A. C. Sheppard (CNC). (p. 29).
73. *Eurrhypara hortulata* (L.), ♀. L. Kejimkujik, Queens Co., N.S., 3 July 1968, D. C. Ferguson (USNM). (p. 29).
74. *Diaphantania impulsalis* (H.-S.), NEW COMBINATION, ♀. Key Largo, Monroe Co., Fla., 30 May 1966, Mrs. Spencer Kemp (CNC). (Fascicle 13.3).
75. *Apilocrocis brumalis* (B. & McD.), ♂. Chichen Itza, Yucatan, Mexico, 14 July 1955, E. C. Welling (CNC). (Fascicle 13.3).
76. *Apilocrocis pimalis* (B. & McD.), ♂. Madera Canyon, 4880′, Santa Rita Mts., Santa Cruz Co., Ariz., 25 Aug. 1959, J. G. Franclemont (JGF). (Fascicle 13.3).
77. *Apilocrocis pimalis* (B. & McD.), ♀. Madera Canyon, 4880′, Santa Rita Mts., Santa Cruz Co., Ariz., 20 July 1959, J. G. Franclemont (JGF). (Fascicle 13.3).


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PLATE 2

# Pyraloidea

## PYRALIDAE

figs. 1–31

TWICE NATURAL SIZE

1. *Phlyctaenia leuschneri* Mun., ♂. Holotype. 15 mi W of Cocoa, Orange Co., Fla., 30 March 1966, R. H. Leuschner, genitalia slide EGM/GL 4410 (CNC). (p. 31).
2. *Triuncidia eupalusalis* (Wlk.), ♂. Siesta Key, Sarasota Co., Fla., 30 May 1957, C. P. Kimball, genitalia slide 373 DK (CNC). (p. 20).
3. *Triuncidia eupalusalis* (Wlk.), ♀. Siesta Key, Sarasota Co., Fla., 13 April 1956, C. P. Kimball, genitalia slide 372 DK (CPK). (p. 20).
4. *Crocidophora tuberculalis* Led., ♂. Laval des Rapides, Que., 13 June 1964, A. C. Sheppard (CNC). (p. 22).
5. *Crocidophora tuberculalis* Led., ♂. Baie d'Urfé, Que., 29 July 1956, A. C. Sheppard (CNC). (p. 22).
6. *Crocidophora tuberculalis* Led., ♀. Wedge Plantation, McClellanville, S.C., 5 July 1967, James W. Porter (WPC). (p. 22).
7. *Crocidophora pustuliferalis* Led., ♂. Wedge Plantation, McClellanville, S.C., 21 July 1970, at light, R. B. Dominick (WPC). (p. 21).
8. *Crocidophora pustuliferalis* Led., ♂. Wedge Plantation, McClellanville, S.C., 19 July 1970, at light, R. B. Dominick (WPC). (p. 21).
9. *Crocidophora pustuliferalis* Led., ♀. Wedge Plantation, McClellanville, S.C., 16 July 1970, at light, R. B. Dominick (WPC). (p. 21).
10. *Crocidophora serratissimalis* Zell., ♂. Vineland Station, Ont., 5 July 1938, W. L. Putman, host *Leersia oryzoides* (CNC). (p. 21).
11. *Crocidophora serratissimalis* Zell., ♂. Port Stanley, Ont., 19 June 1922, G. T. Spencer (CNC). (p. 21).
12. *Crocidophora serratissimalis* Zell., ♀. Wedge Plantation, McClellanville, S.C., 29 April 1968, at light, R. B. Dominick (WPC). (p. 21).
13. *Phlyctaenia quebecensis* Mun., ♂. Holotype. Lac Mondor, Ste. Flore, Que., 12 July 1951, E. G. Munroe (CNC). (p. 31).
14. *Phlyctaenia quebecensis* Mun., ♀. Paratype. Mer Bleue, Ont., 21 June 1937, G. A. Hobbs (CNC). (p. 31).
15. *Phlyctaenia coronata tertialis* (Gn.), ♂. Hamden, New Haven Co., Conn., 10 June 1967, D. C. Ferguson (USNM). (p. 31).
16. *Phlyctaenia coronata tertialis* (Gn.), ♀. Hamden, New Haven Co., Conn., 14 June 1967, D. C. Ferguson (USNM). (p. 31).
17. *Phlyctaenia coronata tertialis* (Gn.), ♂. Wedge Plantation, McClellanville, S.C., 15 July 1970, at light, R. B. Dominick (WPC). (p. 31).
18. *Phlyctaenia coronata tertialis* (Gn.), ♂. Indiana Dunes State Park, Fremont, Ind., 9 June 1954, R. Coyles and D. F. Hardwick (CNC). (p. 31).
19. *Phlyctaenia coronata tertialis* (Gn.), ♂. Richland Balsam Mt., 6000′, Jackson-Haywood Co. line, N.C., 30 June 1967, at light in forest of *Abies fraseri*, D. C. Ferguson (USNM). (p. 31).
20. *Phlyctaenia coronata tertialis* (Gn.), ♂. Richland Balsam Mt., 6000′, Jackson-Haywood Co. line, N.C., 30 June 1967, at light in forest of *Abies fraseri*, D. C. Ferguson (USNM). (p. 31).
21. *Phlyctaenia coronata tertialis* (Gn.), ♀. Parrsboro, N.S., 8 July 1944, J. McDunnough (CNC). (p. 31).
22. *Phlyctaenia coronata tertialis* (Gn.), ♂. Franz No. 73, Ont., em. in incubator 5 March 1964, Forest Insect Survey, S63-5074-01, reared from *Sambucus* sp. (CNC). (p. 31).
23. *Phlyctaenia coronata tertialis* (Gn.), ♂. Gracefield, Que., 11 June 1937, O. Peck (CNC). (p. 31).
24. *Phlyctaenia coronata tertialis* (Gn.), ♀. Kazubazua, Que., 19 July 1927, F. P. Ide (CNC). (p. 31).
25. *Phlyctaenia coronata tertialis* (Gn.), ♂. Herring Cove, Halifax Co., N.S., 29 June 1968, D. C. Ferguson (USNM). (p. 31).
26. *Phlyctaenia coronata tertialis* (Gn.), ♀. West Dover, Halifax Co., N.S., 15 July 1968, D. C. Ferguson (USNM). (p. 31).
27. *Phlyctaenia coronata tertialis* (Gn.), ♂. Toutle, Wash., 30 May 1947, E. C. Johnston (CNC). (p. 31).
28. *Ostrinia marginalis* (Wlk.), ♂. Gillam, Man., 17 June 1950, J. F. McAlpine (CNC). (p. 25).
29. *Loxostege ephippialis* (Zett.), ♀. Dwarfed specimen. Payne Bay, Que., 6 July 1958, W. R. M. Mason (CNC). (p. 72).
30. *Loxostege ephippialis* (Zett.), ♀. Churchill, Man., 17 June 1937, W. J. Brown (CNC). (p. 72).
31. *Ostrinia marginalis* (Wlk.), ♀. Ottawa, Ont., 18 May 1906, C. H. Young (CNC). (p. 25).


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PLATE 3

# Pyraloidea

## PYRALIDAE

figs. 1–85

NATURAL SIZE 1:1

1. *Loxostege kearfottalis* Walter, ♂. Essex, Calif., 7 April 1935, Grace H. and John L. Sperry (CNC). (p. 62).
2. *Loxostege kearfottalis* Walter, ♀. Split Rock Tank, Mojave Desert, Calif., 20 May 1936, Grace H. and John L. Sperry (CNC). (p. 62).
3. *Loxostege terpnalis* B. & McD., ♂. Lectotype. Olancha, Inyo Co., Calif., 16–23 April, *ex* Barnes coll., "Type ♀", ♂ genitalia slide HWC 7706 (USNM). (p. 62).
4. *Loxostege terpnalis* B. & McD., ♀. Winnemucca, Humboldt Co., Nev., 29 May 1960, T. R. Haig (CNC). (p. 62).
5. *Loxostege allectalis* (Grt.), ♀. Marathon, Brewster Co., Tex., 23 May 1950, E. C. Johnston (CNC). (p. 63).
6. *Loxostege allectalis* (Grt.), ♂. Tucson, Ariz., O. Bryant (USNM). (p. 63).
7. *Loxostege typhonalis* B. & McD., ♂. Paralectotype. Redington, Ariz., *ex* Barnes coll. (USNM). (p. 63).
8. *Loxostege typhonalis* B. & McD., ♀. Paralectotype. Santa Catalina Mts., Ariz., *ex* Barnes coll. (USNM). (p. 63).
9. *Loxostege oberthuralis* Fern., ♂. Ivanpah Mts., Calif., 28 April 1935, Grace H. and John L. Sperry (CNC). (p. 63).
10. *Loxostege oberthuralis* Fern., ♀. Apple Valley, Calif., 9 May 1955, W. R. M. Mason (CNC). (p. 63).
11. *Loxostege egregialis* Mun., ♂. Holotype. Cave Creek Canyon, 5400′, Chiricahua Mts., Cochise Co., Ariz., 18 Aug. 1966, J. G. Franclemont (JGF). (p. 64).
12. *Loxostege egregialis* Mun., ♀. Allotype. Silver Creek Wash, 4880′, 0.7 mi W of Portal, Cochise Co., Ariz., 28 Aug. 1966, J. G. Franclemont (JGF). (p. 64).
13. *Hahncappsia coloradensis* (G. & R.), ♂. 6 mi NW of Newcastle, Wyo., 15 July 1965, R. W. Hodges (USNM). (p. 44).
14. *Hahncappsia coloradensis* (G. & R.), ♂. Scott City, Kan., 31 May 1929, V. F. Calkins (CNC). (p. 44).
15. *Arenochroa flavalis* (Fern.), ♂. Olancha, Inyo Co., Calif., 24–30 June, *ex* Barnes coll. (USNM). (p. 54).
16. *Arenochroa flavalis* (Fern.), ♂. Olancha, Inyo Co., Calif., 8–15 May, *ex* Barnes coll. (USNM). (p. 54).
17. *Arenochroa flavalis* (Fern.), ♂. Holotype of *Loxostege unipunctalis* Walter. Tempe, Ariz., 23 May 1921. E. V. Walter, at light, Tempe no. 5127, ♂ genitalia slide no. HWC 7771 (USNM). (p. 54).
18. *Loxostege unicoloralis* B. & McD., ♀. Phoenix, Ariz., 16 Sept. 1908, R. L. Kunzé (CNC). (p. 62).
19. *Loxostege unicoloralis* B. & McD., ♀. Panamint Mts., Inyo Co., Calif., 29 May 1937, W. Hovanitz (CNC). (p. 62).
20. *Achyra rantalis* (Gn.), ♂. West Fork, 6500′, 16 mi SW Flagstaff, Coconino Co., Ariz., 17 Aug. 1964, J. G. Franclemont (JGF). (p. 47).
21. *Achyra rantalis* (Gn.), ♂. Devil's Den State Park, Washington Co., Ark., 13 July 1966, R. W. Hodges (USNM). (p. 47).
22. *Achyra rantalis* (Gn.), ♂. Paradise, Ariz., Poling (AMNH). (p. 47).
23. *Achyra rantalis* (Gn.), ♀. Devil's Den State Park, Washington Co., Ark., 5 July 1966, R. W. Hodges (USNM). (p. 47).
24. *Achyra rantalis* (Gn.), ♂. Hamden, New Haven Co., Conn., 11 June 1967, D. C. Ferguson (USNM). (p. 47).
25. *Achyra rantalis* (Gn.), ♀. Wapakoneta, Ohio, Wm. Kayser (USNM). (p. 47).
26. *Achyra occidentalis* (Pack.), ♂. Lower L., Calif., 2 Oct. 1934, E. C. Johnston (CNC). (p. 48).
27. *Achyra occidentalis* (Pack.), ♂. Petaluma, Calif., 25 July 1935, E. C. Johnston (CNC). (p. 48).

28. *Achyra occidentalis* (Pack.), ♂. California, *ex* Fernald coll. (USNM). (p. 48).
29. *Achyra occidentalis* (Pack.), ♀. Petaluma, Calif., 25 Oct. 1935, E. C. Johnston (CNC). (p. 48).
30. *Achyra occidentalis* (Pack.), ♂. La Mesa, San Diego Co., Calif., 16 April 1950, E. C. Johnston (CNC). (p. 48).
31. *Achyra bifidalis* (F.), ♀. Brownsville, Tex., *ex* Barnes coll. (USNM). (p. 46).
32. *Achyra bifidalis* (F.), ♀. Brownsville, Tex., *ex* Barnes coll. (USNM). (p. 46).
33. *Sericoplaga externalis* Warr., ♂. Washington, D.C., 12 Feb. 1893, F. C. Pratt (USNM). (p. 56).
34. *Sericoplaga externalis* Warr., ♀. Decatur, Ill., 24–31 July, *ex* Barnes coll. (USNM). (p. 56).
35. *Uresiphita reversalis* (Gn.), ♂. Wedge Plantation, McClellanville, S.C., 9 July 1967, James W. Porter (WPC). (p. 57).
36. *Uresiphita reversalis* (Gn.), ♂. Wedge Plantation, McClellanville, S.C., 8 Aug. 1967, James W. Porter (WPC). (p. 57).
37. *Uresiphita reversalis* (Gn.), ♂. Archbold Biological Station, L. Placid, Fla., 4 April 1962, D. C. Ferguson (USNM). (p. 57).
38. *Uresiphita reversalis* (Gn.), ♂. Siesta Key, Sarasota Co., Fla., 3 Nov. 1956, C. P. Kimball (CPK). (p. 57).
39. *Uresiphita reversalis* (Gn.), ♂. Wedge Plantation, McClellanville, S.C., 30 Sept. 1968, at light, R. B. Dominick (WPC). (p. 57).
40. *Uresiphita reversalis* (Gn.), ♂. Wedge Plantation, McClellanville, S.C., 28 April 1968, at light, R. B. Dominick (WPC). (p. 57).
41. *Uresiphita reversalis* (Gn.), ♀. Wedge Plantation, McClellanville, S.C., 15 Aug. 1968, D. C. Ferguson (WPC). (p. 57).
42. *Uresiphita reversalis* (Gn.), ♀. Wedge Plantation, McClellanville, S.C., 11 July 1967, James W. Porter (WPC). (p. 57).
43. *Uresiphita reversalis* (Gn.), ♀. University Reserve, Welaka, Putnam Co., Fla., 9 April 1962, D. C. Ferguson (USNM). (p. 57).
44. *Uresiphita reversalis* (Gn.), ♀. University Reserve, Welaka, Putnam Co., Fla., 8 April 1962, D. C. Ferguson (USNM). (p. 57).
45. *Sitochroa dasconalis* (Wlk.), ♂. Decatur, Ill., 8–15 Sept., *ex* Barnes coll., ♂ genitalia slide HWC 7759 (USNM). (p. 53).
46. *Sitochroa dasconalis* (Wlk.), ♀. Washington, D.C., 28 July 1883, A. Koebele (USNM). (p. 53).
47. *Sitochroa chortalis* (Grt.), ♂. Ottawa House, Parrsboro, N.S., 1 July 1944, J. McDunnough (CNC). (p. 53).
48. *Sitochroa chortalis* (Grt.), ♀. L. Kejimkujik, Queens Co., N.S., 2 July 1968, D. C. Ferguson (USNM). (p. 53).
49. *Sitochroa chortalis* (Grt.), ♀. Isle Haute, Bay of Fundy, N.S., 5 June 1953, D. C. Ferguson (USNM). (p. 53).
50. *Sitochroa chortalis* (Grt.), ♀. Ste. Anne de Bellevue, Que., 11 June 1947, E. Munroe (CNC). (p. 53).
51. *Sitochroa chortalis* (Grt.), ♀. Osoyoos, B.C., 2500′, 25 June 1953, J. E. H. Martin (CNC). (p. 53).
52. *Sitochroa chortalis* (Grt.), ♂. No data, *ex* E. C. Johnston coll. (CNC). (p. 53).
53. *Sitochroa chortalis* (Grt.), ♂. Todd's Lodge, Oak Creek Canyon, Ariz., 16 June 1946, Grace H. and John L. Sperry (CNC). (p. 53).
54. *Sitochroa aureolalis* (Hulst), ♂. Arizona (USNM). (p. 52).
55. *Sitochroa aureolalis* (Hulst), ♂. Jacumba, San Diego Co., Calif., "7-3", G. H. Field (USNM). (p. 52).
56. *Sitochroa aureolalis* (Hulst.), ♀. Arizona (USNM). (p. 52).
57. *Helvibotys helvialis* (Wlk.), ♂. Brownsville, Tex., 29 March 1937, T. N. Freeman (CNC). (p. 50).
58. *Helvibotys helvialis* (Wlk.), ♀. Brownsville, Tex., 19 March 1937, T. N. Freeman (CNC). (p. 50).
59. *Neohelvibotys arizonensis* (Capps), ♂. Paratype. Madera Canyon, Pima Co., Ariz., 5–12 Sept. 1951, William Hammer, ♂ genitalia slide HWC 17,661 (CNC). (p. 49).
60. *Neohelvibotys arizonensis* (Capps), ♀. Paratype. Madera Canyon, Pima Co., Ariz., 5–12 Sept. 1951, William Hammer, ♀ genitalia slide HWC 17,663 (CNC). (p. 49).
61. *Hahncappsia fordi* (Capps), ♂. Paratype. Madera Canyon, Pima Co., Ariz., 5–12 Sept. 1951, William Hammer, ♂ genitalia slide HWC 17,668 (CNC). (p. 41).
62. *Neohelvibotys polingi* (Capps), ♀. Paratype. Lakeland, Fla., *ex* Barnes coll., ♀ genitalia slide HWC 7844 (USNM). (p. 49).
63. *Hahncappsia alpinensis* (Capps), ♀. Paratype. Montague Co., Tex., 3 July 1940, L. H. Bridwell, ♀ genitalia slide HWC 17,672 (CNC). (p. 41).
64. *Helvibotys freemani* Mun., ♂. Holotype. Brownsville, Tex., 7 March 1937, T. N. Freeman (CNC). (p. 51).
65. *Helvibotys pseudohelvialis* (Capps), ♀. Paratype. Huachuca Mts., Ariz., 17 Aug. 1913, Oslar, ♀ genitalia slide HWC 17,680 (CNC). (p. 51).
66. *Helvibotys pseudohelvialis* (Capps), ♂. Paratype. Madera Canyon, Santa Rita Mts., Ariz., 2 Sept. 1953, R. J. Ford, ♂ genitalia slide HWC 17,659 (CNC). (p. 51).
67. *Neohelvibotys neohelvialis* (Capps), ♀. Paratype. Madera Canyon, Pima Co., Ariz., 5–12 Sept. 1951, William Hammer, ♀ genitalia slide HWC 17,686 (CNC). (p. 49).
68. *Hahncappsia fordi* (Capps), ♀. Paratype. Madera Canyon, Pima Co., Ariz., 5–12 Sept. 1951, William Hammer, ♀ genitalia slide HWC 16,671 (CNC). (p. 41).
69. *Hahncappsia marculenta* (G. & R.), ♂. Ste. Anne de Bellevue, Que., 14 June 1953, A. C. Sheppard (CNC). (p. 41).
70. *Hahncappsia marculenta* (G. & R.), ♀. Montreal, Que., 3 July 1938, A. C. Sheppard (CNC). (p. 41).
71. *Hahncappsia neomarculenta* (Capps), ♂. Looking Glass Rock, near Pisgah Forest, N.C., 2500′, 19 July 1957, J. G. Chillcott, genitalia slide 3718 MS (CNC). (p. 42).
72. *Hahncappsia cochisensis* (Capps), ♂. Paratype. The Basin, Chisos Mts., Brewster Co., Tex., 19 Sept. 1958, R. R. McElvare, ♂ genitalia slide HWC 12,064 (USNM). (p. 44).
73. *Hahncappsia pseudobliteralis* (Capps), ♀. Paratype. Madera Canyon, Pima Co., Ariz., 5–12 Sept. 1951, William Hammer, ♀ genitalia slide HWC 17,628 (CNC). (p. 42).
74. *Hahncappsia mancalis* (Led.), ♂. Pearson, Okla., 23 July 1937, Standish-Kaiser, genitalia slide 3723 MS (CNC). (p. 43).
75. *Hahncappsia jaralis* (Schaus), ♀. Madera Canyon, Santa Rita Mts., Ariz., 7 Sept. 1948, ♀ genitalia slide OBP 97 (USNM). (p. 43).
76. *Hahncappsia cochisensis* (Capps), ♀. Paratype. Madera Canyon, Santa Rita Mts., Pima Co., Ariz., 15 Aug. 1949, C. W. Kirkwood, ♀ genitalia slide HWC 10,018 (USNM). (p. 44).
77. *Hahncappsia huachucalis* (Capps), ♂. Paratype. Southern Arizona, Poling, ♂ genitalia slide OBP 248 (USNM). (p. 45).
78. *Hahncappsia huachucalis* (Capps), ♀. Paratype. Paradise, Cochise Co., Ariz., *ex* Barnes coll., ♀ genitalia slide HWC 7836 (USNM). (p. 45).
79. *Hahncappsia pergilvalis* (Hulst), ♂. Paradise, Cochise Co., Ariz., *ex* Barnes coll., ♂ genitalia slide HWC 7932 (USNM). (p. 43).
80. *Hahncappsia pergilvalis* (Hulst), ♀. Paradise, Cochise Co., Ariz., *ex* Barnes coll., ♀ genitalia slide HWC 7930 (USNM). (p. 43).
81. *Hahncappsia pergilvalis* (Hulst), ♀. Manotick, Ont., 14 Sept. 1955, T. N. Freeman (CNC). (p. 43).
82. *Hahncappsia neobliteralis* (Capps), ♀. Paratype. Hemmingford, Que., 5 Aug. 1924, C. E. Petch, ♀ genitalia slide HWC 17,627 (CNC). (p. 42).
83. *Hahncappsia mellinialis* (Druce), ♀. Patagonia, Santa Cruz Co., Ariz., 2 Aug. 1924, E. P. Van Duzee, ♀ genitalia slide HWC 17,635 (CAS). (p. 45).
84. *Hahncappsia mellinialis* (Druce), ♀. Ramsey Canyon, Huachuca Mts., Ariz., 30 May 1966, R. F. Sternitzky (CNC). (p. 45).
85. *Hahncappsia mellinialis* (Druce), ♀. Tucson, Ariz., 8 Aug. 1930, *ex* E. C. Johnston coll. (CNC). (p. 45).

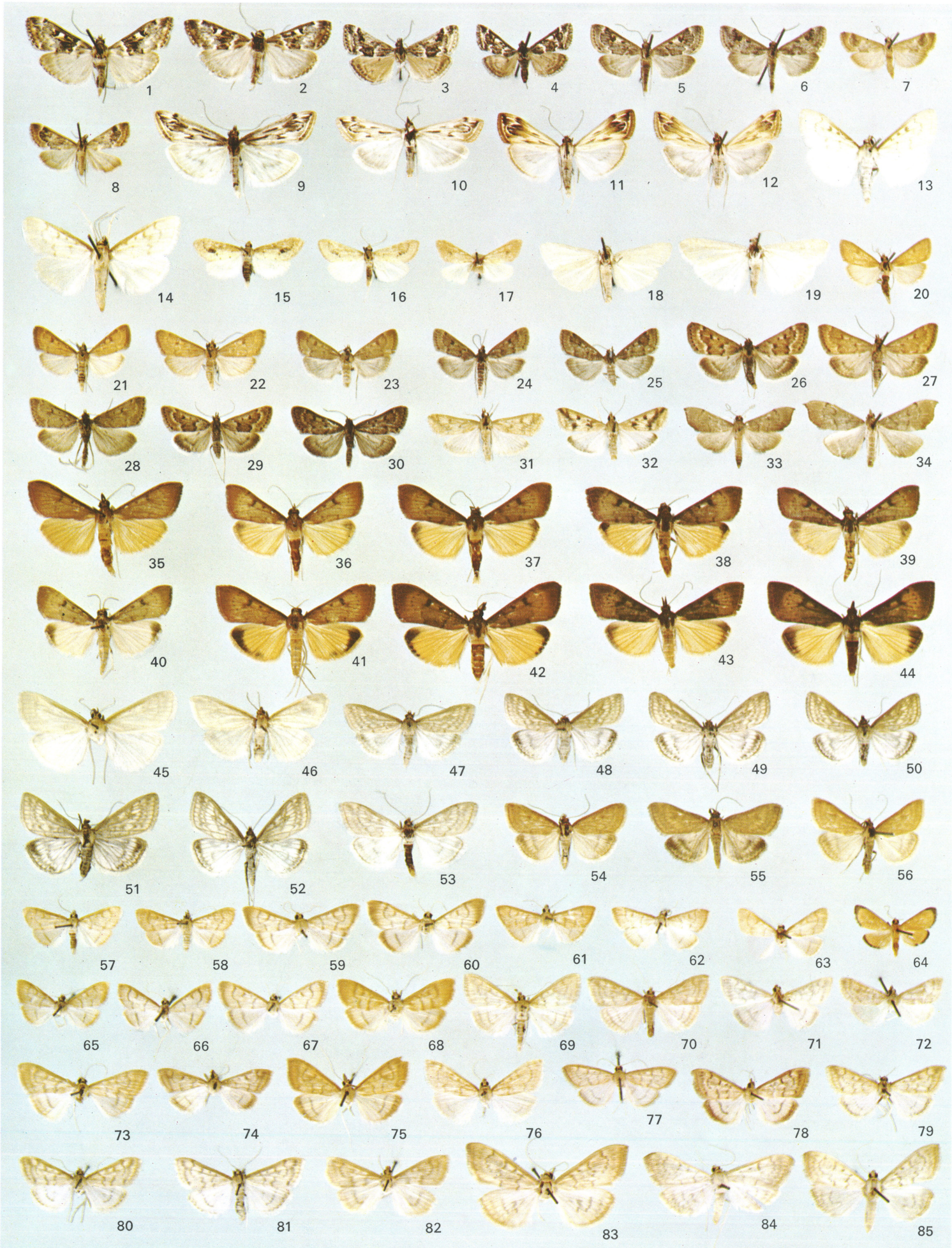
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PLATE 4

# Pyraloidea

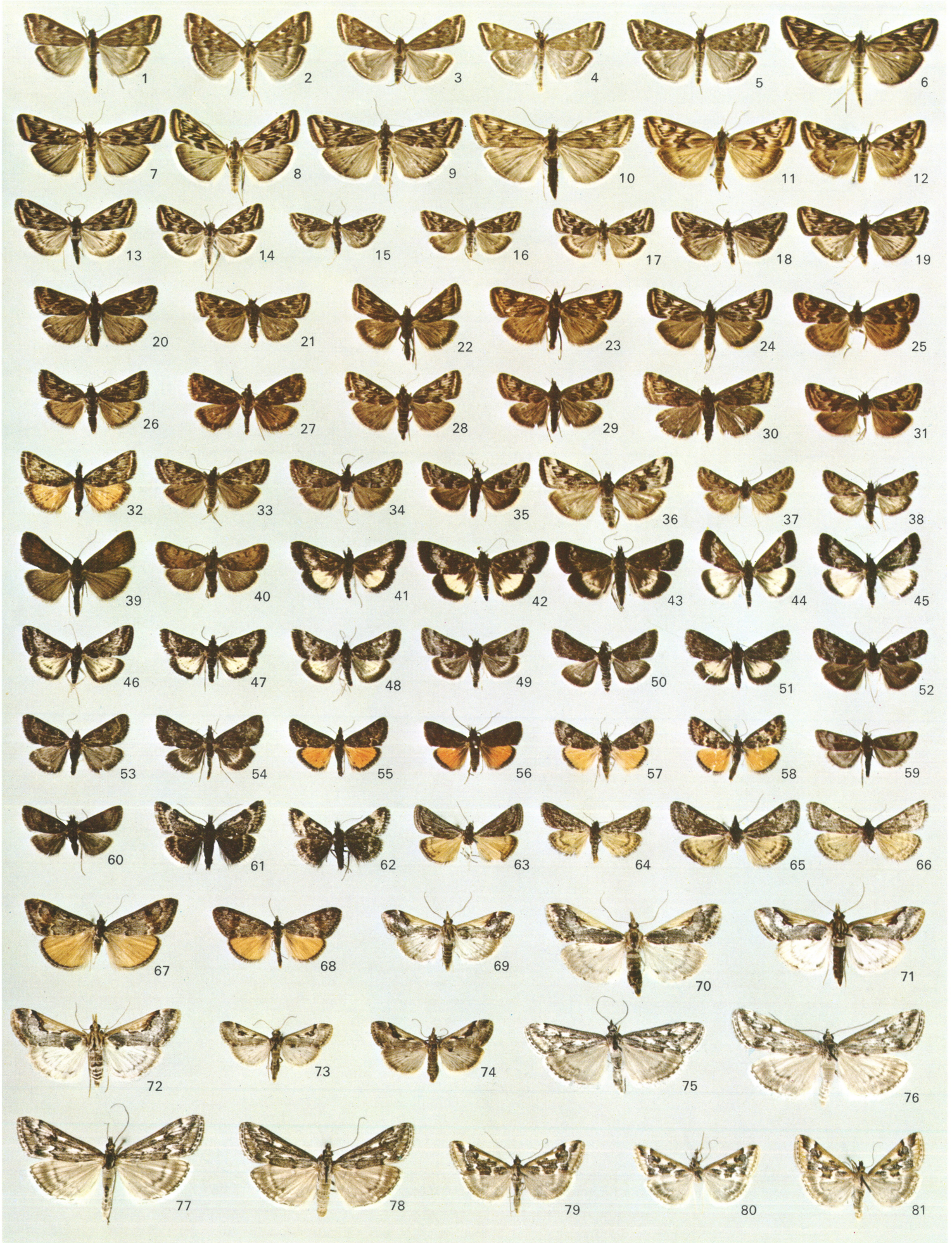
## PYRALIDAE

figs. 1–81

NATURAL SIZE 1:1

1. *Loxostege sticticalis* (L.), ♂. Harrington L., Gatineau Park, Que., 20 June 1954, J. E. H. Martin (CNC). (p. 65).
2. *Loxostege sticticalis* (L.), ♀. Hardy W.C., T3N R1E S30, S.D., 16 July 1965, R. W. Hodges (USNM). (p. 65).
3. *Loxostege sticticalis* (L.), ♀. Aylesford, Kings Co., N.S., 2 Sept. 1951, D. C. Ferguson (USNM). (p. 65).
4. *Loxostege sticticalis* (L.), ♂. Southwestern Research Station, Chiricahua Mts., Cochise Co., Ariz., 26 June 1958, Carl W. Kirkwood (CNC). (p. 65).
5. *Loxostege sticticalis* (L.), ♀. Southwestern Research Station, Chiricahua Mts., Cochise Co., Ariz., 28 June 1958, Carl W. Kirkwood (CNC). (p. 65).
6. *Loxostege cereralis* (Zell.), ♂. Simcoe, Ont., 6 Aug. 1959, Freeman and Lewis (CNC). (p. 77).
7. *Loxostege cereralis* (Zell.), ♀. Red River of N. Cass Co., Fargo, N.D., 11 Aug. 1961, Robert Poole (CU). (p. 77).
8. *Loxostege cereralis* (Zell.), ♀. Hardy W.C., T3N R1E S30, S.D., 16 July 1965, R. W. Hodges (USNM). (p. 77).
9. *Loxostege cereralis* (Zell.), ♀. Oliver, B.C., 31 Aug. 1953, J. E. H. Martin (CNC). (p. 77).
10. *Loxostege cereralis* (Zell.), ♂. Doolittle Ranch, 9800′, Mt. Evans, Colo., 13 Aug. 1961, E. W. Rockburne (CNC). (p. 77).
11. *Loxostege cereralis* (Zell.), ♂. Arizona, *ex* C. V. Riley coll. (USNM). (p. 77).
12. *Loxostege cereralis* (Zell.), ♀. Arizona, no. 13850, *ex* Hy. Edwards coll. (USNM). (p. 77).
13. *Loxostege commixtalis* (Wlk.), ♂. Doyles, Codroy Valley, Nfld., 9 July 1959, D. C. Ferguson (USNM). (p. 77).
14. *Loxostege commixtalis* (Wlk.), ♂. Bog E of Big Indian L., Halifax Watershed, N.S., 27 June 1963, D. C. Ferguson (USNM). (p. 77).
15. *Loxostege commixtalis* (Wlk.), ♀. Cartwright, Labr., 13 July 1955, E. E. Sterns (CNC). (p. 77).
16. *Loxostege commixtalis* (Wlk.), ♀. Mer Bleue, Ont., 4 June 1936, F. A. Urquhart (CNC). (p. 77).
17. *Loxostege commixtalis* (Wlk.), ♀. Mare du Sault, Laurentides Park, Montmorency Co., Que., 2550′, 13 July 1954, Klots, F. and P. Rindge (AMNH). (p. 77).
18. *Loxostege commixtalis* (Wlk.), ♂. Mi 504, Hudson Bay Railway, Man., 29 June 1952, C. D. Bird (CNC). (p. 77).
19. *Loxostege commixtalis* (Wlk.), ♂. Dawson, Yukon, 1500′, 8 July 1949, P. F. Bruggemann (CNC). (p. 77).
20. *Loxostege sierralis internationalis* Mun., ♂. Paratype. Lihumption Park, near Cultus L., B.C., 5000′, 4 Aug. 1927, C. H. Young (CNC). (p. 75).
21. *Loxostege sierralis internationalis* Mun., ♀. Paratype. Hope Mts., B.C., 6000′, 2 Aug. 1932, A. N. Gartrell (CNC). (p. 75).

22. *Loxostege sierralis internationalis* Mun., ♂. Paratype. Vantage, Wash., 11 May 1942, E. C. Johnston (CNC). (p. 75).
23. *Loxostege sierralis internationalis* Mun., ♀. Paratype. Mt. Rainier, Wash., 25 July 1942, E. C. Johnston (CNC). (p. 75).
24. *Loxostege sierralis internationalis* Mun., ♂. Paratype. Mt. Hood, Ore., 16 Aug. 1939, E. C. Johnston (CNC). (p. 75).
25. *Loxostege brunneitincta* Mun., ♂. Paratype. Mt. Shasta, Calif., 7000′, 16–23 July, *ex* Barnes coll. (USNM). (p. 73).
26. *Loxostege brunneitincta* Mun., ♂. Paratype. Truckee, Calif., 5 July 1927, E. P. Van Duzee (CAS). (p. 73).
27. *Loxostege brunneitincta* Mun., ♀. Paratype. Gold L., Sierra Co., Calif., 12 July 1934, *ex* Guedet coll. (CAS). (p. 73).
28. *Loxostege sierralis sierralis* Mun., ♀. Paratype. Carson City, Nev., 25 June 1929, E. P. Van Duzee (CAS). (p. 76).
29. *Loxostege sierralis sanpetealis* Mun., ♂. Holotype. 17 mi E Mayfield, Sanpete Co., Utah, 10,200′, 19 July 1960, F., P. and B. Rindge, collected on NSF Grant G 9037 (AMNH). (p. 76).
30. *Loxostege sierralis sanpetealis* Mun., ♀. Allotype. 17 mi E Mayfield, Sanpete Co., Utah, 10,200′, 19 July 1960, F., P. and B. Rindge, collected on NSF Grant G 9037 (AMNH). (p. 76).
31. *Loxostege sierralis sanpetealis* Mun., ♂. Paratype. So. Utah, July 1900, *ex* Barnes coll. (USNM). (p. 76).
32. *Loxostege brunneitincta* Mun., ♀. Paratype. Bishop, Inyo Co., Calif., 31 May 1937, M. L. Walton (LACM). (p. 73).
33. *Loxostege sierralis sierralis* Mun., ♀. Paratype. Tuolumne Meadows, Calif., 14 July 1935, E. C. Johnston (CNC). (p. 76).
34. *Loxostege sierralis sierralis* Mun., ♂. Paratype. Tuolumne Meadows, Tuolumne Co., Calif., 8–14 July, *ex* Barnes coll., ♂ genitalia slide HWC 10,681 (USNM). (p. 76).
35. *Loxostege sierralis tularealis* Mun., ♂. Holotype. Big Meadows, Tulare Co., Calif., 27 July 1954, R. J. Ford (LACM). (p. 76).
36. *Loxostege cereralis* (Zell.), ♀. Lundy Creek, Mono Co., Calif., 26 July 1935, Lloyd M. Martin (LACM). (p. 77).
37. *Loxostege offumalis* (Hulst), ♂. Pasadena, Los Angeles Co., Calif., 9 March 1909, F. Grinnell, Jr., ♂ genitalia slide HWC 10,684 (USNM). (p. 75).
38. *Loxostege offumalis* (Hulst), ♂. Gavilan Hills, Riverside Co., Calif., 21 March 1949, C. Henne (LACM). (p. 75).
39. *Loxostege thallophilalis* (Hulst), ♂. Mt. Rainier, Wash., 2 Aug. 1942, E. C. Johnston (USNM). (p. 72).
40. *Loxostege thallophilalis* (Hulst), ♀. Keremeos, B.C., 26 June 1938, G. S. Walley (CNC). (p. 72).
41. *Loxostege anartalis anartalis* (Grt.), ♂. Burney Mt., Shasta Co., Calif., 19 June 1926, *ex* Guedet coll. (CAS). (p. 71).
42. *Loxostege anartalis anartalis* (Grt.), ♂. Shasta Retreat, Siskiyou Co., Calif., 8–15 June, *ex* Barnes coll. (USNM). (p. 71).
43. *Loxostege anartalis anartalis* (Grt.), ♀. McCloud, Calif., 6 June 1935, E. C. Johnston (CNC). (p. 71).
44. *Loxostege anartalis rainierensis* Mun., ♂. Holotype. Mt. Rainier, Wash., 2 Aug. 1942, E. C. Johnston (CNC). (p. 71).
45. *Loxostege anartalis rainierensis* Mun., ♂. Paratype. Mt. Rainier, Wash., 3 May 1947, E. C. Johnston (CNC). (p. 71).
46. *Loxostege anartalis albertalis* B. & McD., ♂. Alaska, *ex* Barnes coll. (USNM). (p. 71).
47. *Loxostege anartalis albertalis* B. & McD., ♀. Fort Smith, N.W.T., 9 June 1950, J. B. Wallis (CNC). (p. 71).
48. *Loxostege anartalis albertalis* B. & McD., ♂. Nordegg, Alta., 10 June 1921, J. McDunnough (CNC). (p. 71).
49. *Loxostege anartalis albertalis* B. & McD., ♂. Calgary, Alta., 12 May 1914, F. H. Wolley Dod (CNC). (p. 71).
50. *Loxostege anartalis albertalis* B. & McD., ♀. Aweme, Man., 25 May 1921, N. Criddle (CNC). (p. 71).
51. *Loxostege anartalis lulualis* (Hulst), ♂. Rivière aux Ecorces, Laurentide Park, Que., 27 July 1947, E. Munroe (CNC). (p. 70).
52. *Loxostege anartalis saxicolalis* B. & McD., ♂. Holotype. Stockton, Utah, 11 May 1913, Tom Spalding (USNM). (p. 71).
53. *Loxostege anartalis saxicolalis* B. & McD., ♀. Twogwotee Pass, Wyo., 27 July 1938, Grace H. and John L. Sperry (CNC). (p. 71).
54. *Loxostege anartalis ?anartalis* (Grt.), ♀. Cobb Mt., Lake Co., Calif., 15 June 1944, *ex* Guedet coll. (CAS). (p. 71).
55. *Loxostege immerens* (Harv.), ♀. Pine Valley, San Diego Co., Calif., 17 April 1950, E. C. Johnston (CNC). (p. 69).
56. *Loxostege immerens* (Harv.), ♂. Plumas Co., Calif., June, *ex* Barnes coll. (USNM). (p. 69).
57. *Loxostege immerens* (Harv.), ♀. Valyermo, Los Angeles Co., Calif., 14 April 1938, Don Meadows (CNC). (p. 69).
58. *Loxostege immerens* (Harv.), ♂. Upper Santa Ana R., San Bernardino Co., Calif., 11 May 1947, Grace H. and John L. Sperry (CNC). (p. 69).
59. *Loxostege ephippialis* (Zett.), ♂. Hopedale, Labr., 1 July 1923 (CNC). (p. 72).
60. *Loxostege ephippialis* (Zett.), ♀. Vic. Brooklyn L., Snowy Range, near Centennial, Wyo., 11,000′, 8 July 1929, A. B. Klots (CU). (p. 72).
61. *Loxostege quaestoralis* (B. & McD.), ♂. China Dry L., Inyo Co., Calif., 10 Jan. 1948 (CNC). (p. 69).
62. *Loxostege quaestoralis* (B. & McD.), ♀. China Dry L., Inyo Co., Calif., 10 Jan. 1948 (CNC). (p. 69).
63. *Loxostege mojavealis* Capps, ♂. Mojave Desert, near Phelan, Calif., 16 April 1935, J. A. Comstock, genitalia slide EGM/GL 4001 (CNC). (p. 66).
64. *Loxostege mojavealis* Capps, ♀. Mojave Desert, near Phelan, Calif., 16 April 1935, J. A. Comstock (LACM). (p. 66).
65. *Loxostege kingi* Mun., ♂. Holotype. Las Vegas, Nev., 1 Feb. 1939, L. V. King, genitalia slide 2889 M. d'A. (LACM). (p. 67).
66. *Loxostege kingi* Mun., ♀. Allotype. Las Vegas, Nev., 1 Feb. 1939, L. V. King, genitalia slide EGM/GL 4000 (LACM). (p. 67).
67. *Loxostege annaphilalis* (Grt.), ♂. Sheep Creek, San Gabriel Mts., Calif., 25 April 1931, genitalia slide EGM 1581 (CNC). (p. 68).
68. *Loxostege annaphilalis* (Grt.), ♂. Pine Valley, San Diego, Calif., 30 April 1914, W. S. Wright (LACM). (p. 68).
69. *Loxostege albiceralis* (Grt.), ♂. Madera Canyon, Santa Rita Mts., Ariz., 18 Aug. 1949, Lloyd M. Martin (CNC). (p. 61).
70. *Loxostege albiceralis* (Grt.), ♀. Organ Pipe Cactus National Monument, Ariz., 16 April 1947, Grace H. and John L. Sperry (CNC). (p. 61).
71. *Loxostege albiceralis* (Grt.), ♂. Welder Wildlife Refuge, Sinton, Tex., 14 March 1963, A. and M. E. Blanchard (AB). (p. 61).
72. *Loxostege albiceralis* (Grt.), ♀. Welder Wildlife Refuge, Sinton, Tex., 12 Oct. 1964, A. and M. E. Blanchard (AB). (p. 61).
73. *Loxostege floridalis* B. & McD., ♂. Paralectotype. Everglade, Fla., 16–23 April, *ex* Barnes coll. (USNM). (p. 61).
74. *Loxostege floridalis* B. & McD., ♀. Paralectotype. Everglade, Fla., 24–30 April, *ex* Barnes coll. (USNM). (p. 61).
75. *Loxostege indentalis* (Grt.), ♂. Apple Valley, Calif., 12 May 1955, J. E. H. Martin (CNC). (p. 61).
76. *Loxostege indentalis* (Grt.), ♂. Lee Vining, Mono Co., Calif., 6500′, 19 June 1953, H. P. Chandler (CNC). (p. 61).
77. *Loxostege indentalis* (Grt.), ♂. Rome, Malheur Co., Ore., 29 May 1960, S. G. Jewett, Jr. (USNM). (p. 61).
78. *Loxostege indentalis* (Grt.), ♀. Pullman, Wash., 13 May 1935, J. F. Clarke (USNM). (p. 61).
79. *Loxostege lepidalis* (Hulst), ♂. State Bridge, near Bond, Colo., 7000′, 24 June 1961, M. R. MacKay (CNC). (p. 61).
80. *Loxostege lepidalis* (Hulst), ♀. 25 mi S of Bitter Creek, Sweetwater Co., Wyo., 1–7 July (CM). (p. 61).
81. *Loxostege lepidalis* (Hulst), ♀. 6 mi NW Newcastle, Wyo., 20 July 1965, R. W. Hodges (USNM). (p. 61).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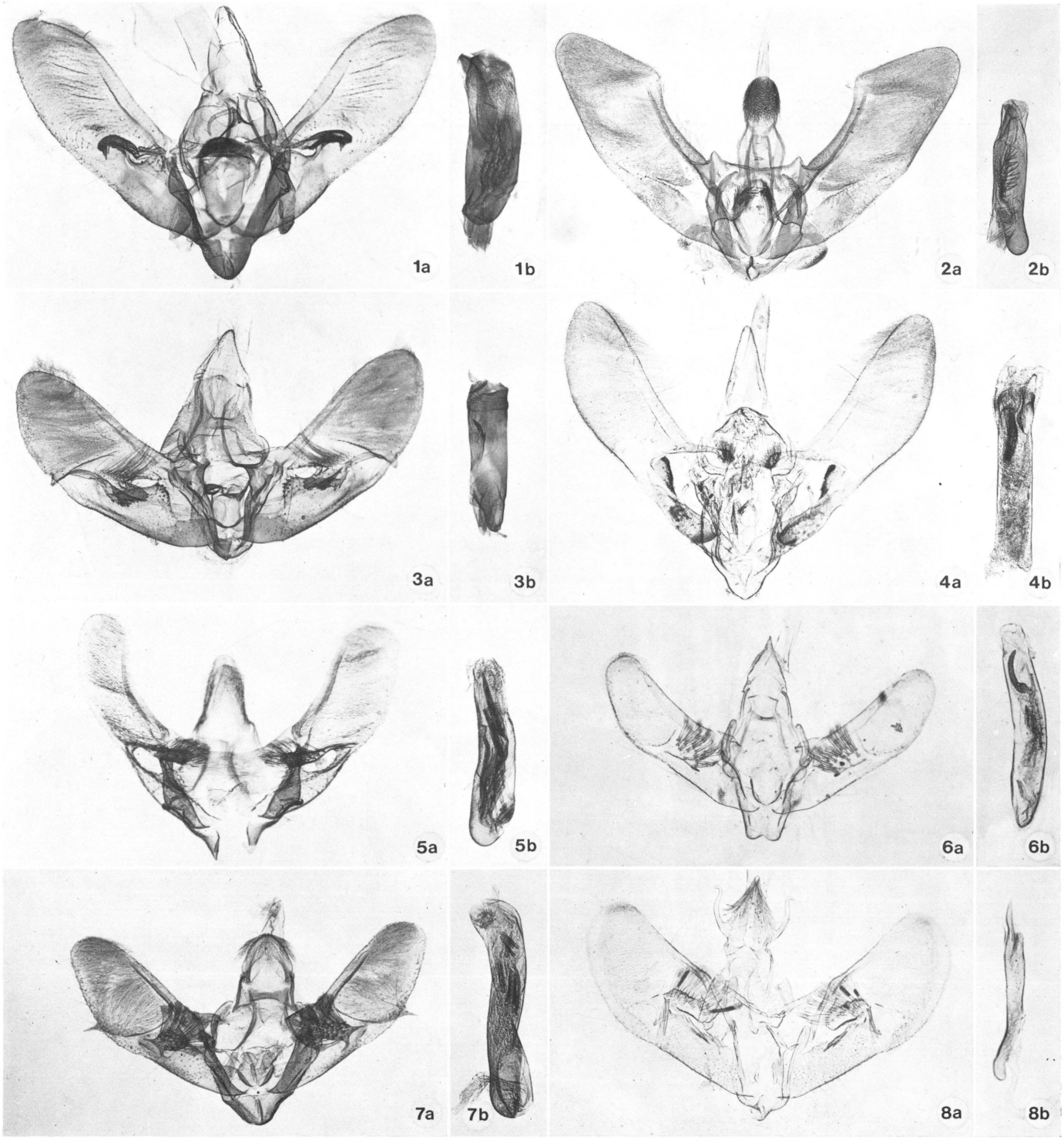



1 a, b. *Munroeodes thalesalis* (Wlk.), ♂. Cameron Co., Tex., 8 July 1968, Roy O. and C. A. Kendall, *ex* larva on *Citharexylum berlandieri* Robins, genitalia slide 3631 DK (CNC). (p. 12). a, genitalia without penis; b, penis.

2 a. *Saucrobotys futilalis futilalis* (Led.), ♂, genitalia without penis. Trenton, Ont., 20 June 1908, Evans, genitalia slide 3413 DK (CNC). (p. 14).

2 b. *Saucrobotys fumoferalis* (Hlst.), ♂, penis. Fort Nelson, B.C., 10 June 1948, W. R. M. Mason, genitalia slide 3417 DK (CNC). (p. 13).

3 a, b. *Nascia acutella* (Wlk.), ♂. Normandale, Ont., 26 July 1956, Freeman and Lewis, genitalia slide 3633 DK (CNC). (p. 15). a, genitalia without penis; b, penis.

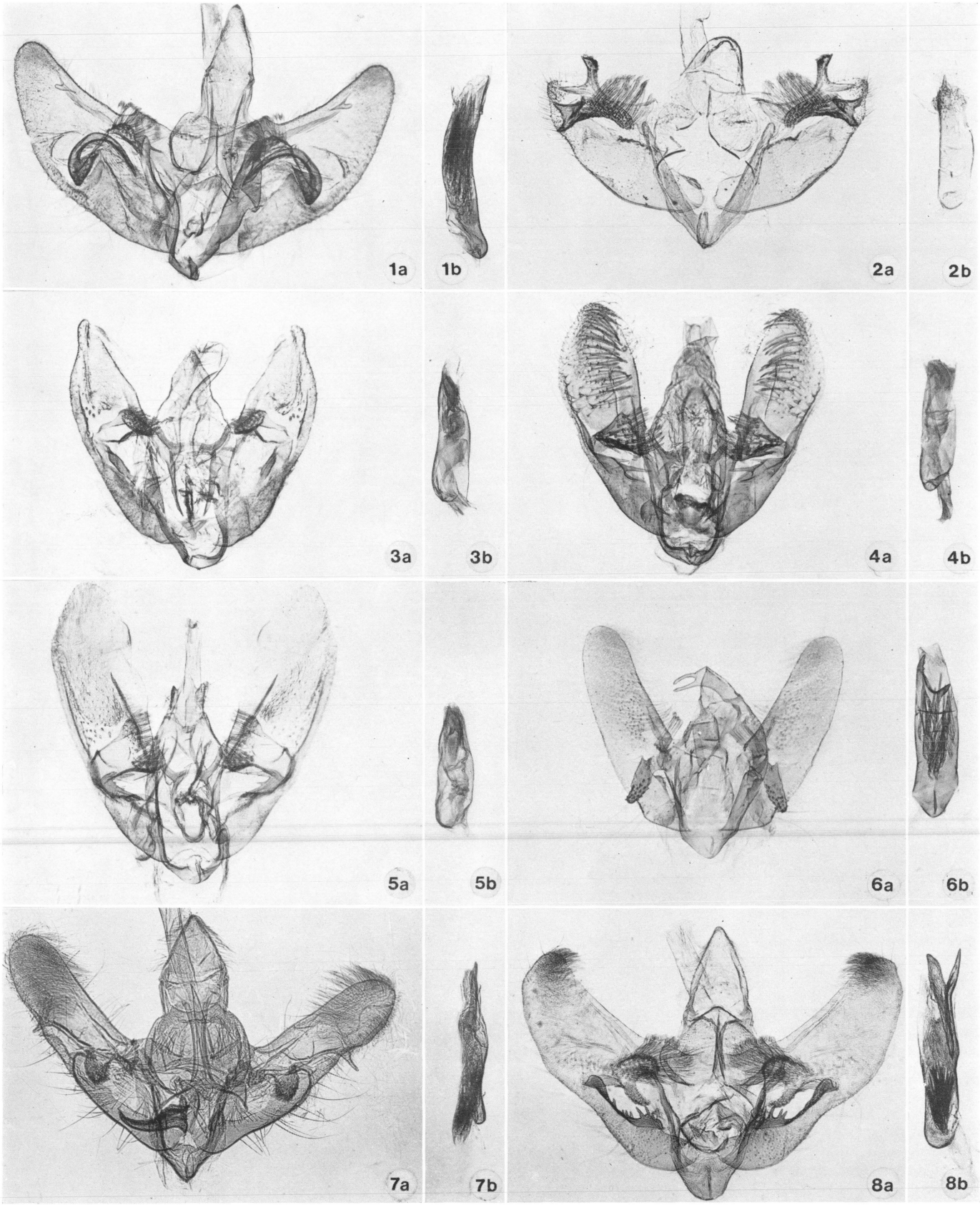
4 a, b. *Epicorsia oedipodalis* (Gn.), ♂. Florida City, Fla., 27 May 1940, M. E. Forsyth, genitalia slide EGM 1416 (CNC). (p. 16). a, genitalia without penis; b, penis.

5 a, b. *Pseudopyrausta santatalis* (B. & McD.), ♂. Homestead, Fla., D. O. Wolfenbarger, genitalia slide 4425 DK (CNC). (p. 17). a, genitalia without penis; b, penis.

6 a, b. *Oenobotys vinotinctalis* (Hmps.), ♂. Brownsville, Tex., 7 March 1937, T. N. Freeman, genitalia slide EGM 1251 (CNC). (p. 18). a, genitalia without penis; b, penis.

7 a, b. *Oenobotys texanalis* Mun. & A. Blanch., ♂. Big Bend, S.W. Tex., O. C. Poling, genitalia slide 3552 DK (Lyman Ent. Museum). (p. 18). a, genitalia without penis; b, penis.

8 a, b. *Triuncidia eupalusalis* (Wlk.), ♂. Siesta Key, Sarasota Co., Fla., 31 Dec. 1958, C. P. Kimball, genitalia slide 4060 MS (CNC). (p. 20). a, genitalia without penis; b, penis.




1 a, b. *Crocidophora serratissimalis* Zell., ♂. Port Stanley, Ont., 19 June 1922, G. T. Spencer, genitalia slide 3390 DK (CNC). (p. 21). a, genitalia without penis; b, penis.

2 a, b. *Fumibotys fumalis* (Gn.), ♂. Annapolis, N.S., 8 Aug. 1946, D. C. Ferguson, genitalia slide 1402 DK (CNC). (p. 28). a, genitalia without penis; b, penis.

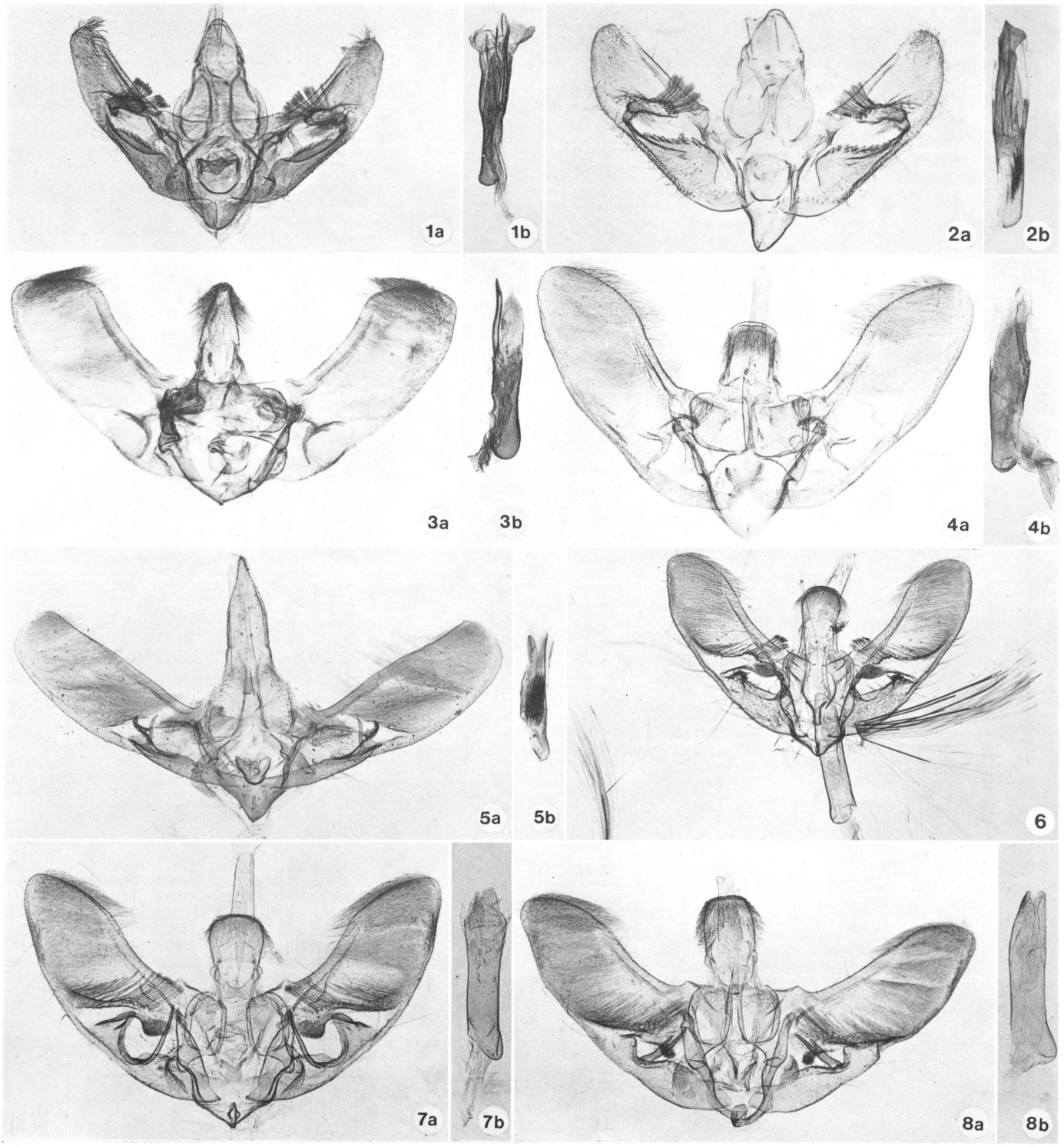
3 a, b. *Ostrinia penitalis* (Grt.), ♂. Swift Current, Sask., 25 Aug. 1939, A. R. Brooks, genitalia slide 4429 DK (CNC). (p. 24). a, genitalia without penis; b, penis.

4 a, b. *Ostrinia obumbratalis* (Led.), ♂. St. David's, Ont., 2 July 1934, W. L. Putman, *ex Bidens cernua*, genitalia slide 4430 DK (CNC). (p. 25). a, genitalia without penis; b, penis.

5 a, b. *Ostrinia nubilalis* (Hbn.), ♂. Wheatley, Ont., 10 July 1925, genitalia slide 4428 DK (CNC). (p. 26). a, genitalia without penis; b, penis.

6 a, b. *Perispasta caeculalis* Zell., ♂. One Sided L., Ont., 2 July 1960, S. M. Clarke, genitalia slide 3382 DK (CNC). (p. 28). a, genitalia without penis; b, penis.

7 a, b. *Eurrhypara hortulata* (L.), ♂. Ste. Anne de Bellevue, Que., 19 June 1945, E. G. Munroe, genitalia slide 3398 DK (CNC). (p. 29). a, genitalia without penis; b, penis.




1 a, b. *Phlyctaenia quebecensis* Mun., ♂, paratype. Lac Mondor, Ste. Flore, Que., 4 July 1951, E. G. Munroe, genitalia slide 4440 DK (CNC). (p. 31). a, genitalia without penis; b, penis.

2 a, b. *Phlyctaenia leuschneri* Mun., ♂, paratype. Pensacola, Fla., 15 Sept. 1962, genitalia slide 4173 MS (CPK). (p. 31). a, genitalia without penis; b, penis.

3 a, b. *Nealgedonia extricalis dionalis* (Wlk.), ♂. Near Doyles, Nfld., 15 July 1968, A. Mutuura, genitalia slide 4415 DK (CNC). (p. 34). a, genitalia without penis; b, penis.

4 a, b. *Mutuuraia mysippusalis* (Wlk.), ♂. Shingle Creek Road, Keremeos, B.C., 30 June 1935, A. N. Gartrell, genitalia slide 3396 DK (CNC). (p. 35). a, genitalia without penis; b, penis.

5 a, b. *Anania funebris glomeralis* (Wlk.), ♂. Salmon Arm, B.C., 28 May 1938, Hugh B. Leech, genitalia slide 3388 DK (CNC). (p. 37). a, genitalia without penis; b, penis.

6. *Hahncappsia fordi* (Capps), ♂, paratype. Chino Canyon, Palm Sprs., Calif., 19 April 1950, E. C. Johnston, genitalia slide HWC 17,606 (CNC). (p. 41).

7 a, b. *Hahncappsia marculenta* (G. & R.), ♂. Near Sarcoxie, Newton Co., Mo., J. R. Heitzman, genitalia slide 2829 DK (JRH). (p. 41). a, genitalia without penis; b, penis.

8 a, b. *Hahncappsia neomarculenta* (Capps), ♂. Independence, Mo., J. R. Heitzman, genitalia slide 2817 DK (JRH). (p. 42). a, genitalia without penis; b, penis.

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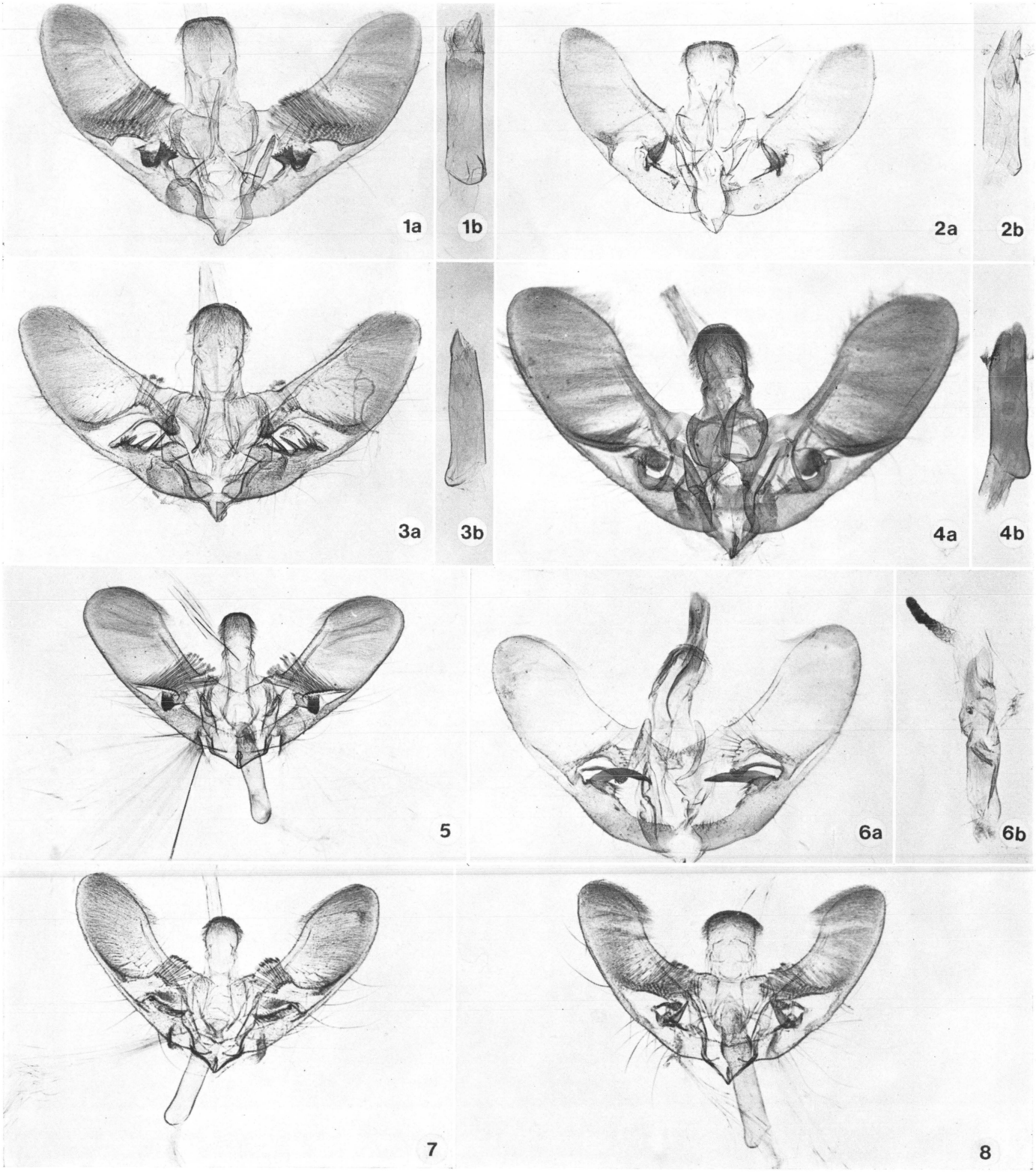
PLATE B *continued*

8 a, b. *Phlyctaenia coronata tertialis* (Gn.), ♂. Near Doyles, Nfld., 29 July 1968, A. Mutuura, genitalia slide 3379 DK (CNC). (p. 31). a, genitalia without penis; b, penis.




1 a, b. *Hahncappsia neobliteralis* (Capps), ♂. Independence, Mo., 3 Aug. 1967, J. R. Heitzman, genitalia slide 2821 DK (JRH). (p. 42). a, genitalia without penis; b, penis.

2 a, b. *Hahncappsia mancalis* (Led.), ♂. Wedge Plantation, McClellanville, S.C., genitalia slide 1538 DK (WPC). (p. 43). a, genitalia without penis; b, penis.

3 a, b. *Hahncappsia pergilvalis* (Hlst.), ♂. [Missouri], 2 May 1926, genitalia slide 2824 DK (JRH). (p. 43). a, genitalia without penis; b, penis.

4 a b. *Hahncappsia coloradensis* (G. & R.), ♂. Payne Co., Okla., 24 July 1934, Edward E. Ivy, genitalia slide 3385 DK (CNC). (p. 44). a, genitalia without penis; b, penis.

5. *Hahncappsia mellinialis* (Druce), ♂. St. Xavier Mission, Tucson, Ariz., 29 July 1924, E. P. Van Duzee, genitalia slide HWC 17,631 (CNC). (p. 45).

6 a, b. *Hahncappsia ramsdenalis* (Schs.), ♂. Key Largo, Fla., Mrs. Spencer Kemp, genitalia slide 453 DK (CNC). (p. 44). a, genitalia without penis; b, penis.

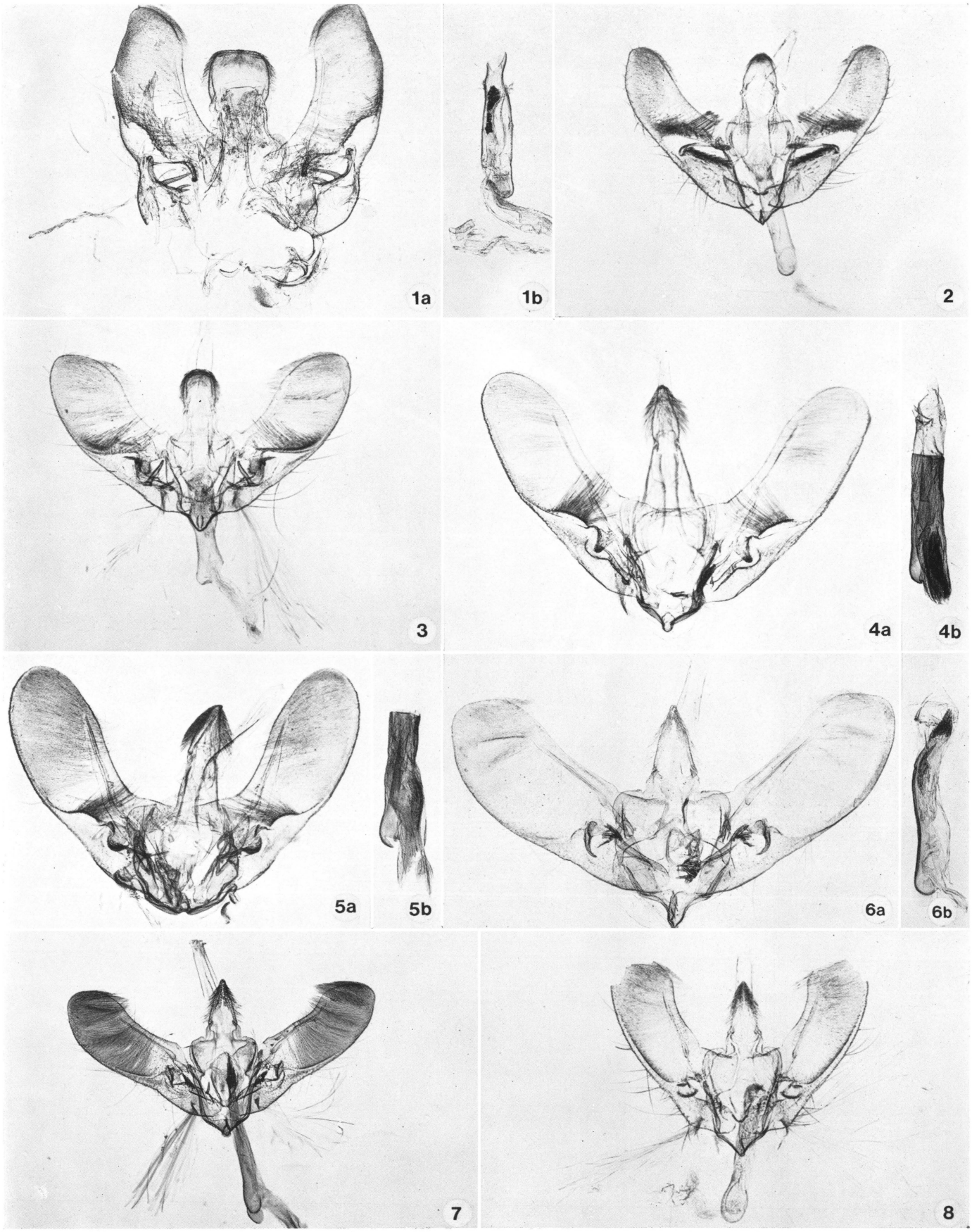
7. *Hahncappsia alpinensis* (Capps), ♂, paratype. San Benito, Tex., genitalia slide HWC 7960 (USNM). (p. 41).

8. *Hahncappsia pseudobliteralis* (Capps), ♂, paratype. Huachuca Mts., Ariz., genitalia slide HWC 7974 (USNM). (p. 42).

PLATE E *on facing page*

1 a, b. *Hahncappsia jaralis* (Schs.), ♂. Zapotitlan de las Salinas, Puebla, Mex., 17 May 1952, Dawson, genitalia slide M.d'A. 714 (CNC). (p. 43). a, genitalia without penis (vinculum broken); b, penis.

2. *Hahncappsia cochisensis* (Capps), ♂, paratype. Madera Canyon, Sta. Rita Mts., Ariz., 16 Aug. 1949, genitalia slide HWC 10,023 (USNM). (p. 44).




3. *Hahncappsia huachucalis* (Capps), ♂, paratype. Paradise, Cochise Co., Ariz., genitalia slide HWC 7924 (USNM). (p. 45).

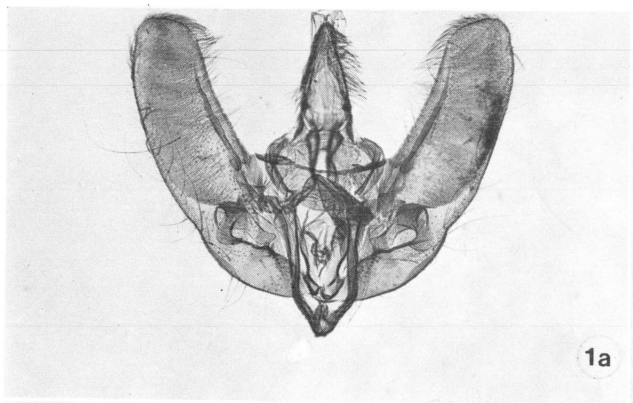
4 a, b. *Achyra rantalis* (Gn.), ♂. Ancaster, Ont., 1 Aug. 1955, J. E. H. Martin, genitalia slide 4420 DK (CNC). (p. 47). a, genitalia without penis; b, penis.

5 a, b. *Achyra occidentalis* (Pack.), ♂. Lower L., Calif., 2 Oct. 1934, E. C. Johnston, genitalia slide 4416 DK (CNC). (p. 48). a, genitalia without penis; b, penis.

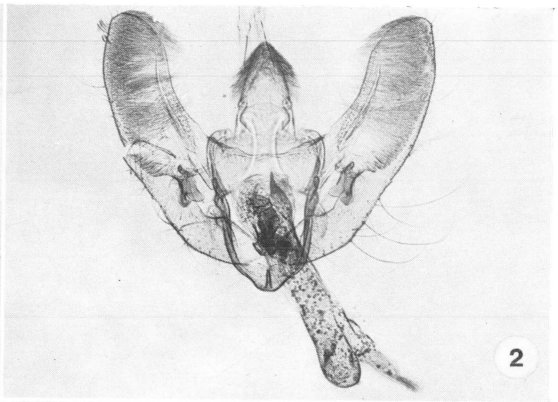
6 a, b. *Neohelvibotys neohelvialis* (Capps), ♂. Clinton, Hinds Co., Miss., 26 Sept. 1967, Bryant Mather, genitalia slide 3101 DK (BM). (p. 49). a, genitalia without penis; b, penis.

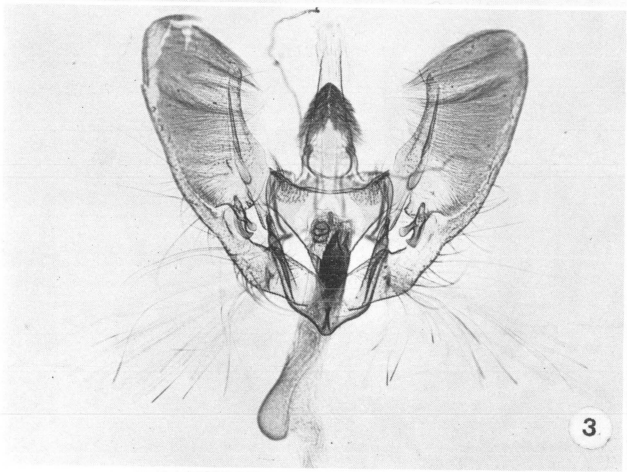
7. *Neohelvibotys arizonensis* (Capps), ♂, paratype. Madera Canyon, Sta. Rita Mts., Ariz., 2 Sept. 1953, R. J. Ford, genitalia slide HWC 17,760 (CNC). (p. 49).

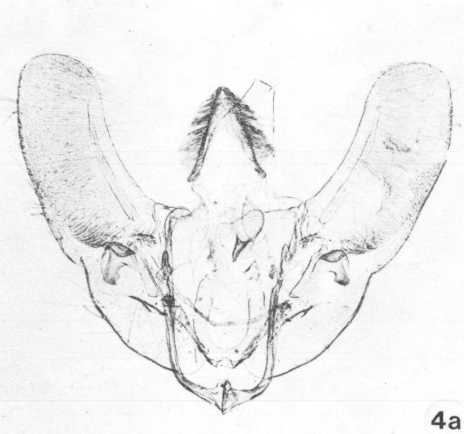
8. *Neohelvibotys polingi* (Capps), ♂, paratype. San Diego, Calif., genitalia slide HWC 7727 (USNM). (p. 49).



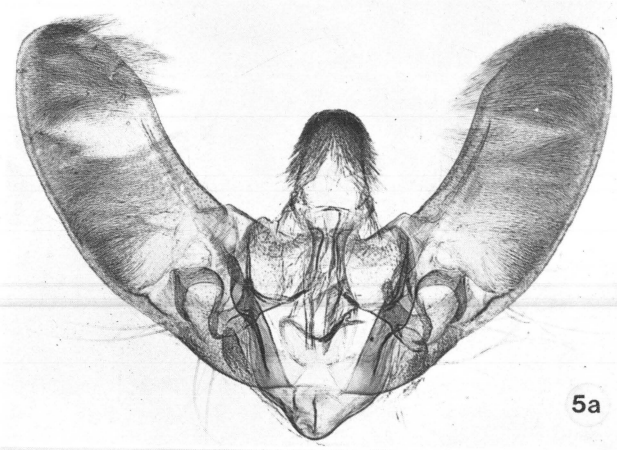




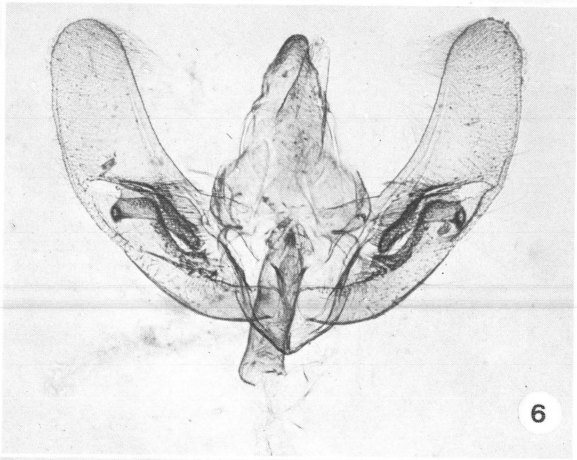



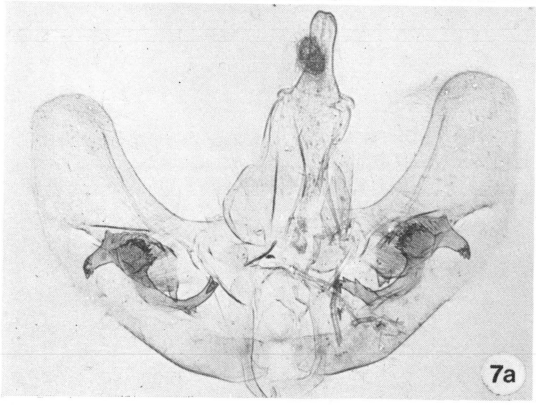





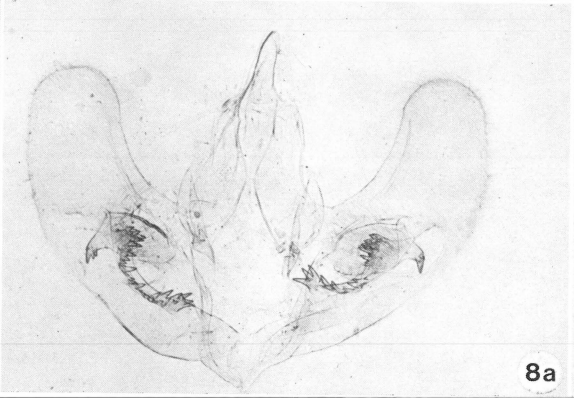












1 a, b. *Helvibotys subcostalis* (Dyar), ♂. Finca La Violeta, Soconusco, Chiapas, Mex., 20 Sept. 1954, F. Hartig, genitalia slide 4442 DK (CNC). (p. 51). a, genitalia without penis; b, penis.

2. *Helvibotys helvialis* (Wlk.), ♂. Norman, Okla., 29 April 1949, W. J. Reinthal, genitalia slide HWC 17,657 (CNC). (p. 50).

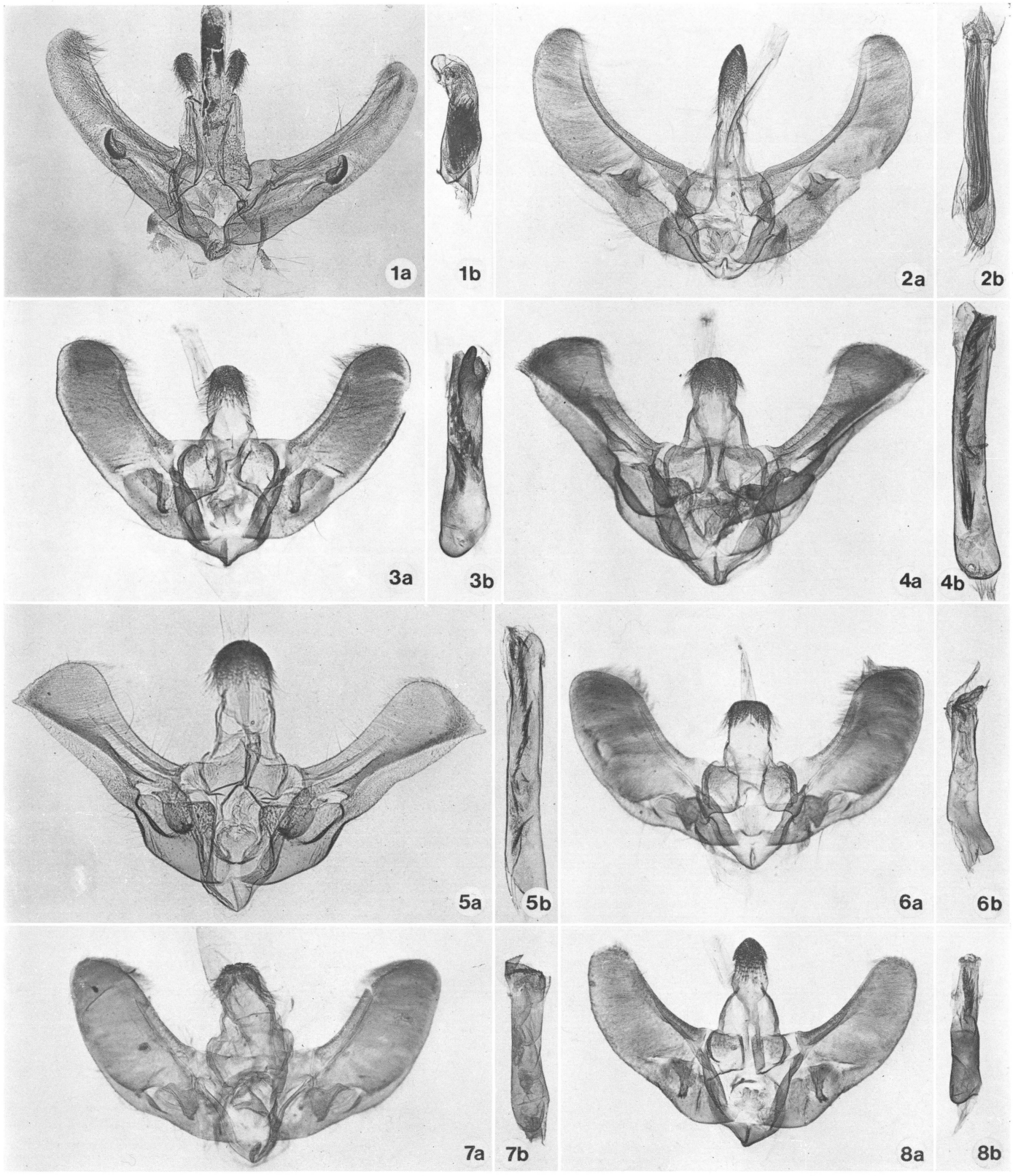
3. *Helvibotys pseudohelvialis* (Capps), ♂, paratype. Vidal, Calif., 16 Sept. 1947, D. Weedmark, genitalia slide HWC 17,651 (CNC). (p. 51).

4 a, b. *Helvibotys freemani* Mun., ♂, holotype. Brownsville, Tex., 4 March 1937, T. N. Freeman, genitalia slide M.d'A. 2887 (CNC). (p. 51). a, genitalia without penis; b, penis.

5 a, b. *Sitochroa chortalis* (Grt.), ♂. Eastman Sprs., Ottawa, Ont., 19 June 1907, C. H. Young, genitalia slide 3370 DK (CNC). (p. 53). a, genitalia without penis; b, penis.

6. *Arenochroa flavalis* (Fern.), ♂. Split Rock Tank, Mojave Desert, Calif., 20 May 1938, Grace H. and John L. Sperry, genitalia slide EGM 1579 (CNC). (p. 54).

7 a, b. *Xanthostege roseiterminalis* (B. & McD.), ♂. Nueces R., Zavalla Co., Tex., 26 April 1910, Hunter and Pratt, at light, genitalia slide 1899 DK (USNM). (p. 55). a, genitalia without penis; b, penis.




1 a, b. *Sericoplaga externalis* Warr., ♂. Pittsburgh, Pa., 10 Aug. 1917, genitalia slide 3402 DK (CNC). (p. 56). a, genitalia without penis; b, penis.

2 a, b. *Uresiphita reversalis* (Gn.), ♂. Glendora, Calif., May 1937, L. Hulbirt, genitalia slide 3400 DK (CNC). (p. 57). a, genitalia without penis; b, penis.

3 a, b. *Loxostege anartalis rainierensis* Mun., ♂, paratype. Mt. Rainier, Wash., 2 Aug. 1942, E. C. Johnston, genitalia slide 3611 DK (CNC). (p. 71). a, genitalia without penis; b, penis.

4 a, b. *Loxostege oberthuralis* Fern., ♂. Walker Pass, Calif., 5 May 1940, E. C. Johnston, genitalia slide 3602 DK (CNC). (p. 63). a, genitalia without penis; b, penis.

5 a, b. *Loxostege egregialis* Mun., ♂, paratype. Deming, N.M., 1–7 Sept., genitalia slide 3600 DK (USNM). (p. 64). a, genitalia without penis; b, penis.

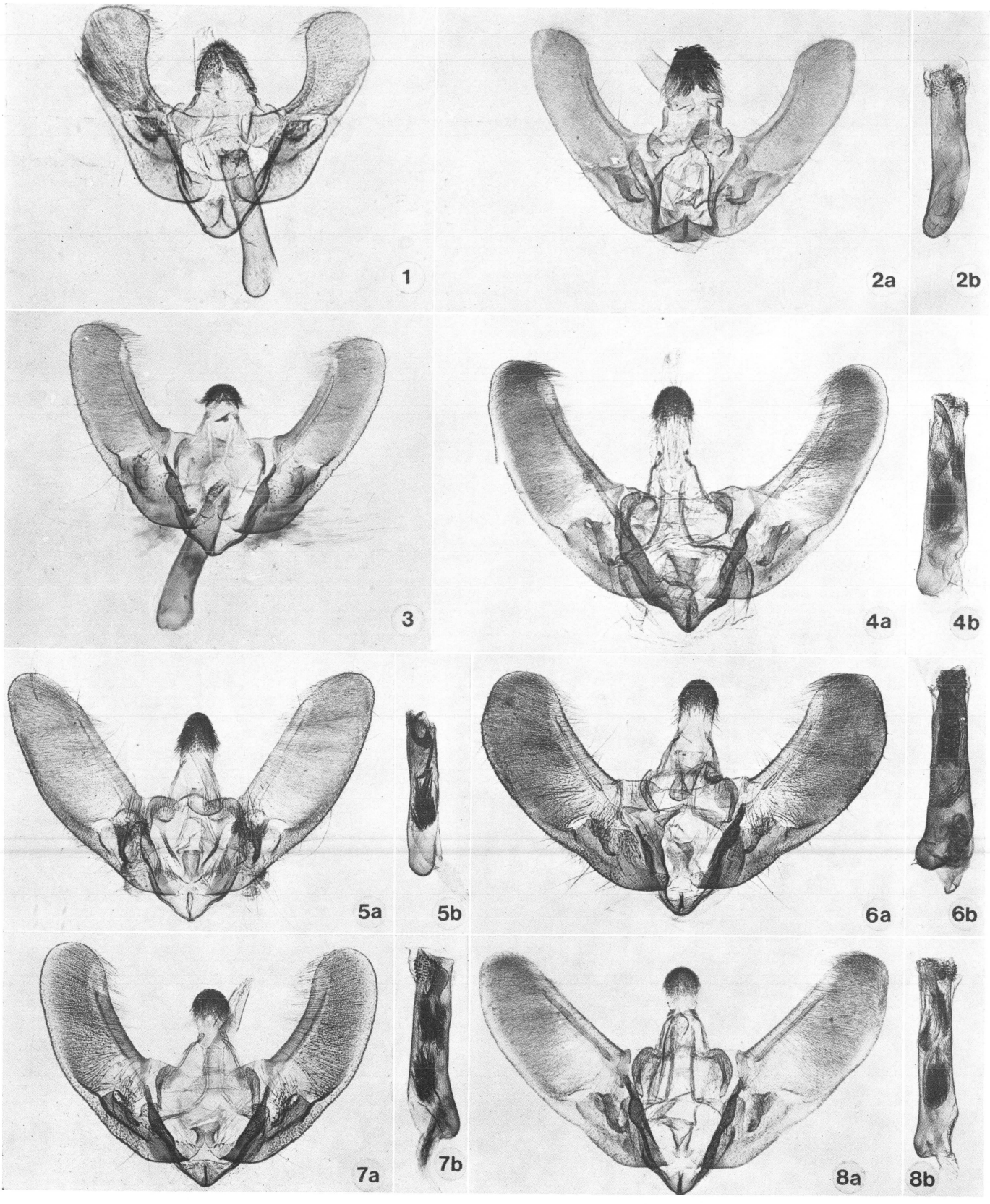
6 a, b. *Loxostege mojavealis* Capps, ♂. Mesquite Sprs., Death Valley, Inyo Co., Calif., 1800′, 23 April 1943, George Willett, genitalia slide 3619 DK (LACM). (p. 66). a, genitalia without penis; b, penis.

7 a, b. *Loxostege kingi* Mun., ♂, paratype. Mesquite Sprs., Death Valley, Inyo Co., Calif., 1800′, 19–22 April 1943, George Willett, genitalia slide 3620 DK (LACM). (p. 67). a, genitalia without penis; b, penis.

8 a, b. *Loxostege annaphilalis* (Grt.), ♂. Havilah, Kern Co., Calif., 3000′, 28 April 1964, J. Powell, genitalia slide 3616 DK (UCB). (p. 68). a, genitalia without penis; b, penis.

PLATE F *continued*

8 a, b. *Xanthostege plana* (Grt.), ♂. Baboquivari Mts., Pima Co., Ariz., 15–30 June 1924, O. C. Poling, genitalia slide 1897 DK (USNM).




1. *Loxostege immerens* (Harv.), ♂. Sand dunes, El Segundo, Los Angeles Co., Calif., 6 March 1952, R. J. Ford, genitalia slide EGM 2671 (CNC). (p. 69).

2 a, b. *Loxostege quaestoralis* (B. & McD.), ♂. Cruther's Cr. Wash, SW of Valyermo, Los Angeles Co., Calif., 4000′, 4 Jan. 1964, C. Henne, genitalia slide 3609 DK (CNC). (p. 69). a, genitalia without penis; b, penis.

3. *Loxostege ephippialis* (Zett.), ♂. Hopedale, Labr., 1 July 1923, genitalia slide Tit. 2 (CNC). (p. 72). Uncus somewhat foreshortened in photograph.

4 a, b. *Loxostege brunneitincta* Mun., ♂, paratype. Summit, Placer Co., Calif., June 1903, *ex* Koebele coll., genitalia slide 4384 DK (CAS). (p. 73). a, genitalia without penis; b, penis.

5 a, b. *Loxostege sticticalis* (L.), ♂. Dominion Range Station, Manyberries, Alta., 13 July 1951, D. F. Hardwick, genitalia slide 4536 DK (CNC). (p. 65). a, genitalia without penis; b, penis.

6 a, b. *Loxostege thallophilalis* (Hlst.), ♂. Mt. Rainier, Wash., 25 July 1942, E. C. Johnston, genitalia slide 4533 DK (CNC). (p. 72). a, genitalia without penis; b, penis.

7 a, b. *Loxostege offumalis* (Hlst.), ♂. Pasadena, Los Angeles Co., Calif., F. Grinnell Jr., genitalia slide 4534 DK (LACM). (p. 75). a, genitalia without penis; b, penis.

8 a, b. *Loxostege sierralis tularealis* Mun., ♂, paratype. Big Meadows, Tulare Co., Calif., 26 July 1954, R. J. Ford, genitalia slide 4391 DK (LACM). (p. 76). a, genitalia without penis; b, penis.