The Moths of America North of Mexico

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EUGENE MUNROE

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The Moths of America North of Mexico

FASCICLE 13.1A

PYRALOIDEA

PYRALIDAE

COMPRISING SUBFAMILIES SCOPARIINAE NYMPHULINAE

EUGENE MUNROE

ENTOMOLOGY RESEARCH INSTITUTE CANADA DEPARTMENT OF AGRICULTURE

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dedicated to the memory of ALBERT F. WINN entomologist, of montreal

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PREFACE

This is the first of four fascicles that will review the superfamily Pyraloidea as it appears in North America. The present fascicle will deal with six subfamilies of the family Pyralidae in two separately paged parts. The first part will be published in three installments. It will comprise the five subfamilies Scopariinae, Nymphulinae, Odontiinae, Glaphyriinae and Evergestinae. The second part will be taken up by the single large subfamily Pyraustinae. Fascicle 14 will deal with the Crambinae and with the closely related Ancylolomiinae, Cybalomiinae and Schoenobiinae, Fascicle 15 with the remaining subfamilies of the Pyralidae and Fascicle 16 with the families Thyrididae, Hyblaeidae and Pterophoridae. As the groups are large and need extensive revision, most fascicles and parts will be published, like the present one, in installments of manageable size.

The aim has been to give a synoptic account in which all species known to me or to my co-authors as occurring in America north of Mexico are illustrated in color, diagnosed and briefly discussed. The text is necessarily condensed. Full descriptions are given only for new taxa; structural features are illustrated only if they are essential for diagnosis. The early stages are briefly noted where known; structural characters of these stages are mentioned only if their significance in classification or identification is understood. Geographical ranges and seasonal occurrence are given in generalized terms: to record data precisely except for types or to present range maps or life-history charts would have made publication much slower and more costly without contributing to the primary objective of the work, which is to make identification possible.

In spite of all limitations I hope it will be found that the present work is a substantial advance over anything that has previously been available. Although there have been recent revisions of some subfamilies, for instance of the Phycitinae by Heinrich, of the Peoriinae by Shaffer, of the Nymphulinae by Lange and of the Odontiinae by myself, most of these are already out of date in certain respects. The latest general synopsis is in McDunnough's *Check List*, now over 30 years old. The last catalogue with bibliographic references is that of Dyar, published in 1903. There has never been a comprehensive manual for identification of North American species of all families and subfamilies of Pyraloidea. These fascicles will give a complete and extensively revised subfamily and generic classification, together with keys, original references, type-localities and information on the taxonomy, distribution and variation of the species. Much previously scattered work will be gathered and organized and a considerable number of new tribes, genera, species and subspecies will be described.

It has been my good fortune to have studied the Pyraloidea in general and the North American fauna in particular for the last twenty-five years. During this time I have collected in every state of the United States except Alaska, and in the majority of Canadian provinces and territories. I have visited most of the major collections and institutions that contain North American material, and through the generosity and great patience of many colleagues I have been able to work on large borrowed collections for extended periods in Ottawa. Even

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PREFACE

though there are still important collections and series that I have not had an opportunity of examining before completing this fascicle, I hope enough has been done to bring the work to a useful level. I cannot claim to have said the last word on North American Pyraloidea but I have tried to lay a satisfactory foundation for future work.

There is opportunity in plenty for further research. I have pointed out many taxonomic uncertainties in the text of the fascicle, but some general remarks may not be out of place here.

First, our knowledge of the fauna is obviously far from complete. Additional species, new to North America, or new to science, have been coming to my attention up to the moment of going to press. There are no doubt many more to be discovered. A substantial number of unrecorded Mexican and tropical American species will almost certainly be collected along our southern borders. Palaearctic and other foreign species continue to be introduced from time to time, both accidentally and deliberately, and these slowly increase our fauna. Some old-world species that range naturally into the northern parts of our territory probably remain to be found, and there must still be many undetected new species. Some of these will likely prove to be striking and distinctive while others will be separated by more careful study from closely similar species with which they have previously been confused.

Second, the classification of the Pyraloidea still needs work. The definitions and arrangement of genera and higher groups given here, though more natural than those in past works, will no doubt be improved considerably as our knowledge of the North American and world faunas advances.

Third, the geographical distribution and variation of most of the species are very incompletely known and our knowledge of the controlling factors is slight. A study of the zoogeography of North American pyraloids would be an interesting and scientifically rewarding undertaking but it lies far beyond the scope of the present work.

Finally, it will be obvious from the text that the surface has hardly been scratched in life-history studies and in working out the taxonomic characters of the early stages. Here is a field of research to which every student, whether professional or amateur, has the possibility of making a significant contribution.

I hope the present work will encourage others to take up these studies and that it will make their first steps easier. I cannot wish better to future students of the Pyraloidea than that they may derive as much pleasure from their investigations as I have done from mine.

EUGENE MUNROE

SUPERFAMILY PYRALOIDEA

This superfamily consists of moths of small to moderate size, which are in some ways intermediate between the true Microlepidoptera and the Macrolepidoptera. The superfamily is one of the largest in the Lepidoptera, being perhaps second only to Noctuoidea in numbers of species. Well over 1,500 species are known from North America. We can only guess at the number of species in the world, but it must exceed 30,000. The greatest number are found in the tropics, but the superfamily is represented in all significant land areas except Antarctica.

The Pyraloidea of our fauna belong to four families. These are very unequal in size and diversity and very different in appearance and structural characters. The largest and most varied family is the Pyralidae. This has about 18 subfamilies in North America, of which five are considered in the present fascicle. There is no single English name for the many different kinds of moths in this family, but "pyrales" or "pyralids" are often used as vernacular terms. They include relatively broad-winged and often brightly colored moths, such as the Odontiinae and Evergestinae, dealt with in this fascicle, and the Pyraustinae, Pyralinae and other subfamilies, reserved for later fascicles. They include also narrowwinged moths such as the brown or silver-striped grass-moths or Crambinae, which are so common on our lawns in summer, and whose relatives are stalk-borers that cause serious damage to corn, sugar-cane, rice and other crops of the grass family. A tropical member of this last group, Myelobia smerintha (Hübner), is the giant of the Pyralidae, attaining a wingspan of up to 6 inches, and having a remarkably sphingidlike build and appearance. Appropriately, its caterpillars bore in the stems of bamboos, the giants of the grass family. The Phycitinae also are narrow-winged. They are usually gray in color. The Peoriinae are similar in proportions but are most often pink, with the costa of the forewings pale.

The larvae of most Pyralidae are concealed feeders. Many of them are leaf-rollers or leafwebbers. Others are borers in plant tissues or subterranean feeders on roots. Many are scavengers, including such stored-products pests as the Mediterranean flour moth*, *Anagasta kuehniella* (Zeller), the Indian-meal moth*, *Plodia interpunctella* Hübner and the meal moth*, *Pyralis farinalis* (Linnaeus), the type-species of the genus on which the family and superfamily are based. The larvae of many Nymphulinae and some Pyraustinae and Schoenobiinae are aquatic; some of these breathe air from bubbles, silken reservoirs or plant tissues; others

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have true gills or are able to breathe through the skin and get their oxygen directly from the water in which they live. A number of kinds of pyralid caterpillars are predatory on other insects, eating sedentary gregarious forms such as scale insects, or living in the nests of bees, wasps and other social insects, eating the early stages and the food stored for them.

Some modern authors, following Meyrick (1884, 1895), divide the Pyralidae into a number of smaller families (Pyraustidae, Crambidae, Galleriidae, Phycitidae, etc.) These divisions were intended by Meyrick to parallel his similar subdivisions of the Noctuidae and Geometridae, which are no longer accepted. The subfamilies of the Pyralidae are of a comparable degree of difference to those of the Noctuidae, and I therefore unite them in a single inclusive family, as was done by Fernald (1902), McDunnough (1939) and many other authors, rather than recognizing the restricted Meyrickian subfamilies. This course is supported by the fact that the groupings and characters given by Meyrick have turned out to be not always natural or reliable.

Of the remaining three families, the Hyblaeidae are a small tropical group with a single introduced species in subtropical North America. In appearance they resemble catocaline Noctuidae and they were included in Noctuidae by Hampson (1903), McDunnough (1938) and other authors. They are easily distinguished from Noctuoidea by the presence of welldeveloped maxillary palpi and the absence of metathoracic ears. They lack also the abdominal ears that are always present in Pyralidae, but they have pyralid-like larvae and pupae. The Thyrididae are a somewhat larger but also mainly tropical family. Several genera

The Thyrididae are a somewhat larger but also mainly tropical family. Several genera occur in North America. They resemble Pyralidae in habits and in general appearance, but they lack maxillary palpi and abdominal ears and have the proboscis naked, not scaled as in Pyralidae.

The last family is the Pterophoridae or plume moths, so called because in almost all genera the forewings are distally divided into two and the hindwings into three narrow lobes with feathery fringes of scales. The moths are delicately built, with narrow wings and long slender abdomens. The caterpillars are cylindrical and usually have a rather dense velvety pile formed of secondary setae. They are often highly host-specific, and the biological associations of the species are consequently extremely interesting. In spite of the great superficial similarity of the species of this family, the structural characters that differentiate the genera are strong. The genital armature in particular is extremely varied in the different genera and species.

The Alucitidae (=Orneodidae) or six-plume moths have often been grouped with the Pterophoridae and are included by McDunnough (1939) in the Pyraloidea. However, their structure is very different and in the present work they are placed in the true Microlepidoptera.

A comprehensive technical characterization of the Pyraloidea is difficult, because of the variation of characters among the families. The moths are usually of slender build, though the Hyblaeidae, most Thyrididae and some Pyralidae are robust. The head is prominent. The proboscis or tongue is typically strongly developed but it is reduced or absent in a number of groups. When present in Pyralidae it is almost invariably strongly scaled at the base. In the Hyblaeidae and Pterophoridae it is similar, but in Thyrididae it is naked. The labial palpi are three-segmented, with a sensory pit opening on the dorsal surface of the third segment. Normally the labial palpi are compact and broadly scaled, forming a recess into which the proboscis is coiled; but in some forms they are long and porrect or reduced and decumbent.

The maxillary palpi are always somewhat reduced. In Hyblaeidae and most Pyralidae they are relatively well developed, with three or four short segments and a conspicuous vestiture of scales; in Thyrididae, in Pterophoridae, in Chrysauginae and in some other Pyralidae they are absent or vestigial. The compound eyes are usually well developed. The lateral ocelli are present in the majority of Pyralidae but are absent in Thyrididae and most Pterophoridae. A weak chaetosema is present near the posterolateral angle of the vertex on each side in some subfamilies of Pyralidae. The antennae are usually filiform or prismatic, occasionally laminate or pectinate. Typically they have two rows of scales on each segment dorsally and have the ventral surface clothed with sensory hairs. The thorax is normal. The legs are normal, with well-developed foretibial epiphysis, a single pair of spurs on the midtibia and two pairs on the hindtibia. The wings typically are broad, evenly scaled and of moderately firm texture. They normally have short fringes of scales except in the anal region, where the fringe is longer and the scales are hairlike. Many Pyralidae have the forewings narrowed and in some, such as Lineodes, the hindwings also are narrow. In the Pterophoridae both pairs of wings are narrow and in all Nearctic genera except Agdistis they are divided by deep fissures into narrow, scale-lined lobes, two on the forewing and three on the hindwing. The venation is variable. Sc of the forewing is simple. Primitively all branches of R are present and arise separately from the cell; in the Pyralidae R_3 and R_4 are invariably stalked or fused. There may be other stalkings and reductions and R₁ may be anastomosed with Sc. In some Pterophoridae only a single radial vein is preserved. Three branches of M are normally recognizable, M₁ being associated with R and M₂ and M₃ with Cu. The branches are variously stalked and fused in some groups. Cu is normally two-branched. 1st A is well developed in most Pterophoridae, but is vestigial or absent in the remaining families. 2nd A is well developed. 3rd A varies: it may be absent, short and free, looped with 2nd A, or looped with a free spur posteriorly. The hindwings have Sc parallel to or anastomosed with Rs either to beyond the middle of the cell (in Thyrididae) or beyond the end of the cell (in Pyralidae and Pterophoridae). The medial and cubital veins are disposed as on the forewings. There are three developed anals in most Pyralidae but the first anal is lacking in Thyrididae, Pterophoridae and some Pyralidae. The abdomen has a welldeveloped pair of ears (tympanic apparatus) at the base ventrally in all Pyralidae. This is lacking in the other three families. The male genitalia are of almost diagrammatic simplicity in many Pyralidae, with simple uncus and gnathos, articulating basally, simple tegumen and vinculum, articulating pleurally, distinct juxta or anellus, tubular aedoeagus and simple, paired valvae. However, ornamented, complicated and modified structures are found in many groups. The female genitalia normally have an ovipositor with a pair of setose lobes. These are supported by a vertical sclerotized bar representing the tergite or dorsal sclerotized plate of the ninth segment. The posterior apophyses are attached to this bar. A similar pair of anterior apophyses is attached to the relatively unmodified eighth tergite. The latter bears setae that are sometimes of taxonomic importance. The seventh and eighth sternites are modified to a varying degree and form the sclerotized anterior and posterior lips of the ostium or copulatory opening. From the ostium the variously ornamented ductus bursae leads to the globular or elongate, simple or ornate bursa copulatrix. A ductus seminalis opens on the ductus bursae or the proximal part of the bursa copulatrix.

The larvae vary considerably in structure and habits but as already noted they are most often concealed feeders: borers, webbers, or leaf-rollers or folders. They usually have only

two setae on the prespiracular wart of the prothorax. If three setae are present, the spiracle is small and round. The larvae are usually cylindrical with well-developed prolegs and strong primary setae, the latter often situated on prominent, pigmented pinacula. The larvae of Pterophoridae usually have prominent secondary hair.

The four families that occur in our fauna are possibly all that belong to the superfamily. Two or three additional families are cited in exotic lists but it is probable that these are either subdivisions of the Pterophoridae or else non-pyraloids. It is still questionable whether the superfamily is a natural one. The presence of tympanic organs sharply divides the Pyralidae from the other families, and neither the Pterophoridae nor the Thyrididae regularly possess any of the main characters that distinguish the Pyralidae from other lepidopterous families. The Hyblaeidae are more closely similar to Pyralidae in structures of the larvae, pupae and adults, but some competent authorities believe they are closer to certain groups of true Microlepidoptera. A more systematic study than has yet been made of the comparative anatomy and phylogeny of the Lepidoptera will be needed to settle this question.

KEY TO FAMILIES OF NORTH AMERICAN PYRALOIDEA

I.	Tympanic organs present at base of
	abdomen beneath Pyralidae
	this page
	Base of abdomen beneath without
	recognizable tympanic organs 2
2.	Maxillary palpi present Hyblaeidae
	Fascicle 16
	Maxillary palpi absent 3
3.	Wings usually wide, never divided into

plumelike lobes; hindwings with Sc and

 Rs approximated or anastomosed beyond middle of cell but before its end Thyrididae Fascicle 16
 Wings always narrow, almost always divided into plumelike lobes, two on the forewing and three on the hindwing; hindwing with Sc and Rs parallel

to beyond end of cell, then diverging Pterophoridae

Fascicle 16

FAMILY Pyralidae

Type-genus: Pyralis Linnaeus, 1758.

NOTE—Opinion 379 of the International Commission on Zoological Nomenclature established the validity of the name *Pyralis* as from 1758, when it was used by Linnaeus in the tenth edition of the *Systema Naturae* in a subgeneric sense. The same opinion ruled that the form Pyralidae is to be used instead of Pyralididae for the family name, although both are grammatically justifiable because the word *pyralis* has alternative stems.

The Pyralidae are mostly small to moderate-sized moths, though some tropical forms, such as certain species of *Myelobia* Hübner (Crambinae), *Siga* Hübner (Pyraustinae) and *Midila* Walker (Midilinae), are large and robust. The largest species in our fauna are cactus-feeding Phycitinae of the *Melitara* group of genera; in these the length of the forewing may be well over 30 mm. Their narrow wings and stout body make them look like cutworm moths of the trifid group of Noctuidae.

We tend to think of the Pyralidae as small and dull-colored moths, triangular or elongate in shape, and often with long porrect labial palpi. Although this is a good characterization of a considerable number of species, the actual range of color and form in the group is almost

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unbelievably wide. Many species have brilliant colors-green, red, blue, orange, yellow, purple, magenta, silver or pearly white; many have contrasting or complicated patterns; many have bizarre shapes or striking secondary sexual characters, such as prominent scale-tufts and distorted legs, wings or antennae. Many of the genera have a deceptive superficial resemblance to other families: Noctuidae, Geometridae, Lithosiidae, Tortricidae, Gelechiidae, Tineidae and even Saturniidae and Sphingidae. The ears or tympanic cavities at the base of the abdomen beneath, facing somewhat forward towards the posterior surface of the hindcoxae, are always present (though weak in the foreign subfamily Midilinae) and will distinguish the Pyralidae from all other groups except the Geometroidea. Veins Sc and R_s of the hindwings are anastomosed or very closely approximated for some distance beyond the cell, so that the first two veins at the front of the hindwing appear to be stalked, forming a fork near the margin, and the next following vein appears simple. The reverse is the case in most Lepidoptera of other families that resemble Pyralidae: the first vein from the front is apparently simple and the next two appear stalked or closely associated. The few forms (such as some Drepanoidea and Sphingoidea) that resemble Pyralidae in this character differ greatly in other respects and are not likely to be confused. When the proboscis or tongue is present in Pyralidae it is almost always scaled at the base (one Australian genus is the only exception known to me). In all Macrolepidoptera and many families of Microlepidoptera the tongue if present is naked at the base. Most Pyralidae have clearly visible, though often small, maxillary palpi (they are rudimentary or absent in Chrysauginae and in a few others). Macrolepidoptera and some families of Microlepidoptera lack the maxillary palpi. These characters are sufficient to distinguish Pyralidae in all cases where doubt is likely to arise.

Pyralidae occur in all parts of our territory that are not permanently covered by ice and snow. In Peary Land and northern Ellesmere Island, at the extreme northern fringes of land, only a single species, *Udea torvalis* (Möschler), occurs. In the middle and southern arctic several additional species come in and the fauna becomes progressively richer as we go southward. Pyralidae fly at an altitude of over 14,000 feet in the Rocky Mountains of Colorado and below sea level in the Death Valley of California. They are well represented in forests, prairies, swamps and deserts. Most species fly at night. The majority of these can be collected at light; some are attracted to flowers; they are seldom seen at "sugar" or other artificial baits. Some species, especially at high altitudes, in the arctic and in deserts, fly by day. Many of these have reduced eyes. These diurnal species often frequent flowers. Some species are crepuscular and are active mainly in the evening and sometimes the morning twilight. Most species of grass moths of the *Crambus* group of genera are at least partly crepuscular. Some fly on into the hours of darkness and come freely to lights; others can be found only by visiting their haunts in the twilight hours. Species of Nymphulini and Schoenobiinae can often be seen flying in large numbers over weedy or reedy bodies of water as dusk approaches.

The habits of the moths have only occasionally been recorded. They would make an excellent subject for systematic study. The resting positions are extremely varied and often surprising: *Terastia meticulosalis* Guenée holds its abdomen curled up over the thorax with the flat lateral scale-tufts spread out like little fins; *Lineodes* and *Zellerina* species hold the wings rolled up and at right angles to the body. Argyractini and certain Glaphyriinae hold the hindwings raised in such a way as to display the metallic spots along the terminal margins.

Galasa nigrinodis Zeller sits up like a little table with horizontally folded wings and with its tufted legs vertically extended. Often the resting positions clarify the significance of details of the pattern that are inconspicuous or confusing in mounted specimens. In the living insect, on the other hand, these elements form part of a coherent pattern adapted to concealment or display.

The times of flight, the habitat preferences, the flight patterns and the mating and oviposition habits of Pyralidae are insufficiently known but they will undoubtedly prove to be interesting. The way that the different scent-tufts and other secondary sexual characters of the males of various species are used seems particularly deserving of attention.

Turning to formal structural characterization, we find that the labial palpi are threesegmented. They are variously long or short, porrect, upturned or decumbent, and roughly or smoothly clothed with long or short scales. The maxillary palpi are small, with three or four round segments, though sometimes they bear extensive scaly vestiture. Sometimes, notably in the Chrysauginae, they are nearly or completely aborted. The prominence and shape of the scaly vestiture of the maxillary palpi are variable: the scales may form large flattened tufts continuing the plane of the frontal scaling; they may be developed into prominent aigrettes of sexually modified scales as in the males of some Phycitinae; or they may be compressed into a compact, pencil-shaped or filiform structure. The proboscis is usually prominent and coiled between the palpi at rest. When present it is almost invariably scaled at the base. As already mentioned this is a useful way of telling Pyralidae from Macrolepidoptera. The compound eyes are large and globular in most species; they tend to be somewhat larger in males than in females. In some day-flying forms they are considerably reduced. The ocelli are usually present, but they may be reduced or absent. The chaetosemata are present in some subfamilies, where they are represented by a patch of short parallel or radiating setae arising from a bare or weakly scaled part of the vertex but not from a distinct tubercle. The antennae are usually simple and filiform or weakly prismatic, but occasionally they are laminate or pectinate. Normally they have two rows of scales to each segment dorsally and they are uniformly pilose, ciliate or fasciculate beneath. In the males of some species the base or the shaft of the antennae is incised or distorted, or bears specialized scaletufts. The wings vary considerably in form. Typically the forewing has all veins present, except for 1st A, which is reduced to a fold or sometimes remains as a weak tubular vein in the terminal part of the wing. R₃ and R₄ are stalked or rarely fused. Other veins are variously stalked or fused in different genera or groups. There is hardly ever a true accessory cell, but R_1 sometimes fuses with Sc distally. The hindwings have R_s apposed to or anastomosed with Sc for a variable distance beyond the cell. This is a good quick character for recognition of the family; in most Lepidoptera R_s is apparently stalked with M₁ and Sc is apparently free. The few moths in which this distinction breaks down are mostly very unlike pyralids in appearance. The cell is usually closed. There are usually three well-developed anal veins, but in Chrysauginae 1st A is usually lacking. The abdomen has a pair of tympanic bullae in the ventral part of the basal segment. In one major group, the Crambiformes (here adopted as a term of convenience), comprising the Crambinae, the Pyraustinae and a number of smaller subfamilies, the tympanic bullae are apposed along the midline and in front of them a median, longitudinal, chitinous flap hangs down into the cavity between the thorax and the abdomen, effectively dividing it into two chambers. This flap, the praecinctorium, has a more or less developed tuft of scales distally, and in some groups it is somewhat divided at

the tip or even strongly bilobed. The second major group, the Pyraliformes, comprising the Pyralinae, the Phycitinae, the Galleriinae and a number of related subfamilies, has the tympanic bullae separate or only weakly apposed and lacks the praecinctorium. The small neotropical subfamily Midilinae constitutes a third group, the Midiliformes, in which the tympanic bullae are small, weak and widely separated. The genitalia are as described for the superfamily. There is a wide range of structural modifications among the different subfamilies, tribes and genera.

The life histories of only a relatively small proportion of pyralid species are well known and general statements must therefore be accepted with caution. The larvae are usually cylindrical, with normal head, well-developed prolegs and prominent setae. The setae often arise from well-defined tubercles. So far as known, the prespiracular tubercle or group of the prothorax never has more than two setae. Setae L1 and L2 of the abdominal segments are approximated and usually arise from the same tubercle. The eggs are thin-shelled and rarely if ever have prominent sculpture. Often they are flattened and lens-shaped. The pupae are obtect. They have the apex of the labrum bilobed.

The larvae are mainly concealed feeders, but their habits vary widely. Many are borers in plant tissues or webbers or folders of leaves. A few, such as certain Odontiinae, are leafminers. A number are scavengers, feeding in dried or decaying organic matter; some of these have become important pests of stored products. A few species are carnivorous, for example feeding on scale insects as does *Laetilia coccidivora* (Comstock) or living as inquilines in the nests of bees and wasps, as do various Galleriinae, Phycitinae and Glaphyriinae. A number of Crambinae and Schoenobiinae are subaquatic as larvae, boring into the stalks and roots of grasses, sedges and rushes that grow in water. Many Nymphulinae have fully aquatic larvae; some of these have prominent gills. In the schoenobiine species *Acentria nivea* (Olivier) not only the larvae but many of the adult females are aquatic: there is a wingless female form that emerges from the water only briefly in order to mate. A fully winged female form also occurs, permitting dispersal of the species.

The classification adopted here departs considerably from that usually followed in North American works, for example McDunnough (1939) or Forbes (1923), and in turn based on that of Hampson (1896, 1898). The newer classification takes into account not only the characters of palpi, wing-venation and tufting and cubital pectination used by Hampson, but also the much more trenchant characters of praecinctorium, chaetosema and genital structure, as elaborated by Börner (1925), E. L. Martin (1956), Marion (1952), Whalley (1960), Müller-Rutz (1929), Sylvén (1947), Shaffer (1968), Heinrich (1956), and Munroe (1958, 1959, 1961, 1964, 1970), among others.

As already mentioned, the structure of the tympanic organs divides the family into three main groups or series. The series Midiliformes contains the single subfamily Midilinae, not represented in our fauna, but monographed by myself (Munroe, 1970). In this group the wings are broad, the body is robust, the maxillary palpi are relatively large, the proboscis is usually but not always reduced, the chaetosema is present, the antennae are short and often laminate or pectinate, the male genitalia are simple and complete and the female genitalia have a broad pilose ovipositor and a short finely spinulose ductus bursae and bursa, usually without special armature.

The series Pyraliformes has the tympanic bullae well developed but usually not fused and there is no praecinctorium. Vein R_5 of the forewing is often stalked with R_{3+4} . In primitive

forms a vestige of 1st A may remain as a tubular vein at the margin of the forewing, but generally this vein is reduced to a fold. 2nd A is well developed; 3rd A is free, anastomosed with 2nd A or connected with it by a crossvein, but rarely if ever forms a large blind loop with it. The hindwings are variable in their characters, with Sc and R_s free and approximated or else anastomosed, with the base of Cu naked or pectinated with scales, and normally with three anal veins, but with 1st A lost in many Chrysauginae. The larvae are variable in characters and are described under the subfamilies.

The series Crambiformes has the tympanic bullae large and fused in the midline. Anterior to them is a longitudinal membranous flap, the praccinctorium, as already described. This flap is frequently transversely flattened near the tip and is almost always fringed or tufted with scales distally. In many pyraustines it is greatly enlarged and bilobed. R_5 of the forewing is stalked with R_{3^+4} in many Crambinae and some Schoenobiinae, but in other subfamilies it is generally free. 1st A of the forewing is preserved as a tubular rudiment at the margin of the wing in most Schoenobiinae and some Nymphulinae, but in other groups is reduced to a fold. 3rd A when present generally forms a blind loop with 2nd A; sometimes it is free, and often it is absent, especially in small forms; rarely if ever does the end of 3rd A continue free beyond a crossvein or anastomosis connecting it to 2nd A. In the hindwing Sc and R_s are usually anastomosed but sometimes only approximated behind the cell. The base of the cubitus is pectinated with hairlike scales in a number of groups. Three anals are always present. As in the Pyraliformes, the larval characters are diverse.

KEY TO SUBFAMILIES OF NORTH AMERICAN PYRALIDAE

I.	Praecinctorium present; tympanic
	bullae medially fused 2
	Praecinctorium absent; tympanic
	bullae separate or approximated 12
2.	Chaetosema present 3
	Chaetosema absent
3.	Forewing with distal part of 1st A de-
	veloped as a tubular vein 4
	Forewing with 1st A represented only
	by a fold 5
4.	Proboscis present; R2 of forewing
	stalked with R_{3+4} ; M_2 of hindwing
	lost; termen of hindwing usually with
	a series of black and metallic spots;
	vinculum of male genitalia without
	shell-like accessory sclerites Nymphulinae
	(nart)
	(purt)
	Prohoscie absent: R of forewing
	\mathbf{R}_2 of forewing
	either starked with or separate from
	K_{3+4} ; M_2 of hindwing present; termen

of hindwing without a series of black

and metallic spots; vinculum of male

- genitalia with a pair of shell-like accessory sclerites Schoenobiinae Fascicle 14
- 5. Vein R₂ of forewing at least closely apposed to and usually stalked with R₃₊₄; labial palpus usually upturned and with basal segment relatively long; wings mostly with a conspicuous pattern of transverse bands on a pale ground Nymphulinae (part) p. 72
- 6. Forewing usually with weakly raised patches of black scales; cubitus of hindwing usually not distinctly pectinated with hairlike scales; lateral arms of tegumen of male genitalia

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about as long as uncus, little tapered ventrally; uncus not strongly compressed or decurved; valve sometimes with a ventral process but without strong costal or medial armature; in our species the gnathos slender and acuminate; the forewing pattern of our species almost always resembling that of Noctuidae, in shades of gray or brown powdering Scopariinae p. 14 Forewing without raised patches of black scales; cubitus of hindwing usually distinctly pectinated with hairlike scales; lateral arms of tegumen strongly narrowed ventrally or much longer than uncus, usually both; uncus usually compressed and strongly curved in the vertical plane; gnathos

- 7. Hindwing with cell closed, M_1 widely separated from R_8 Ancylolomiinae Fascicle 14
- Hindwing with cell open, M₁ basally approximated to R_s Crambinae Fascicle 14
- 8. Valve of male genitalia with costal process; uncus simple; gnathos well developed Cybalomiinae Fascicle 14
- 9. Uncus of male genitalia bilobed and laterally setose; gnathos well developed Odontiinae
 p. 137
- 10. Male genitalia with gnathos well developed, slender, dorsally toothed

near apex; uncus narrow and distally pointed; valve usually without clasper, at most with a simple hooklike clasper Evergestinae p. 253

- 11. Hindwing with areas of spatulate setae in cubital and anal regions of upperside; praecinctorium simple Glaphyriinae p. 194
- Hindwing without areas of spatulate setae in cubital and anal regions above; praecinctorium distally bilobed, often strongly so Pyraustinae Fascicle 13.2
- 13. Proboscis rudimentary or absent; uncus of male with prominent laterally or posterolaterally directed spinelike processes; ovipositor of female with deep compressed lobes Peoriinae Fascicle 15

16. Forewing above tufted with scales; male with labial palpus or basal segment of antenna often produced upward and backward over the vertex; Sc and R_s of the hindwing anastomosed

..... Epipaschiinae Fascicle 15

SERIES CRAMBIFORMES

This series is characterized by the presence of a praecinctorium and the apposition of the tympanic bullae along the midline. The subfamilies are reasonably distinct in our fauna, but the Scopariinae intergrade with the Nymphulinae in the tropics and are hard to separate from the Crambinae in the Australian region. The Glaphyriinae and Evergestinae are perhaps independent derivatives of primitive Nymphulinae, both having lost the chaetosemata. In the Evergestinae the base of the gnathos has become fused with the tegumen, although the shape of the gnathos is like that of Nymphulinae; in the Glaphyriinae the gnathos has been lost and specialized scales have been developed on the wings. The Pyraustinae have probably arisen directly from the Evergestinae, which the more primitive forms resemble closely except in the reduction of the gnathos. The Schoenobiinae, like some Nymphulinae, preserve the primitive character of a partially tubular vein 1st A in the forewing; otherwise they closely resemble Crambinae, but they differ in having specialized shell-shaped accessory sclerites on the vinculum and a brush of stiff setae on the seventh sternite of the male. It is possible that the resemblances are the result of convergent adaptation to a grass-boring mode of life. The Cybalomiinae and Crambinae are closely similar in genital structure and perhaps they should not really be kept separate. The Odontiinae have usually been associated with the Pyraustinae or Evergestinae: in the former case on the basis of general habitus and in the latter on the basis of the fusing of the gnathos with the tegumen basally. However, the simple praccinctorium and the specialized uncus and valves separate them rather sharply from these two groups. The shell-like sclerotizations at the base of the vinculum are reminiscent of those of the Schoenobiinae, but the two groups differ widely in other characters. On the whole the Odontiinae seem most closely similar to the Glaphyriinae. The Dichogamini perhaps represent a connecting link.

subfamily Scopariinae Guenée

Type-genus: Scoparia Haworth, 1812.

Scoparidae Guenée, 1854, Species Général des Lépidoptères, 8, Deltoides et Pyralites, 412.

Eudoridi Stephens, 1852, List of the Species of British Animals, 12: 2. Type-genus: Eudorea Curtis, 1827, now considered a synonym of Scoparia Haworth, 1812.

NOTE—Although the name Eudoridi appears to have priority over Scoparidae by two years, this name or its derivatives have had no recent usage and the name Scopariinae has been used by virtually all authors who have recognized the group as a distinct one in

Fascicle 15

the last 80 or more years. Under Article 23 (d) (ii) of the *International Code of Zoological Nomenclature*, when it is observed that strict application of the Law of Priority to familygroup names would upset general usage, the case is to be referred to the International Commission on Zoological Nomenclature for decision as to which name is to be accepted. Meanwhile I retain the more familiar name.

This subfamily consists of small to medium-sized moths with triangular forewings bearing tufts of scales. In our region the forewings are powdery gray to brown in color with a characteristic pattern somewhat resembling that of trifid Noctuidae. The moths are most common in cool or forested regions. They often sit on the trunks of large trees in the daytime, sometimes in large numbers and in company with other groups of Lepidoptera, especially certain tortricoids, and also with caddisflies. They fly mainly at night and are often collected in numbers at light.

The forewing pattern is cryptic in natural surroundings. Its main elements are narrow, pale, dark-bordered, ante- and post-medial lines, dark orbicular, claviform and reniform spots, the last typically X-shaped or 8-shaped, and dark preapical, pretornal and subterminal triangular patches, separated by a V-shaped subterminal line. The labial palpi in our species are prominent and porrect, with the second segment broadly scaled and with the third segment lying along the dorsal surface of this scaling. The maxillary palpi are large and end in a tuft of scales. The proboscis is well developed. The frons is rounded or flattened and usually is smoothly scaled. The vertex has rough erect scaling and distinct chaetosemata. The eyes and ocelli are large. The antennae are weakly thickened and prismatic in the males, filiform in the females; ventrally they are short-pilose or rarely ciliated or fasciculate; dorsally they have alternate scale-rows somewhat raised. The body and legs are moderately slender. The praccinctorium is simple, with a rounded tuft of scales distally. The forewings are subtriangular, usually of moderate width. The forewings have R₃ and R₄ stalked and R₂ well separated from the stalk. 1st A is absent. 3rd A is weak and free. The upperside has weak areas of raised scales. Sometimes there is a fovea in the cell of the male between the orbicular and reniform spots. The hindwings are of moderate proportions, with the termen rounded. Sc and R_s are anastomosed for a short distance. M_1 is usually shortstalked with R_s. The cell is long, with strongly curved discocellular and acute posterior angle. M₂ and M₃ arise from the posterior angle of the cell or are stalked. Cu₁ and Cu₂ arise basad of the posterior angle. The base of Cu is pectinated with hairlike scales in some species. Three anals are present.

The male genitalia have the uncus short, of moderate width and decurved at the sides. The shape varies somewhat in the different genera. The gnathos in our species is V-shaped or Y-shaped, with the median element narrow and very finely denticulate dorsally at the tip. The tegumen is of moderate height and is little narrowed towards the junction with the vinculum. The latter is of moderate proportions and ventrally rounded. The juxta differs in shape in different genera. The valves are variable in proportion; usually they are expanded and rounded distally; the costa and sacculus are generally weakly inflated. In some genera the ventral margin of the valve bears a pointed projection. The penis is cylindrical and well sclerotized. It may or may not be armed with cornuti. The female genitalia vary somewhat in different genera, but in general the ovipositor lobes are soft, the apophyses are slender, the ductus bursae and bursa in our species are membranous and finely spinulose and have rather simple and usually weak armature. The bursa has a membranous accessory sac.

The early stages have been described for relatively few species. Most of the known larvae feed on mosses, but some European species feed on the roots of flowering plants; one Hawaiian species bores in clubmosses (Lycopodium species) and an Australian species bores in tree-ferns. Hasenfuss (1960) characterizes the larvae as follows, on the basis of European species. The epicranial index varies from 1 to 1.2; the adfrontals reach from $\frac{1}{2}$ to $\frac{1}{3}$ the length of the coronal suture. Setae Adf² are placed above the forking of the epicranial suture but lower than P². Setae P² are more widely separated than setae P¹. Seta Adf¹ is nearcr to F¹ than to Adf². Ocellus 5 is situated dorsocaudad of ocellus 6; ocelli 4, 6 and 5 make a more or less right angle. Seta O³ is below the line connecting ocelli 4 and 5 and is considerably nearer to SO³ than to O². Setae O¹, O² and O³ form an acute or a right angle. O³ is nearer to ocellus 2 than to ocellus 1. On the prothoracic shield setae XD2, SD1 and SD2 form a somewhat obtuse to right angle; SD1 and SD2 are farther apart than SD1 and XD2. On the mesothorax and metathorax seta L2 is macroscopic and there is a macroscopic subventral seta. The prolegs are normal, with the crochets in a complete biordinal or triordinal circle, becoming uniordinal laterally. On abdominal segments 1 to 8 setae D2 are decidedly farther apart than setae D1. Seta L1 is dorsocaudad of L2. On the eighth abdominal segment the line DI to SDI runs before and the line SDI to LI behind the spiracle. The SV-MV group on abdominal segments 1 and 2 consists of three macroscopic setae, that of abdominal segment 7 of two or exceptionally of three. On the ninth abdominal segment setae L2 and L_3 are absent. DI is approximated to the very slender SDI and is placed dorsocraniad of it. Setae D2 are on a common pinaculum. The anal shield is well developed. The setae D2 are closer to each other than to SD1. SD2 is macroscopic. Setae V1 of abdominal segment 10 are about as far apart as those of segment 9. V1 is farther from MV3 than SV2 is from SV3.

The larvae are structurally and in habits closely similar to those of the non-boring Crambinae, to which they are probably closely related phyletically. In the European species investigated by Hasenfuss the line connecting SD1 to L1 of the eighth abdominal segment runs behind the spiracle in Scopariinae and in front of it in Crambinae. Setae V1 of abdominal segment 10 are about as far apart as those of segment 9 in Scopariinae but not more than two-thirds as far apart as those of segment 9 in Crambinae. It remains to be seen whether these distinctions will hold for a wider range of species and genera.

The Scopariinae appear to be an old and primitive group and have a world-wide distribution. The two main genera of North America, *Scoparia* and *Eudonia*, each have a very large number of species, showing considerable variation of detail combined with great uniformity of basic structure. *Eudonia* is well developed on all continental areas except temperate South America. It also occurs in most oceanic islands in the temperate and tropical zones, with the exception of western Polynesia and Micronesia, where it has probably been displaced by more progressive immigrants from the Papuan region. Even in this area a single relict species persists in the mountains of Fiji. Hawaii is a large center of endemism for the genus, with about 100 known species. New Zealand also has many species. Smaller centers exist in tropical and temperate Asia, Europe, the African mountains, America and various island groups. *Scoparia* does not extend onto many oceanic islands, but is more evenly distributed over the continents and adjacent islands, having, for example, a number of endemic species in temperate South America, and rich areas of endemism in New Zealand and in the mountains of New Guinea. There are a number of additional genera, most prolifically developed in the Oriental, Papuan and Australian

regions. For a more detailed account see my paper given at the Tenth International Congress of Entomology (Munroe, 1958).

The pantropical *Musotima* group of Nymphulinae is closely related to the Scopariinae and it is possible that the two subfamilies are not really distinct. Also in the Australian region there exist genera annectant between the Scopariinae and the Crambinae, for example *Protyparcha* Meyrick and *Exsilirarcha* Salmon and Bradley, which would be hard to assign with confidence to one subfamily or the other. There are only four genera of Scopariinae in our fauna. Two of them, as already indicated, are of nearly world-wide distribution. The other two are holarctic and western American, respectively. They are distinguished primarily by characters of the genitalia (see plate A).

KEY TO NORTH AMERICAN GENERA

I.	Male with ventral margin of valve of genitalia entire, lacking a pointed or thumblike process, female ductus		sclerotized and posteriorly emar- ginated Cosipara p. 23
	bursae with an elongate, tubular, sclerotized zone Eudonia P· 47		Male genitalia without long spinulose process from the base of the valve; female with seventh sternite normal 3
	Male with a pointed or thumblike process on ventral margin of valve of genitalia; female ductus bursae with- out an elongate, tubular, sclerotized zone	3.	Male genitalia with uncus spatulate, gnathos triangular, not decurved Gesneria this page Male genitalia with uncus triangular,
2.	Male genitalia with a long spinulose process arising at base of valve; female with seventh sternite heavily		pointed or rounded; gnathos Y-shaped, decurved Scoparia p. 29

GENUS Gesneria Hübner

Gesneria Hübner, [1824–25], Verzeichniss Bekannter Schmettlinge [sic], 368. Type-species: Gesneria centurionalis Hübner [1824–25], an emendation and consequently a junior objective synonym of *Tinea centuriella* [Denis and Schiffermüller], 1775. Subsequent designation, Butler, 1883, Ent. Mon. Mag., 19: 180.

Scoparona Chapman, 1912, Trans. Ent. Soc. London, 1912: 507. NEW SYNONYMY. Type-species: Tinea centuriella [Denis and Schiffermüller], 1775. Monotypy and original designation.

The moths are relatively large; except for occasional dwarfed specimens they exceed in size any other members of the subfamily that occur in our fauna. The pattern is in general typical of the subfamily, but females are often heavily suffused with fuscous, and in certain areas many specimens are pallid, with reduced maculation. The spatulate uncus of the male is characteristic and is reminiscent of more primitive genera found in the Indo-Australian region. The early stages are unknown. The genus is a small one and is characteristic of the boreal life zone in the northern and mountainous parts of Europe, Asia and North America. Two species are known from our fauna.

KEY TO NORTH AMERICAN SPECIES

 Forewing broadly triangular and rather pallid; antemedial line oblique distad between Cu and anal fold; postmedial line almost straight from M₂ to posterior margin rindgeorum p. 21

— Forewing narrower, its termen usually

somewhat rounded and its color most often smoky gray, sometimes heavily infuscated, infrequently pallid; antemedial line oblique basad between Cu and anal fold; postmedial line usually obviously curved or bent between M_2 and posterior margin centuriella this page

Gesneria centuriella [Denis and Schiffermüller], NEW COMBINATION PL. I, FIGS. I-18; PL. A, FIG. 5 (McD. 5725).

Tinea centuriella Denis and Schiffermüller, 1775, Ankundung zur Systematisches Verzeichniss der Schmetterlinge des Wiener Gegends, 319. Type-locality: Vienna region.

Gesneria centurionalis Hübner, [1824–25], Verzeichniss Bekannter Schmettlinge [sic], 368. Type-locality: Vienna region.

NOTE—The name *centurionalis* is an unjustified emendation of *centuriella* Denis and Schiffermüller and consequently is a junior objective synonym of that name under Article 33 (a) (ii) of the *International Code of Zoological Nomenclature*. It follows that the two nominal species have the same type-locality.

Eudorea borealis Duponchel, in Lefebvre, 1835, Ann. Soc. Ent. France, 5: 400, pl. 10, fig. 9. Subsp. NEW COMBINATION with Gesneria. Type-locality: Greenland.

Scopula numeralis Zetterstedt, 1839, Insecta Lapponica, 971. NEW COMBINATION with Gesneria. Type-locality: Lapland.

Phycis quadratella Zetterstedt, 1839, *Insecta Lapponica*, 997. NEW COMBINATION with *Gesneria*. Type-locality: Lapland.

Scoparia centurialis Guenée, 1854, Species Général des Lépidoptères, 8: 418. NEW COMBINATION with Gesneria.

Type-locality: Vienna region.

NOTE—This is an emendation of *centuriella* Denis and Schiffermüller; as such it is an objective junior synonym of that name and has the same type-material and type-locality.

Hypena caecalis Walker, 1858, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 16: 36. Subsp. NEW COMBINATION with Gesneria. Type-locality: Nova Scotia.

Scopula caliginosalis Walker, 1865, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 24: 1460. Subsp. NEW COMBINATION with Gesneria. Type-locality: Nova Scotia.

Scoparia ninguidalis Hulst, 1886, Trans. Amer. Ent. Soc., 13: 147. Subsp. NEW COMBINATION with Gesneria.

Type-locality: Arizona.

Scoparia centuriella form confluella Krulikowsky, 1909, Hor. Soc. Ent. Ross., 23: 18. NEW COMBINATION with Gesneria. Type-locality: Kazan.

PYRALOIDEA

The large size and variegated, smoky-gray pattern of the forewings will generally distinguish this from any other species of the subfamily except the congeneric *G. rindgeorum*. However, as will be seen from the plate, the moths are variable, and occasional small and pale specimens may give trouble. These can be separated from other Scopariinae by their rounded wings and robust build. The genitalia of the male are *Scoparia*-like, but differ in the triangular gnathos and spatulate uncus. The main characters that distinguish this species from *G. rindgeorum* have been pointed out in the key. *G. centuriella* is widely distributed over the northern parts of the Holarctic region and ranges into the Appalachian mountain system and down the Cordillera as far as Arizona, whereas *G. rindgeorum* occurs only in relatively restricted areas of the Cordillera in the northern and central U.S.A.

Even after the considerable individual variation of the present species is taken into account, there are substantial differences among certain of the populations. I consider all the populations of our area to be subspecifically distinct from the nominate subspecies from Central Europe. They also show substantial differentiation among themselves. I recognize four subspecies in our territory.

The life history of this species appears to be unknown, in spite of its abundance and wide range.

Gesneria centuriella borealis (Duponchel), NEW STATUS PL. I, FIGS. I, 2.

Eudorea borealis Duponchel, in Lefebvre, 1835, Ann. Soc. Ent. France, 5: 400, pl. 10, fig. 9. Type-locality: Greenland.

The moths are relatively small (length of forewing 11 to 12 mm) and lack prominent dark shades. The forewings are narrow and have the apex rather sharp and the termen only weakly curved.

The subspecies is confined to Greenland, where it occurs in the Hudsonian or subarctic life zone, ranging as far north as Sondrestromfjord.

Gesneria centuriella caecalis (Walker), NEW STATUS PL. I, FIGS. 3–10; PL. A, FIG. 5.

Hypena caecalis Walker, 1858, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 16: 36.

Type-locality: Nova Scotia.

Scopula caliginosalis Walker, 1865, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 24: 1460. Type-locality: Nova Scotia.

The moths are more like those of the nominate subspecies from Central and Northern Europe (plate 1, figures 17, 18) than like those of the previous subspecies from Greenland. They are variable, but are usually broad-winged and average large in size (length of forewing from 12 to 14 mm). The termen of the forewing is somewhat rounded and typically this wing has blackish-fuscous dusting and shades and a brown postmedial shade on a light-gray ground; a form not uncommon in the female sex has the forewing largely suffused with uniform dark brownish fuscous. The moths in general are more crisply marked than their

European counterparts; the pallid medial area of the forewing is more obvious and the orbicular and reniform spots are smaller and more sharply defined.

The subspecies is transcontinental, ranging from Nova Scotia and Labrador west to British Columbia and southern Alaska, and southward into the northeastern USA as far as Massachusetts and Ithaca, New York and the western states as far as Oregon and Idaho. It is replaced in the Beringian region and the central and southern Rocky Mountain region by the following two subspecies.

> Gesneria centuriella beringiella Munroe, NEW SUBSPECIES PL. I, FIGS. II-14.

Scoparia centuriella beringiella Munroe. Type-locality: King Salmon, Naknek River, Alaska.

The moths are relatively small (length of forewing 22–26 mm) and are pale gray with only very weak dark shades. In extreme specimens the pale color and rounded wings give a very bizarre appearance. Less extreme specimens look like *G. c. borealis* from Greenland, but are distinguished by the wider and more rounded forewings. The subspecies occurs in northern Alaska and along the Bering coast to the base of the Aleutians; it has been taken on Popoff Island and is to be expected in the northern Yukon Territory of Canada. It is found also in the interior of central and south-central Alaska and ranges into northern British Columbia. A series from Cameron Bay, Great Bear Lake (plate 1, figures 7, 8) is referred to the subspecies *caecalis*, but shows characters transitional to those of *beringiella*. Material from the Panhandle (Skagway, Ketchikan) and the south-central coast of Alaska (Anchorage, Seward, Lawing) seems best referred to the subspecies *caecalis*.

TYPES: Holotype: J. King Salmon, Naknek River, Alaska; 10 July 1952; J. B. Hartley. Type no. 11,757, CNC.

Allotype: Q. Same locality, collector and type number; 11 Aug. 1952.

Paratypes: 45 33, 8 99. Umiat, Alaska; 7 and 22 July 1959; R. Madge (2 99). Unalakleet, Alaska; 10 July 1961; B. S. Heming, R. Madge (3 99). Popoff Island, Alaska; 12–13 July 1899; T. Kinkaid, Harriman Alaska Expedition (15 33, 2 99). King Salmon, Naknek River, Alaska; 11 July–11 Aug. 1952; J. B. Hartley (7 33). Near Fort Yukon, Alaska (13). Rampart, Alaska; 8 July 1916; B. P. Clark donor (3 33). Isabel Pass, Mile 206, Richardson Highway, Alaska, 2,900 ft; 17 July 1962; P. J. Skitsko (7 33). Summit Lake, Isabella Pass, Alaska; 9 July 1951; W. R. M. Mason and J. R. McGillis (2 33, 1 9). Atlin, British Columbia 21 June 1914 (2 33); 19 July 1930; D. Fraser (5 33). Summit Lake, Mile 1392, Alaska Highway, British Columbia, 4200–4500 ft; 23–24 June and 14–21 Aug. 1959; E. E. MacDougall (3 33). USNM; AMNH; type no. 11,757, CNC.

> Gesneria centuriella ninguidalis (Hulst) PL. I, FIGS. 15, 16 (McD. 5725a).

Scoparia ninguidalis Hulst, 1886, Trans. Amer. Ent. Soc., 13: 147. Type-locality: Arizona.

The moth is in general similar to G. c. caecalis but the average color is much darker. The

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forewings are usually suffused with brown as in the dark female form of G. c. caecalis, and the hindwings are most often uniformly dark brownish fuscous.

Although it was described from Arizona, the subspecies is more common in Colorado. It ranges north at least to the Wind River Range in Wyoming and probably forms a cline northward to northern Montana, where G. c. caecalis exists in typical form.

Gesneria rindgeorum Munroe, NEW SPECIES PL. I, FIGS. 19–23; PL. A, FIG. I.

DIAGNOSIS: The moth averages a little larger than G. centuriella and gives the impression of being more slenderly built, with broader and somewhat less rounded wings. The color is usually relatively pale gray, with little or no brown suffusion, or rarely with fairly even light-brown tints replacing the gray. The hindwings are gray and not suffused with dark brown as in populations of G. centuriella from the same general region. The antemedial line of the forewing is not obtusely indented on the anal fold to the same degree as in G. centuriella; instead it is weakly oblique distad between Cu and the anal fold. The anterior part of the postmedial line is straight and usually oblique basad from costa to R_{3+4} ; there it is sharply angled or bent and strongly oblique distad to M_2 ; thence it is straight or weakly flexed and slightly divergent from the termen, ending on the posterior margin at three-fourths. In the male genitalia the valve is blunter-tipped and has a shorter ventral process; the juxta is wider and dorsally dentate, as compared with G. centuriella.

DESCRIPTION: The frons is rounded, with mixed blackish-fuscous and brown scales. The vertex has rough, erect scaling, mixed blackish fuscous and brownish or grayish. The labial palpi are porrect and exceed the frons by somewhat more than the length of the head; the third segment is hidden in the scaling of the second; the color is black, whitish at the base beneath. The maxillary palpi are fairly prominent, blackish fuscous, with a dilated tuft of scales distally. The proboscis is fuscous-scaled at its base. The eyes are of moderate size and fuscous in color. The ocelli are moderately large, somewhat removed from the eyes. The antennae of the male are filiform; the sensory area is black and finely ciliated; the dorsal area is smoothly fuscous-scaled except distally where some of the scales are paler and where alternate scale-rows are somewhat raised. The antennae of the female are unknown but probably are not very different. The thorax above is dark brownish fuscous. The abdomen above is smoothly dark grayish fuscous with some intermixture of pale grayish-buff scales. The body beneath is brownish fuscous. The legs are dull grayish buff, strongly infuscated dorsally.

The forewings are subtriangular; the costa is slightly sinuated; the apex is subacute; the termen is weakly curved and oblique; the tornus is rounded and the posterior margin is nearly straight. The ground color above is dull gray, variably dusted with fuscous, the general tone dull gray; occasionally the gray tints are supplanted by brown. The basal area is strongly infuscated. The antemedial line is made up of a basal gray and a distal fuscous element, both weak, it runs obliquely distad from costa at one-fourth to Cu, there it is obtusely angled, erect to 2nd A and increasingly oblique to the posterior margin at one-third. The orbicular and claviform spots are obscure and dark fuscous; the former is a dot, the latter a short dash; both are contiguous with the antemedial line. The reniform spot is 8-shaped, erect

and indistinct. Beyond the reniform and basad of the postmedial line there are traces of a castaneous shade, weaker than the corresponding shade of *G. centuriella*. The postmedial line is composed of a basal blackish-fuscous element and a distal gray one; it is faintly crenulated and begins as a thickened though somewhat diffuse, erect or weakly inwardly oblique element from the costa at four-fifths to vein R_5 ; there it is angled distad to M_1 , then it is rather sharply bent and oblique to posterior margin at three-fourths; this part of the line diverges slightly from the termen and is only very weakly sinuated, often nearly straight in its general course. Immediately beyond the postmedial line is a broad, powdery, fuscous shade, narrowed or interrupted at the middle of the wing. The terminal space is somewhat paler gray. There is an obscure row of fuscous terminal dots between the veins. The fringe is dull grayish buff, with traces of a darker, basal line.

The hindwings are rather broad, with the apex slightly produced. The ground color above is gray or light grayish fuscous, considerably paler than in most specimens of G. *centuriella*. There are in many specimens traces of a fuscous discocellular bar, postmedial line and terminal shade. On the average these are more distinct than in G. *centuriella*. The fringe is gray, with traces of a dark line in the basal half.

The forewings beneath are silky fuscous. The discocellular bar is faint, dark fuscous. There is a row of dark-fuscous terminal lines between the veins. The fringe is brownish fuscous.

The hindwings beneath are brownish fuscous, a little paler than the forewings. There is a dark discocellular lunule. In some specimens there are traces of a dark postmedial line. The fringe is brownish fuscous, with a faintly darker line in the basal half.

The length of the forewing is from 14–17 mm.

The male genitalia have the uncus subtriangular, weakly spatulate distally, and laterally setose. The gnathos is slender, pointed and dorsally rather broadly spinulose in its distal part. The juxta is wide, with two pairs of pointed processes dorsally. The vinculum is ventrally rounded. The valves are of moderate width, rounded but hardly expanded distally with the costa weakly inflated and with a stubby inconspicuous process near the middle of the ventral margin of the valve. The penis is slender and cylindrical and contains a small, dentate cornutus.

The female genitalia are unknown.

The early stages are unknown.

The species is known from Utah, Wyoming, Montana and southern Washington; most of the specimens have been taken at elevations around 8,000 feet.

TYPES: Holotype: J. Ranger Creek Camp, 18 miles southwest of Big Horn, Sheridan County, Wyoming, 7,800 ft; 17 July 1959; F. P. and B. Rindge; collected on NSF Grant G 9037. AMNH.

Paratypes: 16 JJ. Same data as for holotype (3 JJ). Vic. Green River Pass, Wind River Range, Wyoming, 10,000–10,500 ft; Hudsonian Zone Meadow; 18–31 July 1939; A. B. Klots (1 J). Taft, Mineral County, Montana; 23 June 1959; A. K. Wyatt (1 J). Cooke City, Park County, Montana; 20 July 1959; F., P. and B. Rindge; collected on NSF Grant G 9037 (1 J). Warner Ranger Station, 28 miles east-southeast of Moab, Utah, 9,200 ft; 30 July and 1 Aug. 1960; F. P. and B. Rindge; collected on NSF Grant G 9037 (2 J). Warner Ranger Station, La Sal Mountains, Utah, 9,000 ft; 4–10 July 1933 (3 JJ). Southern Utah; July 1900 (1 J). Barnes, Southern Utah; July 1900 (1 J). Southern Utah; Poling (1 J). Utah; July 1900; Poling (2 JJ). AMNH; USNM; ABK; type no. 11,758, CNC. The specimen from Berne, Washington, shown on plate 1, figure 23, is a variant and is excluded from the type series.

GENUS Cosipara Munroe, NEW GENUS Type-species: Scoparia tricoloralis Dyar, 1904.

DIAGNOSIS: The moths are similar in general structure to those of the genera *Scoparia* and *Gesneria*. They differ from both in having in the male genitalia a pair of long spinose sclerites arising at the bases of the valves opposite the juxta and in the female genitalia a heavily sclerotized and rugose area on the seventh sternite adjacent to the ostium. The male has the uncus and juxta as in *Gesneria* rather than as in *Scoparia*. The valve has the distal part somewhat constricted and fluted; just basad of the constriction there is a variably developed blunt process on the ventral margin.

DESCRIPTION: The frons is rounded, with smooth and often shining scaling. The vertex has rough, erect scaling. The labial palpi are porrect, the second segment weakly ascending, the third long and acuminate and lying along or buried in the scaling of the second. The palpus exceeds the frons by about the length of the head. The maxillary palpi are prominent, with triangular, strongly dilated distal tuft. The eyes and ocelli are well developed. The antennae are filiform or slightly thickened in the male; the ventral surface is finely pubescent or ciliated; the dorsal surface is scaled. The proboscis is well developed and is scaled at the base. The body is moderately slender. The praecinctorium is prominent and ends in a large transverse fan of scales. The legs are fairly robust and have no striking peculiarities.

The forewings vary somewhat in proportions, but tend to have the apex and termen rounded to some degree. Vein R_1 arises well basad of the anterior angle of the cell. R_2 arises near the anterior angle and is basally somewhat bent and approximated for a short distance to R_{3+4} . R_3 and R_4 are stalked about halfway from the cell to the apex of the wing. R_5 arises a little behind the anterior angle of the cell and is nearly straight and not basally approximated to R_{3+4} . M_1 arises some distance behind R_5 . The discocellular is anteriorly erect, posteriorly oblique. M_2 and M_3 are somewhat separated at their origins; Cu_1 is more widely separated from M_1 and Cu_2 still more widely from Cu_1 . None of these veins are approximated in their basal parts. 1st A is absent. 2nd A is well developed. 3rd A is weak and free.

The hindwings are of moderate proportions and rather thinly scaled. Cu has traces of pectination, at least in some individuals. Sc and R_s are briefly anastomosed. R_s and M_1 are stalked for a short distance. The cell is about three-fourths as long as the wing. The anterior part of the discocellular is erect, the posterior part strongly oblique distad. The posterior angle of the cell is acute. M_2 and M_3 arise together from the posterior angle of the cell and are normally short-stalked. Cu₁ arises a little basad of the posterior angle of the cell and Cu₂ arises in turn somewhat basad of Cu₁. Three anals are present.

The male genitalia have the uncus rather small, moderately narrow, somewhat pyriform and rounded at the tip. The gnathos is about as long as the uncus and is directed posterad, not decurved. It is rather strongly built, with the lateral arms broadly joined and the median element blunt, finely but rather extensively denticulated distally. The juxta is wide and shieldshaped, and has a pair of long, curved, hornlike, spine-fringed processes articulating with it

laterally. These processes are the most striking feature of the genus in the male sex. The vinculum is of moderate proportions, and is evenly rounded and rather thick ventrally. The valves are fairly narrow and are rounded at the tips. The costa is narrowly inflated. The sacculus is conspicuously widened and is rather heavily sclerotized and somewhat inflated. It ends at about the middle of the ventral margin of the valve in a blunt, somewhat curved process, beyond which the valve is perceptibly narrowed. The dorsal part of the mesal face of the sacculus bears several somewhat oblique sclerotized ridges. The distal part of the valve is radially fluted. The penis is short and somewhat irregularly cylindroidal. It lacks cornuti.

The female genitalia have high, weak, sparsely setose ovipositor lobes. The posterior apophyses are slender and T-shaped. The anterior apophyses are somewhat longer and each has a weak triangular thickening near its middle. The lips of the ostium are somewhat sclerotized and rugose, and the seventh sternite is more or less emarginated and invaginated. The ostial chamber is slightly enlarged and somewhat sclerotized. Following it the ductus bursae is weakly constricted, then membranous, moderately wide, straight and of medium length. The bursa is globular and finely but densely spinulose and has a large, more heavily spinulose signum on one side. There is no accessory sac.

The genus has only a few species and so far as known is purely American, ranging from British Columbia southward through the Cordilleran region into Mexico, Central America and northern South America. The species are closely similar in structure and maculation, and some of them appear to be strongly variable individually. The species limits and intraspecific variation merit further study. I recognize three species as occurring within our limits.

KEY TO NORTH AMERICAN SPECIES

I.	Antemedial line outwardly oblique,	2.	Disc of forewing extensively suffused
	nearly straight, marking off a contrast-		with chestnut brown; wing not gener-
	ingly pale-gray basal area chiricahuae		ally blackish-suffused with a contrast-
	p. 27		ingly pale base tricoloralis
-	Antemedial line obtusely angled at Cu,		this page
	the anterior part more strongly out-		Disc of forewing largely gray, with
	wardly oblique than the posterior part;		at most weak brownish tints, or fore-
	basal area often not contrastingly		wing extensively suffused with blackish,
	pale 2		with contrasting pale-gray base modulalis
			p. 25

Cosipara tricoloralis (Dyar), NEW COMBINATION PL. 1, FIGS. 24-27 (McD. 5728).

Scoparia tricoloralis Dyar, 1904, Ent. News, 15: 72. Type-locality: Wellington, Vancouver Island, British Columbia.

Scoparia rufitinctalis Dyar, 1929, Proc. U.S. Natl. Mus., 74 (24): 2. Not Hampson, 1907, err. det.

The variegated shades and large, blackish, oblique patch of the forewing make this a very conspicuous moth. In our fauna it can be confused only with the following species, *C. modulalis*, which has at most only very weakly developed brown shades in the discal region of the forewing, as contrasted with the strong chestnut-colored area of the present species. Rarely the moths are broadly dark suffused, as shown in plate 1, figure 27, but in such

specimens the base is not contrastingly pale. The moths are of moderate size, the length of the forewing varying from 9–10 mm.

The male genitalia are as described for the genus. The valves are not as strongly narrowed beyond the middle as in the following species, and the ridges of the sacculus are weaker.

The female genitalia are very similar to those of the following species, but have the lateral parts of the seventh sternite shorter and the median part more strongly rugose.

The early stages are unknown.

The species ranges from British Columbia south through Washington, Oregon and northern California and down the Sierra Nevada into the San Bernardino Mountains. It is often abundant in its forested habitat.

> Cosipara modulalis Munroe, NEW SPECIES PL. I, FIGS. 28-35; PL. A, FIGS. 2, 6; PL. G, FIG. I (McD. 5727). Scoparia delphusa Fernald, 1902, in Dyar, U.S. Natl. Mus. Bull. 52: 397. Not Druce, 1896, err. det.

Cosipara modulalis Munroe. Type-locality: Greer, White Mountains, Apache County, Arizona.

DIAGNOSIS: The moths occur in two color forms, with some variation and a small proportion of intergrades. One form is closely similar in appearance to C. tricoloralis, though it tends to be somewhat narrower-winged and is less variegated. In particular the warm brown tints of the discal area of the forewing of C. tricoloralis are in the present species largely replaced by gray, often of a pallid ashy shade. The second form is in its extreme manifestation very different. The whole disc of the forewing is heavily suffused with blackish fuscous, leaving the base contrastingly pale ashy gray. In the terminal area the usual three dark triangular patches appear more or less distinctly on a pale-gray ground. The dark form appears to be more numerous in the female sex than in the male and is more numerous in the southern part of the range than in the north. Both forms are closely similar in external appearance to the corresponding forms (smithi (Druce), 1896, and sabura (Druce), 1896), of the Mexican Cosipara smithi (Druce). Both of these names are NEW COMBINATIONS in Cosipara. However, both the male and female genitalia differ substantially in the present species. In the male the uncus is relatively narrow and pyriform, not wide and subtriangular as in C. smithi; the gnathos, on the other hand, is wider in the present species. The valves are more strongly narrowed in the distal half in the present species than in C. smithi; the ridges of the sacculus are strongly oblique, not nearly longitudinal as in that species and the ventral marginal process of the valve is blunt, not sharp as in C. smithi. In the female genitalia the lateral parts of the seventh sternite are triangular as in C. tricoloralis, not rounded as in C. smithi, but in the new species they are more elongate than in C. tricoloralis, and the median part of the sternite is not rugose.

DESCRIPTION: The frons and vertex are fuscous, with a few gray scales admixed. The scaling of the frons is smooth, that of the vertex rough and erect. The labial palpi are blackish fuscous, with the base narrowly white beneath; the whole palpus exceeds the frons by about the length of the head, and the third segment is more or less free from the scaling of the second. The maxillary palpi are strongly dilated with scales distally and are gray, paler than the labial palpi. The basal scaling of the proboscis is light buff. The eyes and ocelli are fuscous. The antennae are fuscous, filiform in both sexes, scaled above and finely pilose

below. The thorax above is dark gray. The abdomen above is grayish buff. The body beneath is pale buff, with some fuscous scaling on the venter of the abdomen. The legs are gray, with considerable infuscation above.

The forewings are of moderate width, with the costa somewhat curved, the apex moderately rounded, the termen weakly curved and the tornus broadly rounded. The length varies from 8-10 mm. As noted in the diagnosis there are two color forms. In the nominate form the ground color is dull gray, and the basal area is not contrastingly pale. Some specimens have a fine, longitudinal, black basal dash; in others this is absent. The antemedial line is very fine and weak; it is fuscous in color and is outwardly oblique from the costa at one-fourth to Cu, thence less strongly oblique to 2nd A and again more strongly oblique outward to the posterior margin at one-third. Immediately distad of the postmedial line is a thick, outwardly oblique, posteriorly rounded, black fascia from the costa to the anal fold. This fascia takes in the orbicular and claviform spots and in most specimens is prolonged in a narrow process distad along Cu to approach or join the posterior part of the reniform spot. The latter is large, black, 8-shaped, with the posterior loop weak or incomplete. The postmedial line is fuscous, followed by light gray. It is thickened and slightly oblique distad from the costa at three-fourths to vein M1, thence excurved around the angle of the cell and oblique basad to the anal fold, there obtusely angled and less oblique to the posterior margin at three-fourths. There are at most weak traces of brown scaling beyond the reniform spot in the curve of the postmedial line. There are fairly strong, grayish-fuscous, pretornal, preapical and subterminal triangular patches. The fringe is dull gray with darker basal checkering. The second form resembles the form sabura of C. smithi. It has the base of the forewings above contrastingly pale gray, the disc largely suffused with blackish fuscous, obscuring the ordinary markings, but with some brown tints in the bend of the postmedial line. The latter and the markings of the subterminal and terminal areas are as in the nominate form.

The hindwings of both forms above are translucent whitish gray, with narrow terminal infuscation. The fringe is whitish gray with traces of a dark midline.

The forewings beneath are almost uniformly light gray, with traces of a dark discocellular spot and with the anterior part of the postmedial line faintly indicated as a dark-gray bar on the somewhat ocher-tinted costal area. The fringe is gray, with a darker midline.

The hindwings beneath are uniformly whitish gray, without terminal infuscation.

The genitalia are as described for the genus. The differences from allied species are noted in the key and in the diagnosis, above.

The early stages are unknown.

TYPES: Holotype: Q. Greer, White Mountains, Apache County, Arizona, 8,500 ft; 6 Aug. 1962; E. and I. Munroe; black light. Type no. 11,759, CNC.

Allotype: J. Greer, White Mountains, Apache County, Arizona, 8,500 ft; 5 Aug. 1962; E. and I. Munroe; black light; genitalia slide no. 1190 DK. Type no. 11,759, CNC.

Paratypes: 73 specimens. Greer, White Mountains, Apache County, Arizona, 8,500 ft; 5–8 Aug. 1962; E. and I. Munroe, black light (5 specimens). Same locality; 12 June 1936; Grace H. and John L. Sperry (1 specimen); near Rice, White Mountains, Arizona, 7,200 ft; 15–30 July 1925; O.C. Poling (13 specimens). White Mountains, Arizona; 1–15 Aug. 1925; O. C. Poling (18 specimens). White Mountains, Arizona, 7,200 ft; 1–15 Aug. 1925; O. C. Poling (15 specimens); White Mountains, Arizona, 7,200 ft; 15–30 Aug. 1925; O. C.

O. C. Poling (2 specimens). White Mountains, Arizona, 7,200–11,500 ft; 10–30 Aug. 1925; O. C. Poling (4 specimens). Near McNary P.O., White Mountains, Arizona; 15–30 Aug. 1925; O. C. Poling (12 specimens) and 1–15 Sept. 1925 (2 specimens). White Mountains, Arizona (1 specimen). CNC; USNM.

ADDITIONAL MATERIAL: The following specimens are excluded from the type-series, either because they belong to the form with dark-suffused wings or because they come from areas outside the White Mountains of Arizona: Greer, White Mountains, Apache County, Arizona, 8,500 ft; 5 and 6 Aug. 1962; E. and I. Munroe; black light (3 specimens). White Mountains, Arizona; various elevations, localities and dates in 1925; O. C. Poling (34 specimens). Redington, Arizona (2 specimens). Santa Catalina Mountains, Arizona (4 specimens). Onion Saddle, Chiricahua Mountains, Cochise County, Arizona, 7,600 ft; 15 July 1967; J. G. Franclemont (1 specimen). Jemez Springs, New Mexico (1 specimen). Fort Wingate, New Mexico (1 specimen). Horseshoe Springs Camp, 2 miles west of La Cueva, Sandoval County, New Mexico, 7,900 ft; 28-30 July 1961; F., P. and J. Rindge (6 specimens). McMillan Camp, 13 miles north of Silver City, Grant County, New Mexico, 6,800 ft; 19 and 24 July 1961; F., P. and J. Rindge (2 specimens). Bursum Camp, 18 miles east of Alma, Catron County, New Mexico; 9,000 ft; 10 July 1961; F., P. and J. Rindge (1 specimen). Flat Canyon Camp, 33 miles northwest of Huntington, Sanpete County, Utah, 8,800 ft; 7 Aug. 1958; F., P. and J. Rindge (1 specimen). Huntington Canyon Camp, 22 miles northwest of Huntington, Emery County, Utah, 8,000 ft; 9 Aug. 1958; F., P. and J. Rindge (2 specimens). Buckboard Flat Camp, 7 miles west of Monticello, San Juan County, Utah, 8,800 ft; 23-28 July 1960; F., P. and B. Rindge (7 specimens). Denver, Colorado; Oslar (5 specimens). Boulder, Colorado; Oslar (1 specimen). Rock Creek, near Colorado Springs, Colorado; 25 Aug. 1935; A. B. Klots (1 specimen). Reuter Canyon Camp, 5 miles north of Sundance, Crook County, Wyoming, 6,100 ft; 13 July 1959; F., P. and B. Rindge (2 specimens). Spring Creek Camp, 11 miles northeast of Hill City, Pennington County, South Dakota; 30 July 1955; F. and P. Rindge (6 specimens).

REMARKS: So far as North American records go, this is the species referred to by Dyar (1929: 2) as Scoparia delphusa Druce, with S. smithi Druce, S. sabura Druce and S. flexuosa Dyar in synonymy. As already indicated above, Cosipara smithi (Druce) and C. sabura (Druce) are forms of one species but this is clearly distinct from C. modulalis. Cosipara delphusa (Druce), NEW COMBINATION, is a definitely more coarsely powdered species than C. smithi and has the orbicular shorter than the claviform and the postmedial line farther removed from the termen and more sinuous. There is no question that the two species are different. Cosipara flexuosa (Dyar), NEW COMBINATION, from Chiapas, is much more similar to C. smithi and perhaps should be synonymized with it, but I have not examined the type structurally and accordingly I think it wiser to leave the two separate for the time being. None of these four nominal species occurs north of Mexico as far as I know.

Cosipara chiricahuae Munroe, NEW SPECIES PL. 1, FIG. 36; PL. G, FIG. 2.

Cosipara chiricahuae Munroe. Type-locality: Chiricahua Mountains, Arizona, 6,000–9,000 ft.

DIAGNOSIS: The moth somewhat resembles the dark forms of C. modulalis and C. smithi, but is smaller (length of forewing 8 mm) and has the forewings narrower with oblique termen and with the basal area smaller and defined by a straight, outwardly oblique antemedial line. The hindwings are white, without gray tints and with very narrow, rather sharply defined, fuscous shading. The male is unknown, but the female genitalia have the ovipositor lobes triangular and short-setose. The anterior apophyses are about twice as long as the posterior ones. The ostial chamber is funnel-shaped, sclerotized. The bursa is round, with a linear signum.

DESCRIPTION: The frons is rounded, smoothly scaled and dark fuscous. The vertex is roughly scaled, mixed fuscous and buff. There is a white line between the antennal socket and the eye. The labial palpi are porrect, exceeding the frons by a little less than the length of the head. The third segment is hidden in the conical scaling of the second. In color the labial palpi are black, contrastingly pale buff at the base beneath. The maxillary palpi are prominent, with a large, expanded tuft of scales distally; in color they are black with a few pale-buff scales. The basal scaling of the proboscis is light buff. The eyes and ocelli are dark fuscous. The male antennal characters are unknown. The female antennae are filiform, fuscous, scaled above and pubescent beneath. The collar has a number of whitish scales. The thorax above is fuscous, with fine light-gray admixture. The abdomen above is light buff, with the posterior margins of the segments whitish. The body beneath is whitish buff, with a few fuscous scales on the ventral surface of the abdomen. The legs are whitish buff, dorsally banded with fuscous. The praecinctorium ends in a prominent tuft of pure-white scales.

The forewing is 8 mm long, rather narrow, with nearly straight anterior margin, subacute apex, oblique termen, obtuse tornus and basally curved posterior margin. The basal area above is rather small, and defined outwardly by an outwardly oblique, very weakly sinuous, white antemedial line. The basal area itself is light brownish gray, contrasting sharply with the dark-fuscous medial area; it bears a small black dash at the extreme base. The orbicular and claviform spots are almost completely obscured in the blackish-fuscous basal part of the medial area. The distal part of the medial area is more powdery blackish fuscous, traces of the 8-shaped reniform spot are visible. The postmedial line is distinct and light gray. It is erect from the costa at four-fifths to vein R_5 ; there it is right-angled and excurved in the median area, then oblique basad to 2nd A and thence erect to the posterior margin at four-fifths. The subterminal area has large but not very distinct blackish-fuscous preapical and pretornal patches and a row of fairly large fuscous subterminal spots, largest at the middle of the wing. The fringe is buff, with obscure fuscous checkering.

The hindwings above are white, with narrow terminal infuscation. The fringe is basally gray, distally contrastingly white.

The forewings beneath are silky gray, darker towards the apex. The costal area is yellowish buff, with a fuscous postmedial bar. The fringe is light fuscous, with two very narrow, pale-buff lines in the basal half.

The hindwings beneath are as above, but with only a trace of terminal infuscation and with the fringe almost wholly white, with only a very weak sub-basal gray line.

The male genitalia are unknown. The female genitalia are characterized under the diagnosis, above.

TYPE: Holotype: Q. Chiricahua Mountains, Arizona, 6–9,800 ft; 1–5 July 1927; J. A. Kusche. CAS. Only the holotype is known.

GENUS Scoparia Haworth

Scoparia Haworth, 1812, Lepidoptera Britannica, 3: 498.

Type-species: *Tinea pyralella* Hübner, 1796, now considered a synonym of *Scoparia arundinata* (Thunberg), 1792.

NOTE—Whalley (1963: 82) pointed out that *T. pyralella* was designated as type-species of *Scoparia* when Curtis (1827: 170) designated it as type-species of *Eudorea*, which he proposed as a replacement name for *Scoparia*. Curtis wrongly considered *Scoparia* unavailable because of its prior use for a genus of plants. This designation takes precedence over the designation by Hampson in 1897 of *Scoparia cembrae* Haworth, 1812, which has usually been accepted. The change does not affect the use of the name, because *S. pyralella* and *S. cembrae* are currently considered to be congeneric.

Scopea Haworth, 1812, Lepidoptera Britannica, 3: 498.

Type-species: Scopea cembrae Haworth, 1812. Monotypy.

NOTE—This name was used only in combination with the specific name of the type-species. Perhaps it is best treated as an erroneous spelling of *Scoparia*, in which case it has no independent status.

Eudorea Curtis, 1827, British Entomology, 4: 170. Type-species: Tinea pyralella Hübner. Original designation (see note under Scoparia, above).

Cholius Guenée, in Duponchel, 1845, Europae Microlepidopterorum Index Methodicus, 94.

Type-species: Pyralis ochrealis [Denis and Schiffermüller], 1775. Monotypy.

Tetraprosopus Butler, 1882, Ann. Mag. Nat. Hist., (5) 9:97. NEW SYNONYMY. Type-species: Tetraprosopus meyrickii Butler, 1882. Monotypy.

Xeroscopa Meyrick, 1884, Trans. Ent. Soc. London, 1884: 349. Type-species: Scoparia ejuncida Knaggs, 1867. Subsequent designation, Hampson, 1897, Trans. Ent. Soc. London, 1897: 226.

The moths do not differ significantly in external characters from the previous two genera. The North American species are mostly relatively small and dull in coloration, but one or two of the western species are as large as most species of *Eudonia* and even the smaller species of *Cosipara*.

The male genitalia are distinctive. They resemble those of the previous two genera in having a process on the ventral margin of the valve marking the end of the sacculus, but the process is slender and sharp, not blunt as in *Gesneria* and most *Cosipara* species. The uncus is pointed, not spatulate or rounded, and the gnathos is slender, Y-shaped and decurved. The juxta is oblong. The penis usually but not always has distinct cornuti. The female genitalia are not unlike those of *Gesneria*, with the seventh sternite unmodified, the ductus bursae unsymmetrical, with short, weak zone of sclerotization, and the bursa elongate, with diffuse, unsymmetrical areas of strengthened spinules or scobination.

The larvae of North American species have not been described. Certain European species are known to feed underground on the roots of ragwort (*Senecio* species), coltsfoot (*Tussilago*

farfara L.) and ox-tongue (*Picris* species), but they are not particularly close to our species. Some European species are believed also to tunnel in mosses, as do the larvae of a number of species of *Eudonia*. A. E. Brower (personal communication) has informed me that he has found *S. penumbralis* emerging from lichen-covered trunks of black spruce, *Picea mariana* (Miller) Britton, Sterns and Poggenb. in Maine, but it is not known whether the larvae fed there or whether it was only a pupation site.

The genus is a large one, of world-wide distribution in continental areas and subcontinental islands, but unlike the following genus it is not widely distributed on oceanic islands. *Scoparia* and *Eudonia* each have about 40 species in New Zealand, but so far only *Scoparia* is known from Chile, where at least 20 species have been found. The richest known representation of *Scoparia* is in the mountains of New Guinea, where there are dozens of species, some of large size and with unique sexual modifications.

The number of species in North America is small, though probably not all have yet been discovered. The S. basalis group is confined to eastern North America, where it ranges from southern Canada southward through the Appalachians and Ozarks. S. biplagialis is transcontinental and is closely allied to forms ranging from temperate East Asia southward into Ceylon. The S. rigidalis group extends from Arizona southward into South America, where it is represented by S. tersella Zeller and S. subtersella Dyar. The S. cervalis group is widely distributed in the western half of North America and no doubt ranges southward into Mexico. The remaining North American species are known only from the southwest. Their affinities are so far uncertain, but they will probably prove to have Mexican relatives.

KEY TO NORTH AMERICAN SPECIES

Forewing above with postmedial line almost straight and parallel to termen; uncus of male genitalia elongate, dist- ally weakly expanded, either truncate and slightly notched or distinctly bifurcate	- Length of forewing under 10 mm; ground color lighter gray; reniform spot smaller and less conspicuous; hindwing whitish gray, with dark markings hardly indicated; male genitalia with tip of uncus truncate and only faintly notched; a distal patch of numerous small cornuti much more conspicuous than the fused group of few, short, strong, pointed cornuti denigata p. 3 ²
Length of forewing over 10 mm; ground color dark gray; reniform spot large and conspicuous; hindwing whit- ish gray to dark gray, with distinct though faint dark discocellular bar and subterminal shading and pale post- medial line; male genitalia with tip of uncus distinctly bifurcate; a distal patch of small cornuti much less con- spicuous than a fused group of few short, strong, pointed cornuti rigidalis p. 32	 3. Hindwing above dark fuscous, almost matching the obscurely marked, fuscous forewing; eastern penumbralis p. 43 — Hindwing above not dark fuscous, at most dull gray; forewing above rarely dark fuscous and usually with distinct markings; eastern, western or transcontinental
)	FASCICLE 13.1A: 1972

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reniform, orbicular and claviform spots contrastingly blackish fuscous; orbicular almost directly anterior to claviform or at least to its basal part . . *normalis* P. 33

- 6. Length of forewing about 6 mm; its color powdery gray, with very large, though slenderly outlined, 8-shaped reniform spot, more than half width of wing and touching retracted part of postmedial line posteriorly huachucalis
 p. 46
- Forewing with reniform spot much smaller

- 8. Ordinary markings of forewing crisp and contrasting on a dark-gray ground; male genitalia with juxta more than three times as high as wide; Davis Mountains, Texas blanchardi P· 39

9	Ordinary markings of forewing dull and suffused, if fairly distinct then ground color light gray; male genitalia with juxta less than twice as high as wide; central New Mexico to Arizona and Utah	
pachealis	Laterodistal zones of spines of penis arising from the sclerotized wall of the aedoeagus; western New Mexico to Arizona and Utah af	9.
p. 55 ruidosalis p. 37	Laterodistal zones of spines of penis arising from membrane in terminal emarginations of aedoeagus; Sierra Blanca, New Mexico	
balloralis	Uncus of male genitalia subtriangular, tapering to a point; widely distributed in western North America	10.
ifornialis p. 35	Uncus of male genitalia parallel-sided, with broadly rounded end; vicinity of Los Angeles, Californiacala	
plagialis	Forewing above with postmedial line dentate between costa and the median flexure; antemedial line oblique distad from costa to anal fold or 2nd A, then erect or oblique basad to posterior margin; penis of male without cornuti; transcontinental bij	II.
p. 40	Forewing above with postmedial line evenly oblique or weakly curved from costa to median flexure; antemedial line evenly arcuate or with the anterior more strongly oblique part extending only into the discal cell; penis of male with cornuti; eastern	
reomedia	Antemedial line of forewing evenly arcuate; basal area often conspicuously darker than disc; the latter pale gray; reniform spot often reduced and X- shaped; postmedial line nearly straight before and behind the obtuse median flexure ciner	12.
P• 44	Antemedial line of forewing usually angulate in cell, the posterior part straight and slightly oblique distad:	

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13. Cornuti of male genitalia long and slender; female genitalia with ostial end of ductus bursae finely scobinated and with short sclerotized collar somewhat removed from the ostial end; rest of ductus long and coiled, with a number of toothlike spines in the coil basalis P. 45 - Cornuti of male genitalia short and stout; female genitalia with ostial end of ductus bursae wide, sclerotized and funnel-shaped; rest of ductus bursae short, not coiled, gradually expanding and lacking toothlike spines dominicki p. 46

Scoparia rigidalis Barnes and McDunnough

PL. I, FIGS. 39, 40; PL. B, FIG. 1; PL. G, FIG. 3 (McD. 5733).

Scoparia rigidalis Barnes and McDunnough, 1912, Contrib. Nat. Hist. Lep. N. Am., 1 (5): 34, pl. 2, fig. 7.

Type-locality: Palmerlee, Arizona.

NOTE—The lectotype is a male, hereby designated from a series of two male and two female syntypes, all from the same locality. It bears the label, "*Scoparia rigidalis* B. & McD. Type J."

The moth is easily distinguished from all except *S. denigata*. It is relatively large (length of forewing 10–11 mm) and has the forewings medium to dark gray, with the base and most or all of the area beyond the postmedial line infuscated. The antemedial and postmedial line are both narrow, distinct, practically straight, a little paler than the ground color and edged medially by a narrow fuscous line. The antemedial line is strongly oblique distad; the postmedial is oblique basad, paralleling the termen. The orbicular spot is a fuscous dot, placed anterodistad of the similar claviform; the latter is placed on the outer dark element of the antemedial line. Both these spots may be almost obsolete. The reniform spot is fairly large and unsymmetrically 8-shaped, with a strong, black horizontal median bar. The hindwings are light gray, with a fairly distinct fuscous discocellular lunule and a wide and fairly obvious zone of rather weak fuscous terminal suffusion.

The male genitalia have the uncus sharply bifurcate distally. The penis has two groups of cornuti: a small distal patch of spinules and a more basal group of four basally fused spines. The female genitalia have the ductus bursae short, broad and straight; the ostial end has a heavy, gradually tapering sclerotized zone. The bursa is round and membranous.

The early stages are unknown.

The species ranges from the Baboquivari Mountains in Arizona north to the vicinity of Flagstaff, east as far as Comfort, Texas, and south into Chihuahua, Mexico.

Scoparia denigata Dyar

PL. I, FIGS. 41, 42; PL. B, FIG. 2; PL. G, FIG. 4 (McD. 5744).

Scoparia denigata Dyar, 1929, Proc. U.S. Natl. Mus., 74 (24): 2. Type-locality: Huachuca Mountains, Arizona.

NOTE—Dyar designated a holotype for this species. Of the three paratypes, the one from Arizona collected by Poling seems to be conspecific; the one from the White Mountains, Arizona, is a female of *Eudonia alialis* (Barnes and McDunnough) and that from San Diego, California, is a badly worn male of *Eudonia rectilinea* (Zeller).
PYRALOIDEA

This species is very closely similar in its external characters to *S. rigidalis*. The moths are smaller (length of forewing just under 10 mm) and a little paler. The hindwings above are whitish gray and lack the dark markings that are indicated in *S. rigidalis*. In the male genitalia the tip of the uncus is truncate and weakly notched, not sharply bifid as in *S. rigidalis*. The penis has the distal batch of spinelike cornuti relatively more extensive and the small group of fused cornuti relatively smaller than in *S. rigidalis*. The female genitalia are like those of *S. rigidalis* except that the sclerotization of the ostial end of the ductus bursae has its distal end slightly expanded then rounded and constricted to a narrow opening to the membranous part of the ductus bursae.

The early stages are unknown.

I have seen material that I refer to this species from Paradise and Palmerlee and from the Baboquivari, Santa Rita, Huachuca, Chiricahua and White mountains, all in Arizona.

In spite of the close external similarity of this species to S. rigidalis, the genital differences indicate that it is distinct.

Scoparia normalis Dyar PL. 1, FIGS. 37, 38; PL. A, FIGS. 3, 7 (McD. 5726). Scoparia normalis Dyar, 1904, Ent. News, 15: 71. Type-locality: Beulah, New Mexico, 8,000 ft.

The moth is easily distinguished by its large size (length of forewing over 10 mm), pale-gray ground color and distinct and normal maculation.

The male genitalia resemble those of the preceding two species in having a distal group of fine spinuliform cornuti and a more proximal group of a few short, thornlike, basally united, radiating ones. The other structures are considerably different, however. The uncus is short, wide and nearly pentagonal, with narrowly rounded angles; the gnathos is large and blunt-tipped; the juxta is rounded; the valves have the distal parts narrow and fluted and the ventral process broad, though sharply pointed. The female genitalia have the ovipositor lobes normal, the posterior apophyses very short, and the ductus bursae and bursa membranous and unarmed.

The early stages are unknown.

This is one of the less common species of the genus, but it is widely distributed in the mountains of the western interior. I have seen it from Carbon County, Wyoming, from a number of localities in Utah and the Rocky Mountains of Colorado and thence through the mountains of Arizona and New Mexico as far south as the Chiricahuas. It is a species of medium-high elevations, occurring as high as 9,000 feet in Wyoming and below 7,000 feet in Utah and Arizona. It has been taken in some numbers at suitable times and places but usually seems to be rare. It appears to be closely related to the Mexican *Scoparia anadonta* Dyar.

Scoparia palloralis Dyar, NEW STATUS PL. 2, FIGS. 1–7; PL. B, FIG. 3; PL. G, FIG. 5 (McD. 5747a, 5747c, 5749).

Scoparia basalis palloralis Dyar, 1906, Jour. New York Ent. Soc., 14: 106.

Type-locality: Platte Canyon, Colorado.

NOTE—The locality cited is that of the lectotype, a male collected by Oslar, type no. 9637, USNM. The name was based on a series of syntypes from various localities in Colorado,

Arizona and New Mexico, consisting of a mixture of this species and *S. apachealis*. The present specimen is conspecific with the specimen from the Argus Mountains that has for some years been segregated as the type in the USNM. That specimen has lost the abdomen and one forewing and I consequently consider it unsuitable for designation as lectotype. The status of this name is doubtful, because Dyar proposed it as "*Ab. a.* **palloralis**, new variety." The context makes it fairly clear that he was dealing with what he considered a geographic variety, and I therefore consider it to have been proposed at the subspecific rather than the infrasubspecific level and to be available as from Dyar, 1906. The next use was by Barnes and McDunnough in their 1917 Check List, but their bibliographic reference was only implicit. Dyar, 1929: 3, synonymized the species with *S. basalis* Walker. Klima, 1937: 34, cited it as "ab. *palloralis* Dyar" of *S. basalis*. If neither Dyar's nor Barnes and McDunnough's use of the name is considered as making it available, then it has no standing except as of the present date and the name *Scoparia cervalis* McDunnough should be used for the species.

Scoparia basalis obispalis Dyar, 1906, Jour. New York Ent. Soc., 14: 106. NEW SYNONYMY. Type-locality: San Luis Obispo, California.

NOTE—This name was based on a series of four syntypes from the same locality. I hereby designate as lectotype a male in the USNM, type no. 9638. This name was proposed in terms similar to those already discussed for *S. palloralis* and the same argument as to the availability of the name applies. The synonymy is new only in a sense, as Dyar, 1929: 3, listed these two nominal species and also *S. cervalis* in the synonymy of *S. basalis*.

Scoparia cervalis McDunnough, 1927, Can. Ent., 59: 267. NEW SYNONYMY. Type-locality: Seton Lake, British Columbia.

This species varies considerably in size, but is always small, the length of the forewing ranging from 5–9 mm. The appearance varies somewhat, but the species usually has inconspicuous maculation and brown-tinted forewings. The antemedial line is erect except near the costa, where it is weakly oblique distad. The orbicular spot is small and is placed directly ahead or ahead and very slightly distad of the claviform. The postmedial line is angulate between the costa and the median flexure. The dark patches in the subterminal area are usually indistinct.

The male genitalia are distinctive. They resemble those of *S. californialis* in the short penis with a ventral diverticulum containing a patch of numerous small, spinelike cornuti. However they differ from those of *S. californialis* in having the uncus pointed, instead of broadly rounded as in that species. The female genitalia have moderately well-developed, weakly setose ovipositor lobes and short, weak apophyses. The ostial chamber is short, broadly funnel-shaped and sclerotized, and leads into a tubular sclerotized zone of the ductus. The rest of the ductus and the bursa are membranous.

The early stages are unknown.

The species has a wide range in western North America, extending from British Columbia to southern California, western Texas and northern Mexico.

There is considerable variation in the intensity and detailed shape of the markings. Some of this may be geographically correlated, but the material at hand is not representative enough to prove this. The name *obispalis* applies to a small, almost immaculate form from southern coastal California. I have seen a number of specimens of this, but I am not satisfied that it is constant enough to be considered a geographical subspecies. The species is closely similar to *S. californialis* in external appearance. The pointed uncus in the male genitalia is strikingly different from the broadly rounded uncus of *S. californialis*.

Scoparia californialis Munroe, NEW SPECIES PL. 2, FIG. 8; PL. B, FIG. 4. Scoparia californialis Munroe.

Type-locality: Bouquet Canyon, Los Angeles County, California.

DIAGNOSIS: The moth is similar in general appearance to *S. palloralis*. The forewings are rather broadly triangular, distinctly brown and faintly marked. The male genitalia are closely similar to those of *S. palloralis* except in the shape of the uncus, which is larger in the present species and broadly rounded distally, not pointed as in *S. palloralis*.

DESCRIPTION: The frons and vertex are buff, both rather roughly scaled, the frons slightly flattened. The labial palpi are porrect and exceed the frons by a little more than the length of the head. The third segment is hidden in the pointed distal scaling of the second. The color is buff, contrastingly paler at the base beneath. The maxillary palpi are prominent, with a strongly expanded and flattened distal tuft of scales. They are buff in color. The proboscis is prominent, with buff basal scaling. The eyes and ocelli are brown. The antennae of the male are buff, strongly pilose ventrally, scaled dorsally, with alternate scale-rows strongly raised. The thorax above is buff, slightly variegated lighter and darker. The abdomen above is uniformly paler buff. The body beneath and legs are buff.

The forewings are rather broadly triangular, with the costa slightly curved, the apex subacute, the termen nearly straight and weakly oblique, the tornus narrowly rounded and the posterior margin curved near the base. The ground color above is light grayish buff, with widely scattered fuscous dusting. There are traces of darker sub-basal and antemedial spots on Cu. The antemedial line is weak, pale buff, followed by irregular dark-brown shading, and is weakly oblique distad from the costa to Cu, then erect to the posterior margin. The reniform and claviform are small dark-brown spots joined to the antemedial shading. The orbicular spot is small, X-shaped and fuscous. The postmedial line is barely indicated as a fuscous marking near the costa. There are weak, brown, triangular preapical, pretornal and subterminal patches. There is a series of weak brown terminal dots. The fringe is light buff, weakly checkered with brown.

The hindwings above are uniformly whitish buff.

The wings beneath are silky grayish buff and unmarked.

The length of the forewing is 8 mm.

The male genitalia are almost exactly as in the preceding species, except for the parallelsided, distally broadly rounded uncus. The female genitalia are unknown.

The early stages are unknown.

TYPE: Holotype: J. Bouquet Canyon, Los Angeles County, California; 31 May 1937; genitalia slide no. 1232 DK. LACM.

Scoparia apachealis Munroe, NEW SPECIES PL. 2, FIGS. 9–14; PL. B, FIG. 5; PL. G, FIG. 6.

Scoparia apachealis Munroe. Type-locality: Greer, White Mountains, Apache County, Arizona.

DIAGNOSIS: The moths are somewhat variable in appearance, both individually and geographically. They average larger than *S. palloralis* and *S. californialis*, the length of the forewing

varying from 7–10 mm. The markings vary considerably and are discussed under the subspecies. In general they are similar to those of *S. palloralis* and *S. californialis* but with the ground color much grayer, often without brown tints. The male genitalia have the uncus pointed as in *S. palloralis*. The gnathos is narrow and rodlike distally. The juxta is large and shield-shaped, with hornlike dorsolateral processes and a strong, median, carinate, dorsal process. This shape of juxta is found in *S. ruidosalis* and *S. blanchardi* but not in *S. palloralis* and *S. californialis*. The valve is of normal shape for the genus. The penis is slightly expanded distally, and the aedoeagus is armed distolaterally with small but strong spines arising from its lateral walls. The female genitalia have short posterior apophyses, considerably longer anterior apophyses, a wide, short, sclerotized collar near the ostial end of the long slender ductus bursae and a globular unarmed bursa.

The early stages are unknown.

The species ranges from Garfield Co., Utah, southward into Arizona and New Mexico. It has strong geographic variation, the full pattern of which will be revealed only by more extensive collecting. I recognize three subspecies, which would hardly be suspected as being conspecific on the basis of external characters alone.

Details of the type material are given under the nominate subspecies.

Scoparia apachealis apachealis Munroe PL. 2, FIGS. 9, 10; PL. B, FIG. 5; PL. G, FIG. 6. Scoparia apachealis apachealis Munroe. Type-locality: Greer, White Mountains, Apache County, Arizona.

DIAGNOSIS: The size is relatively large, the length of the forewing varying from 8–10 mm, with large specimens predominating within this range. The ground color of the forewings above is dark gray, with the markings weakly visible and often almost obsolete. The antemedial line is weakly arcuate, fuscous, with the small and inconspicuous claviform imbedded in it. The orbicular is inconspicuous and directly anterior to the claviform, often virtually obsolete. The reniform is X-shaped, fuscous, fairly distinct, with the horizontal middle bar stronger than the rest. The postmedial line is pale, linear, inconspicuous and situated rather near the termen. The preapical, pretornal and subterminal patches are weak or absent. The fringe is gray. The hindwings above and both pairs of wings beneath are unicolorous medium gray.

TYPES: Holotype: J. Greer, White Mountains, Apache County, Arizona; 5 Aug. 1962; E. and I. Munroe; black light. Type no. 11,760, CNC.

Allotype: Q. Same data as for holotype. CNC.

Paratypes: 42 specimens. Greer, White Mountains, Apache County, Arizona, 8,500 ft; 2–6 Aug. 1962; E. and I. Munroe; black light; (40 specimens). McGaffey, Zuñi Mountains, McKinley County, New Mexico; 20 and 22 July 1962; E. and I. Munroe; black light (2 specimens). CNC.

Scoparia apachealis pinalensis Munroe, NEW SUBSPECIES PL. 2, FIGS. 11, 12.

Scoparia apachealis pinalensis Munroe. Type-locality: Pinal Mountains, Arizona.

PYRALOIDEA

The moths are smaller than in the previous subspecies, the length of the forewing being about 7 mm. The forewings above are somewhat lighter gray and have more distinct markings. The antemedial line is outlined by a strong fuscous shade; the reniform spot is larger and stronger; the postmedial line is stronger and more contrastingly pale; the preapical, pre-tornal and subterminal patches are stronger and sometimes contrastingly fuscous. The hindwings and underside are uniformly gray, as in the nominate subspecies.

TYPES: Holotype: J. Pinal Mountains, Arizona; July 1900; Kunze; cotype of Scoparia basalis palloralis Dyar. USNM.

Allotype: Q. Data as for holotype. USNM.

Paratypes: 9 specimens. Paradise, Cochise County, Arizona; Aug.; Barnes Collection (1 specimen). Same locality; 16–23 Aug. (1 specimen). Redington, Arizona (1 specimen). Arizona; July, Aug., Sept.; O. C. Poling (6 specimens). USNM; type no. 11,761, CNC.

Scoparia apachealis utalis Munroe, NEW SUBSPECIES PL. 2, FIGS. 13, 14.

Scoparia apachealis utalis Munroe.

Type-locality: Red Canyon Camp, 11 miles southeast of Panguitch, Garfield County, Utah, 7,200 ft.

The moths are about the same size as the nominate species, the length of the forewing ranging from 7.5–10 mm. The forewings are much paler, being a light, rather powdery gray, with a slight brownish tint. The markings are more distinct than in either of the other two subspecies. The antemedial line is rather strongly and widely outlined in fuscous. The claviform and orbicular spots are usually black and clearly visible, often longitudinally linear, the orbicular directly anterior to the claviform. The reniform spot is well developed, fuscous, and X-shaped or 8-shaped. The postmedial line is pale, linear and narrowly outlined basad and broadly bordered distad with fuscous, the latter border being composed of the usually fused, but sometimes partly or wholly separated, preapical, pretornal and subterminal spots. There is a distinct row of fuscous subterminal dots. The fringe is buffy gray, faintly checkered with fuscous. The hindwings above are rather light gray, slightly darkened terminally. The wings beneath are somewhat darker gray and unmarked.

TYPES: Holotype: 3. Red Canyon Camp, 11 miles southeast of Panguitch, Garfield Co., Utah, 7,200 ft; 11 July 1960; F., P. and B. Rindge; collected on NSF Grant G 9037. AMNH. Allotype: Q. Same data as holotype. AMNH.

Paratypes: 40 specimens. Same locality and collectors as for holotype, 11–13 July 1960 and 24 July 1958, F., P. and J. Rindge. AMNH; type no. 11,762, CNC.

Scoparia ruidosalis Munroe, NEW SPECIES PL. 2, FIG. 15; PL. B, FIG. 6. Scoparia ruidosalis Munroe.

Type-locality: Cedar Creek Campground, Ruidoso, Lincoln County, New Mexico, 7,000 ft.

DIAGNOSIS: This species is closely similar in general appearance to the preceding. It is about the size and color of *S. apachealis apachealis* but is a little narrower-winged and

considerably more distinctly marked. The antemedial line has a perceptible pale element followed by a zone of fuscous shading. The orbicular and claviform spots are fairly large and distinct and are transversely elongated. The reniform spot is rather diffuse. The postmedial line is fairly distinct; it has the pale element stronger and is more sinuous than in *S. apachealis*. The preapical, pretornal and subterminal patches are separate and of moderate size, but they do not contrast very strongly with the dark-gray ground color. The male genitalia are almost exactly as in *S. apachealis* except for the aedoeagus, which instead of having lateral denticulated zones near the apex has a pair of ventrolateral emarginations at the end, each with a group of short, separated spinules set in the membrane that occupies the emargination.

DESCRIPTION: The frons is rounded, somewhat roughly scaled, with fuscous scales mixed with a few light-gray ones. The vertex is roughly scaled, with fuscous and light-gray scales about equally mixed. The labial palpi are porrect and exceed the frons by a little more than the length of the head. The third segment is hidden in the pointed vestiture of the second. The color is dark fuscous, narrowly and contrastingly white at the base beneath, and with some light-gray dorsal scaling. The maxillary palpi are prominent, with an expanded scale-tuft at the end. Their color is fuscous, shading to light gray distally. The basal scaling of the proboscis is gray. The eyes and ocelli are fuscous. The male antennae are filiform, fuscous and pilose beneath, scaled dorsally, with alternate light-gray and fuscous scale-rows, the light-gray rows wider and raised. The thorax above is dark gray, slightly variegated in tone. The abdomen above is dark gray. The body beneath is gray. The legs are gray, strongly and broadly banded with dark fuscous.

The forewings are moderately narrow; the costa is nearly straight except at the extreme base and near the apex, where it is curved; the apex is subacute, very narrowly rounded; the termen is straight and oblique; the tornus is obtuse; the posterior margin is curved near the base. The ground color above is light gray, rather thickly dusted with fuscous, giving a general dark-gray effect. There is a small but distinct fuscous basal spot and there are fine fuscous sub-basal dashes in the cell and before and behind 2nd A. The antemedial line is light gray, bordered distally with fuscous; it is moderately oblique distad from the costa at one-fourth and is obtusely angled at Cu, thence erect to the posterior margin at one-fourth. The orbicular and claviform spots are similar, somewhat elongate, fuscous, one immediately behind the other, both touching the dark shading of the antemedial line. The reniform is fuscous, X-shaped and rather diffuse; it is preceded by a dark mark on the costa. The postmedial line is light gray, fairly wide and distinct. It is weakly zigzagged from the costa to M_2 , there obtusely angled and oblique and slightly curved to the posterior margin. The preapical, pretornal and subterminal triangular patches are well developed but separate; they are only moderately dark and do not contrast strongly with the ground color. There is a row of dark-fuscous subterminal dots. The fringe is light gray, weakly checkered with fuscous. The hindwings above are uniformly medium gray, with paler fringe.

The wings beneath are shining dark gray, with the costa of the forewings tinged with ochreous. The reniform spot of the forewing is indicated as a fuscous cloud and there are traces of a fuscous postmedial line on forewings and hindwings.

The male genitalia are almost exactly as in S. apachealis except for the differences noted in the diagnosis, above.

The early stages are unknown.

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TYPES: Holotype: J. Cedar Creek Campground, Ruidoso, Lincoln County, New Mexico, 7,000 ft; 29 July 1962; E. and I. Munroe; black light. Type no. 11,763, CNC.

Paratypes: 333. Same data as for holotype (13). Same locality as for holotype; 30 June 1961; F., P. and J. Rindge; collected on NSF Grant G 9037 (233). CNC; AMNH.

This species is evidently the replacement of S. apachealis in the Sierra Blanca, but the differences in the aedoeagus appear to be of specific value.

Scoparia blanchardi Munroe, NEW SPECIES PL. B, FIG. 7. Scoparia blanchardi Munroe.

Type-locality: Mount Locke, Davis Mountains, Texas, 6,700 ft.

DIAGNOSIS: The moth resembles S. apachealis and S. ruidosalis, but has narrower forewings and darker ground color than the darkest specimens of S. apachealis. The maculation of the forewings is distinct and better developed than in S. apachealis or S. ruidosalis. The structure of the male genitalia in general resembles that of S. apachealis, but the juxta has the dorsal prominences much larger in proportion to the reduced central part.

DESCRIPTION: The frons is rounded, with somewhat roughened scaling, mostly fuscous but mixed with light gray. The vertex has rough erect scaling, mixed light gray and fuscous. The labial palpi exceed the frons by about the length of the head; the third segment is mostly hidden in the long anterior scaling of the second; in color the labial palpi are grayish fuscous with some lighter admixture and with the base broadly and contrastingly light creamy buff. The maxillary palpi are prominent and have an expanded distal scale-tuft. They are fuscous, tipped with light grayish buff. The proboscis has light grayish-buff basal scaling. The eyes and ocelli are fuscous. The antennae are somewhat thickened and compressed in the male; the ventral surface is dark fuscous and densely short-pilose. The dorsal surface has alternate fuscous and light-buff scale-rows. The thorax above is mixed fuscous and light grayish buff. The abdomen above is grayish buff, with the posterior margins of the segments paler and browner. The body beneath is light buff. The legs are light buff, strongly banded with dark fuscous.

The forewings are relatively narrow, with the costa nearly straight or even slightly concave to near the apex, then weakly convex; the apex is subacute, narrowly rounded; the termen is somewhat oblique and almost straight to near the rounded tornus; the posterior margin is convex, most strongly so near the base. The length of the forewing varies from 7–9 mm. The ground color above is light gray with fairly dense fuscous and some buff dusting, the general effect powdery fairly dark gray. There are obscure blackish-fuscous powdering and spots in the basal area. The antemedial line is distinct though a little diffuse; it is light gray, bordered distally with dark fuscous; it runs obliquely distad from the costa at one-fifth or one-sixth from base to Cu, where it is obtusely angled; thence it is erect to the posterior margin at one-third from base. The orbicular and claviform spots are strong black dashes, the claviform directly behind the orbicular and both basally fused with the dark element of the antemedial line. The reniform spot is X-shaped and black, with some ferrugineous scaling in the anterior and posterior angles. The postmedial line is strong and

light gray, bordered basally with blackish fuscous; it runs obliquely distad for a short distance from the costa at five-sixths from the base, then is obtusely angled and runs obliquely basad to another obtuse angulation on M_1 ; thence it is oblique distad to M_2 , where it is obtusely angled, running obliquely basad to the posterior margin near the tornus. There are fairly distinct fuscous preapical, pretornal and subterminal triangular patches. The fringe is checkered with light grayish buff and dark fuscous.

The hindwings above are light gray, weakly infuscated on the veins and towards the termen. The fringe is light buff basally, light gray distally.

The forewings beneath are shining dark fuscous, with an obscure dark postmedial line, followed immediately by traces of a buff band. The fringe is light buff, with weakly interrupted medial and distal bands.

The hindwings beneath are shining grayish fuscous, with traces of a darker postmedial line. The fringe is as above, but darker.

The male genitalia in general resemble those of *S. apachealis*, but the dorsal processes and carina of the juxta are relatively larger and the body of the juxta is relatively shorter. The juxta as a whole is much narrower. The denticulated bands of the penis are somewhat more strongly developed in the present species.

The early stages are unknown.

TYPES: Holotype: J. Mount Locke, Davis Mountains, Texas, 6,700 ft; 6 Sept. 1969; A. and M. E. Blanchard. AB.

Paratypes: 6 33. Same locality and collectors as for holotype; Aug.-Sept. 1969. AB; type no. 11,956, CNC.

The moth will be figured in a subsequent part.

Scoparia biplagialis Walker

PL. 2, FIGS. 16-29; PL. B, FIG. 8; PL. G, FIG. 7 (McD. 5747, in part, 5748).

Scoparia biplagialis Walker, 1865, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 34: 1499.

Type-locality: St. Martin's Falls, Albany River, Hudson's Bay.

Scoparia libella Grote, 1878, Bull. U.S. Geol. Geog. Surv. Terr., 4: 675. Type-locality: Maine.

NOTE—The species was described from a series of syntypes from Maine, Massachusetts and New York. The lectotype, hereby designated, is a female in the BMNH.

Scoparia fernaldalis Dyar, 1904, Ent. News, 15: 72. Subsp. Type-locality: Kaslo, British Columbia.

Scoparia pacificalis Dyar, 1921, Ins. Insc. Mens., 9: 66. Subsp. Type-locality: Victoria, British Columbia.

Scoparia alaskalis Barnes and Benjamin, Contrib. Nat. Hist. Lep. N. Am., 5: 49. Subsp. Type-locality: Ketchikan, Alaska.

The moths are somewhat variable in size and color, but have a characteristic appearance that usually permits them to be recognized without difficulty. They are distinguished from species of the S. palloralis group by having the orbicular spot placed distinctly basad of the claviform; usually both spots are elongate and most often they are hollow, the black outline being occupied by a brown central shading. Members of the S. penumbralis and S. basalis groups, which have the orbicular and claviform similarly placed, have them smaller and never brown-filled. Also in these latter groups the postmedial line is straight or evenly curved from the costa to the median flexure, whereas in S. biplagialis the postmedial line is strongly angled in this region.

The genitalia of the present species are distinctive in both sexes. In the male the penis lacks cornuti, though the vesica is very finely microspinulose. In this respect the species resembles members of the genus *Eudonia*, but the pointed uncus and the distinct ventral process on the valve will distinguish it. In the female genitalia there are two depressed spinulose signa in longitudinal series on one side of the bursa, a character unique among North American species.

The early stages are unknown.

This species is widespread in the more northerly parts of the continent. It ranges from Newfoundland to the Carolinas and westward across Canada and the northern half of the United States to the Pacific Coast and northward to the Aleutians. As already mentioned, there is a considerable amount of variation, and forms strikingly different in size and in intensity of maculation can at times be found even in the same locality. There is no significant structural variation among these different individual and geographical variants, and there is no basis at present for recognizing more than one species. Yet it will not be surprising if biological studies later show that we are dealing with a complex of species with poor morphological differentiation. This must be left to future students to investigate. The species appears to be closely related to the Asian *S. murificalis* Walker and allies, which have similar maculation and genitalia.

The variation of the species would make an interesting subject for detailed study. For the present I recognize five subspecies.

Scoparia biplagialis bellaeislae Munroe, NEW SUBSPECIES PL. 2, FIGS. 16–18. Scoparia biplagialis bellaeislae Munroe. Type-locality: Natashquan, Quebec.

The moth is similar in size and shape to the nominate subspecies, but the ground color of the forewings is brown, not gray, and the maculation is very much obscured or completely obsolete. It occurs on the north shore of the Gulf of St. Lawrence, in Newfoundland and as transitional populations in Prince Edward Island and Cape Breton Island.

TYPES: Holotype: J. Natashquan, Quebec; 10 Aug. 1929; W. J. Brown. Type no. 11,764, CNC.

Allotype: Q. Bradore Bay, Quebec; 29 July 1930; W. J. Brown. Type no. 11,764, CNC.

Paratypes: 2 33, 8 99. Bradore Bay, Quebec; 31 July-1 Aug. 1930; W. J. Brown (7 99). St. Anthony, Newfoundland; 15 and 22 Aug. 1951; J. B. Wallis (1 3, 1 9). Goose Bay, Labrador, Newfoundland; 13 Aug. 1949; Smith and Butler (1 3). Type no. 11,764, CNC.

In Prince Edward Island and at Baddeck, Cape Breton Island, Nova Scotia, specimens

resembling this subspecies are found mingled with specimens typical of the nominate subspecies and with intermediates (plate 2, figures 17, 18).

Scoparia biplagialis biplagialis Walker PL. 2, FIGS. 19–24; PL. B, FIG. 8; PL. G, FIG. 7 (McD. 5747, in part). Scoparia biplagialis Walker, 1865, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 34: 1499. Type-locality: St. Martin's Falls, Albany River, Hudson's Bay. Scoparia libella Grote, 1878, Bull. U.S. Geol. Geog. Surv. Terr., 4: 675. Type-locality: Maine. NOTE—See remarks in the synonymy of the species, above.

The moths vary in size, the length of the forewing ranging from 6–8 mm. The ground color is gray, varying considerably in shade from specimen to specimen, and the dark markings are moderately well developed. The orbicular and claviform spots are usually brown-filled, but they are sometimes reduced to black dashes by suppression of the brown scaling and part of the black outline. Within the rather wide range of occurrence of the subspecies relatively little difference is observable in the range of variation, though a few local variants are known that deserve further investigation. For example, the United States National Museum has a series of small specimens with very dark gray forewings collected at Skyland, Virginia, in July by Dyar. At Highlands, North Carolina, a very large strain, with heavy black orbicular and claviform spots, flies in mid-July. Later and earlier, in June and August, specimens of normal size and appearance occur at the same locality. Whether this is a simple case of seasonal variation remains to be established.

The subspecies is bi- or multi-voltine in most parts of its range. It occurs from Nova Scotia to South Carolina, across a wide band of the continent from northern Ontario to Missouri and west to the Rocky Mountains. In many areas it is the most numerous species of its subfamily. It is one of several species that have been confused with *S. basalis* in the past but McDunnough (1961: 3) pointed out that the two species are different.

Scoparia biplagialis fernaldalis Dyar PL. 2, FIG. 25 (McD. 5747b). Scoparia fernaldalis Dyar, 1904, Ent. News, 15: 72. Type-locality: Kaslo, British Columbia.

The moths are similar to moderate-sized, dark-winged specimens of the nominate subspecies. The dark markings are in general rather inconspicuous, and the orbicular and claviform spots are reduced to black dashes in the majority of specimens. A long series collected by Cockle and Dyar at the type-locality shows very little variation and in general similar dark forms are predominant through the interior of Washington and southern British Columbia.

> Scoparia biplagialis pacificalis Dyar pl. 2, figs. 26–28 (McD. 5747d, 5748).

Scoparia pacificalis Dyar, 1921, Ins. Insc. Mens., 9: 66. Type-locality: Victoria, British Columbia.

Scoparia alaskalis Barnes and Benjamin, 1922, Contrib. Nat. Hist. Lep. N. Am., 5: 49. Type-locality: Ketchikan, Alaska.

PYRALOIDEA

Unlike the previous subspecies, the moths are large and pale, with well-defined though not particularly heavy markings. The subspecies is common in Vancouver Island and extends southward in the coastal zone of Washington at least as far as Mount Rainier and north through coastal British Columbia to the Panhandle of Alaska. Dyar was right in his surmise (1929) that *S. pacificalis* and *S. alaskalis* are the same. I can see no significant difference between specimens from Ketchikan and those from Vancouver Island. The Coast Range of the British Columbia mainland appears to be a transition zone between this and the preceding subspecies: the Canadian National Collection has a number of *fernaldalis*-like specimens in a long series from the Diamond Head Trail, Squamish, British Columbia. Specimens from northern British Columbia (Radium Hot Springs) and the Yukon Territory (Dawson) resemble the present subspecies rather than *fernaldalis*.

Scoparia biplagialis afognakalis Munroe, NEW SUBSPECIES PL. 2, FIG. 29. Scoparia biplagialis afognakalis Munroe.

Type-locality: Afognak Island, Alaska.

In size and shape the moth is similar to the preceding subspecies, but the ground color is brown rather than gray, and the wing markings are considerably reduced in intensity, sometimes completely obsolete. The subspecies is reminiscent of S. b. bellaeislae, which lives in somewhat comparable ecological conditions on the opposite side of the continent. However, the present subspecies has the forewings considerably paler and with a weaker brown component in the ground color.

TYPES: Holotype: J. Afognak Island, Alaska; 4 Aug. 1939; E. C. Johnston. Type no. 11,765, CNC.

Allotype: Q. Same data as holotype. CNC.

Paratypes: 53 specimens. Same data as holotype (43 specimens). Kodiak, Alaska; 15 Aug. 1948; E. C. Johnston (10 specimens). Type no. 11,765, CNC.

Scoparia penumbralis Dyar pl. 2, figs. 30–32; pl. 8, fig. 9; pl. G, fig. 8 (McD. 5734).

Scoparia penumbralis Dyar, 1906, Jour. New York Ent. Soc., 14: 103. Type-locality: Center Harbor, New Hampshire.

NOTE—The locality cited is that of the lectotype, hereby designated, a male in the USNM, long segregated as the type.

The species is easily recognized by its rounded forewings and dark-fuscous, almost uniformlycolored forewings and hindwings. Though obscure, the maculation is really rather similar to that of *S. cinereomedia*, *S. basalis* and *S. dominicki*, with obliquely arcuate antemedial and weakly angulate postmedial lines and with the orbicular and claviform spots small, blackish fuscous and set on the antemedial line, the orbicular farther basad than the claviform.

The genitalia of both sexes are distinctive. In the male there are about four large, thick cornuti, apposed in an oblique series. In the female a short, wide, funnel-shaped, sclerotized ductus bursae leads into a long bipartite bursa, the anterior part larger, oval

and longitudinally wrinkled, the posterior part smaller and globular. Attached to the end of the posterior part of the bursa there is a small globular accessory sac.

The early stages are hardly known, but A. E. Brower (personal communication) has told me that he has reared the species from lichen-covered logs of black spruce, *Picea mariana* (Miller) Britton, Sterns and Poggenb. in Maine.

The species is common but somewhat local over a wide area of the northeastern United States and southeastern Canada. It occurs from Cape Breton Island, Nova Scotia, west to Aweme, Manitoba, and south to New Jersey, Mountain Lake, Virginia, and western Pennsylvania. It flies in June through most of its range, but in northern Nova Scotia, Prince Edward Island and New Brunswick it flies mainly in July. A pale variant (plate 2, figure 32) has been collected at McClellanville, South Carolina, but its range and constancy have not been established.

Scoparia cinereomedia Dyar

pl. 2, figs. 33-37; pl. b, fig. 10; pl. g, fig. 9 (McD. 5734, 5736).

Scoparia cinereomedia Dyar, 1904, Ent. News, 15: 72. Type-locality: New Brighton, Pennsylvania.

NOTE—The species was described from two male syntypes from the same locality, both of which are in the USNM. I hereby designate one of these, which bears the label "Scoparia cinereomedia Dyar Type", as lectotype.

Scoparia truncatalis McDunnough, 1922, Can. Ent., 54: 36. Type-locality: Norway Point, Lake of Bays, Ontario.

In its typical form this species is easily recognized. The medial area of the forewing above is broadly and smoothly light gray; the basal area is fuscous, limited by the fuscous, evenly arcuate or slightly angled antemedial line, on which the dark orbicular and claviform spots hardly show. The postmedial line is arcuate or obtusely angled, closely followed by long, diffuse, fuscous preapical and pretornal patches; the subterminal patch is reduced to a small triangle at the middle of the rather well-developed row of subterminal spots. The only other North American species that looks at all like this is the southwestern *S. schwarzalis*, which is more strongly contrasting and which has the orbicular spot distinct and placed directly in front of the claviform.

The name truncatalis applies to a form in which the dark and pale areas of the wing are much less sharply contrasting, the whole forewing being subdued gray, with the basal area not contrastingly darker and the postmedial line and the dark patches beyond it not as conspicuously dark. The holotype of *S. truncatalis* has markings exactly like those of *S. cinereomedia*, except for the weaker contrast, but some of the paratypes are referable to *S. basalis*. These two species, *S. cinereomedia* and *S. basalis*, are hard to distinguish sharply in markings and are closely similar in genitalia in both sexes. In the female the present species appears to have more numerous and more closely set spines in the curve of the ductus bursae. For this reason and because of the very different appearance of extreme forms I consider the two species different; indeed I would not be surprised to find that more than one species has been included under *S. basalis*. The whole question needs further study, supplemented by information on the biology of the various forms.

The male genitalia have the uncus triangular, the gnathos long, slender and decurved, the juxta oval, the valves somewhat expanded and rounded distally, with a small pointed

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process near the middle of the ventral margin. The penis is of even width, is slightly arcuate and bears four rather slender straight or weakly curved cornuti. The female genitalia have the ovipositor triangular and the apophyses delicate, the anterior apophyses about twice the length of the posterior ones. The ductus bursae is long, slender and coiled near the bursa. The ostial end is finely scobinated for a short distance, then is membranous, with a short sclerotized collar just proximad of the junction of the ductus seminalis, then with a long membranous coiled zone, containing a considerable number of fine toothlike spines. The bursa is globular and densely scobinated, more heavily on one side than on the other, but lacks a definite signum. There is a round, membranous accessory sac at the posterior end of the bursa.

The early stages are unknown.

The species is fairly common over much the same range as the preceding one, extending from Nova Scotia to southern Ontario and south through Pennsylvania and Virginia to Highlands, North Carolina. It flies in July throughout its range. In eastern Canada it is usually found in rich, deciduous forest.

Scoparia basalis Walker

PL. 2, FIGS. 38-41; PL. G, FIG. 10 (McD. 5747, in part).

Scoparia basalis Walker, 1865, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 34: 1497.

Type-locality: North America, from Carter's collection.

NOTE—The lectotype in the BMNH, hereby designated, is a female and is one of two syntypes with the same locality data and which were both supposedly males. It bears the label "62–85" and has had the genitalia prepared and mounted on BMNH slide Pyr. 3766.

This species is closely similar in external appearance to the unicolorous form of S. cinereomedia. The forewings have the basal area gray, not infuscated. The antemedial line is generally obtusely angulate at or near Cu and is seldom evenly arcuate. The orbicular and claviform spots are much more distinct than in S. cinereomedia, and the claviform is usually produced as a black dash. The reniform tends to be larger than in S. cinereomedia and is 8-shaped and well formed. The postmedial line is farther from the termen and is often somewhat incurved before and behind the median flexure. The pale element of the postmedial line is distinct, and the pretornal patch is large and distinct. There is some variation in size, many specimens being as large as typical specimens of S. cinereomedia, others being somewhat smaller (length of forewing 5–6 mm as against 7–8 mm in larger strains).

The male genitalia are not sharply distinguishable from those of *S. cinereomedia*, but on the average they seem to have the cornuti more slender and slightly more strongly curved. The female genitalia are almost exactly as in *S. cinereomedia*, but have fewer spines in the ductus bursae.

The two species are found in similar habitats at the same times of year and often fly abundantly together. However, the present species has been taken in Arkansas, where S. cinereomedia has not so far been found.

As already stated under S. cinereomedia, the relationships of the two species and their forms are not well understood. It may be that they are all forms of one variable species, or on the other hand it is possible that more than two species will eventually be recognized.

The name S. basalis has often been badly misapplied in the past. Most of the material placed under this name in collections has actually been of S. biplagialis, but other small gray species such as S. palloralis and S. cervalis and even Eudonia heterosalis and other Eudonia species have also been included. The synonymy given by Dyar (1929: 3) is particularly misleading, but McDunnough's 1961 paper has cleared up much of the confusion.

Scoparia dominicki Munroe, NEW SPECIES PL. 2, FIGS. 43, 44; PL. C, FIG. I; PL. H, FIG. I. Scoparia dominicki Munroe. Type-locality: Wedge Plantation, McClellanville, South Carolina.

DIAGNOSIS: In general appearance this species is closely similar to *S. basalis*. The posterior part of the antemedial line is more oblique, the angulation being more obtuse. The orbicular and claviform spots are minute and are situated on the antemedial line. The reniform spot is rather small and is placed close to the postmedial line. The preapical and pretornal fuscous patches are rather strong and tend to fuse at the middle of the wing.

The genitalia differ obviously in both sexes from those of S. basalis. In the male the cornuti are much shorter and thicker, though not as wide at their bases or arranged in as regular a row as in S. penumbralis. In the female the ostial end of the ductus bursae is wide, sclerotized and funnel-shaped, not cylindrical and scobinated as in S. basalis. The adjacent zone of the ductus is curved and somewhat expanded and has a zone of weak sclerotization. The rest of the ductus is short, membranous and gradually expanding. It does not at all resemble the narrow, coiled, spinose ductus of S. basalis. The bursa and accessory sac are as in S. basalis.

As the external appearance is so similar to that of the variable S. basalis, I omit a detailed description.

The early stages are unknown.

TYPES: Holotype: Q. Wedge Plantation, McClellanville, South Carolina; 9 May 1968; R. B. Dominick and C. R. Edwards; at light; genitalia slide 1223 DK. Type no. 11,821, CNC. Allotype: J. Same data as for holotype; genitalia slide 1353 DK. USNM.

Paratype: 1 2. Same locality and collectors as for holotype; 4 May 1968; genitalia slide

1351 DK. WPC.

Scoparia huachucalis Munroe, NEW SPECIES PL. 2, FIG. 42; PL. H, FIG. 2.

Scoparia huachucalis Munroe. Type-locality: Huachuca Mountains, Arizona.

DIAGNOSIS: The moth is of small size and medium-gray color. The costa of the forewing is straight; the apex is rather narrowly rounded; the termen is oblique; and the tornus is obtuse. The antemedial line consists of a light-gray element bordered distally by a fuscous line and set in a zone of fuscous dusting. The orbicular and claviform spots are small black dashes touching the antemedial line; the orbicular is placed directly in front of the claviform. The reniform spot is large and 8-shaped and touches the postmedial line. The latter is weak, fuscous, somewhat sinuated and expanded into black dashes along the veins. The preapical and pretornal patches are moderately developed; the subterminal patch is smaller. The

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genitalia of the female have the bursa small and globular and armed with fine spinules, the ductus bursae is slender and membranous. The moth can hardly be confused with any other species known from the southwest.

DESCRIPTION: The frons is rounded, smoothly scaled and fuscous. The vertex is roughly scaled, mixed fuscous and light gray. The labial palpi are short, somewhat decurved, with the third segment hidden in the scaling of the second; the color is dark fuscous, narrowly light gray at the base beneath. The maxillary palpi are prominent, with somewhat expanded distal scaling. Their color is dark fuscous, tipped with light gray. The basal scaling of the proboscis is light gray. The eyes and ocelli are fuscous. The antennae of the type are broken off. The thorax above is finely mixed dark fuscous and light gray. The abdomen above is light gray. The body beneath and legs are light gray. The legs are strongly banded with dark fuscous. The wings above are as characterized in the diagnosis. The length of the forewing is 6 mm. The wings beneath are silky gray, the forewing with a brownish tint and with the dark markings of the upper surface weakly repeated.

The male genitalia are unknown. The female genitalia have the ovipositor lobes weak and triangular. The posterior apophyses are short and fine. The anterior apophyses are somewhat longer and considerably stronger. The ostium is unarmed. The ductus bursae is slender and membranous. The bursa is globular and finely spinulose, but lacks a definite signum.

The early stages are unknown.

TYPE: Holotype: Q. Huachuca Mountains, Arizona; 30–31 May 1935; J. A. Comstock; genitalia slide 4106 EGM. LACM. The holotype lacks the right forewing.

GENUS Eudonia Billberg

Eudonia Billberg, 1820, Enumeratio Insectorum in Museo Billberg, 93. Type-species: Tinea mercurella Linnaeus, 1758. Monotypy.

Eudoria Chapman, 1912, Trans. Ent. Soc. London, 1911: 507.

Type-species: Eudorea murana Curtis, 1827. Original designation.

NOTE—Although this name was accepted by Pierce and Metcalfe (1938: 58) and by Marion (1955: 52), Whalley (1963: 82) rejected it because of Chapman's statement that it is a "mutation of *Eudorea*". I do not agree with Whalley's view, as I consider that Chapman intended simply to indicate the derivation of the name, which he proposed for a previously unrecognized genus. He made no express statement that *Eudoria* was intended as an emended replacement for *Eudorea*, which would be required for its suppression under Article 33 (a) (ii) of the *International Code of Zoological Nomenclature*. The point is academic, as the discovery of *Eudonia* Billberg has made both *Eudoria* Chapman and *Witlesia* Chapman junior synonyms, and consequently even if *Eudoria* is available in this sense it is not required.

Witlesia Chapman, 1912, Trans. Ent. Soc. London, 1911: 507.

Type-species: Eudorea pallida Curtis, 1827. Monotypy.

NOTE—Whalley (1963: 82) also sinks *Dipleurina* Chapman, 1912, as a synonym of this genus. Although this is a tenable point of view, I prefer to keep the two separate. *Dipleurina* has no known North American species.

The moths of this genus are closely similar in appearance and external structure to those of

the genus *Scoparia*. The labial palpi tend to be longer, and the males usually have a thinly scaled or scaleless fovea on the forewing above between the orbicular and reniform spots. However dissection of the genitalia is the only safe way of assigning an unknown species.

The male genitalia of *Eudonia* have the uncus more or less oval, strongly decurved and setose at the sides, and usually somewhat tapering posterad, often with a notch in the middle of the apex. The valves are simple, lacking the ventral process found in the other genera in our territory. The juxta is pyriform. The penis is cylindrical and is armed at most with minute scobinations or spinules on the vesica, lacking true cornuti. On each side of the aedoeagus, where it passes through the surrounding membrane, is a small, round, buttonlike sclerite, bearing a few short setae. The female genitalia have the ovipositor lobes weakly developed and sparsely setose. The ovipositor is strongly retractile and the posterior apophyses are as long and strong as the anterior ones. The ductus bursae is longer and more slender than in *Scoparia* and has a fairly long, tubular, sclerotized zone not far from the ostium, distad of which is a long, slender, membranous zone, part of which is arranged in two or more distinct, tight coils. The bursa is small, sharply defined and globular. It is usually finely spinulose; generally it has a small, round, depressed, more coarsely and densely spinulose signum on one side. There is a globular membranous accessory sac attached to the bursa, usually placed somewhat unsymmetrically near its end.

The early stages of the American species are unknown, but several European and Hawaiian species are known to have larvae that tunnel in mosses or bore in their stems. One Hawaiian species bores in the stems of clubmosses, *Lycopodium* species.

The genus is a very large one and is very widely distributed. It is represented on all major land areas except Greenland, Antarctica and, so far as known, temperate South America. It is very widely distributed on oceanic islands. Its richest development is in the Hawaiian islands, where about 100 species are known. It is also well represented in New Zealand, but curiously enough is absent from Micronesia and western Polynesia, except for a single species in Fiji. In some regions the species have strongly modified cryptic patterns, but structurally the moths are remarkably uniform; the genitalia often show no reliable species differences even between forms widely separated geographically or in external appearance. The North American species are relatively little modified in pattern and have the typical facies of the subfamily.

KEY TO NORTH AMERICAN SPECIES

I.	Postmedial line of forewing above al-		Antemedial line of forewing above
	most parallel to termen, either straight		obtusely angled at Cu, posterior part
	or with a very broadly obtuse angle		very weakly oblique distad 3
	opposite cell 2		
	Postmedial line of forewing above	3.	Forewing above with ground color
	strongly angulate opposite cell, often		white or nearly so expallidalis
	zigzagged anterior to the angulation 6		p. 52
			Forewing above with ground color
2.	Antemedial line of forewing above		distinctly gray or brownish gray 4
	strongly oblique distad, nearly straight		
	torniplagalis	4.	Forewing above with antemedial and
	p. 53		postmedial lines narrow and distinct;

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	ground color gray, without brownish tints; orbicular spot directly in front of claviform or even displaced a little distad rectilinea		Antemedial line of forewing above not angled at posterior margin of cell, or length of forewing over 7 mm; eastern, transcontinental or western
	Forewing above with antemedial and postmedial lines slightly diffuse; ground color and dark areas with a distinct brownish tinge; orbicular spot displaced somewhat anterobasad from	9.	Length of forewing about 7 mm; its ground color above light gray with brownish-gray markings; antemedial line strongly oblique distad and weakly angulate distad in cell: Arizona franclemonti
	claviform 5		p. 62
5.	Wings of normal proportions; north-		Pattern of forewing otherwise; length of forewing often over 7 mm 10
	p. 51 Forewing abnormally small and nar- row, especially in the female; coastal region of central California franciscalis p. 52	10.	Forewing 8 to 12 mm long, but often very narrow; postmedial line of fore- wing above acutely angled basad in radial region before median flexure; antemedial line oblique distad, with
6.	Reniform, orbicular and claviform		two conspicuous dentations; northern
0.	spots developed as black streaks;		p. 68
	these longitudinal streaks the most prominent markings of the upperside of the forewing strigalis p. 70		Postmedial line of forewing above smoothly oblique, curved or obtusely angled basad before median flexure; antemedial line either arcuate, some-
	Reniform, orbicular and claviform spots of forewing above not developed as conspicuous black streaks		times with dentations, or obtusely angled in cell, the posterior part only slightly oblique 11
7.	Forewing about 7 mm long; upperside light gray, with broad disc and con- trasting dark markings; basal area fuscous-dusted; a black oblique ante- medial dash on costa; orbicular and	II.	Reniform spot of forewing above 8- shaped, narrowly black and con- trasting, strengthened along Cu and extended so as to approach or meet the black dashlike orbicular
	claviform black dots, the latter directly behind the former, a gray streak separating them; reniform X-shaped, black, with anterior angle weakly brown-filled; postmedial line and sub- terminal markings black; Arizona . <i>schwarzalis</i>		Reniform spot of forewing above dif- fusely fuscous, or if black then not strongly contrasting and with no tendency to extend basad along Cu towards the orbicular 13
	p. 63 Markings of forewings otherwise: if	12.	Forewing above smoothly light gray; orbicular and claviform spots and
	light gray with contrasting dark mark- ings, then the size larger and the de- tails of the markings different		antemedial line, especially its anterior part, strengthed and fused to form a contrasting black marking which is by far the most conspicuous element of the
8.	Antemedial line of forewing above angled at posterior margin of cell,		pattern
	otten acutely so; length of forewing under 7 mm; ground color medium gray; eastern heterosalis p. 71		Forewing above strongly dusted and mottled with fuscous, especially in the median area; if orbicular and clavi- form spots and antemedial line

49

 Ground color of forewing above dull powdery gray; the dark ordinary spots Forewing above narrower, with ape and termen rounded; markings tend ing to be crisper on a more finel 	n gs 1; . albertalis P. 55
and lines the most conspicuous mark- ings	1- ly . rotundalis p. 60
- Ground color of forewing above	1;
heavily mottled and dusted with	n
fuscous in addition to the ordinary	. bronzalis
markings; the transverse lines often	p. 67
contrastingly pale	al
14. Forewing above with ordinary spots and transverse lines strong and black- ish fuscous on a rather light gray and postmedial lines clearly evident British Columbia to central California	t; a17
ground; orbicular and claviform spots	a
strong, blackish fuscous; north-	ts
eastern vivida	cophthalma
p. 56	p. 64
 Forewing above with ordinary spots	ch
and transverse markings weaker, duller	op
fuscous, not contrasting; orbicular and	ne
claviform spots weak or obsolescent;	<i>echo</i>
western	p. 66

Eudonia rectilinea (Zeller), NEW COMBINATION PL. 3, FIGS. 1, 2 (McD. 5730, 5742, in part).

Scoparia rectilinea Zeller, 1874, Verh. K.-K. Zool.-Bot. Ges. Wien, 24: 427, pl. 12, fig. 3. Type-locality: Vancouver Island.

Scoparia refugalis Hulst, 1886, Trans. Amer. Ent. Soc., 13: 148. NEW COMBINATION with Eudonia. Type-locality: California.

NOTE-Rindge (1955: 169) gives the type-locality as Marin County, California.

Scoparia nominatalis Hulst, 1886, Trans. Amer. Ent. Soc., 13: 148. NEW SYNONYMY and NEW COMBINATION with Eudonia.

Type-locality: Vancouver Island.

The moth is of moderate size (length of forewing 8–10 mm). The forewings are fairly wide, with subacute apex and oblique termen. The postmedial line is nearly straight, but usually with weak sinuation. It is narrow and fuscous and is separated by a pale line from the nearly or quite fused preapical and pretornal fuscous patches. The ground color is medium to dark gray, with no brownish tint in fresh specimens. The antemedial line is anteriorly outwardly oblique, posteriorly nearly erect; it often has slight dentations in the cell. The orbicular spot is black, annular and longitudinally oval; sometimes it is incomplete. The claviform is a black dash directly behind the orbicular. The reniform is large, obliquely 8-shaped and often filled with fuscous or situated in a fuscous patch. The hindwings are medium gray.

The male genitalia have the uncus short, moderately wide and distinctly incised at the middle of the apex; the gnathos has the median element slender and distally pointed; the juxta is pyriform; the valves are narrow and parallel-sided, with the tips somewhat obliquely truncate; the penis is about 12 times as long as wide and slightly curved. The female genitalia have the ovipositor lobes weakly developed, hardly setose. The posterior apophyses are threadlike, as long as the slightly thicker anterior apophyses. The latter have a rhomboidal expansion. The ostial chamber is funnel-shaped, membranous, leading to a tubular sclerotized part of the ductus, followed by a coiled membranous part. The bursa is small and round with a slightly elongate signum and a round accessory sac.

The early stages are unknown.

The species is abundant from southern British Columbia (Vancouver Island to Kaslo) south to Siskiyou and Plumas Counties in California and thence south through the Coast Range to the San Bernardino Mountains and the San Diego region. It is characteristic of fairly moist habitats but occurs in both forested and open areas.

It is not likely to be confused with anything except E. commortalis, which is paler, browner and less sharply marked.

Eudonia commortalis (Dyar), NEW COMBINATION PL. 3, FIGS. 3, 4 (McD. 5731).

Scoparia commortalis Dyar, 1921, Ins. Insc. Mens., 9: 67. Type-locality: Victoria, British Columbia.

NOTE—The lectotype is a female in the USNM, hereby designated, from the above locality, collected by E. H. Blackmore and bearing the labels, "199" and "Scoparia commortalis Dyar, Type."

The species closely resembles *E. rectilinea*, but seems to be distinct. The size and wing-shape are about the same, but the forewings are paler and have a definite brownish tint. The hindwings are whitish gray rather than dull gray as in the preceding species. The dark elements of the transverse lines of the forewings above are somewhat more diffuse. The antemedial line is more regular than in *E. rectilinea*, being obtusely angled in the cell or even almost regularly arcuate. It is better defined than in *E. rectilinea* because of the presence of a stronger pale element before the rather diffuse dark band. The orbicular is a short black dash, not an oval loop as is usually the case in *E. rectilinea*, and it is displaced a little basad of the claviform instead of being directly in front of it. The reniform is not as strong on the average as in the preceding species, and it is generally X-shaped rather than 8-shaped.

The male genitalia resemble those of E. rectilinea, but have the uncus slightly longer and considerably narrower, the valves shorter and wider, and the penis shorter and somewhat curved. The female genitalia are similar to those of E. franciscalis, described below.

The species appears to be restricted to the coastal zone of the Pacific Northwest, its known range extending from Ketchikan, Alaska, to the Olympic Peninsula and the northern Cascade Mountains of Washington and including the Queen Charlotte Islands and Vancouver Island in British Columbia.

The early stages are unknown.

Eudonia expallidalis (Dyar), NEW COMBINATION PL. 3, FIGS. 5, 6 (McD. 5732).

Scoparia expallidalis Dyar, 1906, Jour. New York Ent. Soc., 14: 101. Type-locality: Verdi, Nevada.

Scoparia rufitinctalis Hampson, 1907, Ann. Mag. Nat. Hist., (7) 19:21. NEW SYNONYMY and NEW COMBINATION with Eudonia.

Type-locality: California.

NOTE—Dyar (1929: 2) completely misidentified this nominal species, listing it as a synonym of *Scoparia tricoloralis* Dyar, now placed in *Cosipara* (see above). McDunnough omitted the name from his *Check List*.

The moth is in general not unlike the previous species, but it is distinguished immediately by its nearly white ground color. The scaling of the wings is thin. The forewings have the basal area white. The antemedial line is represented by a brown shade, angulate in the cell. The orbicular and claviform spots are short, longitudinal, black dashes, often reduced to the point of obsolescence. The orbicular is displaced slightly basad as in *E. commortalis*. The reniform spot is developed as a weak black X, sometimes preceded by a brown spot on the costa. The dark element of the postmedial line is brown, and is usually weakly developed, sometimes completely lost; the shape of the line is as in *E. commortalis*. The markings of the subterminal area are usually extensive, though rather pale brownish fuscous. The preapical and pretornal patches usually unite to form a broad band beyond the postmedial line. The hindwings are almost pure white, not light gray as in *E. commortalis*.

The male genitalia are similar to those of *E. commortalis*, but have the uncus relatively narrower, the valves narrower and basally constricted and the penis straighter. The female genitalia are much as in *E. rectilinea*, but have the apophyses thinner and the signum smaller and almost cordiform.

The early stages are unknown.

The species ranges from northern Washington south through the Sierras to the San Bernardino and San Jacinto Mountains. It is closely related to *E. commortalis*.

Eudonia franciscalis Munroe, NEW SPECIES PL. 3, FIGS. 7–9. Eudonia franciscalis Munroe.

Type-locality: San Francisco, California.

DIAGNOSIS: The moth resembles E. commortalis, but it is narrower-winged, particularly in the female, and is somewhat smaller. The forewings are rather uniform brown, with the pale elements rather than the dark elements of the transverse lines standing out from the ground color. The orbicular and claviform spots are small black dashes as in E. commortalis, but the orbicular is not displaced basad as in that species.

DESCRIPTION: The frons is rounded, rather roughly scaled in varying shades of brown, and conspicuously overhung by a long tuft of scales extending forward between the antennae. The vertex is similarly colored but more roughly scaled. The labial palpi are porrect and exceed the frons by about twice the length of the head; the third segment is hidden in the scaling of the second; the color is light brownish fuscous above, pale buff at the base beneath. The maxillary palpi are prominent, with a strongly expanded distal tuft of scales;

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they are fuscous to near the tip of the tuft, but the latter is pale buff. The basal scaling of the proboscis is pale buff. The eyes and ocelli are fuscous. The antennae are filiform and ciliate in both sexes; alternate dorsal scale-rows are weakly raised distally; the color is light brown above, slightly darker below. The thorax above is brown. The abdomen above is brownish gray, the posterior margins of the segments are paler. The body beneath and the legs are light brown; the legs are broadly banded with fuscous.

The forewings are narrow, especially in the female. The costa is weakly curved; the apex is moderately acute; the termen is straight and oblique; and the tornus is obtuse. The ground color above is olivaceous fuscous, somewhat darker in the female than in the male. The basal area is longitudinally streaked with blackish fuscous. The antemedial line is distinct, pale buff, somewhat irregularly arcuate from the costa at one-fourth to the posterior margin at one-third. The orbicular and claviform spots are longitudinal black streaks; the orbicular is longer than the claviform and is placed directly in front of it. The reniform spot is rather small, black, X-shaped, with a longitudinal black line emphasizing the intersection of the X and with a pale spot in the posterior angle. The postmedial line is distinct, pale buff, nearly straight and parallel to the termen. The preapical and pretornal patches are fused to form a broad fuscous subterminal band, slightly narrowed medially. Beyond this is a pale-buff terminal zone bearing a row of blackish-fuscous subterminal spots and a small narrow subterminal triangle. The fringe is gray, checkered with fuscous.

The hindwings above are uniformly light gray. The fringe is light gray, with a darker sub-basal line.

The wings beneath are light gray, almost unmarked. The forewings are a little darker than the hindwings and are somewhat tinged with brown.

The length of the forewing is about 8 mm.

The male genitalia are much like those of *E. commortalis*. The female genitalia are almost exactly as in *E. expallidalis*, except that the signum is smaller and round.

The life history is unknown.

TYPES: Holotype: Q. San Francisco, California; 24 June 1925; H. H. Keifer. CAS. Allotype: S. 5961, California; No. 13834, Collection Hy. Edwards. AMNH. Paratype: 1 Q. San Francisco, California; 30 June 1908. Type no. 11,766, CNC.

Similar but broader-winged specimens occur in the San Diego region and elsewhere in southern California. I refer them tentatively to the present species but additional study is desirable. These specimens are excluded from the type series.

This species appears to be a southern segregate of E. commortalis. Because of the differences in maculation and the almost brachypterous female I treat it as a distinct species, but further investigation may show that it is only a subspecies or local variant.

Eudonia torniplagalis (Dyar), NEW COMBINATION PL. 3, FIGS. 10–16 (McD. 5729, 5750).

Scoparia torniplagalis Dyar, 1904, Jour. New York Ent. Soc., 12: 105. Type-locality: Seattle, Washington.

NOTE—The locality cited is that of the lectotype, hereby designated, a female in the USNM, type no. 7886, one of two syntypes from that locality. The other, labeled "Type" by Dyar, has lost its abdomen.

Scoparia alialis Barnes and McDunnough, 1912, Contrib. Nat. Hist. Lep. N. Am., I (5): 35, pl. 3, fig. 6. Subsp. NEW COMBINATION with Eudonia, NEW STATUS. Type-locality: Fort Wingate, New Mexico.

The strongly outwardly oblique antemedial line and straight or slightly bent postmedial line on a narrow, smoothly gray forewing, with more or less prominent antemedial and terminal dark shades, are characteristic of this species, which should not be confused with any other. There is considerable variation in depth of the gray ground color and in size. The length of the forewing varies from 8–12 mm.

The male genitalia have the uncus of moderate width, laterally rounded and decurved, distally truncate and shallowly notched. The gnathos is shorter than the uncus, with the median part slender and distally narrowly rounded. The juxta is long and narrowly pyriform. The valves are somewhat expanded distally and rounded at the tips. The penis is cylindrical, weakly curved and about 12 times as long as wide.

The female genitalia have the ovipositor lobes weak and sparsely setose. The posterior apophyses are slender and straight. The anterior apophyses are about the same length as the posterior ones, but have a triangular sub-basal expansion on the dorsal side. The bursa is slender and has a tubular, membranous, ostial section, followed by a longer, tubular, sclerotized zone. Beyond this is a long, slender, coiled, membranous portion, leading to the bursa. The bursa is globular and spinulose, with a moderately small, round, depressed, spinulose signum on one side. There is a small membranous accessory sac.

The early stages are unknown.

The species has a wide range in the forests of the Cordilleran and Pacific regions from southern British Columbia and the Black Hills of South Dakota to southern California, Arizona and New Mexico. The detailed distribution is rather fragmented. On present information there seem to be three main areas in which the species occurs: one in the Pacific Northwest; one extending from the Black Hills through Utah and Colorado to Arizona and New Mexico; one in the mountains of southern California. Each of these is characterized by a distinct subspecies.

Eudonia torniplagalis torniplagalis (Dyar) PL. 3, FIGS. 10, 11 (McD. 5729).

Scoparia torniplagalis Dyar, 1904, Jour. New York Ent. Soc., 12: 105. Type-locality: Seattle, Washington (see note in the synonymy of the species, above).

As compared with the other subspecies the nominate subspecies has the ground color of the forewings very dark gray, with the dark areas consequently contrasting relatively little. The maculation is otherwise almost as in the following subspecies.

This is the subspecies of the Pacific Northwest. It is known from Vancouver Island and adjacent areas of the mainland of British Columbia and ranges southward into Washington as far as Seattle and Yakima County. Further collecting in suitable habitats may well extend this range to the south and east.

> *Eudonia torniplagalis alialis* (Barnes and McDunnough) PL. 3, FIGS. 12-14 (McD. 5750).

Scoparia alialis Barnes and McDunnough, 1912, Contrib. Nat. Hist. Lep. N. Am., I (5); 35, pl. 3, fig. 6.

Type-locality: Fort Wingate, New Mexico.

The markings of the moth do not differ significantly in arrangement from those of the nominate subspecies, but the lighter areas of the ground color in the discal and basal areas are much paler gray and the dark areas are both more extensive and more intense, so that the whole wing presents a much more strongly contrasting appearance.

The subspecies is found in the Black Hills of South Dakota, in various mountain ranges in Wyoming and Utah, in Colorado from Estes Park south to Mesa Verde, in Arizona and New Mexico from Flagstaff east to the eastern slope of the Sangre del Cristo Mountains, and south to the Chiricahua Mountains, the vicinity of Silver City, New Mexico, and the Sierra Blanca in south-central New Mexico. Although there are minor differences in the populations found over this wide range, there seems to be no tendency to the formation of well-marked subspecies.

Eudonia torniplagalis perfectalis Munroe, NEW SUBSPECIES PL. 3, FIGS. 15, 16.

Eudonia torniplagalis perfectalis Munroe. Type-locality: Upper Santa Ana River, San Bernardino County, California.

This subspecies resembles the preceding in general appearance, but is larger (length of forewing 11-12 mm) and has even more strongly contrasting maculation. The forewing has the base blackish fuscous, not pale as is often the case in the other subspecies. The basal area is separated from the antemedial-medial blackish-fuscous shading by an arcuate light-gray antemedial line. The pale discal area is even lighter gray than in the previous subspecies. The fuscous element of the postmedial line is fine and distinct. The hindwings are translucent whitish gray, considerably paler than in the other subspecies.

TYPES: Holotype: J. Upper Santa Ana River, San Bernardino County, California; 27 July 1947; Grace H. and John L. Sperry. Type no. 11,767, CNC.

Allotype: Q. Same locality, collector and number; 23 July 1947. CNC.

Paratypes: 1 3, 5 99. Same locality as holotype; 19 July–9 Aug. 1947; Grace H. and John L. Sperry; A. L. Melander (1 3, 3 99). Hathaway Creek, San Bernardino County, California; 2 Aug. 1940; J. A. Comstock (1 3, 1 9). CNC; USNM; LACM.

Eudonia albertalis (Dyar), NEW COMBINATION PL. 3, FIGS. 17–19; PL. A, FIGS. 4, 8 (McD. 5745). Scoparia albertalis Dyar, 1929, Proc. U.S. Natl. Mus., 74: (24): 2.

Type-locality: Banff, Alberta.

The moth is fairly large (length of forewing 8–10 mm). The forewings are broadly triangular and the ground color is uniformly somewhat powdery gray. The costa is weakly curved; the apex is acute, with the extreme tip narrowly rounded; the termen is rounded and distinctly oblique; the tornus is obtuse. The antemedial line is indistinct and fuscous, varying from outwardly oblique and bidentate to almost regularly curved. The orbicular and claviform spots are small black dashes. The orbicular is anterior to and considerably basad of the claviform. The reniform spot is diffuse, fuscous, 8-shaped, the median bar more distinct and blackish. The postmedial line is fuscous and is placed fairly far out on the wing. It is almost erect near the costa, but bends increasingly distad to the rounded median flexure; thence it runs obliquely basad to 2nd A and there bends towards the posterior margin. The

pretornal and preapical shades are greatly reduced, but there is a fairly distinct fuscous subterminal triangle. The fringe is gray, and the hindwings are dull gray, sometimes rather pale, but often nearly as dark as the forewings.

The male genitalia have the uncus fairly long, with truncate or weakly notched tip and rounded, decurved, setose sides. The gnathos is not as long as the uncus; its median element is slender and rodlike, with a small bulbous expansion at the apex. The juxta is short and pyriform. The valves are fairly slender but are distally rounded and expanded. The penis is cylindrical and somewhat curved, about nine times as long as thick. The female genitalia have the ductus bursae long, with a narrow, tubular, sclerotized zone near the ostial end; the rest of the ductus is membranous and coiled and expands gradually to its junction with the bursa. The bursa is globular, spinulose, with a small, depressed, heavily spinulose, nearly round signum on one side. There is a small, globular, membranous accessory sac.

The early stages are unknown.

The species occurs in montane forests from the Rocky Mountains of Alberta west to Vancouver Island and south into Washington, Idaho and as far as the Wind River Range of Wyoming.

> Eudonia vivida Munroe, NEW SPECIES PL. 3, FIGS. 20, 21. Eudonia vivida Munroe. Type-locality: Parrsboro, Nova Scotia.

DIAGNOSIS: This is the eastern counterpart of E. albertalis and the moth is fairly similar in maculation. The ground color is paler and less powdery than in E. albertalis. The dark markings are stronger and better defined, especially the orbicular and claviform spots. The postmedial line is not as strongly sinuated. The male genitalia have the uncus relatively shorter and wider than in E. albertalis; the gnathos is relatively longer and the values are shorter and not as strongly expanded distally.

DESCRIPTION: The frons is rounded, smoothly scaled and light gray. The vertex has fine, rough, erect scaling, and is also light gray. The labial palpi are porrect, exceeding the frons by somewhat more than the length of the head; the third segment is not hidden by the scaling of the second. The labial palpi are fuscous on the sides, light gray above and contrastingly light grayish buff at the base beneath. The maxillary palpi are prominent, somewhat dilated with scales distally, fuscous with pale-gray apices. The eyes are large; both they and the ocelli are fuscous. The antennae are slender in both sexes; the ventral surface is pilose and dark gray. The dorsal surface has alternate fuscous and light-gray scale rows; in the distal part of the antenna alternate scale-rows are somewhat raised. The thorax above is light gray with a weak buffy tint. The abdomen above is smoothly light grayish buff, the buff tint stronger on the posterior margins of the segments. The body beneath and legs are light grayish buff; the legs are weakly banded with fuscous.

grayish buff; the legs are weakly banded with fuscous. The forewings are of moderate width; the costa is curved; the apex is subacute; the termen is oblique and weakly curved; the tornus is obtuse; and the posterior margin is somewhat rounded. The ground color above is light gray with sparse fuscous dusting which hardly affects the general tone. There is an oblique blackish-fuscous dash near the base. The antemedial line is heavy, blackish fuscous, arcuate from the costa at one-fourth to the posterior margin at one-third. It is usually preceded by a narrow pale-gray zone, and its distal edge tends to be diffuse and powdery. The orbicular and claviform spots are strong black dashes, the orbicular is directly ahead of the claviform or slightly displaced basad. Both connect basally with the antemedial line. The reniform spot is black, 8-shaped, with the middle line strengthened; in some specimens the posterior loop is open. The postmedial line is black. It arises from the costa at five-sixths and is erect or nearly so for a short distance, then straight and oblique distad to the median flexure, which is narrowly rounded. Behind this the line is roughly parallel to the termen, running straight or weakly concave outward to the posterior margin at three-fourths. The preapical and pretornal patches are mostly gray and weakly contrasting, but in some specimens they are blackish fuscous, though they are usually not large. There is a row of blackish subterminal dots, somewhat enlarged at the middle of the wing. The fringe is light gray, slightly darker basally. The length of the forewing varies from 8–9 mm.

The hindwings above are very light gray, slightly darkened terminally. The fringe is whitish gray.

The forewings beneath are light gray, almost unmarked.

The hindwings beneath are whitish gray.

The male genitalia have the uncus rather broadly rounded, decurved and setose at the sides, weakly notched distally. The gnathos is slender, a little longer than the uncus and has a small bulbous distal expansion. The juxta is rounded ventrally and tapers dorsally. The valves are rather short and widen considerably towards the somewhat oblique terminal margin. The penis is cylindrical, curved and about nine times as long as wide. The female genitalia have the ovipositor lobes triangular and weakly setose. The posterior apophyses are slender and longer than the anterior ones, which are rhomboidally expanded sub-basally. The ostial chamber is conical and is followed by a rather short, tubular, sclerotized zone of the ductus. The rest of the ductus is membranous, moderately coiled. The globular, spinulose bursa has a small, round, spinulose signum and a small, membranous accessory sac.

The early stages are unknown.

TYPES: Holotype: J. Parrsboro, Nova Scotia; 16 July 1944; J. McDunnough. Type no. 11,768, CNC.

Allotype: 9. Ottawa House, Parrsboro, Nova Scotia; 11 Aug. 1943; J. McDunnough. Type no. 11,768, CNC.

Paratypes: 9 33. 6 99. Parrsboro, Nova Scotia; 12 and 16 July 1944; J. McDunnough (2 33). White Point Beach, Queen's County, Nova Scotia; 27 July 1935; J. McDunnough (1 9). South Milford, Nova Scotia; 1 July 1934; J. McDunnough (1 3). Digby, Nova Scotia; 5 July 1935; J. McDunnough (1 9). Campobello, Nova Scotia (1 3). Mount Lyall, Quebec, 1,500 ft; 5 Aug. 1933; W. J. Brown (1 9). Mont Joli, Quebec; 9 Aug. 1954; J. R. McGillis (1 3). Trinity Bay, Quebec; 17 Aug. 1929; W. J. Brown (1 3, 1 9). Goose Bay, Labrador; 13 Aug. 1949; Smith and Butler (1 9). Mount Bigelow, Maine, 3,800 and 4,000 ft; 7 Aug. 1954 and 8 Aug. 1952; A. E. Brower (1 3, 1 9). Franconia, New Hampshire; Mrs A. T. Slosson (1 9). Crawford's, New Hampshire; Mrs. A. T. Slosson (1 3). Eagle Lakes, Mount Lafayette, New Hampshire, 4,200 ft; 20 Aug. 1938 (1 9). CNC; USNM; AMNH; CM.

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Eudonia spaldingalis (Barnes and McDunnough), NEW COMBINATION PL. 3, FIGS. 22, 23 (McD. 5743).

Scoparia spaldingalis Barnes and McDunnough, 1912, Contrib. Nat. Hist. Lep. N. Am., 1 (5): 35, pl. 3, figs. 1, 4.

Type-locality: Eureka, Utah.

NOTE—The species was described from six male and nine female syntypes. I select the specimen in the USNM labeled "Scoparia spaldingalis B. & McD. Type \mathcal{J} " as lectotype (NEW DESIGNATION). This is the specimen shown by Barnes and McDunnough, op. cit., in their fig. 1.

The moth is easily distinguished by the pale-gray forewings, with arcuate, heavily infuscated antemedial band and strong, conjoined, black orbicular and claviform dashes. The reniform spot is 8-shaped, black, rather delicate and far removed from the postmedial line; the posterior loop of the 8 is sometimes open. The postmedial line is weak, pale gray, with hardly a trace of a darker border on the basal side, except at the costa, where there is a short fuscous or black mark. The line is rather close to the termen; it is evenly oblique before and behind the median flexure; the latter is obtusely rounded. The preapical and pretornal shades are obsolescent, but the subterminal spots are black and well marked and often fuse at the middle of the wing to form a narrow triangular patch. The fringe is light gray. The hindwings are whitish gray and thinly scaled.

The male genitalia have the uncus short and very wide, the sides rounded, decurved and setose, the distal end broadly truncate. The gnathos is as long as the uncus but has a narrow, somewhat compressed, curved, pointed median element. The juxta is pyriform with the narrowed dorsal part short, slender and sharp. The penis is rather strongly curved and is more than ten times as long as wide. The valves are rather strongly narrowed basally, but are expanded and symmetrically rounded distally. The female genitalia have the ovipositor lobes weak and sparsely setose. The posterior apophyses are threadlike and considerably longer than the anterior ones. The latter have a prominent, rhomboidal sub-basal expansion. The ductus bursae is basally conical, sub-basally tubular and sclerotized, then has a long, membranous part forming about eight coils. The bursa is small, rather strongly spinulose, with a round, depressed, spinulose signum and small accessory sac.

The early stages are unknown.

The species ranges from southern Alberta and the interior of British Columbia southward through Wyoming, Utah and Colorado to the vicinity of Flagstaff, Arizona, and Sandoval County, New Mexico. It occurs mostly at an elevation of about 6,000 to 8,000 feet and flies mainly in July.

Eudonia spenceri Munroe, NEW SPECIES PL. 3, FIGS. 24-29.

Eudonia spenceri Munroe. Type-locality: Diamond Head Trail, Squamish, British Columbia, 3,200 ft.

DIAGNOSIS: This species resembles *E. spaldingalis* in pattern, but has the ground color of the forewings above darker and considerably more variegated, the antemedial line less heavily infuscated, the orbicular and claviform spots smaller, the former usually prolonged to join the reniform along Cu. The postmedial line is more distinct than in *E. spaldingalis* and is

usually fairly strongly margined on the basal side with dark gray or fuscous; it is obtusely angled basad before the median flexure and somewhat incurved behind it. The preapical and pretornal triangular patches are generally fairly well marked and dark brownish fuscous in color. The hindwings are usually darker gray than in *E. spaldingalis*.

DESCRIPTION: The frons is rounded and smoothly scaled; the vertex has rough erect scaling; in color both are mixed light gray and grayish fuscous. The labial palpi are porrect and exceed the frons by somewhat more than the length of the head; the second segment is a little oblique; the third segment is acuminate and lies along the dorsal edge of the terminal scaling of the second, but is not concealed in it. In color the labial palpi are dark fuscous, somewhat paler gray dorsally and white at the base beneath. The maxillary palpi are prominent, with a large expanded tuft of scales distally; the color is dark fuscous, paler at the tip. The proboscis has dark basal scaling. The eyes and ocelli are fuscous. The antennae are filiform, dark gray, pubescent beneath, scaled above, with alternate scale-rows light gray and somewhat raised. The thorax above is brownish fuscous. The tegulae have considerable black scaling. The abdomen above is brownish gray. The body beneath and the legs are light buffy gray; the legs have dark bands dorsally.

The forewings are moderately wide, with convex costa and rounded apex; the termen is straight, weakly excurved, or often slightly incurved behind the apex; and the tornus is somewhat rounded. The ground color above is light gray, dusted and overlaid to a variable extent with brown and with blackish fuscous. The median area particularly is often heavily suffused with dark tones. There is a black basal dash behind the cell. The rest of the basal area is often contrastingly pale, but it may be dark. The antemedial line is rather far out on the wing; it is oblique distad from the costa at about one-fourth; it has an angulation distad opposite the orbicular, a slight deflection basad between the orbicular and the claviform, and thence runs nearly erect to the posterior margin at one-fourth. In color it is blackish fuscous, rarely contrasting, and is sometimes preceded by an inconspicuous pale-gray zone. The orbicular spot is black, transversely oval and usually annular; it touches or almost touches the antemedial line and is often prolonged along Cu to join the posterior loop of the reniform. The claviform spot is a strong black dash, situated directly behind the orbicular and joined basally to the antemedial line. The reniform spot is black, 8-shaped and oblique; its posterior loop is complete and approaches or touches the postmedial line; often there is a black streak through the middle. The postmedial line consists of a fairly distinct whitish-gray element preceded by a less distinct grayish-fuscous element. It arises from the costa at three-fourths to four-fifths, is nearly erect for a short distance, then it is obtusely angled or acutely dentate basad, thence oblique distad to the median flexure, thence moderately oblique basad for some distance and curved to run almost at right angles to the posterior margin at four-fifths. The preapical and pretornal patches are of variable intensity, from weakly dark gray to strongly fuscous, often with a brownish tint. There is a blackish-fuscous subterminal line, interrupted on the veins in many specimens and with a narrow triangular expansion in the middle of the wing. The fringe is gray, with a darker line in the basal part.

The hindwings above are pale gray, narrowly infuscated terminally. The fringe is whitish gray, with a darker line in the basal part.

The forewings beneath are dull gray. The costa is paler and buff-tinted, with a postmedial gray bar. The fringe is gray, with a darker line in the basal part.

The hindwings beneath are light gray. The costa and fringe are paler. There are often traces of a dark discocellular lunule.

The length of the forewing varies from 8–10 mm.

The male genitalia have the uncus broadly oval, narrowly excavated distally, the sides decurved and setose. The gnathos is triangular and tapers to a slender point. The juxta is subovate. The valves are narrow, widening evenly distad, distally rounded. The costa and sacculus are both narrowly inflated. The penis is cylindrical, about nine times as long as wide, not conspicuously curved. The female genitalia have the ovipositor lobes weak, obliquely truncate and sparsely setose. The posterior apophyses are threadlike, about the same length as the anterior ones. The latter are thicker and have a rhomboidal sub-basal expansion. The ostial chamber is cup-shaped and leads into a cylindrical sclerotized part of the ductus; following this is a membranous section in about seven coils, leading to the moderately large, globular, finely spinulose bursa. On this is a small, longitudinally elongate, depressed signum. There is a small, round accessory sac.

The early stages are unknown.

TYPES: Holotype: J. Diamond Head Trail, Squamish, British Columbia, 3,200 ft; 5 Aug. 1953; G. J. Spencer. Type no. 11,769, CNC.

Allotype: Q. Same data as for holotype, but 12 Aug. 1953. CNC.

Paratypes: 21 33, 39 99. Same locality as for holotype; 9–29 Aug. 1953; G. J. Spencer, W. R. M. Mason, Edith Mason, S. D. Hicks. CNC.

MATERIAL EXCLUDED FROM TYPE SERIES: A long series from: British Columbia, including Vancouver Island; Washington; Oregon; Idaho; Montana; Utah; California, as far south as Alma in the Coast Range and Tuolumne County in the Sierra Nevada; Mesa Verde, Colorado; a large number from the Pinal Mountains, Arizona, and a single specimen from the Huachuca Mountains.

REMARKS: There is no significant geographical variation in this extensive range. Even the Arizona specimens are almost the same in appearance as typical specimens from the Pacific Northwest. In the latter region there is a fairly conspicuous variant in which the black lines and spots are somewhat reduced, the basal and terminal areas are smeared with whitish gray and the medial area is contrastingly dark. This seems to intergrade with normal specimens and is probably no more than an allelic form.

This species constitutes a considerable part of Dyar's concept of E. nominatalis (Hulst), though he mixed material of other species with the present one. He had not seen the type of nominatalis, which, as noted above, is a synonym of E. rectilinea (Zeller).

Eudonia rotundalis Munroe, NEW SPECIES PL. 3, FIGS. 30, 31.

Eudonia rotundalis Munroe.

Type-locality: Bursum Camp, 18 miles east of Alma, Catron County, New Mexico, 9,000 ft.

DIAGNOSIS: The moth is of moderate size (length of forewing 8–9 mm), with fairly narrow forewings and somewhat rounded apex and termen. The ground color of the forewings is fairly smooth light gray, with weak infuscation in the antemedial and terminal areas. The

antemedial line is faintly indicated, outwardly oblique. The orbicular and claviform spots are small and faint, separate from the antemedial line, with the orbicular directly in front of the claviform. The reniform is small, 8-shaped, fairly well removed from the postmedial line. The latter is light gray, poorly defined, far out on the wing, weakly angulate anterior to the median flexure. The hindwings are light gray. The male genitalia have the uncus fairly wide with strongly curved sides and a very wide setose zone on each side. The tip of the uncus tapers to a narrowly rounded apex without median incision. The moth has narrower and rounder wings than *E. albertalis*; it is darker and less contrastingly marked than *E. spaldingalis*; and it is more smoothly and uniformly gray and less heavily marked than *E. spenceri*. It differs from all these species in the oblique antemedial line and in the shape of the uncus.

DESCRIPTION: The frons is rounded, somewhat roughly scaled, mixed light and dark gray, with a fairly prominent overhanging scale-tuft extending forward from between the antennae. The vertex is similarly colored, but has rough, erect scaling. The labial palpi are porrect with the third segment hidden in the rather deep scaling of the second; they exceed the frons by a little more than the length of the head; in color they are dark fuscous, narrowly light grayish buff at the base beneath. The maxillary palpi are prominent, with a strongly expanded distal scale-tuft; in color they are fuscous with light-gray tips. The basal scaling of the proboscis is light gray. The eyes are large, dark fuscous. The ocelli are fuscous. The antennae are somewhat thickened in the male, filiform in the female; they are fuscous and finely pubescent below; above they have alternate row of light-gray and fuscous scales, the light-gray rows raised. The thorax above is gray, weakly and finely dusted with fuscous. The abdomen above is shining gray. The body beneath and the legs are light grayish buff, the abdomen and legs banded with fuscous.

The forewings are fairly narrow; the costa is somewhat curved; the apex is rounded; the termen is oblique and rounded; the tornus is obtuse and the posterior margin is very weakly curved. The ground color is smooth medium gray, finely powdered with fuscous, the powdering weaker in the distal part of the medial area than elsewhere. The base is somewhat infuscated; the antemedial line is weak, diffuse, fuscous, slightly irregular, oblique distad from the costa at one-fourth to the posterior margin at one-third. The orbicular and claviform are weak fuscous dots or dashes, separate from the antemedial line and with the orbicular directly anterior to the claviform. The orbicular is fairly small, weak, fuscous, 8-shaped, outwardly oblique, not closely approaching the postmedial line. The latter is light gray, preceded by a weak fuscous line. It is placed rather close to the termen; it is usually weakly indented anterior to the median flexure; the latter is rounded and the line is thence straight and oblique or weakly flexed to the posterior margin. The preapical, pretornal and subterminal triangular patches are strong, grayish fuscous, and occupy most of the subterminal space, though they are distinctly separated in most specimens by a V-shaped gray line. The fringe is gray, lightly checkered with fuscous.

The hindwings above are light gray, with narrow, inconspicuous terminal darkening. The fringe is light gray, the basal part with a weak buff tint.

The forewings beneath are silky gray, the costa narrowly buff and intercepted by a dark postmedial bar. There are traces of a fuscous discocellular spot. The fringe is light gray with two darker lines.

The hindwings beneath are as above.

The male genitalia have the uncus rather wide, with curved sides and narrowly rounded tip without median incision; the lateral setose zones are unusually wide. The gnathos is weak, with a narrow median element. The juxta is pyriform. The valves are of moderate length and expand evenly from a rather narrow base to a broadly rounded tip. The penis is about ten times as long as wide. The female genitalia have the ovipositor lobes triangular and hardly setose. The slender anterior apophyses are longer than the medially thickened posterior ones. The ductus bursae has a cylindrical sclerotized zone. The globular, spinulose bursa has a small, depressed, spinulose signum and a membranous accessory sac.

The early stages are unknown.

TYPES: Holotype: J. Bursum Camp, 18 miles east of Alma, Catron County, New Mexico, 9,000 ft; 14 July 1961; F., P. and J. Rindge; collected on NSF Grant G 9037. AMNH.

Allotype: Q. Same data except collected 16 July 1961. AMNH.

Paratypes: 41 3, 7 99. Same locality and collectors as for holotype; 7–16 July 1961 (36 33, 5 99.) Horseshoe Springs Camp, 2 miles west of La Cueva, Sandoval County, New Mexico, 7,900 ft; 30 and 31 July 1961; F., P. and J. Rindge; collected on NSF Grant G 9037 (3 33). Cowles, New Mexico; 2 July 1935; A. B. Klots (1 3). Mesa Verde National Park, Montezuma County, Colorado; 9 July 1959; Margot May (1 3). West Fork, 6,500 ft, 16 miles southwest of Flagstaff, Coconino County, Arizona; 4 July 1951; R. W. Hodges (2 99). AMNH; type no. 11,770, CNC; CPK; ABK; JGF.

Eudonia franclemonti Munroe, NEW SPECIES PL. 3, FIG. 32.

Eudonia franclemonti Munroe.

Type-locality: West Fork, 6,500 ft, 16 miles southwest of Flagstaff, Coconino County, Arizona.

DIAGNOSIS: The relatively small size (length of forewing 8 mm) and general appearance of this moth are not dissimilar to those of E. rotundalis. The present species has the ground color of the forewings paler, the general appearance more variegated, the darker areas medium gray with a definite brownish tint and the orbicular and claviform spots distinct and blackish, though small.

DESCRIPTION: The frons is rounded, smoothly scaled, whitish buff, with a few fuscous scales; it is overhung by a whitish-buff scale-tuft extending forward between the antennae. The vertex has erect whitish-buff scaling; some of the setae of the chaetosemata are blackish. The labial palpi are porrect and exceed the frons by somewhat more than the length of the head; the third segment is hidden in the scaling of the second. The color is blackish fuscous, with a few pale-buff scales distally above and with the base beneath contrastingly whitish. The maxillary palpi are prominent and have an expanded distal tuft of scales. They are fuscous, tipped with light gray. The basal scaling of the proboscis is light gray. The eyes are large and fuscous. The ocelli are fuscous. There is a fuscous zone behind each eye. The antennae are somewhat thickened in the male, finely filiform in the female, pilose beneath in both sexes. The ventral surface is fuscous; the dorsal surface is scaled, with alternate fuscous and raised pale-buff scale-rows. The thorax above is light grayish buff. The abdomen above

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is of the same color but is smoother in texture. The body beneath is whitish buff. The legs are pale buff, dorsally banded and dusted with fuscous.

The forewings are moderately narrow, with the costa curved, the apex subacute, narrowly rounded, the termen rounded and oblique, the tornus obtuse and the posterior margin weakly rounded. The length of the forewing is about 8 mm. The ground color above is light buffy gray with scattered yellowish-buff and fuscous scales which hardly alter the general tone. There is an outwardly oblique fuscous mark from the costa to the middle of the wing just beyond the base. The basal area has rather strong fuscous dusting. The antemedial line is outwardly oblique from the costa at one-third to the posterior margin at two-fifths; it has an inconspicuous dentation just behind the cell. It is diffuse, fuscous, narrowed at the postcellular dentation and preceded by a very narrow undusted zone of the ground color. The orbicular and claviform are blackish-fuscous dots, one directly behind the other, the claviform touching the antemedial line. The costa is diffusely infuscated between the orbicular and the reniform. The latter is small, brownish fuscous, 8-shaped and oblique and does not closely approach the postmedial line. The postmedial line is weak, brownish fuscous, a little stronger near the costa. It arises from the costa at about four-fifths and is weakly oblique basad to R5; there it is obtusely angled and runs obliquely distad to the obtuse median flexure; then it is oblique basad and almost straight, ending on the posterior margin at four-fifths. The preapical, pretornal and subterminal patches are fairly strong but separate; in color they are brownish fuscous. There is a broken fuscous terminal line. The fringe is whitish buff checkered with fuscous.

The hindwings above are translucent whitish gray, weakly infuscated terminally. The fringe is whitish buff with a faint fuscous line basad of the middle.

The forewings beneath are smoothly grayish buff, paler and yellowish buff along the costa and termen. There are faint indications of the dark pattern of the upperside. The fringe is whitish buff.

The hindwings beneath are whitish gray and unmarked.

The male genitalia have the uncus moderately short and wide, with rounded setose sides and very weak terminal indentation. The gnathos is very slender and is shorter than the uncus; the median element is a slender rod ending in a minute knob. The juxta is pyriform. The valves are evenly expanded with the tips rounded. The penis is straight, cylindrical, about eight times as long as wide. The female genitalia are unknown.

The early stages are unknown.

TYPES: Holotype: J. West Fork, 6,500 ft, 16 miles southwest of Flagstaff, Coconino County, Arizona; 3 July 1964; J. G. Franclemont. JGF.

Paratype: 1 3. Same locality as for holotype; 4 July 1961; R. W. Hodges. Type no. 11,969, CNC.

Eudonia schwarzalis (Dyar), NEW COMBINATION PL. 3, FIG. 33 (McD. 5378).

Scoparia schwarzalis Dyar, 1906, Jour. New York Ent. Soc., 14: 103. Type-locality: Santa Rita Mountains, Arizona.

The species is known only from the holotype, which lacks the head and one forewing. Although cited by Dyar as a male, the holotype is actually a female.

The length of the forewing is about 7 mm. The width is moderate; the costa is weakly curved; and the apex, termen and tornus are rounded. The ground color above is light gray, with a sparse scattering of fuscous scales. There is an inconspicuous fulvous basal patch. The antemedial line is poorly developed: an outwardly oblique black line on the costa is followed by a diffuse zone of fuscous dusting, blending with the dusting of the basal area. The orbicular and claviform spots are distinct black dots, the former placed almost directly anterior to the latter. Between the two there is an elongate fulvous patch. The reniform spot is about equidistant from the orbicular spot and the postmedial line. It is gamma-shaped, black, the anterior loop filled with brown and with some brown scaling elsewhere in the vicinity. The postmedial line is narrow, fuscous, weakly zigzagged anterior to the median flexure, oblique basad posterior to it. Almost immediately beyond the postmedial line. Beyond this band is a row of subterminal fuscous spots, largest in the middle. The fringe is gray, checkered with fuscous.

The hindwings are light gray, weakly infuscated distally.

The male genitalia are unknown. The female genitalia are typical of the genus, with the ovipositor lobes weakly developed, with the posterior apophyses about the same length as the anterior, with a tubular sclerotization near the ostial end of the ductus bursae and with the rest of the ductus bursae long, coiled and membranous. The bursa is round and spinulose, with a small, depressed, spinulose, somewhat elongate signum on one side, extending anteriorly into the wall of the ductus bursae. There is a small, membranous accessory sac.

The early stages are unknown.

The type specimen was collected on 30 May 1898 by E. A. Schwarz.

Further material should be looked for in the Santa Rita Mountains and other ranges of southern Arizona.

Eudonia leucophthalma (Dyar), NEW COMBINATION PL. 3, FIGS. 34-36 (McD. 5739).

Scoparia leucophthalma Dyar, 1929, Proc. U.S. Natl. Mus., 74 (24): 3. Type-locality: Victoria, British Columbia.

The moth is of moderate size (length of forewing 7.5–9 mm) and has the forewings moderately broad, with subacute, narrowly rounded apex and straight, weakly oblique termen. The ground color is light gray with extensive fuscous mottling and suffusion and often with some buff or brownish scaling along the cubitus. The dark spots and patches are large and conspicuous and the general appearance is of strong variegation. The most distinctive feature of the species is the orbicular spot, which is large and 8-shaped and has the posterior loop filled with white or light gray, contrasting with adjacent areas of the wing. The antemedial line is inconspicuous, arcuate and shallowly dentate. The postmedial line is well defined, light gray and strongly angled between the costa and the median flexure. The preapical, pretornal and subterminal patches are usually large, fuscous and conspicuous. An aberration has the basal and terminal areas broadly suffused with whitish gray. The hindwings above are light fuscous, somewhat darker terminally.

The male genitalia have the uncus short, rounded, very wide and slightly notched medially. The gnathos is short, thick and finger-like. The valves are somewhat narrowed basally, expanded, rounded and a little oblique distally. The penis is cylindrical, weakly curved and about eight times as long as wide. The female genitalia have the ovipositor lobes short, poorly developed, blunt and hardly setose. The posterior apophyses are fine and threadlike, longer than the anterior apophyses. The latter have a rhomboidal thickening sub-basally. The ostial chamber is cup-shaped, finely spinulose. It leads into the long, narrow, coiled ductus bursae, which has a tubular sclerotized zone immediately adjacent to the ostial chamber. The rest of the ductus is finely spinulose and membranous. The bursa is globular, finely spinulose and has a small, round, depressed, spinulose signum on one side. There is a small, round, membranous accessory sac.

The early stages are unknown.

The species is so far known only from Vancouver Island, British Columbia and from the coastal region of central California. The populations from these two areas differ considerably, but I treat them as subspecies of a single species. In both areas *E. leucophthalma* flies in June and July, whereas the *E. echo* apparently flies in August and September in the same localities, though it is known to fly earlier inland.

Eudonia leucophthalma leucophthalma (Dyar) PL. 3, FIG. 34 (McD. 5739).

Scoparia leucophthalma Dyar, 1929, Proc. U.S. Natl. Mus., 74 (24): 3. Type-locality: Victoria, British Columbia.

The moth is relatively small, with a forewing length of 7.5–8 mm. The forewing above is less contrastingly marked than in the following subspecies and has a rather buff or olivaceous tint. The antemedial line and orbicular and claviform spots are relatively inconspicuous.

This subspecies is so far known only from Victoria, British Columbia. I have seen only the type series.

Eudonia leucophthalma petaluma Munroe, NEW SUBSPECIES PL. 3, FIGS. 35, 36. Eudonia leucophthalma petaluma Munroe. Type-locality: Petaluma, California.

The moth is larger than the nominate subspecies (length of forewing 8–9 mm) and has the forewings less brownish and considerably more variegated. The antemedial line is relatively strong, though somewhat diffuse; it consists of about equally well-developed basal light-gray and distal fuscous elements. The orbicular and claviform spots are relatively large blackish-fuscous patches. The reniform spot is darker and more strongly contrasting than in the nominate subspecies.

TYPES: Holotype: J. Petaluma, California; 11 June 1938; E. C. Johnston. Type no. 11,771, CNC.

Allotype: Q. Same locality, collector and type number; 21 July 1936. CNC.

Paratypes: 24 33, 1 \bigcirc . Same locality, collector and type number, various dates in May, June and July. CNC.

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Eudonia echo (Dyar), NEW COMBINATION PL. 3, FIGS. 37–39; PL. 4, FIGS. 1–4 (McD. 5740).

Scoparia echo Dyar, 1929, Proc. U.S. Natl. Mus., 74 (24): 3. Type-locality: Victoria, British Columbia.

The moth resembles *E. leucophthalma* and has about the same size range. The apex is somewhat more acute and the termen more oblique in the forewings. In general the forewings are less variegated and more extensively suffused with fuscous than in *E. leucophthalma*, but this character varies geographically, Vancouver Island specimens tending to be more variegated than others. The posterior loop of the reniform spot does not contain a contrastingly pale spot but is filled with gray, matching the ground color. The orbicular spot is not displaced basad of the claviform, as in *E. leucophthalma*, but instead is almost directly in front of it or even somewhat displaced distad. The postmedial line is fine, whitish gray, and runs obliquely basad from the costa instead of being oblique distad for a short distance, as is usually the case in *E. leucophthalma*.

The male genitalia have the uncus short and moderately wide, with curved setose sides and rounded tip. The gnathos is slender and considerably shorter than the uncus. The median element is narrow but tapers slightly to a small bulbous swelling at the tip. The juxta is pyriform. The valves are somewhat narrowed basally, moderately expanded distally and rounded at the tip. The penis is about 12 times as long as wide and is moderately curved except at the base and tip, which are straight. The female genitalia are rather similar to those of *E. leucophthalma*. They have the apophyses very fine and threadlike, the anterior apophyses as long and as slender as the posterior ones, with only a small sub-basal expansion. The membranous part of the ductus is long and thin and forms about seven tight coils. The signum is round and very small. The accessory sac is small.

The early stages are unknown.

The species ranges from Vancouver Island east at least to Kaslo and Nelson, British Columbia. Thence it extends south through Washington and Oregon into California, where it occurs as far south as Marin and Madera counties. Mainland specimens are smaller, darker and considerably less contrastingly marked than those from Vancouver Island, and I accordingly distinguish two subspecies. However the geographic variation of this species deserves more careful study and the pattern may prove to be more complex when more extensive material has been examined.

Eudonia echo echo (Dyar) PL. 3, FIGS. 37-39 (McD. 5740).

Scoparia echo Dyar, 1929, Proc. U.S. Natl. Mus., 74 (24): 3. Type-locality: Victoria, British Columbia.

The moths are relatively large (length of forewing 7.5–9 mm, but averaging nearer the latter figure) and are more strongly variegated than in the following subspecies. The forewing above has more pale dusting and mottling; the orbicular and claviform spots are relatively large and contrasting, and the reniform spot is large and conspicuous.

The subspecies flies in southern and eastern Vancouver Island in August and September. Further investigation may show that it is somewhat more widely distributed in coastal areas. Most Washington material, including a series from Elwa River, Clallam County, just south of Vancouver Island, seems clearly referable to the following subspecies, but a single female from Cathlamet, Wahkiakum County, is closely similar to typical Vancouver Island specimens.

Eudonia echo gartrelli Munroe, NEW SUBSPECIES PL. 4, FIGS. 1-4. Eudonia echo gartrelli Munroe. Type-locality: Shingle Creek Road, Keremeos, British Columbia.

The moth is on the average smaller than the preceding subspecies (length of forewing 7-8.5 mm, average about 8 mm). There is less pale dusting and mottling on the forewing, which has a relatively uniform and powdery dark appearance. The orbicular, claviform and reniform spots are relatively small and inconspicuous; the pale postmedial line is weaker; and the dark markings of the subterminal area tend to run together more and to contrast less with the ground color.

TYPES: Holotype: J. Shingle Creek Road, Keremeos, British Columbia; 21 July 1936; A. N. Gartrell. Type no. 11,772, CNC.

Allotype: Q. Data as for holotype.

Paratypes: 11 33, 6 99. Same locality and collector as for holotype; 9–24 July 1936. CNC.

ADDITIONAL MATERIAL EXAMINED. A long series from various localities in southern British Columbia, from Lillooet to Kaslo; from Clallam, Clarke, King, Kitsap, Kittitas, Okanogan, Pierce, Snohomish, Thurston, Whatcom and Yakima counties, Washington; from Biggs, Sherman County, Oregon; and from Siskiyou, Lake, Marin, Contra Costa and Madera counties, California.

The subspecies appears to be more abundant in the northern part of its range. In the typelocality it flies in the latter part of July and early August, but in many localities it flies mainly in August. In Siskiyou County, California, it has been taken in early July and late August and is doubtless double-brooded.

Eudonia bronzalis (Barnes and Benjamin), NEW COMBINATION PL. 4, FIG. 5 (McD. 5741).

Scoparia bronzalis Barnes and Benjamin, 1922, Contrib. Nat. Hist. Lep. N. Am., 5: 48. Type-locality: San Bernardino, California.

The moths are relatively small (length of forewing 7–7.5 mm). The forewings have the apex and termen more rounded than in the previous two species. The ground color is largely suffused with brownish fuscous, with a weak bronzy luster, from which the species takes its name. The antemedial line is narrow, very weakly oblique distad and has both basal pale and distal fuscous elements weak and inconspicuous. The orbicular and claviform spots are both obscure black dots, one directly behind the other, close to or touching the antemedial line. The reniform spot is of moderate size, inconspicuous, X-shaped or sometimes 8-shaped and without a contrasting pale spot in the posterior loop. The postmedial line is narrow, pale buff, and incurved before and behind the rather sharp median flexure. The dark patches of the subterminal region are large but they hardly contrast with the dark ground color. The fringe is gray, checkered with fuscous. The hindwings above are light grayish fuscous.

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The male genitalia are unknown. The female genitalia have the ovipositor lobes weak and sparsely setose. The apophyses are slender and threadlike; the posterior and anterior apophyses are of about the same length. The ductus bursae is slender, with a tubular, weakly sclerotized zone near the ostial end, the more distal part membranous and coiled. The bursa is small and globular, with a small, hemispherically depressed, strongly spinulose signum on one side, otherwise membranous, with only inconspicuous microspinules. There is a globular, membranous accessory sac.

The early stages are unknown.

The species was described from a short series of females from San Bernardino and Loma Linda, San Bernardino County, California. I also refer three females from Pinnacles National Monument, San Benito County, California, to this species, though they are somewhat grayer than the types.

The moths have been collected in late September and in October.

This species appears to be closely related to *E. echo*, and it may not really be more than subspecifically distinct. If this is so, then the name *bronzalis* will take precedence, with *echo* and *gartrelli* as subspecies.

Eudonia lugubralis (Walker), NEW COMBINATION PL. 4, FIGS. 6–15 (McD. 5742, in part, 5746).

Scoparia lugubralis Walker, 1865, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 34: 1498.

Type-locality: St. Martin's Falls, Albany River, Hudson's Bay.

Scoparia phycitinalis Dyar, 1929, Proc. U.S. Natl. Mus., 74 (24): 4. NEW SYNONYMY and NEW COMBINATION with Eudonia.

Type-locality: Bilby, Alberta.

Eudoria persimilalis McDunnough, 1961, Amer. Museum Novit., 2054: 7, fig. 5. NEW SYNONYMY and NEW COMBINATION with Eudonia.

Type-locality: Doyles, Codroy Valley, Newfoundland.

NOTE—The holotype and allotype, which McDunnough cited as being in his collection, were later presented by him to the CNC.

The moths are somewhat variable in size and in proportions of the wings; the length of the forewing ranges from 8–12 mm; the forewings of males are often moderately wide, but in many specimens they are narrower than in most American species of the genus; females often, though not always, are weakly brachypterous, with the wings reduced in both length and width as compared with males from the same place. Variation in the width of the wing is continuous within series from the same locality and does not seem to be accompanied by differences in pattern or color. Throughout most of the range the moths have the forewings medium gray with fine fuscous dusting, giving a dark bluish-gray general effect. The antemedial line is outwardly oblique and somewhat irregularly dentate; in some specimens the posterior part of the line is outwardly oblique, in others it is inwardly oblique; the latter is more apt to be the case in broad-winged males. In color the antemedial line is diffusely grayish fuscous, preceded by a variably distinct light-gray zone. The orbicular and claviform spots are small and fuscous. The claviform is near the antemedial line but the orbicular is placed distinctly anterodistad of the claviform and is well removed from the antemedial line. The reniform spot is small, fuscous, X-shaped or 8-shaped, and is usually surrounded by a

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small patch of dark-gray dusting which often extends to the costa. The postmedial line is fuscous followed by light gray; it is sharply angled basad at R_{3+4} , then extends distad to the sharp median flexure, from which it runs more or less straight or with slight curvature or angulation to the posterior margin. The preapical, pretornal and subterminal fuscous patches are usually well developed, though not very strongly contrasting. The fringe is gray, checkered with fuscous. The hindwings above are dull brownish fuscous, somewhat darker terminally and with the fringe paler.

The male genitalia have the uncus somewhat variable in width, but usually narrow, with the sides decurved and setose and the tip not or hardly indented. Because of the downward curvature of the sides, the apparent width and indentation are considerably affected by the position of the specimen. The gnathos is as long as the uncus and is fairly strong but divided nearly to the tip. The juxta is pyriform. The valves are of moderate length and expand gradually and weakly to the slightly unsymmetrically rounded tip. The penis is cylindrical, weakly curved, about 12 times as long as wide. The female genitalia have the ovipositor lobes poorly defined and sparsely setose. The anterior and posterior apophyses are of about the same length. The ductus bursae is long and slender, with a tubular sclerotized zone near the ostium, the remainder membranous and weakly coiled near the bursa. The latter is globular, finely spinulose, with a round, well-defined but small, depressed, spinulose signum.

The early stages are unknown.

This species is closely similar in appearance and ecology to the north European *E. alpina* (Curtis), but that species has the gnathos heavy and triangular. *D. lugubralis* ranges from Newfoundland to Alaska in the Hudsonian and Canadian zones and extends locally and sporadically south into the transition zone in Canada and the northern U.S.A. McDunnough's concept of *E. lugubralis* (McDunnough, 1961:5) was based largely on *E. vivida* Munroe, and consequently he was led to redescribe the present species as *E. persimilalis*. Despite the wide range and variability of *E. lugubralis* it shows little obvious geographical differentiation. However, a series from Unalakleet, Alaska, has the maculation considerably obscured and seems worthy of recognition as a subspecies.

Eudonia lugubralis lugubralis (Walker) PL. 4, FIGS. 6–12 (McD. 5742, in part, 5746).

Scoparia lugubralis Walker, 1865, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 34: 1498.

Type-locality: St. Martin's Falls, Albany River, Hudson's Bay.

Scoparia phycitinalis Dyar, 1929, Proc. U.S. Natl. Mus., 74: (24) 4. Type-locality: Bilby, Alberta.

Eudoria persimilalis McDunnough, 1961, Amer. Museum Novit., 2054: 7, fig. 5. Type-locality: Doyles, Codroy Valley, Newfoundland.

The characters of this subspecies are as described for the species. The subspecies has a northern transcontinental range, being rather generally abundant in the Hudsonian and Canadian zones from Newfoundland to eastern Alaska and the Yukon Territory. It is abundant in parts of Nova Scotia and New Brunswick and in Labrador and northern Quebec and Ontario. Thence it extends across the parkland and forest belts of the Prairie Provinces to the Rocky Mountains of Alberta and north to Bathurst Inlet and the Mackenzie Delta.

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Westward the species ranges to Ketchikan, Alaska and Whatcom County, Washington, but it seems to be scarce in the Cordillera and not to extend far southward. In the east it ranges southward sporadically to Maine, New Hampshire and southern Quebec and Ontario.

Eudonia lugubralis madgei Munroe, NEW SUBSPECIES PL. 4, FIGS. 13–15. Eudonia lugubralis madgei Munroe Type-locality: Unalakleet, Alaska.

The basic maculation is like that of the nominate subspecies, but it is considerably suffused and weakened. The ground color of the forewings is pale and has a smooth appearance because of the reduction of the fuscous dusting; in most specimens it is strongly browntinted. The antemedial line is usually reduced or absent and always lacks the pale-gray element. The orbicular and claviform spots are rather weak but are usually visible. The reniform spot may be either normal or partly obscured. The postmedial line is represented by its dark element, which is usually fairly strong and shaped as in the nominate subspecies. The pale element is also visible but is of the same color as the ground of the wing. The preapical and pretornal patches are well developed in most specimens, somewhat brownish fuscous in color. However the subterminal patch and spots are generally reduced. The fringe is brownish gray, often with faint fuscous checkering. The hindwings are as in the nominate subspecies. The length of the forewing ranges from 10–12 mm. In most specimens the forewings are rather narrow and some females have a weak tendency to brachyptery.

TYPES: Holotype: J. Unalakleet, Alaska; 7 July 1961; R. Madge. Type no. 11,773, CNC. Allotype: Q. Data and type number as for holotype. CNC.

Paratypes: 16 33, 7 2° . Same data and type number as for holotype, except 1 3 collected 23 June 1961. CNC.

No doubt this subspecies will prove to have a more extensive range along the western coast of Alaska.

Eudonia strigalis (Dyar), NEW COMBINATION PL. 4, FIGS. 16–18 (McD. 5735).

Scoparia strigalis Dyar, 1906, Jour. New York Ent. Soc., 14: 104. Type-locality: Grimsby, Ontario.

NOTE—The locality cited is that of the lectotype, hereby designated, a specimen without abdomen segregated as type in the USNM.

This is a small species (length of forewing 5.5–7.5 mm). The forewings above have the ground color evenly light gray, with the antemedial line absent or hardly indicated and the post-medial line very fine and weak, fuscous, straight and oblique before and behind the obtusely angled median flexure. The orbicular and claviform spots are produced as fine but conspicuous, longitudinal, black streaks. There are one or two similar streaks in the basal area, one in line with the claviform, the other near the posterior margin. The reniform spot is fairly large, 8-shaped, but weakly defined except for a longitudinal black streak through its middle. The preapical and pretornal patches are reduced or absent, but the subterminal

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spots are conspicuous, black, prolonged into longitudinal streaks, the median ones sometimes united to form a triangular patch. The fringe is light gray. The hindwings vary from light to dark gray.

The male genitalia have the uncus short, rounded, wide, laterally setose and without terminal incision. The gnathos is relatively strong, the median piece with triangular base extending into a clavate distal part. The juxta is pyriform. The valves are narrow, subtruncate distally, parallel-sided, and with an oblique patch of hairlike setae near the middle of the ventral margin. The penis is cylindrical, straight and about nine times as long as thick. The female genitalia have the ovipositor lobes poorly developed and weakly setose. The posterior apophyses are threadlike, about as long as the somewhat thicker anterior apophyses. The ductus bursae is long and slender, with a tubular sclerotized zone at the ostial end, the distal part membranous and weakly coiled. The bursa is globular, finely spinulose, with a small, round, depressed, strongly spinulose signum on one side and with a small, globular, membranous accessory sac.

The early stages are unknown.

The species ranges widely through the eastern part of the continent, from Nova Scotia and southern Ontario to southern Florida, but it appears to be rare everywhere. The pattern of black streaks appears to distinguish it easily from other species, but it is possible that there will prove to be a dimorphic form with a more normal pattern.

Eudonia heterosalis (McDunnough), NEW COMBINATION PL. 4, FIGS. 19–21.

Eudoria heterosalis McDunnough, 1961, Amer. Museum Novit., 2054: 9, fig. 7. Type-locality: Kearney Lake Road, Halifax County, Nova Scotia.

NOTE—The holotype was presented by McDunnough to the CNC after the publication of his paper.

The moth is small (length of forewing 5.5–7 mm). The forewings are fairly narrow, with narrowly rounded apex and somewhat rounded and oblique termen. The ground color above is gray, dusted and mottled with fuscous, the general effect somewhat variegated dull gray. There are short dark sub-basal streaks. The antemedial line is weak but evident, light gray followed by fuscous; it is oblique distad from the costa at about one-fourth to Cu, there right angled and oblique basad to the posterior margin at one-third. The orbicular and claviform are minute black dots, one directly behind the other, the claviform touching the angle of the antemedial line. The reniform spot is 8-shaped, fuscous, weak except for a darker longitudinal median streak. The postmedial line is fine, weakly denticulate, oblique distad from the costa to the obtusely angled median flexure, thence oblique basad to the posterior margin. The preapical, pretornal and submarginal spots are large, triangular and clearly developed. The fringe is gray, checkered with fuscous. The hindwings are varying shades of gray.

The male genitalia have the uncus longer than wide, with the sides somewhat curved and setose and with the tip shallowly incised. The gnathos is slender, Y-shaped and shorter than the uncus. The juxta is pyriform. The valves are short and wide and broaden distally to an obliquely rounded tip; they do not have an oblique patch of setae as in *E. strigalis*. The penis is somewhat curved, about seven times as long as thick. The female genitalia have the ovipositor lobes poorly differentiated and weakly setose. The posterior apophyses are as

long as the anterior ones but thinner. The ductus bursae is long and fairly wide, with a rather short and wide, tubular, sclerotized zone at the ostial end; the rest of the ductus is wide, membranous and tightly coiled. The bursa is globular and spinulose. It has a round, depressed, spinulose signum on one side and a conspicuous zone of coarse spinules on the other. There is a globular membranous accessory sac.

The early stages are unknown.

This species has nearly the same range as the last, but is considerably more numerous. It has been taken from Nova Scotia and southern Quebec and Ontario south to Louisiana and Florida. It has generally been mixed in collections with *Scoparia basalis* and *S. biplagialis*, but the position of the orbicular directly in front of the claviform and the outward angulation of the antemedial line should distinguish it easily. The genital characters are of course very distinctive.

The species differs obviously in both male and female genital characters from E. strigalis; nonetheless the relationship of the two deserves further study. Some variants of E. heterosalis look uncomfortably like transitions to E. strigalis in maculation and the pattern of the latter could well be that of a dimorphic form. It would not be astonishing to find either variants of E. strigalis with a pattern of the normal type seen in E. heterosalis or streaked forms of E. heterosalis superficially resembling E. strigalis.

SUBFAMILY Nymphulinae Duponchel

Type-genus: Nymphula Schrank, 1802.

Nymphulites Duponchel, 1844, Catalogue des Lépidoptères d'Europe, 201.

Musotimidae Meyrick, 1886, Trans. Ent. Soc. London, 1886: 217. Tribe. Type-genus: Musotima Meyrick, 1886.

Hydrocampinae Ragonot, 1891, Ann. Soc. Ent. France, (6) 10: 445. Type-genus: Hydrocampa Stephens, 1829, now considered a synonym of Nymphula Schrank 1802.

These moths have attracted considerable attention because of their pleasing appearance and especially because of the aquatic early stages of the majority of the species and the accompanying structural and biological adaptations.

The moths are of small to medium size and delicate build. They are often pale in color and usually have a definite and complicated pattern of transverse bands. Some species have a row of shining metallic spots along the termen of each hindwing, which are raised and displayed when the moth is at rest. The labial palpi are well developed and usually have the basal segment relatively long. The maxillary palpi are prominent. The chaetosemata are distinct. The proboscis is generally well developed. The frons is usually rounded and not prominent. The eyes are large and the ocelli are well developed. The body is usually slender. The praecinctorium is simple and not bilobed. The wing venation varies, but in North American species the radial field of the forewings is narrow and vein R_2 is usually stalked with R_{3^+4} . The hindwings often have a rounded or angulate incision of the termen somewhat behind the apex.

The male genitalia have a simple uncus, most often long and slender, and a long, slender gnathos, basally articulating at the base of the tegumen, and distally usually with a dorsal

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row of teeth. The juxta is simple. The valves are usually simple and distally rounded. In a number of genera they have long, thick, strongly bent, scalelike setae extending dorsally beyond the costa. These setae are usually few in number and arise from different parts of the valve in different genera. Their function has not been determined. The female genitalia vary considerably in different genera. The bursa often, but by no means always, has a strong and elaborate armature of spines.

The life history differs in different groups, but the most familiar genera, including most of the North American ones, are aquatic. However the primitive *Musotima* and *Ambia* groups, best represented in the tropics, appear normally to have terrestrial, fern-feeding larvae. In North America the genus *Undulambia* has larvae of this type. As Lange (1956) has emphasized, the remaining genera have larvae that fall into two distinct biological types: (1) case-making, leaf-eating larvae with or without gills that live in standing water and (2) web-spinning, alga-eating larvae that always have blood gills and live on rocks in rapidly flowing streams. In North America these differences seem to correlate well with differences in adult structure, but in the Old World tropics, as Lange points out, it is doubtful that these regularities hold.

I follow Lange in recognizing these groupings as tribes, but I add the tribe Ambiini, to accommodate the forms with terrestrial larvae.

KEY TO NORTH AMERICAN TRIBES AND GENERA

1. Hindwing with M_2 present 2

- Hindwing with M_2 absent . . (Argyractini), 11
- 2. Forewing with cell about half length of wing; in North American species hindwings and sometimes forewings strongly incised behind M₁; a glandular swelling behind costa of forewing of male near middle

(Ambiini), Undulambia

p. 75

- Forewing with cell at least three-fifths length of wing; wings usually not strongly incised behind M₁; male without a conspicuous glandular swelling behind costa (Nymphulini), 3
- 3. Forewing with veins M₃ and Cu₁ stalked Langessa p. 100

- weakly excavated behind M_1 ; posterior process of eighth sternite of male abdomen absent or very narrow5 5. Outer margin of hindwing with a series of black and metallic spots 6 Outer margin of hindwings without such spots 7 6. Black spots distinctly separate, with pupillate bluish centers; 1st A of hindwing complete Neocataclysta p. 78 Black spots not distinctly separate; metallic spots not pupillate; 1st A of hindwing vestigial Chrysendeton p. 79 7. Apex of forewing angular 8 8. Size small; color blackish; second segment of labial palpus long, with rough thick scaling, third segment relatively short and slender, the palpus weakly ascending Nymphuliella p. 93
- Size medium; color white, with blackbordered, straw-yellow bands; labial

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palpus rather short, moderately up- turned, with relatively short, curved second segment, its rough, irregular scaling grading to the slender scaling	12. Hindwing with cell open Eoparargyractis p. 130 — Hindwing with cell closed
of the third segment	13. Hindwing with cell more than half length of wing; outer margin of hind- wing not emarginate behind apex
 9. Antennae strongly annulated Parapoynx p. 102 Antennae with at most weakly raised scale-rows on each segment dorsally 10 	Parargyractis p. 116 — Hindwing with cell at most just over half length of wing; outer margin of hindwing emarginate behind apex 14
 10. Hindwing pale or with pale median area; eighth sternite of male without a median posterior process; bursa of female large, armed with signa or spines Munroessa 	 14. Veins Sc and R_s of hindwing separating halfway between cell and apex of wing Usingeriessa p. 112 Veins Sc and R_s of hindwing separation
p. 85 — Hindwing dark; eighth sternite of male with a narrow but conspicuous	ting just before apex of wing Neargyractis p. 115
posteriorly directed process; bursa of female small, narrow, unarmed Synclita P. 95	15. Termen of forewing excavated; disco- cellular of hindwing almost straight <i>Contiger</i> p. 92
11. Forewing with apex falcate Oxyelophila p. 133	 Termen of forewing not appreciably excavated; discocellular of hindwing strongly curved Oligostigmoides
- Forewing with apex not faicate	p. 111

TRIBE **Ambiini** Munroe, NEW TRIBE Type-genus: *Ambia* Walker, 1859.

The moths are variable in size but are broad-winged and usually have undulate or incised outer margins in the hindwings or in both forewings and hindwings. The male genitalia are of rather simple type with robust tegumen and vinculum, spatulate uncus and strong gnathos. The valves are short, broad and simple.

The larvae so far as known are terrestrial and feed on ferns.

This tribe includes at least Ambia Walker, Undulambia Lange and Midilambia Munroe, but probably will also include a number of other tropical forms whose classification is beyond the scope of the present work. The group has strong affinities with the tribe Musotimini, found in the tropics of both hemispheres, but the species of that tribe that I have examined have Scoparia-like male genitalia, with a free pointed process from the sacculus of the valve. For the present, therefore, I think it wise to consider these groups as belonging to separate tribes, even though the larvae of Musotima, like those of Undulambia, are terrestrial forms that feed on ferns.

In North America the Ambiini are represented by only a single genus, confined in our territory to southern Florida. In the tropics there are many species, though the majority seem to be rare and to have local, relict distributions.

GENUS Undulambia Lange

Undulambia Lange, 1956, Wasmann Jour. Biol., 14: 83. Type-species: Ambia striatalis Dyar, 1906. Original designation.

The moths are of medium to small size, with broad wings and excised outer margin in both forewings and hindwings. The labial palpi are upturned, long and slender, reaching or surpassing the vertex. The maxillary palpi are short, with a few projecting scales. The eyes are large. The ocelli are lacking. The forewing has a glandular swelling in the subcostal area of the male in North American species. Vein R_1 of the forewings is short, fused with Sc. R_2 is stalked with R_{3+4} . R_5 and M_1 are approximated or short-stalked basally. The discocellular is curved. M_2 and M_3 arise from the posterior angle of the cell and are curved and approximated basally. M_3 and Cu_1 arise close together but are not curved and approximated basally. Cu_2 arises from the cell somewhat basad of Cu_1 . and A is well developed. Ist A is represented by a fold only and 3rd A by a rudiment. In the hindwings Sc and R_s are briefly anastomosed. R_s separates from the cell well before the end of the latter. The discocellular is erect or weakly curved. M_2 arises a little before the posterior angle of the cell. Cu_1 arises about at the posterior angle of the cell. Cu_2 arises considerably basad of the angle. Three anals are present.

The male genitalia have the uncus and gnathos narrow, weakly curved, fingerlike. The juxta is dorsally bifid. The vinculum is evenly rounded ventrally. The valves are simple, fairly narrow, with rounded apex and oblique terminal margin. The penis is fairly short, curved, distally and sub-basally expanded. The female genitalia have the bursa and ductus bursae unsymmetrical, striated.

The larva of U. *polystichalis* feeds on ferns. The larvae of other species very likely have similar habits.

Three species are known from our territory. They are not very closely related and further generic subdivision may be required when the relationships of tropical species of the group have been fully worked out. Two of our species have immediate relatives in the American tropics, whereas the third, *A. striatalis*, is, so far as known, a Florida endemic, without close relatives elsewhere, though it is very possible that something similar will be discovered in Cuba or elsewhere in the Antilles.

KEY TO NORTH AMERICAN SPECIES

I.	Wings brown, with longitudinal pale		pattern elements, if present, less con-
	streaks between veins; longitudinal		spicuous than transverse ones 2
	pattern elements more conspicuous	2.	Hindwing above predominantly dark
	than transverse ones striataus		polystichalis
	uns page		p. 76
	Wings pale or dark, with curved and		Hindwing above predominantly white rarissima
	angled transverse bands; longitudinal		p. 76

Undulambia striatalis (Dyar)

PL. 4, FIG. 22 (McD. 5693).

Ambia striatalis Dyar, 1906, Jour. New York Ent. Soc., 14: 90. Type-locality: Charlotte Harbor, Florida.

The moth, with its streaky brown wings, is quite unmistakable. The genitalia are as described for the genus.

The life history is unknown.

The moth is widely distributed in central and southern Florida and ranges north along the coast to Martha's Vineyard, but it is not common in collections. Kimball (1965) quotes Franclemont's observation that specimens collected at light are usually found at the bottom of the sheet, near the ground. Kimball supposes that this low-flying habit may lead to the species being missed by many collectors.

Undulambia polystichalis Capps PL. 4, FIGS. 23, 24.

Undulambia polystichalis Capps, 1965, Florida Ent., **48**: 155, figs. 1–4. Type-locality: Zellwood, Florida.

The moth is moderately small (length of forewing 6–8 mm) and is rather variable in color. The males vary from fulvous to dark fuscous. In this sex the wings usually have white streaks between the veins on the area before the postmedial band. The forewings of the male have a weakly angulate pale antemedial line, sometimes obsolete, a strong fovea behind the costa opposite the end of the cell, a white postmedial line, bordered basally and distally with black, and strongly retracted on Cu_2 , then expanded into two triangular or rectangular white spots before the posterior margin. There is a white subterminal band, varying in width and distinctness, and often broken on the veins. The hindwings have basically similar markings but lack the fovea and have a distinct discocellular spot. The female lacks the fovea of the forewings and is mostly dark fuscous, with reduced and interrupted white bands.

The male genitalia are much as in U. striatalis but have the uncus relatively shorter and armed with a couple of spines at the tip dorsally. The valves are wider and more rounded than in U. striatalis, and the penis is narrower and more nearly straight. The female genitalia have the ovipositor lobes wide, soft and sparsely setose. The apophyses are simple and of moderate length. The ductus bursae is slender and expands gradually towards the bursa. The bursa is small and densely spinulose but has no signum.

The larva bores in the stems of the leather-leaf fern, *Polystichum adiantiforme* (Forster) J. Smith. It is a pest to growers of this plant in Florida. The life history has been described by Kuitert and Dekle (1962).

The species occurs in Florida, where it has been collected in the area from Gainesville and Jacksonville to Sarasota. It belongs to a poorly understood tropical species group. It is a matter of assumption that all the variants grouped here are actually conspecific. Study of the range of variation in reared material will be needed to show whether this is really so. It is not impossible that this will prove to be a synonym of some previously described tropical species.

> Undulambia rarissima Munroe, NEW SPECIES PL. 4, FIG. 25.

Undulambia rarissima Munroe. Type-locality: Florida City, Florida.

DIAGNOSIS: The moth in general resembles Ambia tessellalis Hampson, described from Jamaica. The present species has much heavier fulvous markings and in particular has a

broad, fulvous, black-margined postmedial band on both forewings and hindwings in place of the narrow line of *A. albitesselalis*. *U. rarissima* is easily distinguished from the other two North American species by the predominantly white hindwings.

DESCRIPTION: The frons is rounded, smoothly scaled, white above and fulvous below. The vertex is white. The labial palpi are long, slender, cylindrical, and upturned; they extend in front of the frons by about twice the length of the head. The first two segments are fulvous; the long, acuminate third segment is white. The maxillary palpi are weakly dilated with scales. The segments are fulvous, tipped with fuscous. The proboscis is well developed, light brown. The eyes are large and fuscous. The antennae are short, annulated and light fulvous in color. The body is slender, white above with a wide fulvous mid-dorsal stripe. The body beneath and legs are white, with some fulvous scaling. The forewings are fairly narrow, with falcate apex and sinuous termen, containing dark scale-tufts in the fringe. The male has a subcostal fovea opposite the end of the cell. The ground color is white. There is a fulvous basal patch, broader anteriorly than posteriorly. There is a narrow, distinct, fuscous antemedial line, oblique distad to the middle of the cell, there obtusely angled and oblique basad to the posterior margin. The cell is suffused with fuscous from basad of the antemedial line to the curved fuscous discocellular lunule. This fuscous patch anteriorly blends into an orange area surrounding the subcostal fovea. This in turn is extended distad as a fuscous patch as far as the narrow fuscous postmedial line. The postmedial line is erect from the costa to Cu₁, then curves rapidly to Cu₂ basad of the end of the cell; there it is acutely angled and runs straight and somewhat obliquely distad to the posterior margin at threefifths. There is a wide, fulvous, black-margined subterminal band, strongly retracted in an acute angle on the anal fold. The subterminal band touches the fulvous, inwardly blackmargined terminal band subapically and joins it at the tornus. Elsewhere the two are separated by a narrow zone of the white ground color. The fringe is white with fuscous interceptions. The hindwings are colored like the forewings. There is an 8-shaped fulvous to fuscous marking on the disc, representing a combination of the antemedial, postmedial and discocellular lines. The subterminal band is broad, fulvous, black-margined and touches the similarly colored terminal band subapically and fuses with it at the anal angle. The fringe is as on the forewings. The termen is angulate at the end of R_s. The markings are as beneath above but somewhat more diffuse.

The male genitalia are unknown. The female genitalia have the ovipositor lobes weak, broad and short-setose. The apophyses are short. The ostium is narrow and the bursa is slender, membranous and unarmed.

TYPE: Holotype: Q. Florida City, Florida; 3 March 1939; Mrs. L. E. Forsyth. Type no.11,774, CNC.

TRIBE Nymphulini Duponchel

Nymphulites Duponchel, 1844, Catalogue des Lépidoptères d'Europe, 201. Hydrocampidae Guenée, 1854, Species Général des Lépidoptères, 8: 254.

The moths are of medium to small size in our fauna, with slender build, long slender legs and variable wing shape and pattern. The cell is well over half the length of the forewings.

There is no conspicuous subcostal fovea on the forewings of the male. The wings are usually not incised behind M_1 . Vein M_2 of the hindwings is present. The larvae are aquatic and make cases of leaves or leaf fragments on vascular plants living in standing or slowly running water. Gills are present in some genera, absent in others. Pending a full study of the generic relationships in the subfamily I follow the order of genera suggested by the phylogenetic tree given by Lange (1956: 65), with minor modifications.

GENUS Neocataclysta Lange

Neocataclysta Lange, 1956 Wasmann Jour. Biol., 14: 90. Type-species: Pyralis magnificalis Hübner, [1796]. Monotypy and original designation.

The moths are of moderate size and slender build, with fairly narrow wings and with metallic marginal spots on the hindwings. The labial palpi are long, slender and upturned, reaching as far as the vertex. The maxillary palpi are short and roughly scaled. The proboscis is present. The frons is rounded and smoothly scaled. The vertex is somewhat raised and has slightly roughened scaling. The eyes are large. The ocelli are small but distinct. The antennae are slender and filiform, finely short-pilose below, scaled above, with the distal scale-row of each segment weakly raised in the distal part of the antenna. The body is slender, with the tip of the abdomen considerably exceeding the anal angle of the hindwings, especially in the male. The forewings have vein R_1 free, R_2 stalked with R_{3^+4} , and R_5 free. The cell is about two-thirds as long as the wing; the posterior discocellular is moderately curved. M_1 arises somewhat behind the anterior angle of the cell; M2 and M3 arise from the posterior angle and are weakly curved and approximated basally; Cu1 arises basad of the posterior angle of the cell; it is not curved or approximated to M₃ basally. Cu₂ arises from the cell at about five-sixths of the cell-length from the base. The hindwings have the outer margin evenly rounded. Sc anastomoses with R_s for a short distance. M_1 is free. M_2 , M_3 and Cu_1 are closely spaced around the posterior angle of the cell. The anterior discocellular is obtusely angled and the cell is about half the length of the wing. Cu₂ arises from the cell at about three-fourths of the cell-length from the base. There are three anal veins. The outer margin of the hindwings has black spots with metallic blue centers.

The male genitalia have the uncus short and fingerlike. The gnathos has a dorsal group of spinules. The valves are long and slender; the sacculus is strong, with a basal group of spines. The penis has a compact group of cornuti. The female genitalia have the base of the ductus bursae wide, with scattered spinules; there is a heavily sclerotized collar. The bursa is large and elongate; the signa are represented by two conspicuous groups of closely set spines.

The early stages are not known with certainty. Forbes (1911: 120) described a larva as *Elophila* sp., but he did not give the basis of his identification. Lange supposed that the larva was that of *Neocataclysta magnificalis*, but this certainly requires confirmation. The larva is described as making a spheroidal case of duckweed leaves (*Lemna* species), without a sharp lateral edge, differing in this respect from those of *Nymphula* and *Parapoynx*. The larva has small head, no tracheal gills, no posterior ocellus, and head, setae and prolegs much as in *Synclita* and *Munroessa*. The punctures of the front are closer together than in those genera, about one-fourth as far apart as the setae. The adfrontal punctures are higher than the setae, but not as much so as in *Synclita* and *Munroessa*. Setae M¹ of the labrum are lower than setae M² and

close to the middle line. The ventral prolegs have about 50 hooks, the anal prolegs about 15. The spiracles of the first four abdominal segments are larger than the rest, with those of segments 3 and 4 the largest; but the remaining spiracles appear to be functional. The pupa has the last spiracles on conical projections, and has a spine in the spiracular position on the ninth abdominal segment. The pupa described was very small and came from Cedar Lake in northwestern New Jersey. As explained below, I think it not unlikely that this description really refers to *Synclita obliteralis*.

Only one species of the genus is known. In general appearance it resembles species of *Parargyractis* but the pupillate spots of the hindwings and the presence of vein M_2 distinguish it.

Neocataclysta magnificalis (Hübner) PL. 4, FIGS. 26, 29, 30 (McD. 5699).

Pyralis magnificalis Hübner, [1796], *Sammlung Europäischer Schmetterlinge*, **6**: pl. 18, fig. 104. Type-locality: Europe [Erroneous, evidently actually North America].

Cataclysta lamialis Walker, 1859, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 17: 436. Type-locality: United States.

Cataclysta? heliopalis Clemens, 1860, Proc. Acad. Nat. Sci. Philadelphia, 12: 218. Type-locality: Lake Teedyuscong, Pennsylvania.

The moth is of moderate size and rather narrow-winged. It has a pattern much like that of *Parargyractis* species, with alternating fuscous and pale bands radiating from the tornus of the forewings and with metallic and black spots along the outer margin of the hindwings, but the spots are black with blue pupils, not alternating black and blue as in *Parargyractis* species. The moths are substantially larger than *Chrysendeton* species (length of forewing from 8–11 mm).

The genitalia are as described for the genus.

The early stages require further study. See the notes under the genus.

The species is a fairly common one. It ranges from Nova Scotia and southern Quebec south to the Sarasota and Lake Okeechobee districts of Florida.

GENUS Chrysendeton Grote

Chrysendeton Grote, 1881, Papilio, 1: 16.

Type-species: Cataclysta medicinalis Grote, 1881. Subsequent designation, Shibuya, 1928, Jour. Fac. Agric. Hokkaido Imp. Univ., 22: 146.

NOTE—In this publication Grote used *Chrysendeton for* "Group A2 of *Cataclysta* Hübner". Most authors have taken this as a validation of the name in a subgeneric sense. Should this not be accepted, then *Chrysendeton* dates from Grote, 1882, *New Check List of North American Moths*, 54, as cited by Lange (1956).

The moths are very small, with narrow, acute-tipped forewings and with metallic spots on the outer margin of the narrow hindwings. The frons is rounded. The labial palpi are long and slender, with the first and second segments rough-scaled below; the third segment is long and acuminate in males, shorter in females, reaching the vertex in the former, half-way up the frons in the latter. The maxillary palpi are short; they are pointed apically, roughscaled basally. The proboscis is well developed. The eyes are large, and the ocelli are present. The antennae are somewhat thickened in the males, filiform in the females, densely

short-pilose below, scaled above, with alternate scale-rows somewhat raised on the distal part of the antenna. On the forewings vein R_1 is free; R_2 is stalked with R_{3^+4} ; R_5 and M_1 are free, arising a little apart from each other and a little behind the anterior angle of the cell. The discocellulars are oblique distad and almost straight. The cell is over two-thirds as long as the wing. M_2 , M_3 and Cu_1 arise fairly close together at the posterior angle of the cell but are not curved and approximated to one another basally. Cu_2 arises far out on the cell. Ist A is absent; 2nd A is fully developed; 3rd A is represented by a basal rudiment. The hindwings are narrow. Veins Sc and R_s are fused completely. M_1 is free, or weakly stalked with R_s . The cell is partly open, the discocellular being incomplete anteriorly. M_2 and M_3 are basally curved and approximated. Cu_1 arises with them at the posterior angle of the cell or sometimes a short distance basad but is not curved and approximated to M_3 . Cu_2 arises from the cell at about two-thirds. Ist A is weakly developed towards the termen only; 2nd and 3rd A are normally developed. The legs are long; in the male the outer preapical spur of the hindtibia is aborted and in the female it is half the length of the inner spur; the apical spurs of both mid- and hind-tibiae are subequal in both sexes.

The male genitalia have the uncus long, slender and rodlike. The gnathos is shorter, triangular, and has fine dorsal teeth. The valves are slender and unarmed. The penis is long, slender and cylindrical, bent near the apex and variously armed with cornuti. In the female genitalia the ovipositor is long and needlelike. The anterior and posterior apophyses are greatly lengthened, joined anteriorly. The basal part of the ductus bursae is long and sclerotized. The ductus proper is long, with an enlarged sclerotized collar at the junction with the ductus seminalis. The distal part may be spiculate or folded and sclerotized, depending on the species. The bursa is densely spiculate.

The early stages are unknown. Lange (1956) considered the long sharp ovipositor to be probably adapted to laying eggs in plant tissues.

The genus is of tropical affinity. It has a number of neotropical species and also appears to be closely related to the Old World genus *Nymphicula* Snellen, which has a substantial number of species in Africa, tropical Asia and the southwest Pacific area. In North America *Chrysendeton* appears to be confined to the southeastern quadrant, ranging from Pennsylvania and Illinois south to Florida and Mississippi.

Further study of the species, their variation and their biology would be useful. Most of the material I have seen is in indifferent condition, and it is hard to determine the range of individual and geographic variation. I follow Lange's arrangement of the species except that I drop the name *C. claudialis*, which is of uncertain application.

KEY IO NOKIH A	AMERICAN SPECIES
1. Forewing above with a distinct, out- wardly oblique, white postmedial	from costa imitabilis
band, extending from costa at about three-fourths from base towards tornus: this band converges with the	2. Length of forewing under 6 mm; pale areas relatively restricted; Florida kimballi p. 81
 white subterminal band that runs parallel to the termen	 Length of forewing over 6 mm; pale areas of forewing not as restricted; dark areas paler; Central to South- eastern States medicinalis p. 81
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KEY TO NORTH AMERICAN SPECIES

Chrysendeton medicinalis (Grote) PL. 4, FIGS. 27, 28 (McD. 5697).

Cataclysta medicinalis Grote, 1881, Papilio, 1:15. Type-locality: Carbondale, Illinois.

NOTE-Cataclysta claudialis Walker, 1859, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 17: 437, with type-locality "United States", has frequently been used for this or a related form. The two specimens under this name in the BMNH, one of which is labeled "Type", both belong to a very different species and are both labeled "St. Domingo." P. E. S. Whalley, who has kindly investigated this matter for me, says (in *litt.*), "We have only two specimens in our series, both labeled 'St. Domingo'. I have looked through the series of other species which look similar to this, but there is no trace of any Walker 'Doubleday' material. I have had a look in our accessions in case some of the material was there, but I have been unable to trace any. We are faced with two possibilities, one is that Walker gave the type-locality wrong in the first place, the second is that the type is either lost or in another museum . . . but from our records all this Doubleday material came to us. The St Domingo specimens do not bear the same label as other Doubleday material...." Under the circumstances I think it best to leave C. claudialis as a nomen inquirendum and to ignore it so far as our fauna is concerned. The St. Domingo specimens, of which a photograph is before me, are not conspecific with any form known to occur in North America.

The moth has the characteristic pattern of the genus. It is larger (length of forewing 6.5-7 mm) and paler than other North American species and is the only one known to range out of the extreme southeast. The pattern is closest to that of *C. kimballi*, which it resembles in the distinct postmedial white line of the forewings and the powdery dark postmedial zone and conjoined black and metallic marginal spots of the hindwings.

The male genitalia have the gnathos and the valves relatively long and slender. The saccus is short and wide. The penis has a single very small cornutus. The female genitalia are elongate, with membranous ductus bursae and well-defined spinulose bursa.

The species ranges from Pennsylvania to Illinois and south to the Sarasota district of Florida and to Mississippi. In Florida it occurs sympatrically with the following two species. It is not very common in collections.

Chrysendeton kimballi Lange PL. 4, FIGS. 31-35. Chrysendeton kimballi Lange, 1956, Wasmann Jour. Biol., 14: 97, fig. 144. Type-locality: Oneco, Manatee County, Florida.

The moth is closely similar to *C. medicinalis* in external appearance, but is a little smaller (length of forewing 4.5-5 mm) and on the average is darker in color, with the dark areas of the wings both deeper in tone and more extensive.

The male genitalia are much as in *C. medicinalis*, but they have the gnathos and the valves relatively shorter and wider and the vinculum ventrally extended into a slightly longer and narrower saccus. The female genitalia are shorter than those of *C.medicinalis*, with less differentiated bursa and with the ductus bursae uniformly spinulose.

The species ranges from Florida and South Carolina to Louisiana. I have seen authentic material from Bradenton, Oneco, Siesta Key, Tampa, Homestead, the Tamiami Trail and the northeast corner of Monroe County as well as a series from the Wedge Plantation. It has a long flight period, at least from May to October.

Chrysendeton imitabilis (Dyar) PL. 4, FIGS. 36, 37 (McD. 5707). Elophila imitabilis Dyar, 1917, Ins. Insc. Mens., 5: 78. Type-locality: Lakeland, Florida.

The moth is similar to the preceding in size and general appearance, but is on the average a little larger (length of forewing from 5-6 mm) and even darker. On the forewings there is no distinct oblique white postmedial band. The wing is narrower than in *C. kimballi* and the apex is more strongly acute, almost falcate.

The male genitalia in general resemble those of the other species of the genus, but the cornutus of the penis is much larger and heavier. In the female the genitalia of the present species differ in having the ductus bursae strongly sclerotized, with the wall folded.

This species seems to be common in Florida. I have seen authentic material from the following localities: Bradenton; Sarasota; Siesta Key, Sarasota County; Homestead; Royal Palm Park; northeast corner of Monroe County; Saint Lucie County. It also occurs in South Carolina at the Wedge Plantation, McClellanville.

GENUS Nymphula Schrank

Nymphula Schrank, 1802, Fauna Boica, 2 (2): 162.

Type-species: *Pyralis potamogalis* Hübner, 1796, a junior objective synonym of *Phalaena potamogata* Linnaeus, 1758, now considered a synonym of *Phalaena nymphaeata* Linnaeus, 1758. Subsequent designation, Moore, 1885, *The Lepidoptera of Ceylon*, **3**: 304.

NOTE—This type-fixation, though generally accepted, is beset with difficulties. Hübner figured under the name Pyralis potamogalis the generically different Phalaena stagnata Donovan, 1806. However, in the accompanying text (Hübner, 1796, Der Sammlung Europäischer Schmetterlinge, Sechste Horde. Die Zünsler, p. 19), he cited [Phalaena] Geom[etra] potamogata L[innaeus] in the synonymy of his Pyralis potamogalis, thus indicating that the latter name was a mere emendation of the Linnean name, consistent with the practice of Hübner and other early authors on Lepidoptera, who changed the terminations of specific names when they transferred the species to different major groups. Under article 33 (a) (ii) of the International Code of Zoological Nomenclature this is an invalid emendation and is accordingly to be treated as a junior objective synonym; the identity of Hübner's figure is therefore irrelevant, even though his concept of Linnaeus' species was wrong, at least in part. The identity of Phalaena potamogata Linnaeus can fortunately be established without doubt. Paul E. S. Whalley has been kind enough to examine material in the Linnean Collection in London, England, and writes as follows: "The specimens of potamogata in the Linnean Collection are definitely females of Nymphula nymphaeata Linn. None of this material has really been examined closely previously, and there will be need for lectotypes to be designated from the Linnean specimens of these two species. There are specimens of both species with 'Linnean' labels, and I think that ... these two specimens should be designated as lectotypes." I gladly follow Whalley's suggestion and hereby designate as lectotypes the specimens of Phalaena nymphaeata and Phalaena potamogata bearing the corresponding Linnean labels in the Collection of the Linnean Society, London. Whalley has kindly arranged to affix appropriate lectotype labels. Phalaena potamogata Linnaeus, 1758, and Pyralis potamogalis Hübner, 1796, are thus subjective synonyms of Phalaena nymphaeata Linnaeus, 1758. The two species originally included in Nymphula by Schrank are thus subjective but not objective synonyms and Moore's type designation appears to be the valid one. Earlier designations of Pyralis numeralis Hübner, 1796, by Duponchel, 1831, Histoire Naturelle des Lépidoptères ou Papillons de France, 8 (2), Nocturnes, 5 (2): 10, and of Pyralis interpunctalis Hübner, 1796, by Guenée, 1854, Species Général des Lépidoptères, 8: 402 are invalid as neither of them is among the originally included species.

Elophila Hübner, 1822, Systematisches-Alphabetisches Verzeichniss . . . Gattungsbenennungen, 54.

Type-species: *Elophila nymphaealis* Hübner [recte, Denis and Schiffermüller, 1775], a junior objective synonym of *Phalena Geometra nymphaeata* Linnaeus, 1758. Designated by Whalley, 1966, *Ent. Gazette*, **17**: 72.

NOTE—Whalley considered *nymphaealis* an incorrect subsequent spelling of *nymphaeata*, which would have no independent status, but I consider that *Pyralis nymphaealis* Denis and Schiffermüller, 1775, is an emendation of *P. nymphaeata* and that it consequently has the status of a junior objective synonym of the latter.

"Hydrocampe" Latreille, 1825, Familles Naturelles du Règne Animal, 478.

NOTE—In this work Latreille cited a single species, *Phalaena potamogata* Linnaeus, 1758, but the name he gave for the genus is a vernacular one without latinized equivalent and it consequently has no standing in formal nomenclature. It is important because of the latinized forms given in subsequent works (see below).

Hydrocampus Berthold, 1827, Latreilles Natürliche Familien des Thierreichs, 485. Type-species: Phalaena potamogata Linnaeus, 1758, now considered a synonym of Nymphula nymphaeata (Linnaeus), 1758. Monotypy.

NOTE—This and the two following names are independent latinizations of Latreille's vernacular "Hydrocampe" and they thus have status as independent names and not misspellings or emendations, though in practice it does not matter, as the type-species are either the same or objectively synonymous.

Hydrocampa Stephens, 1829, The Nomenclature of British Insects, 46.

Type-species: *Pyralis potamogalis* Hübner, 1796, now considered a synonym of *Nymphula nymphaeata* (Linnaeus), 1758. Designated by Duponchel, 1831, *Histoire Naturelle des Lépidoptères ou Papillons de France*, **8**(2), *Nocturnes*, **5**(2): 10.

Hydrocampe Latreille, 1829, in Cuvier, Le Règne Animal, 5, Les Crustacés, les Arachnides et les Insectes, 2: 418.

Type-species: *Phalaena potamogata* Linnaeus, 1758. Designated by Blanchard, 1845, *Histoire Naturelle des Insectes*, 408.

NOTE—Blanchard cited this species as "*Hydrocampe potamogalis* Lin." and I therefore accept it as a misspelling or emendation of the originally included *Phalaena potamogata* Linnaeus, rather than as a citation of *Pyralis potamogalis* Hübner, which Latreille did not explicitly include.

The moths are relatively large but delicately built, with long slender legs and broad wings. The frons is rounded in the female, slightly flattened in the male. The labial palpi are upturned, passing the middle of the frons in the male, shorter in the female; the first two segments have short and rather rough scaling, the third is smoothly scaled and acuminate. The maxillary palpi are fairly prominent, rough-scaled. The proboscis is well developed. The eyes are large. The ocelli are small but distinct, situated on each side of the somewhat elevated vertex. The antennae are slightly thickened in the male, filiform in the female; the sensory surface is densely short-pilose; the dorsal surface is scaled, with alternate scale-rows

somewhat raised, especially on the distal part of the antenna. The body is slender. The praecinctorium has a transverse, fan-shaped, distal tuft of scales. The legs are long and very slender. The outer tibial spurs are a little shorter than the inner ones. The forewings are fairly wide, with acute apex and weakly sinuated termen. The cell is about three-fifths as long as the wing. Vein R_1 arises a little before the end of the cell. R_2 is stalked with R_{3^+4} . R_5 arises from about the anterior angle of the cell; it is straight and not basally approximated to R_{3+4} . The discocellulars are erect and hardly curved. Vein M_1 arises distinctly behind the anterior angle of the cell. M₂ and M₃ arise together at the posterior angle. Cu₁ arises a little basad of the posterior angle. These three veins are not curved and approximated basally. Cu₂ arises from the cell at about three-fourths. 2nd A is well developed. 1st A is absent and 3rd A is rudimentary. The hindwings are broad with narrowly rounded apex and with the termen weakly excavated behind apex. Veins Sc and R_s are anastomosed for a moderate distance beyond the cell. M_1 is free. The cell is about half as long as the wing; the discocellular is moderately curved. M₂ and M₃ arise from the posterior angle of the cell; they are curved and approximated basally. Cu₁ arises almost at the posterior angle, but it is not curved and approximated to M₃. Cu₂ arises from the cell just beyond the middle.

The male genitalia have the uncus fairly wide. The gnathos is relatively short, compressed and dorsally denticulate. The valves are long and narrow, distally rounded. They have a setose tubercle at the base and a few long, curved, forward-directed, scalelike setae near the costa. The penis is cylindrical and has several cornuti. The female genitalia have the ostial chamber wide, funnel-shaped, sclerotized and ending in a valvelike sclerotization. The bursa is elongate, denticulate at the base, but without signum.

The early stages are hardly known for the North American species but they have been worked out in some detail for the European N. nymphaeata (Linnaeus). The larva is gill-less and lives in a case of leaves of aquatic plants. Until the young larva has finished overwintering the case is filled with water and the larva breathes through the cuticle. In the spring the case is filled with air and the larva breathes through its spiracles. The eggs are laid in flat masses on the undersides of leaves of aquatic plants. The insect pupates in a cocoon spun in the last larval case, which is fixed to a plant stem 5 or 10 cm beneath the surface of the water. For details see Wesenberg-Lund (1926). The structural characters are described by Hasenfuss (1960). On the head seta O^3 is distinctly nearer So³ than to O^2 . The epicranial index is about 3. Seta Adf² is somewhat higher than P². On the prothoracic shield XD₂, SD₁ and SD2 form an acute angle. D2 is almost directly ventrad of D1. The thoracic shield lacks a caudal thickening. On the meso- and meta-thorax L₂ is greatly reduced; L₁, L₂ and L₃ form an oblique line. On abdominal segments 1-8, D2's are farther apart than D1's. D2 is four times longer than D1 and L1 four times longer than L2. The SV group has two setae on the first abdominal segment, three on the second. The prolegs are reduced to swellings without the normal cylindrical element. Each proleg has two parallel, transverse, biordinal or triordinal rows of crochets. The caudal crochets are often enlarged. The spiracles are large on abdominal segments 2-4; on the prothorax and on abdominal segments 1 and 5-8 they are about half as large. The anal shield is fairly well developed. D1, L1 and D2 are almost in a line; SD1 is minute and somewhat off the shield. N. nymphaeata eats a wide variety of aquatic plants growing in stagnant or slowly flowing water, including: waterlilies (Nymphaea and Nuphar species); pondweeds (*Potamogeton* species); knotweed, *Polygonum* amphibium L.=*P.natans* [Michx.] Eaton non Gueldenst.; frogbit, Hydrocharis morsus-ranae L. and bur-reed (Sparganium species).

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The genus is a small one, with several closely related species in Europe and temperate Asia and a single species in North America.

Nymphula ekthlipsis (Grote) PL. 6, FIGS. 22, 23 (McD. 5692). Hydrocampa ekthlipsis Grote, 1876, Can. Ent., 8: 111. Type-locality: Albany, New York.

This species is easily distinguished from other North American Nymphulinae by its bold pattern of fuscous-bordered yellow bands on a white ground. The size is fairly large (length of forewing 11-13 mm).

The genitalia are as described for the genus.

The life history is hardly known. No doubt it is very similar to that of the closely related European N. *nymphaeata*, described under the genus, above. According to Forbes (1923) the larva lives in an oblong case on sedges, Cyperaceae.

The moth is common in the northeastern States and southeastern Canada. It is known from Maine through southern Quebec and Ontario to Manitoba and south to Massachusetts, New York and Illinois.

GENUS Munroessa Lange

Munroessa Lange, 1956, Wasmann Jour. Biol., 14: 100. Type-species: Nymphula serralinealis Barnes and Benjamin, 1924. Original designation.

The moths are variable in size. They are moderate to slender in build, with long slender legs. The frons is rounded and smoothly scaled. The vertex is more roughly scaled and somewhat raised. The labial palpi are upturned, with the first two segments roughly scaled and the third segment slender and acuminate, reaching at least to the middle of the frons and often to the vertex, a little longer in males than in females. The maxillary palpi are fairly prominent, roughly scaled, but do not have an expanded distal scale-tuft. The eyes are large. The ocelli are small but distinct. The proboscis is well developed. The antennae are slightly thickened in the male, filiform in the female, finely short-pilose below and scaled above, with alternate scale-rows weakly raised. The praccinctorium is moderately long, with a transverse, fan-shaped, distal tuft of scales. The forewings are fairly wide, with the outer margin rounded or weakly excavated behind the apex. The cell is about two-thirds as long as the wing. R_1 arises very slightly before the end of the cell. R_2 is free or stalked with R_{3+4} . The discocellulars are nearly straight and very slightly oblique distad. R_5 arises a little behind the anterior angle of the cell and is not curved or approximated to R_{3+4} basally. M_1 arises somewhat behind R_5 . M_2 , M_3 and Cu_1 are closely spaced around the posterior angle of the cell. M₂ and M₃ are at most very weakly curved and approximated basally; Cu₁ is not curved and approximated to M₃. Cu₂ arises from the cell at about four-fifths. 1st A is obsolete. 2nd A is well developed. 3rd A is rudimentary. In the hindwings Rs is strongly anastomosed with Sc. M_1 is very briefly stalked with R_s . The cell is about half as long as the wing. The discocellular is weakly curved. M2, M3 and Cu1 arise close together at the blunt posterior angle of the cell. M₂ and M₃ are curved and approximated basally.

 Cu_1 is not curved and approximated to M_3 . Cu_2 arises from the cell at about two-thirds from the base.

The male genitalia have the uncus long and slender, narrowly rounded at the tip. The gnathos is shorter and more slender than the uncus, it is T-shaped, with the lateral arms meeting the median part at a right angle; the median element is distally dentate above. The juxta is rather short, dorsally narrowed. The valve is long and parallel-sided; the tip varies in shape, but it is armed anteriorly with short, strong, spinelike setae. The penis is stout and has a well-developed armature of cornuti. The female genitalia have the ostium wide. The base of the ductus bursae is sclerotized and ends in a valvelike, sometimes spinose structure. The bursa is a long sac with a spined signum or with isolated spines.

The larvae are gill-less. They live in standing or slowly flowing water and either make cases of leaves of aquatic plants or bore in the stems. The structural characters have not been described in any detail. The crochets of the prolegs are in two transverse series as in *Nymphula*.

So far as known the genus is confined to North America. There are two species groups: the *icciusalis* group, with the sexes almost alike, with yellow ground color and black-outlined white areas, about as well defined on the hindwings as on the forewings, and the *gyralis* group, with the females much more obscurely marked than the males, the hindwings paler than the forewings and with much less well-defined markings, the markings of the forewings confused on a gray or brown ground.

KEY TO NORTH AMERICAN SPECIES

- over 8 mm); round pale spot anterior to middle of posterior margin of forewing minute or obsolete; forewing mostly brownish with a pale-orange and white triangular area based on middle of costa; Florida and coastal Carolinas nebulosalis

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 — Size larger (length of forewing usually over 8 mm); round pale spot anterior to middle of posterior margin of forewing distinct, black-margined, though often small; forewing more 3. Dark areas of wing usually fairly even yellow or buff; white spot anterior to middle of posterior margin of forewing above usually large; maculation crisp; penis of male with a bi- or tridentate cornutus and a few fine spines; ductus bursae relatively long, with two sclerotized zones; bursa extensively spinulose icciusalis

p. 87

 Dark areas of wings usually somewhat variegated with fuscous; white spot anterior to middle of posterior margin of forewing small; maculation somewhat confused; penis of male with a small but relatively wide, finely serrate cornutus and a group of numerous, very small spines; female with ductus bursae relatively short and with a single sclerotized zone; bursa not conspicuously spined faulalis p. 89

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PYRALOIDEA

Munroessa icciusalis (Walker)

PL. 4, FIGS. 38-42; PL. 5, FIGS. 1-3, 11; PL. C, FIG. 2; PL. H, FIG. 3 (McD. 5691, in part).

Leucochroma icciusalis Walker, 1859, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 19: 971. Type-locality: United States, E. Doubleday.

Hydrocampa? formosalis Clemens, 1860, Proc. Acad. Nat. Sci. Philadelphia, 1860: 217. Type-locality: Lake Teedyuscong, Pike County, Pennsylvania.

Hydrocampa genuialis Lederer, 1863, Wiener Ent. Monat., 7: 451, 483, pl. 18, fig. 2. Type-locality: "Nordamerica, Venezuela."

NOTE—The type material consisted of four syntypes in the Vienna Museum and in the Kaden collection. Some at least of the latter collection is now in the Museum of the Zoological Institute of the USSR Academy of Sciences in Leningrad; this collection was rich in material from Venezuela, but I was unable to locate any pyralid types in it during my stay in Leningrad in 1964. I restrict the type-locality of *H. genuialis* to North America and specifically to northeastern Pennsylvania, though there is no evidence known to me as to the exact locality from which Lederer's type material came.

The moth is variable in size (length of forewing 6.5–12 mm). The markings also vary, but typically have a mainly yellow or light-brown ground. On the forewings there is an outwardly oblique, black line followed by a white triangle near the middle of the costa; there is a white lunule followed by a black line at the end of the cell; and there is a usually fairly large, round, white, black-margined spot anterior to the middle of the posterior margin. There is an irregular white subterminal band, often weakly bordered outwardly with black. The hindwings have the median area white, bordered basally and distally by a black line. The basal black line is straight and oblique. The distal black line is strongly sinuated and is sometimes followed by a second, more diffuse, parallel black band. The subterminal white band is a little more regular than that of the forewings and, like it, is sometimes bordered outwardly with black. The fringes on both forewings and hindwings are checkered to a varying extent with yellow or buff, white and fuscous.

The genital characters are as outlined in the key.

The life history is somewhat uncertain because of possible confusion with *M. faulalis*. The larvae are gill-less and make oblong biconvex cases of parts of various aquatic plants. They are apparently particularly partial to pondweeds (*Potamogeton* species), as food, but they have been reported from a number of other plants.

The species ranges from Newfoundland to Florida and west to Nebraska. It occurs also in British Columbia, where it has been collected in the Okanagan and Fraser valleys, at Vancouver and on southern Vancouver Island. It may have been introduced in these western localities as there is no evidence that the range is continuous transcontinentally.

There is substantial individual variation, the basis of which is not well understood. In particular in many specimens the normally yellow areas are replaced by more contrasting and somewhat more restricted areas of light brown. Such specimens are perhaps more frequent in boreal habitats and those characterized by oligotrophic lakes; however, so far as present information goes the association is neither constant nor exclusive. There is also variation in the size of individuals and in the width and intensity of the yellow or brown markings, as well as in the degree of development of the black lines that margin the various white areas.

On the whole the black lines seem to be better developed in southern specimens than in northern ones, but there is much individual variation. I recognize three subspecies, but more may eventually be needed.

Munroessa icciusalis icciusalis (Walker) PL. 4, FIGS. 38–42.

Leucochroma icciusalis Walker, 1859, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 19: 971.

Type-locality: United States, E. Doubleday.

Hydrocampa? formosalis Clemens, 1860, Proc. Acad. Nat. Sci. Philadelphia, 1860: 217. Type-locality: Lake Teedyuscong, Pike County, Pennsylvania.

Hydrocampa genuialis Lederer, 1863, Wiener Ent. Monat., 7: 451, 483, pl. 18, fig. 2. Type-locality: "Nordamerica, Venezuela."

I refer all the somewhat variable material from New Brunswick to British Columbia and southward to Florida to a single subspecies, to which the three available names for the species apply. However in the Atlantic Provinces of Canada there are two well-defined local populations, one in Nova Scotia and the other in the Avalon Peninsula of Newfoundland, which appear to deserve subspecific rank. These are described below.

> Munroessa icciusalis albiplaga Munroe, NEW SUBSPECIES PL. 5, FIGS. 1, 2.

Munroessa icciusalis albiplaga Munroe. Type-locality: White Point Beach, Queen's County, Nova Scotia.

The moth is similar to pale examples of the nominate subspecies but has the ground color very pale buffy yellow, with the white areas hardly contrasting and the black lines almost obsolete on the forewings and very poorly defined on the hindwings. The size falls within the range of that of the nominate subspecies.

The life history is not recorded, but no doubt it is similar to that of the nominate subspecies.

TYPES: Holotype: J. White Point Beach, Queen's County, Nova Scotia; 19 July 1934; J. McDunnough. Type no. 11,775, CNC.

Allotype: Q. Same data as for holotype, but collected 25 July 1954. CNC.

Paratypes: 17 specimens. Same locality as holotype; July 1954; J. McDunnough. South Milford, Nova Scotia; 7 July 1934; J. McDunnough. LaHave Island, Nova Scotia; 15 Aug. 1910; C. H. Young. Port Wallis, Halifax County, Nova Scotia; 15 Aug. 1952; D. C. Ferguson. Type no. 11,775, CNC; NSM; DCF.

Two specimens from Dulvey House, Canadian National Park, Prince Edward Island, appear to belong to this subspecies, but they are excluded from the type series.

Munroessa icciusalis avalona Munroe, NEW SUBSPECIES PL. 5, FIGS. 3, 11. Munroessa icciusalis avalona Munroe.

Type-locality: Donovan's, Avalon Peninsula, Newfoundland.

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PYRALOIDEA

The moth is similar to the preceding in the uniform tone of the yellow areas, the low contrast between yellow and white areas and the reduction of the black lines. It differs in having the yellow much deeper and of a distinctly orange shade, rarely approached even in individual variants of other populations, and in having the white areas somewhat restricted on both forewings and hindwings. On the forewings the round white spot anterior to the middle of the posterior margin is much reduced in some individuals, but the uniform orange-yellow tone of the darker areas and the locality will distinguish these specimens from M. faulalis, which is not known to occur in Newfoundland.

The genitalia are as in the nominate subspecies.

The life history is undescribed.

TYPES: Holotype: 3. Donovan's, Avalon Peninsula, Newfoundland; 21 July 1954; D. C. Ferguson. Type no. 11,776, CNC.

Allotype: Q. Same data as for holotype. CNC.

Paratypes: Ten specimens. Same data as for holotype, and Salmonier, Avalon Peninsula, Newfoundland; July 1954; D. C. Ferguson. Type no. 11,776, CNC; NSM; DCF.

Munroessa faulalis (Walker)

PL. 5, FIGS. 4-8; PL. C, FIG. 3; PL. H, FIG. 4 (McD. 5691, in part).

Leucochroma faulalis Walker, 1859, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 19: 973.

Type-locality: unknown, from the Milne collection.

Hydrocampa pacalis Grote, 1881, Papilio, 1: 17. NEW COMBINATION with Munroessa and NEW SYNONYMY.

Type-locality: New York.

The moth in general resembles M. *icciusalis*, but averages smaller (length of forewing 8–10 mm) and has the maculation of the wings more obscure and confused. On the forewings the white areas are much reduced, and in particular the round white spot before the middle of the posterior margin of the wings is minute. The yellowish areas tend to be brown-tinted and clouded with fuscous. The black lines are smudgy and inconspicuous. The hindwings have the median white area somewhat constricted in many specimens. As on the forewings the darker areas are brown-tinted and often clouded with fuscous. The black lines are usually weak and diffuse; the basal black line is often clearer than the postmedial one.

The male and female genitalia are very distinct from those of M. *icciusalis*. The main differences are pointed out in the key.

The early stages are not certainly known. It is possible that some of the descriptive material referred to M. *icciusalis* is really based on this species.

The species ranges from southern Ontario, from a line from Trenton to Teeswater, south to southern Florida (Everglades National Park). Lange (1956) noted that there were two species confused under the name M. *icciusalis*, and he suggested that one might be M. *faulalis*, but he had not examined the types and was unable to make the association definitely. E. L. Martin compared specimens for me at the British Museum (Natural History) and I was subsequently able to verify the comparisons myself. The above synonymy can be taken as definite.

Munroessa nebulosalis (Fernald) PL. 5, FIGS. 9, 10; PL. C, FIG. 4; PL. H, FIG. 5 (McD. 5690). Hydrocampa nebulosalis Fernald, 1887, Ent. Americana, 3: 127. Type-locality: Florida.

The moth is generally similar to M. *icciusalis* and M. *faulalis*, but it is smaller (length of forewing 5–8 mm) and darker in color. Both forewings and hindwings have the basal area orange-yellow. On the middle of the costa of the forewings is a fairly large, roughly triangular pale area, consisting of an orange-yellow lunule, margined basally and distally by a white stripe. There is no round, white, black-margined spot anterior to the middle of the posterior margin of the forewings. The hindwings have the median white area very narrow, almost filled by the orange-yellow discal spot.

The male genitalia are much as in M. *icciusalis*, but the armature of the penis is different, consisting of two simple cornuti. The female genitalia have the ductus bursae short, wide and sclerotized and the bursa oval and largely membranous, with only a small patch of spines.

The life history is unknown.

The moth is known from Florida, where it is fairly widely distributed, and from Georgia, where it was collected by Osten Sacken in 1879. More recently it has been taken at the Wedge Plantation, McClellanville, South Carolina.

Munroessa gyralis (Hulst)

PL. 5, FIGS. 12-22 (McD. 5688, 5689).

Hydrocampa gyralis Hulst, 1886, Ent. Americana, 13: 159. Type-locality: Georgia.

NOTE—The locality cited is that of the lectotype, selected by Klots, 1942, Bull. Amer. Museum Nat. Hist., 79: 420.

Nymphula dentilinea Hampson, 1897, Trans. Ent. Soc. London, 1897: 139. Type-locality: Florida.

Nymphula serralinealis Barnes and Benjamin, 1924, *Contrib. Nat. Hist. Lep. N. Am.*, **5**:190. Subsp. Type-locality: Hymers, Ontario.

The moth is larger than the other species of the genus (length of forewing in males 8–12 mm, in females 11–14 mm). There is pronounced sexual dimorphism. The males have a fairly well-developed pattern, basically similar to that of other species of the genus, but with the white areas reduced. There are in the anterior part of the forewings definite, fuscous-edged, white antemedial and postmedial lines and a similarly colored discocellular lunule. The termen is weakly angled in the middle and is preceded by a silvery-white band of uneven width. The ground color varies from rusty brown to gray, with lighter and darker variegation. The hindwings are paler than the forewings, varying from whitish buff to medium buff, often with the medial area paler, though not contrastingly so, and outlined by diffuse gray or fuscous lines, not by sharp black ones. The females have relatively longer wings and have the maculation inconspicuous or obsolete. The ground color of the forewings varies from orange-buff to brownish fuscous, with faint traces of darker antemedial and postmedial lines. The hindwings are much paler, ranging from whitish buff to grayish or yellowish buff. The medial area is somewhat paler in some specimens, and there are generally more or less distinct traces of sinuate fuscous antemedial and postmedial lines.

The male genitalia have the uncus somewhat narrowed and decurved at the tip. The median element of the gnathos is slender, somewhat enlarged and spinose dorsally at the tip. The juxta is short and wide. The valves are broadened and rounded apically; the basal tubercle has relatively long radiating setae. The penis is cylindrical, with a pair of flattened cornuti, each ending in a comb of spines. The female genitalia have the ostial chamber large, sclerotized and funnel-shaped, opening into the wide, fluted ductus bursae. The bursa is small and has a lanceolate patch of spinules.

The only reliable information on the life history seems to be that given by McGaha (1952, 1954) for the subspecies M. g. serralinealis, which he studied at the University of Michigan Biological Station in Cheboygan County. All other accounts are clouded by doubt as to the identity of the larvae. McGaha does not give structural details. The figure by Peterson of a larva doubtfully identified as *M. gyralis* shows the setae on some segments. The elliptical eggs are laid in masses of about 25 and immediately sink to the bottom. The larvae hatch in about 12 days and begin feeding on the lower epidermis of the leaves of the hosts, which are generally white waterlilies of the genus Nymphaea. Before long the larvae cut patches from the leaf, most successfully from the edge but sometimes, though with difficulty, from the central part of the leaf. The larva then typically feeds on the upper surface of the leaf, using the leaf patch as a mobile cover and migrating slowly towards the petiole. It then changes its habits, boring into the petiole and using the petiole tissue as food. After the tunnel is about an inch deep the larva stops boring and turns around. It then rests head up, reaching out from the burrow at night and sometimes on cloudy days to feed on the leaf tissue. During this time it may remain covered by the patch of leaf that it brought with it, but this is often detached by wave action. The last-instar larva lines the cavity in the petiole with silk and closes it with a cap of coarse silk to form a pupation chamber. The plant responds to injury of the petiole by making a gall-like swelling around the site of the excavation. The adult emerges by removing the silken cap and crawling out onto the leaf. More rarely pupal chambers are excavated two or three inches down the stem by larvae that have entered through the side. Some larvae pupate in chambers made by attaching leaf patches to the underside of the leaf. These chambers are all sealed and contain an air space in which the pupa lives. Some larvae never enter the petiole and live to pupation under a web on the underside of the leaf. The larva is gill-less with an elongate prognathous head. McGaha says the pupa cannot be distinguished from those of other Nymphulini until the colors of the adult wings begin to show through the integument.

There is considerable individual and regional variation in this species. It seems likely that there is also seasonal variation, and clonal or environmentally regulated variation between different restricted colonies. A careful study of the pattern of variation would be interesting. There is a general difference between southern and northern individuals. As names are available for the two components I recognize them as subspecies, though they reflect only a part of the variation of the species.

> Munroessa gyralis gyralis (Hulst) PL. 5, FIGS. 12–20 (McD. 5688). Hydrocampa gyralis Hulst, 1886, Ent. Americana, 13: 150. Type-locality: Georgia.

Nymphula dentilinea Hampson, 1897, Trans. Ent. Soc. London, 1897: 139. Type-locality: Florida.

This is the southern subspecies, ranging from southern Florida to New England with little geographical variation, except that specimens from extreme southern Florida average very small and dark. This subspecies has relatively small males, with dark wings, restricted whitish areas and a general orange-brown tone. The females have yellowish or brown forewings and tend to have the hindwings considerably suffused with gray or buff.

Munroessa gyralis serralinealis (Barnes and Benjamin), NEW STATUS PL. 5, FIGS. 21, 22 (McD. 5689).

Nymphula serralinealis Barnes and Benjamin, 1924, Contrib. Nat. Hist. Lep. N. Am., 5: 190. Type-locality: Hymers, Ontario.

This averages larger than the nominate subspecies. The markings are similar, but in males the white elements tend to be strong, and gray tints predominate in the darker areas, which are rarely darkened or orange-suffused as in the nominate subspecies. The females have almost immaculate orange-yellow, brown or dark-gray forewings and have the hindwings whitish and less strongly marked than in the nominate subspecies.

The present subspecies ranges from Quebec through Ontario and Michigan to southern Manitoba. Limited material from Nova Scotia and Maine seems closer to the preceding subspecies.

For notes on the life history see the account under the species heading, above. There may be regional differences in host preference. McGaha found this species only on white waterlilies (*Nymphaea* species) in Michigan, but it has been reared in Manitoba on a yellow waterlily, identified as *Nuphar advena* (Aiton) Aiton fil.

GENUS Contiger Lange

Contiger Lange, 1956, Wasmann Jour. Biol., 14: 109.

Type-species: Oligostigma vittatalis Dyar, 1906. Monotypy and original designation.

The moth is of moderately small size (length of forewing 6–8.5 mm), with fairly wide, heavily marked, subfalcate wings. The labial palpi are short, weakly ascending, slender and roughscaled. The maxillary palpi are prominent, and have an expanded tuft of scales at the end. The frons is rounded, smoothly scaled. The vertex is elevated and rough-scaled. The proboscis is fairly well developed. The eyes are large. The ocelli are well developed. The chaetosemata are rather prominent. The antennae are smooth, somewhat thickened in the male, scaled above and finely short-pilose below. The body is of moderate proportions. The legs are long and slender, with short tibial spurs. The praecinctorium is rather short and ends in a wide, transverse, fan-shaped tuft of scales. The forewings are moderately wide, with the termen excavated behind the apex, then strongly curved between M₃ and Cu₁ and with the tornus broadly rounded. Vein R₁ arises near the anterior angle of the cell. R₂ is briefly stalked with R_{3+4} . R_3 and R_4 separate very close to the apex. R_5 arises from the anterior angle of the cell, but it is not basally curved or approximated to R_{3+4} . The discocellular is erect, weakly incurved. The cell is about two-thirds as long as the wing. M_1 arises a little behind the anterior angle of the cell. M₂, M₃ and Cu₁ arise close together around the posterior angle of the cell. These three veins are curved and approximated basally. Cu₂ arises a little basad of the posterior angle of the cell. 1st A is lacking. 2nd A is well developed. 3rd A is lacking. The

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hindwings are long and narrow, with the apex rounded and the outer margin excavated at about M_2 , strongly curved at Cu_1 . Sc and R_s are anastomosed for some distance. M_1 is free. The cell is about half the length of the wing. The discocellular is weakly curved, almost erect. M_2 , M_3 and Cu_1 arise close together at the posterior angle of the cell and are basally curved and approximated to one another. Three anals are present.

The male genitalia have the uncus narrow, tapering to a narrowly rounded tip. The gnathos is long, compressed, decurved to a point distally and with dorsal teeth. The juxta is triangular, thickly spinulose dorsally. The vinculum is narrow ventrally. The valve is of moderate size, is rounded at the apex and has a basal group of small spines. The penis is long and slender, slightly bent, with the vas deferens entering distad of the middle. It has a strong spinelike cornutus and a number of smaller cornuti. The eighth sternite has a short, wide, triangular projection posteriorly. The female genitalia have the base of the ductus bursae wide and spinulose, separated from the bursa by a sclerotized collar. The bursa is oval and unarmed. The anterior apophyses are strong and are fused at their anterior ends.

The early stages are unknown.

Only a single species is known. The genus resembles *Synclita* in having a median ventral process on the posterior edge of the eighth sternite of the male, but differs from it in many characters. Lange says that the relationships of the genus are southern, but it is not really very close to any other genus known to me.

Contiger vittatalis (Dyar) PL. 5, FIGS. 23, 24 (McD. 5685). Oligostigma vittatalis Dyar, 1906, Jour. New York Ent. Soc., 14: 89. Type-locality: Biscayne Bay, Florida.

NOTE—The locality given is that of the lectotype, hereby designated, a male in the USNM.

The moth is grayish brown, with dark-brown sub-basal and subterminal bands, bordered at a short remove on the medial sides by antemedial and postmedial brown lines. There is an orange-and-brown discal mark on each wing and a dull-orange, fuscous-bordered subterminal band. The fringes have fuscous interceptions, giving them a jagged look. The length of the forewing varies from 6–8.5 mm.

The genitalia are as described for the genus.

The species is not very common in collections, but it is widely distributed in the Southeast, ranging from Biscayne Bay, Florida, north to South Carolina and west to Opelousas, Louisiana. As Dyar points out, it superficially resembles species of *Diasemiodes*, but it should not be confused with any other North American species.

GENUS Nymphuliella Lange

Nymphuliella Lange, 1956, Wasmann Jour. Biol., 14: 110. Type-species: Diathrausta daeckealis Haimbach, 1915. Original designation.

The moth is small and dark fuscous in color, with acute apex and truncate forewings. The frons is rounded and smoothly scaled. The vertex is elevated, sparsely but roughly scaled. The labial palpi are porrect, exceeding the frons by nearly the length of the head; the second segment has broad compressed scaling, abruptly truncated in front. The third segment is

cylindrical and projects conspicuously from the dorsal edge of the truncated terminal scaling of the second. The maxillary palpi are prominent and somewhat dilated with scales. The proboscis is somewhat reduced. The eyes are of moderate size. The ocelli and chaeto-semata are prominent. The body is short and fairly thick for the size of the insect. The legs are moderately slender, with rather long tibial spurs. The praecinctorium is rather short, with a transverse flattened scale-tuft at the end. The wings are almost as in *Contiger*, but the margins are only very slightly excavated.

The male genitalia have the uncus of moderate length, flattened, constricted before the tip and with the tip itself spatulate. The gnathos has a rather wide base; the medial part is spikelike, tapering and downturned at the extreme tip, with a few small spines dorsally. A cuplike ventrolateral process arises from each side of the tegumen near the base. The juxta is short and wide, constricted medially. The vinculum is wide and subtruncate ventrally. The valves are short and fairly wide, with the costa somewhat expanded in its middle part and with the ventral margin weakly excavated a little beyond the base; the terminal margin is oblique and the apical part of the valve is setose. The penis is weakly curved near the tip and has one curved cornutus and several smaller, straight, pointed ones. The female genitalia have the ovipositor lobes rather small, with short setae. The apophyses are slender, the posterior apophyses longer than the anterior. The ostial chamber is rather small and leads into an irregular sclerotized collar. The bursa is short, oval and has a few irregularly distributed spinules. There is an accessory sac into which the ductus seminalis opens and which connects with the ductus bursae at the sclerotized collar.

The larva is gill-less. Ocelli I and II are larger than the others; III and IV are small and close together. The frons is broad and triangular and extends nearly to the incision of the posterodorsal margin of the epicranium. The prothoracic shield is very large and extends laterally to include the prespiracular setae. The coxae touch mesally on the prothorax and the mesothorax. The prothoracic spiracle is reduced and apparently functionless. The abdominal setae are fine and short and the tubercles are minute. The spiracles are small, round and pale, but otherwise apparently normal. The eighth segment has a decided dorsal hump. The prolegs are short, broad and humplike. There are 46 to 50 crochets on each proleg, arranged biordinally in two transverse rows; those of the posterior row are much shorter than those of the anterior row. The full-grown larva is about 10 mm in length. The pupa has the spiracles of abdominal segments 2, 3 and 4 enlarged and protruding. The other abdominal spiracles are vestigial.

Only one species of the genus is known. Its relationships within the tribe are not clear.

Nymphuliella daeckealis (Haimbach) PL. 5, FIG. 25 (McD. 5720).

Diathrausta daeckealis Haimbach, 1915, Ent. News, 26: 322, pl. 12, fig. 5. Type-locality: Brown's Mills Junction, New Jersey.

Nymphula broweri Heinrich, 1940, Proc. Ent. Soc. Washington, 42: 37, pl. 6, figs. 3-3b; pl. 7, fig. 10.

Type-locality: Southwest Harbor, Maine.

The moth is small (length of forewing 4.5-5.5 mm). The body and wings are dark fuscous, with or without fine, weakly indicated traces of a pale-buff postmedial line on forewings and

hindwings. These lines are a little more strongly indicated on the underside. The fringe of the forewing has traces of white in the middle part of the termen above and below.

The genitalia are as described for the genus.

The structural characters of the larva are as described for the genus. The head is dark brown with pale ocelli. The prothoracic shield is blackish brown. The thorax is pale smoky fuscous, with the intersegmental membrane between the prothorax and head and also the venter of the prothorax and mesothorax dull white. The coxae of the thoracic legs are white with the sclerotized areas dark brown. The abdomen is sordid white, with the tubercles unpigmented. The foodplant is probably *Cephalozia fluitans* (Nees) Spruce, a member of the family Jungermanniaceae. The larva lives in a case on this aquatic plant in the bog pools in which it grows. The pupa is formed in the larval case, which remains attached to submerged parts of sedges and other plants. These life-history notes are taken from the account by Heinrich (1940) and are based partly on observations made by A. E. Brower.

The moth is uncommon in collections. It occurs in bogs from New Jersey to Maine and should be looked for elsewhere. The moths occur in June and July around the water holes in large bog areas. They rest on bladderwort (*Utricularia* species), grasses and other vegetation, or on the surface of the water. They fly with a fluttering flight over the water and often rest. The species does not closely resemble any other North American nymphuline. The square forewings will distinguish it from dark specimens of *Synclita* species. It resembles some Pyraustinae in a general way, but the strong chaetosemata will distinguish this species. The family characters will distinguish it from various small Noctuidae and true Microlepidoptera, with which it might be confused in superficial aspect.

GENUS Synclita Lederer

Synclita Lederer, 1863, Wiener Ent. Monat., 7: 448. Type-species: Synclita gurgitalis Lederer, 1863. Monotypy.

NOTE—Lederer also named and figured *Synclita modestalis*, but bracketed the name with *S. gurgitalis* and gave it in roman characters instead of italics, the convention he normally used for synonyms. It seems probable that he named the two sexes at the time his plate was prepared and decided before he completed the text that the two nominal species should be listed in synonymy. The genus is therefore virtually monotypic. Should this view not be accepted, *S. gurgitalis* is the type-species by subsequent designation of Shibuya, 1928, *Jour. Fac. Agric. Hokkaido Imp. Univ.*, 22: 140.

The moths are small, with rounded wings, obscure or obsolete maculation and usually with dark colors. The frons is flat and oblique. The vertex is elevated and has rough, erect scaling. The labial palpi are upturned and reach the middle or dorsal edge of the frons; the first two segments are rough-scaled beneath; the third segment is short with truncated scaling. The maxillary palpi are short and not dilated with scales. The proboscis is greatly reduced. The eyes are of moderate size. The ocelli are rather small. The antennae are somewhat thickened in the male, filiform in the female, with alternate dorsal scale-rows raised in the distal part of the antenna. The body is of moderate thickness. The legs are of moderate proportions and have very long tibial spurs. The praecinctorium is rather short and ends in a transverse flattened tuft of scales. The forewings are of moderate width and have the apex, termen and tornus rounded. The cell is narrow and about two-thirds as long as the

wing. Veins R_1 and R_2 are free. R_3 and R_4 are stalked more than half-way from the cell to the apex. R_5 is from the anterior angle of the cell; it is straight and not basally approximated to R_{3^+4} . The discocellulars are straight and erect. M_1 arises considerably behind the anterior angle of the cell. M_2 , M_3 and Cu_1 are moderately spaced around the posterior angle of the cell; these veins are not curved and approximated basally. Cu_2 arises from the cell at about four-fifths. 1st and 3rd A are obsolete; 2nd A is well developed. The hindwings are narrow and somewhat oblong, with apex and termen rounded. Sc and R_s are anastomosed for some distance. M_1 is free and arises from the anterior angle of the cell. The cell is about three-fifths as long as the wing and has the discocellular erect and somewhat incurved in the middle. M_2 , M_3 and Cu_1 are narrowly spaced around the posterior angle of the cell; they are not curved and approximated basally. Cu_2 arises from the cell at about two-thirds.

The male genitalia have the uncus long, slender, parallel-sided and rounded at the tip. The gnathos is shorter, narrower, pointed at the tip and has a few dorsal denticles near the tip above. The juxta is short, wide and oblong. The vinculum is narrow, ventrally rounded. The valve is fairly short and wide, distally rounded and has a patch of spinules at its base. The penis is stout, with one long cornutus and a group of numerous small spines. The eighth tergite is excavated on each side of the midline. The median process is slender and is armed with angular processes or spinules at the tip. The female genitalia have the ostial chamber funnel-shaped, leading to a valvelike structure. The ductus bursae is slender and sclerotized. The bursa is a small membranous sac.

The larva is cylindrical and gill-less, with a prognathous head and obliquely truncate anal region. The first four abdominal spiracles are relatively large, especially the third and fourth; the last four are smaller. The first two pairs of thoracic coxae are contiguous on the midventral line. The last pair are separated. The prolegs are reduced; the first four pairs have on each proleg two transverse rows of crochets; the anal prolegs have a single row of crochets each. The larva lives in a short case with somewhat rounded sides made out of leaves or leaf fragments. The pupa is of normal form for the tribe. It has three pairs of large spiracles dorsal to the wing-cases. These spiracles are situated on prominent conical tubercles. The other spiracles are reduced. There is a pair of thornlike tubercles on the ninth abdominal segment. The leg-cases are somewhat variable in length, but usually reach to the seventh or eighth abdominal sternum. These two sterna are somewhat swollen ventrally.

The eggs are oval and flattened and are laid on submerged leaf-surfaces of aquatic plants, often in ribbon-like groups near the edges. The young larvae apparently breathe cutaneously and live in a water-filled case, but the older larvae live in an air-filled case from which they reach out to feed on leaves. Before pupating the larva attaches the case to leaves or petioles, either above or below the water surface, and spins a silken inner cocoon in the case. The food plants are various. At least *S. occidentalis* is polyphagous.

The genus is distinguished from others by the habitus and by the narrow midventral process of the male eighth abdominal sternite. It appears to be a purely American group, with species ranging from Canada to Argentina.

I recognize four North American species, but the taxonomy deserves closer attention on the basis of better series and comparison of reared material.

KEY TO NORTH AMERICAN SPECIES

- 1. Moth very small: length of forewing of female under 5 mm; wings very narrow, blackish fuscous, immaculate *tinealis* this page
- Moth moderately small: length of forewing of male usually over 5 mm and wings relatively wide, female larger; wings often blackish fuscous, but if so always with obvious though not necessarily contrasting maculation 2
- 2. Process of eighth sternite of male with a small tooth-like process on each side near apex; California and Arizona occidentalis p. 100
 — Process of eighth sternite of male

- 3. Male grayish fuscous, with complete though not very distinct pale-gray postmedial line on forewings and hindwings; apex of median process of male eighth sternite heavily sclerotized, not very sharp; female light gray with darker median area bounded by pale-gray antemedial and postmedial lines atlantica p. 99
- Male blackish fuscous with obscure maculation and only indications of a postmedial line; apex of median process of male eighth sternite sharp and not strongly sclerotized; female orange-brown or brown, variegated with fuscous obliteralis p. 98

Synclita tinealis Munroe, NEW SPECIES PL. 5, FIGS. 26, 27; PL. C, FIG. 5.

Synclita tinealis Munroe. Type-locality: Monroe County, New York.

DIAGNOSIS: This is a minute species, with narrow, unicolorous, dark-fuscous wings. The median process of the male eighth abdominal sternite is sharp and is armed with three or more parallel setalike spines.

DESCRIPTION: The frons is more rounded and the labial palpi are more closely and smoothly scaled than in other species of the genus. The head, the body above and the wings above and beneath are uniformly blackish fuscous and immaculate, a little darker in the male than in the female. The body beneath is white anteriorly, grayish fuscous elsewhere. The legs are grayish fuscous. The length of the forewing varies from 3–5 mm.

The male genitalia have the uncus long and slender, somewhat flattened. The gnathos is a little shorter than the uncus and very slender, hardly expanded at the tip. The juxta, vinculum and valves are much as in other species. The penis is cylindrical, obtusely bent near the tip and armed with a single short, rather thick, sharp cornutus. The female genitalia have the ductus bursae and bursa very weakly sclerotized.

The early stages are unknown.

TYPES: Holotype: J. Monroe County, New York; 9 Aug. 1947; C. P. Kimball. Type no. 11,777, CNC.

Allotype: Q. Same locality, collector and type number; 13 July 1948. CNC.

Paratypes: 18 specimens. Same locality and collector as for holotype; July, Aug., Sept. Pearl, Rankin County, Mississippi; May, July, Aug., Sept.; Bryant Mather. Gainesville, Florida; 24 April 1952; J. R. Vockeroth. Archbold Biological Station, Lake Placid, Florida;

1-7 May 1964; R. W. Hodges. Wedge Plantation, McClellanville, South Carolina; 4 Aug. 1968; D. C. Ferguson. Baton Rouge, E. Baton Rouge Parish, Louisiana; 1 Sept. 1970; G. Strickland. Type no. 11,777, CNC; CPK; BMNH; WPC; GS; USNM.

Synclita obliteralis (Walker) PL. 5, FIGS. 28-33; PL. C, FIG. 6 (McD. 5686).

Isopteryx? obliteralis Walker, 1859, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 17: 399. Type-locality: United States.

Hydrocampa proprialis Fernald, 1888, Ent. Amer., 4: 37. Type-locality: Florida.

NOTE—The locality cited is that of the lectotype, a specimen in the USNM hereby designated from a series of 14 syntypes from Florida and Texas.

NOTE—Parapoynx obscuralis Möschler, 1881, Verh. K.-K. Zool.-Bot. Ges. Wien, 31: 432, pl. 18, fig. 39, not Grote, 1881, has customarily been placed in the synonymy of S. obliteralis, but it is really an unrelated species from South America, as Möschler's figure plainly shows. It should be removed from the synonymy of S. obliteralis and from the North American list.

The moths are sexually dimorphic. The male is smaller (length of forewing 5–6 mm) and has the forewings relatively wide, with the termen weakly oblique. The ground color is fuscous, obscurely variegated with brown and with a whitish discocellular lunule on the forewings. The female is larger (length of forewing 7–9 mm) and is considerably paler in color. Dull grayish brown or orange-brown predominates, but there is some grayish-fuscous suffusion, especially on the forewings before the middle and in the terminal area.

The male genitalia are as described for the genus. The uncus is wider than in the preceding species and the gnathos is relatively thick, deep and heavy. The penis has a rather long serrate cornutus supplemented by a patch of fine spines. In the female genitalia the ductus bursae has a narrow sclerotized collar, and the bursa has a patch of spines.

The life history has been described several times though no detailed structural description of the larva has been published. It is essentially as described for the genus. The larva lives on a variety of aquatic plants, and the details of the case and of the egg-laying habits vary with the host plant. Among the recorded hosts are: waterlilies (Nymphaeaceae) (Dyar, 1906; Forbes, 1923; Williams, 1944), floating pondweed, *Potamogeton natans* L. (Hart, 1895). My colleague D. P. Pielou found it to be a regular member of the fauna associated with duckweed (*Lemna* species) in the Ottawa region. The larva and pupa lived in a flattened, ovalsided case made of whole leaves or even whole plants. In structural characters these larvae and pupae agreed with the partial description given by Forbes (1911) of "*Elophila* species". As the identification of that larva and pupa apparently rested only on the resemblance of the larval habits and food to those of the European *Cataclysta lemnata*, I think it at least as likely that Forbes had a larva of the present species and not of *Neocataclysta magnificalis*, as supposed by Lange (1956). For amplification see the remarks given under that species.

As several close species are already known in this genus, and as there are indications of differences in the food preferences and modes of life of the larvae described by different workers, more careful comparative study of the life histories of different strains and of associated series of adults would be desirable.

The species is a common one, ranging from western Nova Scotia to southern Manitoba, through Quebec and Ontario, and south to southern Florida and to Brownsville, Texas. The species occurs also in British Columbia at Vernon, where it was perhaps introduced. It has also been introduced into the Hawaiian Islands (Williams, 1944; Zimmerman, 1958) and more recently into England (Shaffer, 1968).

The insect is a minor pest of ornamental aquatic plants, especially waterlilies, and often becomes established in greenhouses. It appears to be perfectly at home in the wild, however, even as far north as Canada.

> Synclita atlantica Munroe, NEW SPECIES PL. 6, FIGS. 1, 2; PL. C, FIG. 7.

Synclita atlantica Munroe. Type-locality: Round Hill, Nova Scotia.

DIAGNOSIS: This species is closely similar to S. obliteralis, but paler, more gray than brown, with darker antemedial and subterminal zones on the forewings and with a complete pale-gray postmedial line on both forewings and hindwings. In the male the process of the eighth abdominal sternite has the tip thicker and more heavily sclerotized than in S. obliteralis.

DESCRIPTION: The head and palpi are pale grayish buff, weakly tinged with fuscous. The eyes and ocelli are fuscous. The antennae are dark fuscous. The body above and beneath and the legs are pale grayish buff.

The forewings are of moderate width; in the male the termen is moderately oblique, in the female it is more strongly oblique; in both sexes the apex and tornus are rounded. The forewings above are light grayish buff in the male, paler in the female. The basal area is weakly suffused with brownish fuscous. Beyond this is a wide, pale, obtusely angled antemedial band, followed by the narrow, brownish-fuscous medial area. There is a white, fuscous-bordered discocellular lunule. The distal edge of this lunule is touched by the oblique, irregularly sinuous, inwardly fuscous, outwardly whitish-gray postmedial line. The distal part of the wing is a little paler than the medial part in the male, much paler in the female. In both sexes there is a dark subapical patch on the costa and a dark subterminal band; these are darker and wider in the male than in the female. There is a somewhat irregular and interrupted row of whitish subterminal spots. The fringe is brownish fuscous with weak darker checkering. The hindwings above are grayish fuscous in the male, gray with fuscous dusting in the female, in both sexes with weakly sinuous whitish-gray antemedial lines bounding a slightly darker medial area. The wings beneath are gray, darker in the male than in the female, with lighter-gray veins and postmedial and subterminal lines.

The male genitalia have the uncus moderately narrow, flattened, weakly spatulate and decurved distally. The gnathos is slender but fairly strong, a little shorter than the uncus, compressed, with a few dorsal denticles and one ventral one near the tip. The vinculum is ventrally subangulate. The valves are of moderate width, with the distal margin oblique. The penis has the cornutus fairly long, distally truncate and very finely serrate along its margin. The accessory spinules are very fine, hardly evident. In the female genitalia the ovipositor lobes are small and pointed. The apophyses are long and fine. The ostium is simple. The ductus bursae and bursa are small, hardly sclerotized.

The early stages are unknown.

TYPES: Holotype: J. Round Hill, Nova Scotia; 31 July 1939; in light trap; H. T. Stultz. Type no. 11,778, CNC.

Allotype: Q. Annapolis, Nova Scotia; 25 August 1946; McDunnough and Ferguson. Type no. 11,778, CNC.

Paratypes: 2 99. Kelly Mountain, near Englishtown, Victoria County, Nova Scotia; 28 July 1970; D. C. Ferguson. DCF.

This species is very similar to S. *obliteralis* in size and general structure, but the difference in the shape of the process of the male eighth abdominal sternite seems of specific importance.

Synclita occidentalis Lange PL. 5, FIGS. 34, 35; PL. C, FIG. 8.

Synclita occidentalis Lange, 1956, Wasmann Jour. Biol., 14: 106, figs. 47, 66. Type-locality: Elkhorn Ferry, Yolo County, California.

The moth is closely similar to S. obliteralis, but is larger in size (length of forewing in males about 8 mm, in females about 11 mm). The wings are more brightly marked and have more reddish coloration on the upper and lower surfaces than do those of S. obliteralis. In the male the valves are larger; the gnathos is longer; and the median process of the eighth abdominal sternite is blunt and has two accessory prongs.

sternite is blunt and has two accessory prongs. The early stages are described by Lange (1956, 1956a). They are closely similar to those of *S. obliteralis*. The eggs are disc-shaped and are laid either singly or in overlapping groups of up to about 60 on the submerged parts of aquatic plants, usually near the edges of the leaves. The larvae are gill-less. The young larvae are fully aquatic and cut out small pieces of leaves which they attach to the lower surfaces of floating leaves, living in the shelter thus constructed. As the larvae get larger they make oblong, air-filled cases out of two pieces of leaf. The cases may float on the surface of the water or may be found on the undersides of floating leaves or even on petioles several inches below the surface. The pupa is formed in the silk-lined case. There are at least two generations a year in the Sacramento Valley of California. Adults are common in rice-fields and in permanent ponds. Among the hosts are *Bacopa rotundifolia* (Michaux) Wettst.; pondweed, *Potamogeton gramineus* L.; arrowhead (*Sagittaria* species); *Echinodorus cordifolius*; yellow water-weed, *Jussiaea californica*; and cat-tail (*Typha* species). *Echinodorus* is a preferred foodplant.

The species is known from Colusa to San Diego Counties, California and from Prescott, Arizona. Its range may prove to be somewhat wider.

GENUS Langessa Munroe, NEW GENUS Type-species: Nymphula nomophilalis Dyar, 1906.

The moths are fairly small, slender in build, dark-colored, with narrow wings and long legs and abdomen. The frons is rounded, fairly smoothly scaled. The vertex is somewhat elevated, with moderately rough scaling. The labial palpi are short, porrect or somewhat drooping; the scaling of the second segment is rough and wide; the third segment is cylindrically scaled, distinctly narrower than the second. The maxillary palpi are prominent but drooping, strongly dilated with scales distally. The proboscis is much reduced but distinct. The eyes are rather small. The ocelli are small. The antennae are strongly annulated, weakly ciliated below, scaled above. The body and legs are slender; the abdomen greatly exceeds the anal angle of the wings in both sexes. The tibial spurs are short. The praccinctorium is long and ends in a rounded tuft of scales. The forewings are long and narrow, with very narrowly rounded apex and tornus and short, erect termen. The cell is about three-fifths as long as the wing. R_1 arises from the anterior angle of the cell. R_2 is stalked with R_{3+4} . R_5 is stalked with R_{2-4} . The discocellular is moderately curved and oblique distad. M_1 arises a little behind the anterior angle of the cell. M_2 arises from the posterior angle; it is basally straight and not approximated to M_3 . M_3 and Cu_1 are stalked, $M_{3+}Cu_1$ arising contiguously with M_2 from the posterior angle of the cell. Cu_2 arises from the cell at about four-fifths. Ist and 3rd A are lacking. and A is well developed. The hindwings are narrow, almost oblong. Sc and R_s are strongly anastomosed. M_1 and R_s are short-stalked. The cell is about half the length of the wing. The discocellular is curved and posteriorly is strongly oblique distad. M_2 and M_3 arise from the posterior angle of the cell. They are curved and approximated basally. Cu_1 arises just basad of the posterior angle. It is not basally curved or approximated to M_3 .

The male genitalia have the uncus long, moderately wide, parallel-sided to near the tip, there very weakly expanded and terminally rounded. The gnathos is slender and tapers almost to a point; it is strongly sclerotized and somewhat shorter than the uncus; it has a few spinules dorsally near the tip. The juxta is oval. The vinculum is narrow and midventrally carinate. The valves are of moderate length, with costal and ventral margins almost parallel, very weakly sinuated and narrowly inflated; the tip is unsymmetrically rounded. The penis is long and slender and slightly dilated at each end. It has no cornuti. The female genitalia have the ovipositor lobes long and slender, finely setose. The apophyses are slender and threadlike, the anterior and posterior ones about the same length.

The early stages are unknown.

Only one North American species is known. There are closely related species in tropical America. The stalked condition of M_3 and Cu_1 of the forewings will distinguish this from other North American Nymphulinae. Lange (1956) mentioned and figured the type-species but for unstated reasons excluded it from the Nymphulinae. I take pleasure in naming this genus for my old friend Harry Lange in recognition of his pioneer work on the classification of North American Nymphulinae, Pterophoridae and other groups. This work is all the more creditable in that it has been done in the interstices of a busy career as an economic entomologist and university teacher.

Langessa nomophilalis (Dyar), NEW COMBINATION PL. 6, FIGS. 3, 4 (McD. 5687).

Nymphula nomophilalis Dyar, 1906, Jour. New York Ent. Soc., 14: 84. Type-locality: Hastings, Florida.

NOTE—This is the locality of the lectotype, male, hereby selected from among seven syntypes listed by Dyar. The specimen is in the USNM and bears the following labels: "Hastings, Fla. April"; "Collection W. D. Kearfott"; and, on red paper, "Type no. 9493 USNM".

The moth is of moderately small size (length of forewing from 7–9 mm). The forewings above are dark fuscous, in the male with some rusty-brown powdering along the costa basad and distad of the round, dark, discocellular spot, in the female almost unicolorous, with the

discocellular spot only faintly visible. There are scattered bluish-white scales here and there on the wing, concentrated to form a weak subterminal line, more obvious in the male than in the female. The fringe is shining fuscous with darker checkering. The hindwings above are fuscous with obscure dark subterminal spots in cell Cu_2 and at the anal angle. The fringe is light brownish fuscous.

The genitalia are as described for the genus.

The early stages are unknown.

The species is widely distributed and not uncommon in Florida, where it ranges from Gainesville to Homestead and probably farther. It has been collected from February to June.

The slender wings, straight termen and different pattern will distinguish this from *Synclita obliteralis*. It is much larger than *S. tinealis*, has more variegated wings, even in the female, and has the forewings and hindwings different shades of brownish fuscous, not uniformly blackish fuscous as in that species.

GENUS Parapoynx Hübner

Parapoynx Hübner, [1825], Verzeichniss Bekannter Schmettlinge [sic], 362. Type-species: Phalaena stratiotata Linnaeus, 1758. Subsequent designation, Guenée, 1854, Species Général des Lépidoptères, 8: 269.

Eustales Clemens, 1860, Proc. Acad. Nat. Sci. Philadelphia, 1860: 216. Type-species: Eustales tedyuscongalis Clemens, now considered a synonym of Parapoynx seminealis (Walker), 1859. Monotypy. NEW SYNONYMY.

Sironia Clemens, 1860, Proc. Acad. Nat. Sci. Philadelphia, 1860: 218. Preoccupied by Sironia Hübner, 1823, Zuträge zur Sammlung Exotischer Schmettlinge [sic], 2:31. Type-species: Sironia maculalis Clemens, 1860. Monotypy. NEW SYNONYMY.

Nymphaeella Grote, 1880, North Amer. Ent., 1: 97. Type-species: Nymphaeella dispar Grote, 1880, now considered a synonym of Parapoynx maculalis (Clemens), 1860. Monotypy.

The moths are of moderate to small size, with long, narrow wings, usually with a characteristic pattern of straight or weakly curved antemedial, postmedial and terminal bands across the hindwings, and with gilled larvae living in standing or slowly flowing water. The frons is rounded and smoothly scaled. The vertex is roughly scaled, not or very little elevated. The labial palpi are long, strongly upturned, with the second segment curved and moderately scaled, the third segment long, slender and acuminate, usually reaching or exceeding the level of the vertex. The maxillary palpi are prominent and moderately to strongly dilated with scales. The proboscis is moderately developed. The eyes are large. The ocelli are variable, being well developed in some species, small or absent in others. The antennae are somewhat thickened in the males, slender in the females, strongly annulated in all species, at least in the distal part of the shaft. The body is slender and the abdomen usually extends some distance behind the anal angle of the wings, especially in the male. The legs are slender, with long spurs. The praecinctorium is long and ends in a rounded tuft of scales. The forewings are long and narrow, especially in the females. The cell is about two-thirds as long as the wing. Vein R₁ arises fairly near the end of the cell. R₂ is free or stalked with R₃₊₄. R₃ and R_4 are long-stalked. R_5 arises at or a little behind the anterior angle of the cell. M_1 arises somewhat behind R_5 . Both are straight and are not approximated to other veins basally. The lower discocellular is angled or curved to a varying degree behind its midpoint. M_2 , M_3 and Cu_1 arise close together at or near the posterior angle of the cell. They are not curved or approximated to one another basally. Cu_2 arises well out on the cell. Ist A is lacking. 2nd A is well developed. 3rd A is small or absent. The hindwings are long and narrow. Sc and R_s are anastomosed, often nearly to the apex. M_1 is free. The cell is half as long as the wing or somewhat longer. The discocellular is moderately and evenly curved. M_2 , M_3 and Cu_1 arise close together at or near the posterior angle of the cell. They are not curved and approximated to one another basally, Cu_2 arises somewhat basad of the posterior angle.

The male genitalia have the uncus and gnathos stout. The gnathos has small dorsal spines or none. The penis is small and has at most fine spinules; large cornuti are lacking. The valves are simple; there may be one or more small seta-bearing papillae near the base of the sacculus. The female genitalia have the ductus bursae elongated. The ostial chamber is sclerotized and is sometimes followed by a sclerotized collar. The ductus bursae is unsclerotized and leads into an elongate bursa. The latter is unarmed or has two longitudinal bands of small denticles.

The larvae differ from those of other genera known from standing water in that they have several groups of conspicuous tracheal gills on each segment. The numbers of filaments in the groups differ from species to species. The larvae of North American species so far as known are case-makers or live under a detached piece of leaf sewn to the underside of another leaf. They feed on a variety of aquatic plants. The structural characters of the American species have not been thoroughly studied, though Forbes (1910) has given some notes. Except for the presence of gills the larvae are apparently not very different from those of Nymphula, but the ellipses of crochets on the midabdominal prolegs are hardly broken and the anal prolegs have each a curved, almost elliptical band of crochets rather than a straight one as in Synclita and Nymphula. McGaha (1954) has collated biological information on several species. The larvae and pupae of some of these are so much alike that he had difficulty distinguishing them.

The genus is of moderate size but is of nearly worldwide distribution. There is considerable difference in maculation among the American species and there are some structural differences as well, notably in the development of the ocelli and vertex, the length of the discal cells and the shape of the discocellulars and also in the position of the forking of Sc and R_s in the hindwings. However the genital structures are very uniform, as are the structure and biology of the early stages. I therefore have no hesitation in following Lange in his grouping of these species in a single genus.

KEY TO NORTH AMERICAN SPECIES

- Forewings and hindwings above with a small dark discocellular dot; this dot faint only in virtually immaculate white specimens allionealis
 p. 100
- Hindwings and usually forewings without a dark discocellular dot on upperside 2
- 2. Hindwings above nearly immaculate white, without distinct antemedial, postmedial and terminal bands maculalis p. 104
 Hindwings above with distinct and regular antemedial, postmedial and
 - terminal bands on a paler ground 3

3.	Forewings above colored much like	5.	Forewing above suffused with dull	
-	the hindwings, with dark bands of		brownish fuscous; postmedial line, if	
	about the same tone on a pale ground 4		visible, a narrow zigzag pale line;	
	Forewings above much darker and		hindwing without incision in termen	
	more suffused than the hindwings		near M_1 and with terminal markings	
	and with bands, if any, much less		at ends of M_2 and M_3 not more highly	
	distinct; at least the whole discal cell		differentiated than those at ends of	
	of the forewings dark 5		other veins obscuralis	
			p. 105	
4.	Hindwings above with antemedial		Forewing above suffused with shining	
	and postmedial bands black, with		brown or castaneous; postmedial band	
	distinctly less curvature than termen		of forewing above, if visible, wide,	
	and terminal band badiusalis		straight from costa to anal fold then	
	р. 106		strongly angled basad; hindwing	
	Hindwings above with antemedial and		with an incision in the termen about	
	postmedial bands brown or at most		at M_1 and with markings of termen on	
	dark brownish fuscous, almost exactly		upperside specialized into rudimentary	
	parallel to termen and terminal band		ocellate spots at the ends of veins M_2	
	curviferalis		and M ₃ seminealis	
	p. 108		p. 108	

Parapoynx maculalis (Clemens) PL. 6, FIGS. 5–7, 9, 10 (McD. 5680).

Sironia maculalis Clemens, 1860, Proc. Acad. Nat. Sci. Philadelphia, 1860: 218. Type-locality: Lake Teedyuscong, Pike County, Pennsylvania.

Nephopteryx seminivella Walker, 1865, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 35: 1717. Type-locality: United States.

Nymphaeella dispar Grote, 1880, North Amer. Ent., 1: 97. Type-locality: Lewis County, New York.

NOTE—Varieties *foeminalis* Dyar, from Palm Beach, Florida, and *masculinalis* Dyar, from Cocoanut Grove, Florida, were both described in *Jour. New York Ent. Soc.*, 14: 80, 1906, explicitly as aberrations of "*Nymphula*" *maculalis*. They have never been used in a specific or subspecific sense and therefore have no standing in formal zoological nomenclature.

The moths are of moderate size (length of forewing in males 7-11 mm, in females 9-13 mm). There is strong sexual dimorphism. Males normally have the forewings white, with fuscous clouding along the posterior margin and usually along the radial and cubital stems. There is a fuscous patch at the middle of the posterior margin extending a variable distance forward, another somewhat variegated fuscous patch over the discocellulars. There are fuscous terminal and subterminal lines and fine longitudinal streaking in the terminal area. In the female the forewings are usually uniformly slate gray, sometimes with a brownish tinge. In both sexes the hindwings are most often immaculate white except for a small gray marking near the anal angle, representing the termination of the postmedial band. There is variation in several directions. Rarely males have the forewings uniformly dark like those of normal females (ab. *foeminalis*). Females not uncommonly have traces of dark pattern on the dark ground color of the forewings. This may resemble the pattern of *P. badiusalis* females. Rarely the
ground color of the female forewings is white, with traces of such dark patterns (ab. *masculinalis*). As indicated, there is some variation in the quality and depth of the forewing color in the female. In the male the intensity and extent of the dark markings vary appreciably. Sometimes they are almost black and occupy a large part of the wings; in other specimens they are grayish and more restricted. These variations in intensity seem to be partly local, but they do not follow any major geographic pattern that I have been able to detect. They may depend on the genetic makeup of particular colonies or perhaps on local factors of food or environment. The hindwings sometimes have either the antemedial or the postmedial line faintly indicated as a fuscous shade similar in course to the corresponding line of *P. badiusalis*.

The male genitalia are much like those of other species. The valves are fairly wide and rounded at the tip. They have no setigerous tubercle at the base of the sacculus. In the female genitalia the bursa lacks obvious rows of denticles.

The life history has been described by various authors (Forbes, 1910; Welch, 1916, 1924; Welch and Sehon, 1928; McGaha, 1952, 1954). The chaetotaxy has not been described in detail, though Forbes figures some of the head setae. The eggs are laid on the undersides of floating leaves of waterlilies, most commonly the yellow waterlilies (Nuphar species). The young larvae on hatching sink passively through the water. At this stage they can apparently survive only on the red permanently submerged leaves of *Nuphar*, from which they make small cases by cutting out fragments. At about the third instar they migrate to the surface, either by floating or by crawling up the petioles of floating leaves, in the latter event feeding as they go. They then feed on the undersides of waterlily leaves, replacing the old red cases by degrees with green fragments detached from floating leaves. At this stage the cases may be free or they may be fixed ones made by attaching a fragment of leaf to the underside of an entire floating leaf. The older larvae at times feed on white waterlilies (*Nymphaea* species), and on water-shield (Brasenia species), as well as on yellow waterlilies, but the preferences appear to vary at different places and times. The fully grown larva has the head pale yellow; otherwise the larva is transparent; just before pupation it turns yellowish. It has five groups of gill-filaments on each segment from T₃ to A8; T₁ has none, T₂ has four and A₉ has one. The posterior subdorsal group has five or four filaments; the anterior subdorsal group has mostly one less filament on each segment. The anterior and posterior subventral groups of segments A2 to A7 have the same number of filaments, namely five each, whereas other recorded North American species have one less filament in the anterior subventral than in the posterior subventral group.

The species is a common one from Nova Scotia through southern Quebec and Ontario (at least as far north as Laniel and Biscotasing) to Michigan, Wisconsin and the Lake of the Woods district in extreme western Ontario. Thence it ranges south to the southern Everglades of Florida. As mentioned above, there is considerable variation from population to population, but I have been unable to detect consistent geographical trends.

> Parapoynx obscuralis (Grote) PL. 6, FIGS. 13, 14 (McD. 5682).

Oligostigma obscuralis Grote, 1881, Papilio, 1: 18. Type-locality: New York.

NOTE—The locality given is that of the lectotype female selected by Shaffer, 1968, *Entomologist's Gazette*, 19: 107.

The moth is of moderate to small size (length of forewing from 7-11 mm). The ocelli are greatly reduced but recognizable. The males are smaller than the females, but there is little difference in maculation. The dull-brown forewings with angulate pale-buff postmedial line are characteristic. The hindwings are much as in *P. badiusalis*, but have the ground color buff-tinted, the antemedial and postmedial lines fuscous rather than black and not as crisp as in *P. badiusalis*; the antemedial line is always less distinct than the postmedial and is sometimes almost obsolete.

The male genitalia have the uncus narrow and fingerlike, the gnathos short and subtriangular, denticulate above at the tip. The juxta is oblong. The vinculum is narrow. The valves are relatively narrow, and each has a single papilla at the base of the sacculus, bearing two or three short setae. The penis is short and unarmed. The female genitalia are typical of the genus. The bursa is globular and has a pair of linear, longitudinal, depressed, denticulate signa.

The early stages have been discussed by Hart (1895), Berg (1950) and McGaha (1954). The larvae make cases or nests on a variety of aquatic plants, including eelgrass (Vallisneria species), pondweeds (Potamogeton species), and yellow waterlilies (Nuphar species). The fullgrown larva is yellowish white, is only weakly translucent and has light-brown setae. The distribution of gill-tufts is as in *P. maculalis*, but the numbers of filaments are different. On abdominal segments 1 to 8 the anterior subdorsal group has four filaments and the posterior subdorsal six filaments. The anterior subventral group has four filaments and the posterior subventral five filaments. The eggs are laid at night by the moth, which stands near the edge of a floating leaf and thrusts its abdomen under the edge, laying the eggs in about four rows on the under surface of the leaf near and parallel to its margin. The eggs are elliptical and slightly flattened, about 0.60×0.46 mm in length and width and yellow in color. They develop in about 11 to 15 days. Berg was unable to rear the young larvae on pondweed, but Hart found them in great numbers on eelgrass. It seems likely that the newly hatched larvae may normally be passively dispersed to their appropriate host as are those of P. *maculalis* and that they may later become more tolerant in their acceptance of different host species. According to Berg the mature larvae have much the same variation in case-making habits as other species of the genus, and the pupae are formed in floating cases or in attached ones at or below the surface. The winter is passed in the larval state.

The species occurs from Nova Scotia through southern Quebec and Ontario to Wisconsin and south to southern Florida. There are indications of weak geographic variation, but this is obscured by individual and strain differences, and without much more extensive material I will not attempt to characterize it.

Parapoynx badiusalis (Walker)

PL. 6, FIGS. 18, 19 (McD. 5684, in part).

Cymoriza badiusalis Walker, 1859, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 19: 955.

Type-locality: Canada [probably Ontario].

Oligostigma albalis Robinson, 1869, Ann. Lyceum Nat. Hist. New York, 9: 153, pl. 1, fig. 3. Type-locality: New York; Pennsylvania.

NOTE—I have not studied authentic type material, and it is not listed by Klots (1942) as being in the AMNH. However, it is likely that one or more syntypes may yet turn up, in

which event it will be possible to restrict the type-locality by designation of a lectotype. Meanwhile there is no pressing need for a restriction. Robinson's figure is clearly referable to the present species.

The moth is of moderate to small size (length of forewing 7-11 mm). The sexes are almost alike, but females are larger and have the termen of the forewings straighter and more oblique. The ocelli are small but distinct. The white wings with fuscous antemedial and postmedial bands and fulvous, black-bordered terminal band will distinguish this from any species except *P. curviferalis*, which differs in having the antemedial and postmedial bands of the hindwings brown or fuscous, not black, and parallel to the termen, not less strongly curved than the termen as in the present species.

The male genitalia are much like those of other species. The uncus is relatively short, finger-shaped. The gnathos is short and T-shaped. The juxta is small, dorsally bifid. The vinculum is ventrally rounded. The valves are very long and slender, distally rounded and somewhat expanded; the basal setigerous tubercle arises directly from the sacculus and is conical, bearing a single short seta, or sometimes more than one. The female genitalia have the sclerotized collar of the ductus bursae distinct, the bursa long and narrow, with a pair of linear spinulose signa.

The life history is described by Berg (1950). The larvae feed on pondweeds (Potamogeton species), most commonly on the submerged species, but sometimes on the floating pondweed leaves, P. natans L. Berg noted no differences in the structure or appearance of the full-grown larva from that of Parapoynx obscuralis. It makes a case from two oval pieces of leaf fastened together with silk. The larva extends its anterior end from the case to feed on Potamogeton leaves and its posterior end to eject excrement. The larva vibrates periodically to oxygenate the case, as does *P. maculalis*. When ready to pupate, the larva attaches the case to a submerged stem of pondweed at such an angle that it resembles a stipule. Then it completely closes the case, seals it with silk and pupates. The pupal case is filled with gas, not water. Pupae removed from the case and kept in shallow water develop nearly to maturity then die; but if they are removed to moist air at the stage when the wing markings have begun to show through the integument they often emerge normally, though they are apt to die from desiccation or mold. The females oviposit at night, and seem to lay eggs mostly in masses on the undersides of floating leaves. The moth sits on the edge of a leaf in the same way as P. obscuralis and curls its abdomen under the leaf to lay eggs. The eggs are usually found in rows of four ranks on the underside of floating pondweed leaves, near the margin. They are yellow and up to 0.6 mm long. The eggs hatch in from $7\frac{1}{2}$ -11 $\frac{1}{2}$ days. The newly hatched larvae begin at once to eat pondweed leaves and make miniature cases similar to those of the adults. The larvae pass the winter on the food plant beneath the ice. They resume feeding as soon as the temperature is raised, naturally or in the laboratory. McGaha (1954) reports having reared older larvae collected on whitish water-milfoil, Myriophyllum exalbescens Fernald. These larvae had cases made of pieces of the red submerged leaves of yellow waterlily, Nuphar variegatum Engelm.

The species is abundant near lakes and slow streams. It ranges from Prince Edward Island, Mont Joli, Quebec, and Maine westward through southern Quebec and Ontario as far as north-central and southwestern Manitoba and south through Nebraska and the eastern states to Key Largo, Florida. There is considerable individual and local variation, but as in the previous species this does not correlate well with geography.

Parapoynx curviferalis (Walker) PL. 6, FIGS. 20, 21 (McD. 5684, in part).

Oligostigma curviferalis Walker, 1865, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 34: 1331. Type-locality: North America.

The moth is closely similar to *P. badiusalis*, but differs in having the antemedial and postmedial bands of the hindwings brown or fuscous, not black, and parallel to the termen, not distinctly less curved than the termen. The length of the forewing varies from 8-11 mm.

The genitalia are not unlike those of P. badiusalis, but in the male the uncus and gnathos are longer and more slender. The juxta is shorter. The valves are relatively shorter and wider in the present species, and the basal setae are usually two in number and are borne on separate papillae, arising dorsad of the sacculus, not from it as in P. badiusalis. In the female the bands of spinules on the bursa are not as strong in this species as in P. badiusalis.

The early stages are unknown.

The species is considerably less common than P. badiusalis and apparently is more restricted in its habitats. Several of the localities where it has been collected are in the vicinity of large rivers. It ranges from Carleton County in western New Brunswick through the St. Lawrence Valley in the Montreal and Thousand Islands districts to southern Ontario, Illinois, and south through Maine and West Virginia to St. Augustine, Florida. The St. Augustine specimen has wider bands than most northern ones, but otherwise is similar. It is from the Sweadner collection and was taken with a considerable series of P. badiusalis.

> Parapoynx seminealis (Walker) PL. 6, FIGS. 11, 12 (McD. 5683).

Oligostigma seminealis Walker, 1859, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 17: 430. Type-locality: United States.

Eustales tedyuscongalis Clemens, 1860, Proc. Acad. Nat. Sci. Philadelphia, 1860: 216. Type-locality: Lake Teedyuscong, Pike County, Pennsylvania.

The moth resembles *P. obscuralis* in having dark forewings and banded hindwings, but the forewings are silky reddish brown or brown, and the hindwings are much more crisply marked than in *P. obscuralis*. The pale postmedial line or band of the forewings, when recognizable, is wide, straight and weakly oblique basad from the costa near the apex to the anal fold, there abruptly angled basad, terminating behind the cell somewhat basad of the posterior angle. On the hindwings both the antemedial and the postmedial bands are strong and dark fuscous. They diverge somewhat in the middle and are appreciably farther apart and contrast more strongly with the whiter ground color. The posterior margin is incised a little behind the apex, and following the incision there are two rudimentary ocellate terminal spots. The length of the forewing varies from 8-13 mm. The vertex is little elevated and the ocelli are obsolete.

The male genitalia are not unlike those of *P. curviferalis*, but the valves are shorter and wider and not expanded distally. The setigerous tubercles are closer to the dorsal margin of the

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sacculus than in that species. The female genitalia have the bursa relatively larger than in *P. curviferalis* and have the pair of linear denticulate signa long and strong.

The life history has been described by Forbes (1910). The larva feeds on floating-heart (*Limnanthemum* species); it avoids pondweeds (*Potamogeton* species) in nature but accepts them in captivity. The larva resembles that of other species in most respects; segments A1 to A7 have three filaments in the anterior subdorsal gill-tuft, four in the posterior subdorsal; segments A1 to A8 have three filaments in the anterior subventral tuft and four in the posterior subventral. The early larva is a leaf-miner, forming a trumpet-shaped mine close to the lower surface of the leaf. The third-stage larva removes the lower epidermis as well as the parenchyma and covers itself with a fragment of leaf. Its path continues the mine of earlier instars. The fourth and fifth instars live in a case between the leaf and a leaf-fragment or between two complete leaves and feed on the red undersides of the leaves in a series of bands, forming a very characteristic pattern. The pupa is indistinguishable from that of *P. obscuralis*.

The species is common from Massachusetts to southern Florida.

Parapoynx allionealis Walker PL. 6, FIGS. 8, 15–17 (McD. 5681).

Paraponyx [sic] allionealis Walker, 1859, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 17: 453. Type-locality: United States, Doubleday.

The moth is of moderate to small size (length of forewing 6-12 mm). The wings are of moderate width and truncate in the male, narrower and with the apex of the forewings acute in the female. The markings are obscure, somewhat stronger in males than in females. Wellmarked specimens have fuscous dots on the discocellulars of forewings and hindwings and a fuscous dot in the cell of the forewings. There are traces of an oblique, fuscous antemedial line, a slightly stronger but similar postmedial line, a brown subterminal band, which on the forewings begins from an oblique apical line, and a fuscous adterminal line. In poorly marked specimens all of these markings may be lost except for the dark discocellular spots of the forewings and hindwings, and even these spots may be only feebly indicated. The vertex is somewhat elevated, and the ocelli are small but distinct.

The male genitalia are much as in other species but have the setigerous tubercle arising from the dorsal margin of the sacculus and bearing two or more setae. The valves are not expanded distally. The female genitalia have the bursa long and slender, hardly differentiated from the ductus bursae and lacking rows of denticles.

The life history is poorly known, but brief notes have been published by Berg (1950) and McGaha (1954). Berg reared a single adult from a multiple collection made from floating pondweed, *Potamogeton natans* L. The exuviae of the larva were preserved and were found to have gills. McGaha reared a single female of *P. allionealis* from a leaf of white waterlily, *Nymphaea odorata* Aiton. The larva was taken in company with three male *P. maculalis* larvae, from which it was not distinguished, and several gill-less *Munroessa serralinealis* larvae. The gilled larvae were under patches attached to the undersides of leaves. These patches had not been severed from the leaves to which they belonged. The female *P. allionealis* mated readily with one of the male *P. maculalis*, but it did not lay eggs. I have not seen the specimens but both male and female were identified by Hahn W. Capps. McGaha

believes that the occurrence on *Nymphaea* is exceptional and that the normal host must be some other plant.

The species is widely distributed and is often very abundant, especially in the South. I recognize two subspecies.

Parapoynx allionealis allionealis Walker PL. 6, FIGS. 8, 15 (McD. 5681, in part).

Paraponyx [sic] allionealis Walker, 1859, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 17: 453.

Type-locality: United States, Doubleday coll.

NOTE—I hereby restrict the type-locality to Florida, which is consistent with the appearance of the lectotype male, hereby designated, a specimen in the BMNH bearing a greenrimmed type label and the printed label, "2. Paraponyx Allionealis.", cut from a copy of Walker's *List*.

Parapoynx aptalis Lederer, 1863, Wiener Ent. Monat., 7: 452, 485. Type-locality: North America.

This subspecies has the ground color suffused with dull brown in the male and almost uniformly brown in the female. In the male the black cell-spot and discocellular spots are distinct and the transverse lines and bands are reasonably well marked. In the female the markings are very indistinct, and the wings are almost unicolorous brown.

The subspecies is very abundant throughout Florida and ranges northward at least into Georgia. Even in Florida white females occur as rare aberrants. The subspecies gradually intergrades northward to the following. The population at the Wedge Plantation, McClellanville, South Carolina, is variable and transitional.

> Parapoynx allionealis itealis (Walker) PL. 6, FIGS. 16, 17 (McD. 5681, in part).

Hydrocampa itealis Walker, 1859, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 17: 458.

Type-locality: United States, Doubleday coll.

NOTE—The locality given is that of the lectotype female, hereby selected from the two syntypes cited by Walker. I reject the syntype from Georgia because this locality is too marginal to serve as a satisfactory type-locality for the subspecies. I arbitrarily restrict the locality of the lectotype to New York, which is consistent with its appearance.

Parapoynx cretacealis Lederer, 1863, Wiener Ent. Monat., 7: 452, 484. Type-locality: North America.

Paraponyx [sic] plenilinealis Grote, 1881, Papilio, 1: 17. Type-locality: Wisconsin.

The male is similar to that of the preceding subspecies but averages larger in size and has the ground color of the wings paler and with sparser brown dusting. The females are much paler than those of the nominate subspecies; and, though the markings are usually faint, they commonly show as a series of weak, transverse, brown or fuscous lines. The discal spots seem to be almost always present, though they are often pale gray and inconspicuous. Except for these spots the wings are frequently almost immaculate white.

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The little information that we have on the life history has been given under the species heading.

The subspecies is widely distributed in the eastern part of the continent, ranging from Nova Scotia to southwestern Manitoba and southward to meet the nominate subspecies, probably in a blend zone of considerable extent.

GENUS Oligostigmoides Lange

Oligostigmoides Lange, 1956, Wasmann Jour. Biol., 14: 86. Type-species: Oligostigmoides cuernavacale Lange, 1956. Original designation.

The moths are of moderate to fairly large size. The labial palpi are long, slender and upturned, attaining the vertex; the first and second segments are broadly scaled; the third is long and acuminate. The maxillary palpi are slender and roughly scaled. The eyes are large. The ocelli are present. The proboscis is long. The antennae are annulated and are minutely ciliated beneath. The forewings are rather narrow, with curved costa, narrowly rounded apex, oblique outer margin, obtusely rounded tornus and somewhat curved posterior margin. The cell is narrow and about two-thirds as long as the wing. Vein R_1 arises somewhat before the anterior angle of the cell. R_2 is stalked with R_{3+4} . R_{2-4} arises from the anterior angle of the cell. R_5 arises from the same point, but is straight and not approximated to R_{2-4} . The discocellulars are curved. M_1 arises considerably behind the anterior angle of the cell. M₂ and M₃ arise together from the posterior angle of the cell, but they are not approximated in their basal portions. Cu₁ arises distinctly basad of the posterior angle of the cell. Cu₂ arises from the cell at five-sixths. 1st A is obsolete. 2nd A is well developed. 3rd A is short and straight. The hindwings are rather narrow, subtriangular; the apex is rounded; the termen is excavated behind M_1 ; the anal angle is broadly rounded. There is a series of simple metallic and black spots on the termen in the region of the excavation. Sc and R_s are strongly anastomosed. M_1 is free. The cell is a little over half the length of the wing. The discocellular is obtusely angled in the middle. M₂ and M₃ arise from the posterior angle of the cell and are strongly approximated basally. Cu₁ arises a little basad of the posterior angle and is not basally approximated to M₃. Cu₂ arises from about the middle of the cell.

The male genitalia have the uncus fairly long, with a strong spatulate expansion distally. The gnathos is strong and is elbowed towards the uncus and has strong dorsal teeth. The juxta is short and rounded. The vinculum is narrow. The valves are widened and distally truncate. There is an apical group of crochetlike spines and a spinose subcostal process near the apex, followed by a group of spines. The penis is large and distally expanded; there is a group of spinelike cornuti and a terminal spiculate zone. The eighth sternite has two rodlike lateral supporting arms. The female genitalia have the ductus bursae wide and short, its base enlarged and scobinated. There is a short sclerotized zone at the distal end of the ductus bursae. The bursa is saclike, membranous, without signa.

The early stages are unknown. Lange thought it likely that the larva lives on rocks in rapid streams, but this is conjectural. The wing-venation agrees with North American Nymphulini, and therefore I leave it in this tribe for the present.

There is only one species known to occur north of Mexico. It ranges far southward and Lange (1956) described a second species from Mexico. Additional species from South America will be referred to this genus but these transfers are beyond the scope of the present work.

Oligostigmoides cryptalis (Druce) PL. 1, FIG. 43 (McD. 5706).

Cataclysta cryptalis Druce, 1896, Biologia Centrali-Americana. Insecta. Lepidoptera-Heterocera, 2: 274, pl. 63, fig. 19.

Type-locality: Jalapa, Mexico.

NOTE—The locality cited is that of the lectotype, hereby designated, a male in the BMNH, the specimen figured by Druce.

The confused bands of the forewings, the white, outwardly jagged, medial area of the hindwings and the seven small terminal black dots straddling the incision of the termen of the hindwings will separate this species readily from others known to occur in our territory. However, closely similar species of this genus occur in Mexico, and unusual specimens should be viewed with suspicion.

The genitalia are as described for the genus.

The life history is unknown.

The species is recorded as ranging from Panama to Texas, but the genus needs revision and it is possible that not all the material listed from this wide range is conspecific.

TRIBE Argyractini Lange

Argyractini Lange, 1956, Wasmann Jour. Biol., 14: 76.

The moths have the first anal vein present at the margin of the forewings, as in Schoenobiinae. The hindwings lack vein M_2 and usually have 1st A vestigial, though sometimes it is normally developed. The middle and hind tibiae of the females have each a well-developed row of swimming hairs. The female genitalia lack the signum or have scattered or spirally arranged thornlike spines or have small spines arranged in extensive bands. The larvae so far as known live on submerged rocks in rapid streams. They have clumps of blood-gills along the sides of the abdomen. They live under silken webs which they spin on the surfaces of stones. They eat algae and diatoms that grow on the rocky substrate. The mandibles are large and flattened and have the teeth arranged in a flat plane.

The tribe has numerous species and several additional genera in the neotropics. A number of old-world tropical species and genera also appear to be related, though not as closely. It is not yet certain how well the tribal boundaries hold up for tropical genera.

GENUS Usingeriessa Lange

Usingeriessa Lange, 1956, Wasmann Jour. Biol., 14: 116. Type-species: Elophila brunnildalis Dyar, 1906. Original designation.

The moths are moderately small, with narrow wings. The termen of the hindwings is weakly incised and is ornamented with a moderately developed row of metallic and black spots. The frons is rounded. The labial palpi are long and strongly upturned, reaching or surpassing the vertex. The vertex is moderately developed. The maxillary palpi are moderately long and are tapered apically. The eyes are rather small. The ocelli are present. The antennae are slender, weakly annulated, ciliate beneath and scaled above. The proboscis is well developed. The body is fairly stout. The praecinctorium is transversely flattened. The forewings have R_1 free, R_2 stalked with R_{3+4} , R_{2-4} from before anterior angle of cell. R_5 arises from the anterior angle of the cell. The cell is about three-fourths of the length of the wing. The discocellulars are straight and oblique distad. M_1 arises at about the middle of the cell. M_2 and M_3 arise from the posterior angle of the cell and are approximated for some distance. Cu_1 arises somewhat basad of the posterior angle. Cu_2 arises from cell at about three-fourths from base. 1st A is developed near the termen. 2nd A is well developed. 3rd A is obsolete. The hindwings have the termen slightly excised behind M_1 . The cell is about half as long as the wing. Sc and R_s are anastomosed for a considerable distance. The upper discocellular is in line with the free part of M_1 ; the lower discocellular is straight and weakly oblique distad. M_3 and Cu_1 arise together from the posterior angle of the cell. Cu_2 arises from the cell at three-fourths from base. The first anal is basally obsolete, distally developed. The second and third anals are fully developed.

The male genitalia have the uncus long, triangular, distally rounded, sparsely setose above. The gnathos is wide, distally a little swollen and dorsally denticulate. The juxta is strongly bifid dorsally. The vinculum is prolonged into a triangular saccus. The valves are distally attenuated, with the costa somewhat sinuate and bearing a row of specialized setae. The penis is slender and cylindrical, with two parallel rows of cornuti. The female genitalia have the ostial chamber cup-shaped and scobinated. Following this there is a sclerotized collar, leading to a membranous, gradually widening ductus bursae. The bursa is large and globular, with varying numbers of small spines.

The early stages are unknown, but the moths occur near fast streams, and it is likely that the biology resembles that of *Paragyractis*.

Two species are known from America north of Mexico. There are additional species in tropical America.

KEY TO NORTH AMERICAN SPECIES

1. Forewing with distinct, dark, triangular apical patch, separated by a tapering white band from darkoutlined fulvous terminal band; hindwing with dark basal area contrasting with white medial area onyxalis

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Forewing with narrow indistinct apical patch or band, not contrasting with fuscous apex termen; hindwing generally infuscated, without contrasting dark basal and pale medial areas brunnildalis p. 114

Usingeriessa onyxalis (Hampson) PL. 6, FIG. 24 (McD. 5710).

Cataclysta divulsalis Walker; Druce, 1896, Biologia Centrali-Americana. Insecta. Lepidoptera-Heterocera, 2: 272, pl. 63, fig. 13. In part, err. det.

Cataclysta onyxalis Hampson, 1897, Trans. Ent. Soc. London, 1897: 149. Type-locality: Teapa, Tabasco, Mexico.

NOTE—Hampson proposed this as a "new name" for *Cataclysta divulsalis* Druce not Walker, but this name is not a true homonym, but simply represents a misidentification of the material that Druce had before him, because he cites the original reference of Walker's description and the locality of his type. Hampson refers only to Druce's figure and not to his text citation; also he gives the additional localities West Indies and Venezuela, not

cited by Druce. The validity of Hampson's name, which is unaccompanied by any description, rests squarely on the "indication" provided by the figure citation. The specimen on which the figure is based must therefore be the holotype. Unfortunately Druce does not mention the locality of the figured specimen. However, I consider the specimen in the BMNH labelled "*Cataclysta onyxalis* Hampson type Q" to be the holotype.

Elophila cancellalis Dyar, 1917, Ins. Insc. Mens., 5: 77. NEW SYNONYMY and NEW COM-BINATION with Usingeriessa. Type-locality: Devil's River, Texas.

The moth is of moderate size (length of forewing 7–8 mm). The general coloration is dark and the maculation is crisp and contrasting as compared with the dull suffused aspect of the following species. The forewings have a wide dark basal area, followed at a short distance by a narrow, fuscous antemedial line. The postmedial area is lighter, but heavily fuscous-dusted, and is limited outwardly by an angulate fuscous postmedial line. The broad, distinct, darkbrown subapical triangle is characteristic. It is separated from the fulvous, dark-edged terminal band by a white wedge. The hindwings have the basal area dark brown, followed as on the forewings by a narrow fuscous line. The medial area is whitish. There is irregular subapical fuscous clouding. The speculum consists of a regular series of five, round, black subterminal spots, separated by metallic-blue patches; each spot is united distally with a corresponding terminal spot which is slightly displaced posteriad. The subterminal spots are preceded basally by a crenulated black line.

The male genitalia are much as in *U. brunnildalis*, but the uncus is longer; the gnathos is expanded at the tip; the saccus is sharper; the valves have more highly differentiated apical setae; and the cornuti are stronger. The female genitalia have the ovipositor lobes high, narrow and weakly setose, with the dorsal part extended posteriad. The posterior apophyses are slender and of moderate length; the anterior ones are wider at the base and a little longer. The ostium is wide and the ostial chamber is funnel-shaped. The ductus bursae is long; its distal part is tightly coiled and has a single row of thick-based spines. The bursa is round and densely spinose, with the spines finer distally.

The early stages are unknown.

The species ranges from southern Texas south to Costa Rica and perhaps farther. Records from the West Indies require confirmation. The Texas specimen was taken in May. The specimen figured on the plate is of doubtful identity but was the best available when the photograph was being made. It is close enough to give a good idea of the appearance of the species.

> Usingeriessa brunnildalis (Dyar) PL. 6, FIGS. 25, 26 (McD. 5694).

Elophila brunnildalis Dyar, 1906, Jour. New York Ent. Soc., 14:91. Type-locality: Walters Station, California.

The moth is of moderate size (length of forewing varying from 7.5–11 mm). The wings are brownish fuscous, obscurely marked. The forewings have a broad, obscure, slightly inwardly oblique, brownish-fuscous sub-basal band, followed at a short distance by a narrow ante-medial line of the same color. The postmedial line is obscure, paler, outwardly angled at the

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middle of the wing, then retracted, obtusely angled and parallel to the antemedial line in the posterior part of the wing. There is a roughly triangular, dark brownish-fuscous subapical patch immediately beyond the postmedial line. The hindwings are colored much like the forewings and have a similar though narrower sub-basal band and a similar antemedial line. There is an outwardly oblique, dark, pale-bordered discocellular marking. The terminal spots are black, distinct, and set in two offset rows on a metallic bronzy field.

The genitalia are as described for the genus.

The early stages are unknown.

The species is local though sporadically common. It ranges from Placer to San Diego Counties in California and thence east to Arizona and Del Rio, Texas (one specimen identified by Lange).

GENUS Neargyractis Lange

Neargyractis Lange, 1956, Wasmann Jour. Biol., 14: 118. Type-species: Elophila slossonalis Dyar, 1906. Original designation.

The moths are rather small, with fairly broad forewings with rather straight, erect termen. The hindwings have the termen slightly incised behind the apex and a row of black and metallic terminal spots. The forewings and hindwings characteristically have a pale sub-basal band of nearly uniform width. The frons is rounded and smoothly scaled. The vertex is somewhat elevated. The labial palpi are slender and strongly upturned, with the third segment long and acuminate, reaching the vertex or nearly so. The maxillary palpi are short and tapering. The proboscis is fairly well developed. The eyes are large. The ocelli are absent. The antennae are somewhat thickened and compressed in the male, filiform in the female. They are ciliated beneath, scaled above, with alternate scale-rows somewhat raised in the distal part of the shaft. The body is slender and in the male considerably exceeds the anal angle of the hindwings. The praecinctorium is transversely compressed. There is a tuft of scales at the base of the abdomen of the male on each side beneath. The wing venation is almost as in *Usingeriessa*, but the anastomosis of Sc and R_s in the hindwings extends almost to the apex of the wing, and M₂ and M₃ of the forewings are not basally approximated.

The male genitalia have the uncus long and slender, somewhat dilated subapically, constricted apically. The gnathos is fairly wide, sagittate, with numerous small lateral teeth. The juxta is small, trapezoidal. The vinculum is prolonged into a short saccus. The valves are fairly long and expand slightly and evenly to a rounded tip; there are several long strong subapical setae. The penis is slender and is armed with a group of small spinelike cornuti. The eighth sternite has a pair of lateral sclerotized rods. In the female genitalia the ostial chamber is wide, shallowly cup-shaped and spinulose. The ductus bursae is long, slender and membranous. The bursa is small and heavily spinulose. It has at its junction with the ductus bursae a few small spines and a group of about five very long spines which project anterad into the bursa.

The early stages are unknown.

There is only one species known from North America. A number of closely related species or subspecies occur in the West Indies and on the mainland of tropical America.

Neargyractis slossonalis (Dyar) pl. 6, figs. 27, 28 (McD. 5698).

Elophila slossonalis Dyar, 1906, Jour. New York Ent. Soc., 14: 93. Type-locality: Charlotte Harbor, Florida.

NOTE—This is the locality of the lectotype, hereby selected, a specimen in the USNM, with the data Charlotte Harbor, Florida, March.

The moth is moderately small (length of forewing 6–7 mm). It is distinguished from other North American species by the pale antemedial band of the forewings and hindwings as well as by the structural characters.

The genitalia are as described for the genus.

The early stages are unknown.

The species ranges throughout Florida, and will no doubt be found to extend marginally into neighboring states.

GENUS Parargyractis Lange

Parargyractis Lange, 1956, Wasmann Jour. Biol., 14: 120. Type-species: Elophila truckeealis Dyar, 1917. Original designation.

The moths are of moderate to small size, with narrow wings and with metallic spots along the termen of the hindwings. The frons is rounded, smoothly scaled. The vertex is somewhat elevated. The labial palpi are upturned, but do not reach beyond the middle of the frons. The first and second segments have projecting scales. The third segment has rough scales or is smooth. The maxillary palpi are prominent and almost reach the end of the second segment of the labial palpi; they taper to a pointed tip. The eyes are large. The ocelli are absent. The proboscis is slender but well developed. The antennae in the male are ciliated, with alternate scale-rows of the dorsal surface raised; in the female the cilia are shorter. The forewings are elongate, pointed at the tip. The termen is oblique. The tornus is rounded or obtuse. The cell is narrow, two-thirds to three-fourths as long as the wing. R_1 is free. R_2 is stalked with R_{3+4} . R_{2-4} arises before the apex of the cell. R_3 and R_4 are long-stalked, sometimes completely fused. R₅ arises from the anterior angle of the cell and basally is straight, not curved or approximated to R_{2-4} . The discocellulars are outwardly oblique, posteriorly somewhat curved distad. M_1 arises distinctly behind the anterior angle of the cell. M_2 , M_3 and Cu_1 arise close together around the posterior angle of the cell, but they are not obviously approximated to one another in their basal parts. Cu₂ arises well out on the cell. 1st A is represented by a tubular vein in the terminal part of the wing. 2nd A is fully developed. 3rd A is short and weak. The hindwings have the apex narrowly rounded, the anal angle broadly rounded. The termen is not incised. The cell is two-thirds to three-fourths as long as the wing and is closed, with the discocellular erect to behind the middle, then obtusely angled and weakly oblique to the posterior angle. Sc and R_s are anastomosed for some distance, and separate from M_1 distinctly before the anterior angle of the cell. M_1 is free, arising from the anterior angle of the cell. M_3 and Cu_1 arise from the posterior angle of the cell and may be somewhat approximated in their basal parts or immediately divergent, depending on the species. Cu₂ arises from the cell a variable distance beyond the middle. 1st A is weak or basally obsolete. 2nd and 3rd A are fully developed.

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The male genitalia have the uncus long, subtriangular or parallel-sided, rounded at the tip, setose dorsally and often with short spinules projecting laterally. The basal part of the gnathos is transverse, the median part long, slender and distally pointed, with dorsal spines reduced or absent. The juxta is small; its shape is variable. The vinculum is narrow. The valves are short, wide, distally expanded then broadly rounded, unarmed. The penis is slender and cylindrical, usually with a pair of patches of short, spinelike cornuti. The female genitalia have the ostial chamber enlarged and sclerotized, sometimes with scobinations or spinules. The ductus bursae is long and slender. The bursa may or may not be distinctly marked off, and there may or may not be a distinct collar or valvelike sclerotization. The bursa may lack spines, or may have a few or a larger number arranged in an incomplete or complete spiral.

The early stages of several species are known. They live on alga-covered rocks in rapid streams. The females enter the water to lay eggs, using the scaled legs as oars and carrying an air bubble as a source of oxygen. The eggs are laid in groups on rocks, usually on the undersides. They are flattened and oval. The newly hatched larvae are gill-less, but after the first molt they have blood gills. They live under silken webs which they spin, and they feed on algae. The fully grown larvae are flattened and have groups of several blood gills on each segment above and below the spiracle. The head is flattened. The mandibles operate transversely and vary in length and shape with the species. The labrum has the usual six setae on each side, but they apparently vary in arrangement. Lloyd (1914) shows them in P. confusalis as being arranged in a straight transverse line, with the two middle setae on each side enlarged and fanlike. In two South American larvae that he figures and which are perhaps referable to this genus, the setae are differently arranged, and three or four on each side are fanlike. The chaetotaxy has not been completely figured or described. Lloyd shows in P. fulicalis a straight transverse row of setae across each thoracic segment. Segments AI to A8 appear to have a single seta in a dorsolateral position on each side and A8 also has a posterior dorsal pair. Ag and A10 appear to have more normal setal patterns. A South American larva figured by Sattler (1961) appears to be more cylindrical and to have a less modified setal pattern. It is obviously related to Parargyractis but its generic placement is unknown. The pupa is formed in an air-tight, gas-filled cocoon, spun in or outside the larval web. It has free leg-cases and looks not unlike those of Nymphulini, but it has the spiracles of the third and fourth abdominal segments tubular and strongly developed. The larvae are parasitized by tachinid flies of the genus Ginglymyia and by various Hymenoptera (Lloyd, 1919; Lange, 1956a).

The genus is a large one, with many species in tropical America in addition to the nearctic ones considered here. It is likely that further collecting and study will reveal additional species within our limits.

KEY TO NORTH AMERICAN SPECIES

1. Length of forewing under 5 mm; ground color of wings white; transverse markings scanty, orange-yellow; terminal spots of hindwing consisting of three large, poorly defined, metalliccentered, partly confluent black spots, each preceded basally by a shallowly lunular black line-segment drumalis p. 119

 Length of forewing usually over 5 mm; ground color of wings gray or buff; transverse markings various but

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usually brown or dark gray, often heavy and extensive; terminal markings of hindwing consisting of a row of four or more inner black spots	 Distal part of hindwing with white or whitish ground, most of which is finely dusted with black or blackish fuscous
alternating and sometimes partly fusing with marginal black spots and interspersed with metallic spots and frequently a series of orange marginal spots 2	7. Forewing mostly dull brown, with pale discal bar and oblique subapical stripe; hindwing with a sinuous blackish line preceding terminal spots:
2. Hindwing with inner series of black spots consisting of four widely separated black dots followed by silvery areas and alternating with rather narrow triangular black mar-	preceding this in turn three grayish- fuscous loops connecting to the broadly dull-gray ground color of the basal and median areas cronialis p. 129
ginal spots; ground color dark gray; transverse markings obscurely darker; length of forewing up to 14 mm schaefferalis p. 130	 Forewing whitish, light gray or creamy, with fine darker dusting, especially on posterior part of median area, and with distinct light-brown or orange-brown transverse bands; distal
 Hindwing with inner series of black spots consisting of five or more spots, usually close together	half of hindwing broadly whitish, with an oblique black or blackish subapical bar or loop and with at most weak indications of a sinuous
 3. Hindwing with inner row of terminal black spots seven in number	black line preceding terminal spots 8
black spots five in number	8. Hindwing with a solid blackish- fuscous subapical bar bifascialis
4. Forewing with conspicuous within, angulate, transverse line at or beyond middle of wing; subapical white line of forewing basally angulate at about	— Hindwing with a blackish-fuscous subapical loop
vein M_1 avernalis p. 128 — Forewing with at most an indistinct light-gray transverse median line; subapical line of forewing narrow, light-gray, straight or weakly angulate distad at about R_4 longipennis p. 129	9. Discal spot of hindwing composed of a yellow spot flanked by silvery ones; the parallel-sided part of the uncus of the male genitalia about five times as long as wide, the gnathos long and slender; the ostial chamber of the female sclerotized but without rows of denticles
5. Apical half of hindwing with ground color yellow daemonalis p. 119	 Discal spot of hindwing composed of a silvery spot flanked by yellow ones; the parallel-sided part of the uncus of
- Apical part of hindwing with ground color white or whitish, usually with fuscous lines or dusting	the male genitalia about three times as long as wide, the gnathos relatively short and sickle-shaped and with a single subapical dorsal tooth; ostial
 Distal part of hindwing with white or whitish ground, with fuscous or black lines or markings, but without fine dark dusting	chamber of female genitalia armed with conspicuous rows of denticles forming a longitudinal band <i>kearfottalis</i> p. 121
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10.	Fuscous dusting of hindwing ending posteriorly in a point at about vein Cu ₂ II Fuscous dusting of hindwing continu-		dusted, much paler than the oblique antemedial band; western U.S.A. and Canada confusalis p. 127
II.	Postmedial band of hindwing above separated from the dark line that follows it distally by a white zone canadensis p. 126	13.	Length of forewing of large females usually under 8 mm, males smaller; transverse bands with weak reddish or yellowish tints; space basad of terminal
	Postmedial band of hindwing above separated from the dark line that follows it distally by a silvery zone 12		spots of hindwing yellowish-suffused; postmedial dusting restricted and sparse <i>fulicalis</i> p. 125
12.	Wings relatively wide; postmedial space of forewing heavily fuscous- dusted, as dark as or darker than the oblique antemedial band; Arkansas hodgesi		Length of forewing of small males usually over 8 mm, females larger; transverse bands with strong reddish tints; space basad of terminal spots of hindwing white: postmedial dusting
	Wings relatively narrow; postmedial space of forewing sparsely fuscous-		of hindwing extensive and dense jaliscalis p. 122

Parargyractis drumalis (Dyar) pl. 6, fig. 29 (McD. 5696).

Elophila drumalis Dyar, 1906, Jour. New York Ent. Soc., 14: 92. Type-locality: Fort Drum, Florida.

This small white species with its weak yellow transverse bands and confluent hindwing terminal spots cannot be mistaken for anything else that occurs in Florida. The length of the forewing is about 5 mm.

The male genitalia have the uncus rather slender, parallel-sided and distally pointed; the gnathos has the median element sharp and daggerlike. The valves are short and rounded. The penis is about eight times as long as wide. It has the vesica spinulose but otherwise unarmed. The female genitalia have the ovipositor lobes high, narrow and weakly setose. The posterior apophyses are very slender; the anterior ones are thicker but of about the same length. The ductus bursae is short and has a narrow sclerotized collar. The bursa is globular and membranous.

The early stages are unknown.

The species is not uncommon over much of peninsular Florida, where it is known from Weeki Wachee Springs south to Fort Lauderdale.

> Parargyractis daemonalis (Dyar) PL. 6, FIG. 30 (McD. 5705).

Elophila daemonalis Dyar, 1908, Proc. Ent. Soc. Washington, 10: 112. Type-locality: Devil's River, Texas.

NOTE—I select as lectotype a female in the USNM labelled "*Elophila daemonalis* Dyar Type" and "Type no. 11845 U.S.N.M.", the latter on red paper. The species was described from 13 syntypes.

The moth is easily distinguished from other known North American species by the extensive

yellow areas of the wings. In particular the tornal area of the forewings and the whole apical area of the hindwings are broadly yellow. A number of tropical species share these characteristics, and material should therefore be scrutinized with care.

The genitalia of the male are unknown. Those of the female have the ovipositor lobes high, dorsally produced posteriad and almost without setae. The posterior apophyses are very slender and rather long. The anterior apophyses are a little shorter and basally thickened. The ostium is wide. The ostial chamber is funnel-shaped, with a pair of shallow lateral pouches. The ductus bursae is short and straight; it is rather strongly narrowed medially. The bursa is membranous, pyriform and bears a spiral series of 25 to 30 long slender spines on large bases.

The early stages are unknown.

The species is known to me only from the type series collected at Devil's River, Texas, in May 1907. No doubt it will be found at other localities in Texas and northern Mexico.

Parargyractis cappsi Lange PL. 6, FIG. 31.

Parargyractis cappsi Lange, 1956, Wasmann Jour. Biol., 14: 122, figs. 77, 81. Type-locality: Kerrville, Texas.

This is a moderate-sized species, with the length of the forewing 9–10 mm. The forewings have the ground color white. There is a brown area along the costa, giving rise to a brown median band, interrupted in the middle by a white line and yellow behind. The postmedial white area is dusted with fuscous scales. A V-shaped subapical marking is brown anteriorly, yellow posteriorly. A yellow streak from the base extends into the postmedian area. A marginal white area has metallic and white scales posteriorly. The fringe has mixed gray and white scales, with a white patch near the tornus. The hindwings have the ground color white. There are a few fuscous scales on the base near the anal margin. A median yellow area is outlined with silver on each side and margined with dark scales. The apical area is white, with an irregular subapical fuscous loop. The terminal black spots are not distinct; they are accompanied by silvery spots between and yellow spots on the termen. The fringe is dark at the base.

The male genitalia have the uncus long and fairly slender with a tapering basal part and parallel-sided distal part about five times as long as wide, bearing small spines laterally. The gnathos is T-shaped, the median element slender and acuminate. The juxta is reniform. The valves are short and rounded. The penis is long and stout, with a subterminal band of closely placed spines. The apex has several thornlike spines. The female genitalia have the ostial chamber conical, somewhat elongate and finely spinulose; after a narrow collar the ductus bursae is short and membranous, with a longitudinal line of fine spinules. The ductus enlarges gradually into the globular bursa, which is armed with a spiral series of 12 elongate, flattened, finely serrated spines.

The early stages are unknown.

The species was described from Kerrville, Texas, where *P. bifascialis* flies with it in April. It ranges west to Arizona. It can be distinguished from *P. kearfottalis* with certainty only by examination of the genitalia.

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Parargyractis kearfottalis (Barnes and McDunnough) PL. 6, FIGS. 32, 33 (McD. 5695a).

Cataclysta bifascialis kearfottalis Barnes and McDunnough, 1917, Check List of the Lepidoptera of Boreal America: 136.

Type-locality: Phoenix, Arizona.

NOTE—The authorship of this name generates a perplexing nomenclatorial quibble. Dyar proposed the name kearfottalis (Dyar, 1906, Jour. New York Ent. Soc., 14: 92) explicitly as an aberration of Elophila bifascialis-""Ab. c. kearfottalis, new variety." Barnes and McDunnough raised it to subspecies rank, listing it as "a. kearfottalis Dyar" under "5212 bifascialis Rob." in Cataclysta Hbn. In their introduction they say (p. VII), "In the text we have as far as possible used the subdivisions a, b, c, etc., to denote geographical races which have often been listed, especially in Europe, as var." It is evident that they intended kearfottalis to have subspecies rank. Under Articles I and 45c of the International Code of Zoological Nomenclature, infrasubspecific names are excluded from zoological nomenclature, and therefore Dyar's publication of kearfottalis has no standing. Under Article 10b of the Code, "A name first established with infrasubspecific rank becomes available if the taxon in question is elevated to a rank of the species-group, and takes the date and authorship of its elevation." Barnes and McDunnough's listing constitutes such an elevation. However, although their reference is perfectly unambiguous, they did not give the year, journal or page of Dyar's publication. It may be argued, therefore that they did not give a sufficiently precise "bibliographic reference" to constitute an "indication" under Article 16a (i) as required by Article 12. On the other hand Article 10b might be construed as being exempt from this requirement, if it is clear, as in the present case, exactly what name is meant to be raised. If Barnes and McDunnough's action is not accepted, then the citation by Forbes, 1923, Cornell University Agric. Experiment Station Memoir 68: 580, in which he classifies kearfottalis as a "variety" with a list of diagnostic characters and the statement "The variety is only known from the Southwest," is sufficient to validate the name under Article 45d (i) and (ii). The name would then be credited to Forbes, 1923. Both citations are evidently based on Dyar's material, and the type-locality of the species is therefore that cited by him.

The moth is closely similar in external appearance to *P. cappsi*, but averages smaller, the length of the forewing being 7–10 mm. The yellow markings of the wings tend to be less extensive than in *P. cappsi*, and the discal spot of the hindwings is silver, flanked basally and distally with yellowish, not the reverse as in *P. cappsi*. The present species differs from most specimens of *P. bifascialis* in having a slender, fuscous, subapical loop on the hindwings instead of a solid patch as in *P. bifascialis*.

In the male genitalia the uncus is shorter than that of *P. cappsi* and lacks lateral spines. The gnathos is shorter and sickle-shaped and has a single, dorsal, subapical tooth. The valves are narrower, and have shorter, stronger setae. The penis has a distinct apical tooth and three groups of small spines. The female genitalia have the ostial chamber broad and the ostium set with posteriorly projecting spines. There is a distinct sclerotized collar. The bursa is armed with six or seven thornlike spines.

The early stages are unknown.

The species is not very common but it is widely distributed, ranging from Drumheller, Alberta, south to western Texas and west to Washington, Oregon, Nevada and Vidal, San Bernardino County, California.

Parargyractis bifascialis (Robinson) PL. 6, FIG. 34 (McD. 5695).

Cataclysta bifascialis Robinson, 1869, Ann. Lyceum Nat. Hist. New York, 9: 153, pl. 4, fig. 3. Type-locality: Texas.

The moth is variable in size, from small to fairly large for the genus (length of forewing from 6-11 mm). The forewings are dull whitish buff with fine and sparse fuscous dusting, mainly in the posterior postmedial area. The markings are rather smudgy, consisting of a wide light-brown antemedial band, followed closely by a narrow brown antemedial line. Then there is a wide space of the ground color, bearing a small discocellular macule. There are three curved, posteriorly tapering and convergent stripes on the distal part of the wing, two subterminal and one terminal. They are partly bordered with silvery scaling, strongest posteriorly. The fringe is dark gray. The hindwings have the basal half light gray, the distal half creamy white. There is a small fuscous patch near the anal angle. There is a yellowish, darkbordered median spot, bordered basally and distally by prominent silvery patches. There is an oblique blackish-fuscous subapical patch, according to Lange occasionally reduced to a loop like that of *P. kearfottalis*. The terminal spots are as in related species but are not preceded by a black line on the basal side.

The male genitalia have the uncus slightly spatulate and of moderate length, the gnathos short, the juxta heart-shaped, the vinculum produced into a short, sharp saccus, the valves small and the penis slender. The female genitalia have the ovipositor lobes weak and sparsely short-setose. The posterior apophyses are slender and delicate; the anterior apophyses are a little thicker and taper from base to tip. The ostial chamber is rather narrowly tubular and tapers slightly anteriorly; it is somewhat sclerotized and narrows abruptly into the ductus bursae proper, which is short and membranous. The bursa is oval and membranous and has from two to four long spines in an oblique row.

The early stages are unknown. To judge from the habitats where the adults are collected in numbers, the larvae are likely to be found on submerged rock surfaces in large, fast-flowing rivers.

The species is widely distributed. Although there is considerable individual variation, it does not seem to be geographically correlated. The moth is very abundant in southern Canada, ranging from Nova Scotia through southern Quebec and Ontario and south to Virginia, West Virginia, western Texas and New Mexico.

> Parargyractis jaliscalis (Schaus) PL. 7, FIGS. 1, 2 (McD. 5708).

Cataclysta jaliscalis Schaus, 1906, Proc. U. S. Natl. Mus., 40: 135. Type-locality: Jalisco, Mexico.

Elophila satanalis Dyar, 1917, Ins. Insc. Mens., 5: 75. Type-locality: Devil's River, Texas.

The moths vary considerably insize and in intensity of coloration (length of forewing 7–11 mm). The forewings are rather broad, with the apex fairly sharp and the tornal angle well marked. The basal area is rather broadly chocolate brown, taking in the antemedial band and enclosing a gray-tinted area on the posterior margin adjacent to the base. The distal edge of the brown area is almost straight and slightly oblique basad. It is paralleled at a short distance

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by a narrow, inconspicuous, dark-gray antemedial line. Beyond this the wing is gray, more or less heavily dusted or suffused with chocolate brown. There are two converging white wedges before the apex, separated by a chocolate-brown triangle, the latter becoming yellow with fuscous edges posteriorly and ending in a broad silvery tornal patch containing an oblique yellow striga. The terminal band is orange-yellow, narrowly bordered with fuscous, likewise tapering behind and merging into the metallic tornal patch. The hindwing has the basal area narrowly and diffusely light gray. A fairly narrow antemedial fuscous band contains a brickred patch in the cell and is followed by a narrow silvery zone. Beyond this the wing is creamy white, broadly and densely dusted with black in the postmedial area from costa to anal angle, giving a bluish-gray appearance. The terminal spots are large and contrasting, though tending to fuse obliquely; they are situated on an undusted creamy white band, and have weak orange suffusion among them but not basad of the proximal spots. Metallic patches separate the black ones within the row and orange patches separate the black ones at the termen.

The male genitalia have the uncus evenly tapering, about three times as long as its basal width, and broadly rounded at the apex; it has weak spines dorsally in its distal part. The gnathos has the basal arms recurved. The median part is long, fairly slender, tapering to a point and with a small dorsal tooth apically. The juxta is rectangular, short and wide. The vinculum is ventrally truncate. The valves are short and have the costal and ventral margins parallel, the tip evenly rounded; there are about five prominent subterminal setae and a few smaller setae on the sacculus. The penis expands slightly distad and has a dense zone of closely set spinules. The female genitalia have the ostium wide, the ostial chamber funnel-shaped, the ductus bursae slender and membranous, opening into the globular, membranous, unarmed bursa.

The life history has been described by Lange (1956a). In general it is similar to that of other known species. The larvae live in permanent or intermittent streams and shelter under thin silken webs, where they feed on algae and diatoms from the rock surfaces. The females apparently enter the water to lay their eggs under rocks. The eggs are flattened, oval, tancolored and measure $0.24-0.29 \times 0.36-0.42$ mm. The larvae live in areas of very heavy algal growth as compared with the habitat of P. confusalis. The larvae when fully grown are about 15 mm long and 3 mm wide, excluding the gills. The color ranges from dirty white to blackish but is usually lighter than that of P. confusalis. The head and prothoracic shield are brown. The mandibles are decidedly longer than in P. confusalis and the gills are numerous and relatively long. Segments A1 to A8 have four or five gills in the dorsolateral group and the same number in the ventrolateral group. The pupa is brown and measures about 8×3 mm. It is formed in an airtight silken inner cocoon. The cremaster is anchorlike, two-pronged and stouter than that of P. confusalis. There are well-developed dorsal stalked spiracles on segments A2 and A3. Segments A4 to A7 have dorsal and lateral transverse ridges. There appear to be several generations a year. In Colusa County, California, the insects overwinter in the larval state.

The species ranges from southern Alberta to Texas, Arizona, New Mexico and through much of California and well south into Mexico.

Parargyractis hodgesi Munroe, NEW SPECIES PL. 7, FIGS. 3, 4. Parargyractis hodgesi Munroe. Type-locality: Devil's Den State Park, Washington County, Arkansas.

DIAGNOSIS: In general appearance this species resembles P. fulicalis and P. canadensis but the wings are very dark, especially in the male. The antemedial band is broad in both sexes; in the male it is dark grayish fuscous, as dark as the darkest parts of the forewings; in the female it is paler gray than most of the forewing surface, unlike that of P. fulicalis and P. canadensis. The male genitalia have the uncus and gnathos relatively considerably longer and thinner than in those species and the lateral spines of the penis are not nearly as strongly developed in P. hodgesi. The female genitalia have the ostial chamber long and symmetrically funnel-shaped in the present species, not short, wide and unsymmetrical as in P. fulicalis and P. canadensis.

DESCRIPTION: The frons is yellowish buff, somewhat darker medially. The vertex is yellowish buff. The palpi are fuscous basally, yellowish buff distally. The basal scaling of the proboscis is yellowish buff. The eyes and ocelli are brown. The antennae are brown beneath; their dorsal scaling is yellowish buff. The thorax above is fuscous. The abdomen above is fuscous, with the posterior margin of each segment broadly pale buff. The thorax beneath is fuscous, with some pale-buff scaling. The abdomen beneath is fuscous, with the posterior margins of the segments rather narrowly pale buff. The legs are fuscous, with the front basitarsi, the midtarsi and the hindtibiae and hindtarsi light buff.

The forewings are relatively wider in the male than in the female. The forewing length in the male is about 7 mm, in the female about 10 mm. The ground color in both sexes is basically pale gravish buff, but it is heavily suffused and dusted with olivaceous buff, so that the general effect, especially on the forewings, is dark, more so in the male than in the female. The basal area of the forewings is fuscous, inconspicuously paler centrally. The antemedial band is oblique basad from the costa at one-third to the posterior margin at onefourth. It is broad and straight, medially fuscous and broadly bordered basally and more narrowly bordered distally with light gravish buff; in the male the dark element is more intense and conspicuous than in the female, where the band as a whole usually appears somewhat paler than the rest of the wing. Bordering the band distally is a narrow, definite, irregularly dentate fuscous line. There is a weak, quadrangular, pale-centred, fuscous reniform spot. The postmedial line is strongly oblique and slightly convex distad from the costa at three-fourths to Cu₁ near the termen; there it is acutely angled and retracted to an acute angle on Cu₂ near its base; thence the line is convex and oblique distad to the posterior margin near the tornus. The postmedial line is margined distally by a creamy-buff band; this tapers from the costa to the first angulation, where it bends with the postmedial line and narrows to a point at its second angulation, thence running as a line to the posterior margin. Beyond this band is a wedge of fuscous suffusion, followed distally by a subterminal wedge which is anteriorly creamy buff but posteriorly and distally silver. Beyond this is an orange terminal band, which is bent at Cu₂ and runs along it into the angle of the post-medial line. Behind this bend is a silvery tornal patch. The fringe is fuscous basally, gray distally.

The hindwings are narrowly subtriangular, with narrowly rounded apex and broadly rounded anal angle. The ground color above is pale grayish buff, as on the forewings, but the fuscous dusting is confined to a triangular zone on the apical half of the subterminal area. There is a fuscous antemedial band, continuing the line of that of the forewings. The postmedial band is fuscous, with a silvery interior line running its length somewhat distad of its midline. The terminal spots are strong and conspicuous and are preceded by an orange-tinted whitish-buff zone. They consist of a basal row of five round black spots, of which the second is smaller than the others, and a distal row of five black dashes separated by yellow intervals. The black spots of the more basal row are preceded, followed and separated by large nacreous silvery spots; they touch or partly fuse with the nearest marginal black dashes, usually the one slightly posterior to the spot in question. The fringe is dark gray basally, lighter gray distally.

The wings beneath have the markings of the upperside less contrastingly repeated.

The male genitalia have the uncus rather long, fairly wide, basally narrowly triangular, then parallel-sided; the tip is rounded and has a strong ventral tooth. The gnathos has the base triangular, with narrow, vertical, not recurved, lateral arms. The distal part is long, sharp and daggerlike, nearly reaching the tip of the uncus. The juxta is small and rounded. The vinculum is narrow. The valves are short, distally expanded and broadly rounded. The penis is narrow, with small lateral groups of spines. The female genitalia have the ovipositor lobes weakly developed and sparsely setose. The posterior apophyses are very short and weak. The anterior apophyses are stronger and more than twice as long. The ostial chamber is fairly long, symmetrical and narrowly funnel-shaped, with the distal part weakly sclerotized. The ductus bursae is short, narrow and membranous, with a narrow sclerotized collar. The bursa is oval and membranous, with a transverse row of four slender spines arising from enlarged sclerotized bases.

The early stages are unknown.

TYPES: Holotype: J. Devil's Den State Park, Washington County, Arkansas; 19 June 1966; R. W. Hodges. USNM.

Allotype: Q. Same locality and collector as for holotype; 29 May 1966. USNM.

Paratypes: 333, 9 99. Same locality and collector as for holotype; 28 May to 14 June 1966. USNM; type no. 11,968, CNC.

This species is known only from the type lot. No doubt it will prove to be more widely distributed in the Ozark-Ouachita mountain area.

Parargyractis fulicalis (Clemens) PL. 7, FIGS. 5, 6 (McD. 5700).

Cataclysta fulicalis Clemens, 1860, Proc. Acad. Nat. Sci. Philadelphia, 1860: 217. Type-locality: Easton, Pennsylvania.

Cataclysta angulatalis Lederer, 1863, Wiener Ent. Monat., 7: 453, 486. Doubtful synonymy. Type-locality: North America.

This is a small species (length of forewing 5–7 mm). The forewings are fairly wide in the male, narrower in the female. The color is whitish gray, with considerable dark-gray dusting. There is an oblique dark-gray antemedial band on the forewing, followed by a weakly defined dark-gray double loop on the posterior two-thirds of the wing in the medial area. There is a yellowish bar on the discocellulars, basally and distally bordered with dark gray. This bar is situated on an outwardly oblique wedge-shaped dark-gray band which runs into the basal arm of a V-shaped orange-yellow band; the distal limb of the latter runs along the termen. Distad of this are two posteriorly converging white wedges, separated by a dark-gray

wedge. The distal arm of the orange V-shaped band is separated from the distal white band by a narrow dark-gray wedge and is separated from the termen by a narrow dark line. The fringe is gray. The hindwings have the antemedial band of the forewings continued and angled basad posteriorly. Beyond this in the anterior half of the wing is a triangular, subapical, fuscous-dusted area. The subterminal row of black spots has each spot large, conspicuous, and obliquely fused with the terminal spot next behind it. The subterminal spots are separated by metallic-blue spots. The area basad of the subterminal spots is orange-tinted, and there is a black line immediately basad of the costal and anal elements of the series, but this line is widely interrupted in the middle. The terminal black spots are separated by orange spots.

The male genitalia have the uncus of moderate length, slightly expanded distally and rounded at the apex. The gnathos has broad basal arms and a fairly wide, distally pointed median part, considerably shorter than the uncus. The juxta is small and transversely oval. The valves are short, longitudinally striated, distally slightly expanded and strongly rounded. The penis is distally expanded and has a pair of unequal groups of small spines but no other armature. The female genitalia have the ovipositor hardly setose and the apophyses short and slender. The ostial chamber is wide and trapezoidal, with the small aperture of the ductus bursae arising unsymmetrically from its left side. The ductus bursae has a sclerotized collar then is membranous. The bursa is globular and membranous and has a short spiral of about seven slender spines at its base.

The life history of this or a closely related species was described by Lloyd (1914). He shows the larva as being wide and flattened, with shorter, wider head and body than *P*. *confusalis* (=*truckeealis*), as figured by Lange (1956a). The setae of the labrum are in a straight transverse line, with the two middle setae on each side wide and scalelike. The subdorsal gills are arranged in segmental groups of two to four on each of segments A1 to A8 and the subventral groups have from three to five gills each. The larvae, like those of other species of the group, live under silk sheets up to five inches long by an inch wide on rock surfaces in rapidly flowing streams. The pupa as figured by Lloyd is much like that of *P. confusalis* but is less tapered and has a blunter head.

This species occurs in New York, Pennsylvania and West Virginia and an unknown distance northward and southward. The exact distribution and the pattern of transition to the following species require further study.

Parargyractis canadensis Munroe, NEW SPECIES PL. 7, FIGS. 7, 8.

Parargyractis canadensis Munroe. Type-locality: Ottawa, Ontario.

The moth is closely similar to *P. fulicalis* but is a little larger (length of forewing $5 \cdot 5-9$ mm) and is substantially darker. In particular the postmedial region of the forewings has the pallid areas considerably restricted and the two fuscous loops very definitely marked. Dark specimens often have the discal bar and the posterior part of the postmedial area largely fuscous, leaving a round pale spot in the end of the cell and another beyond the discocellulars. On the hindwings the line basad of the subterminal spots is complete or minutely interrupted but is not usually broadly interrupted in the middle, and there is no orange suffusion on the whitish-gray area between the subterminal spots and the preceding line.

The male genitalia are much as in *P. fulicalis* but the aedoeagus is slender and has fairly distinct median spines in addition to the lateral groups. The female genitalia are as in *P. fulicalis* but the spines at the base of the bursa are fewer and very short.

TYPES: Holotype: J. Ottawa, Ontario; 21 July 1950; M. B. D'Aoust. Type no. 11,779, CNC. Allotype: Q. Same data and type number. CNC.

Paratypes: 35 33, 52 99. Data as for holotype (6 33, 5 99). Manotick, Ontario; 16 June 1954; T. N. Freeman (12 33, 25 99). Southampton, Ontario; 8 Aug. 1945; G. S. Walley (1 3). Asperitos Island, Georgian Bay, Ontario; H. Kahl (1 9). Ogoki, Ontario; 9–15 July 1952; J. B. Wallis (15 33, 16 99). Larson's Camp, One Sided Lake, Ontario; 22–25 July 1960; M. R. MacKay (1 3, 5 99). Type no. 11,779, CNC; type lot no. 531, CM.

Although the early stages are unknown the moths are collected commonly near medium to large rivers, where the larvae no doubt live. The relationship of this species to *P. fulicalis* in their zone of contact is not clear. Possibly *P. canadensis* will prove to be only a northern subspecies of *P. fulicalis*.

This is probably the species referred to by Lange (1956a: 286) as *opulentalis* (Lederer) which he says is very common in Canada. I have seen the type series of *P. opulentalis*, which is a small species from Colombia, South America. Lederer's citation of North America as type-locality was a mistake.

Parargyractis confusalis (Walker) PL. 7, FIGS. 9, 10 (McD. 5701, 5709).

Cataclysta confusalis Walker, 1865, List of the Specimens of Lepidopterous Insects in the Collection of the British Museum, 34: 1334.

Type-locality: North America.

NOTE—This species was described from two syntypes, a male and a female, from the collection of Mr. Carter. I designate the male, marked "*Cataclysta confusalis* Type" in the BMNH as lectotype.

Elophila truckeealis Dyar, 1917, Ins. Insc. Mens., 5: 76. NEW SYNONYMY. Type-locality: Reno, Nevada.

This species is closely similar to the two preceding, but averages larger, though the size is rather variable. The length of the forewing ranges from 5-11 mm. The wings are paler and a little browner than in *P. fulicalis* and *P. canadensis*. The forewings have the postmedial area broadly pale and finely dusted with dark brown. The antemedial and postmedial lines enclose a broadly continuous space and do not normally unite to form two loops. The anterior limb of the postmedial line has its dark element linear except at the extreme costa, instead of forming a wedge-shaped mark, and the pale element that follows it is also narrow and linear. On the other hand the subapical dark wedge that follows this pale line is relatively wide. The hindwings have the antemedial band only moderately dark and separated from the antemedial line by a metallic band. There is some yellowish scaling basad of the subterminal row of spots, and the line preceding these spots is broadly interrupted in the middle.

The male genitalia are as in the preceding species but have the gnathos thick and the penis with three groups of spinules. The female genitalia are also similar to those of the preceding, but the ductus bursae arises near the middle of the ostial chamber, and the bursa lacks basal spines.

The early stages have been described by Lange (1956a). The eggs are laid in groups of varying numbers up to 250. They are elongate-ovate, yellowish tan and 0.40-0.45 by 0.25-0.33 mm in length and width. They are laid on rock surfaces under water in streams, often in areas of extremely strong current. The larvae hatch in about three days. The first-instar larvae are white and gill-less and have the proleg crochets arranged in uniordinal rows. The mature larvae are blackish to greenish, with dark-brown head and thoracic shield. They are about 15 mm long by 3 mm wide, excluding gills. The prolegs have crochets arranged in a biordinal semicircle. There is usually a single supraspiracular blood-gill on each side of each abdominal segment and a subspiracular group of about three, but there is local and individual variation. Like those of other species, the larvae live under netlike sheets of silk in depressions of the rocks, usually on the bottoms of rapid streams, but occasionally in lakes. The larvae may live in shallow riffles or in up to 6 feet depth of rapidly flowing water. The pupae are much as in *P. jaliscalis*.

The species is widely distributed from Stanislaus County, California, north to southern British Columbia and east to Nevada, Idaho and Montana.

The synonymy as given above seems to be correct though the name *confusalis* has usually been applied vaguely to one or another of the eastern species.

Parargyractis avernalis (Grote) PL. 7, FIGS. 11, 12 (McD. 5704).

Cataclysta avernalis Grote, 1878, Trans. Kansas Acad. Sci., 8: 53. Type-locality: New Mexico.

Argyractis? confusalis Barnes and McDunnough, 1913, Contrib. Nat. Hist. Lep. N. Am., 2(3): 133, pl. 8, fig. 11.

Type-locality: White Mountains, Arizona.

NOTE—In addition to being a junior synonym of *P. avernalis*, this nominal species is a secondary homonym of *P. confusalis* (Walker).

The moths are sexually dimorphic, but in both sexes are easily distinguished from other North American species. In the male the dark forewings, with oblique, anteriorly and posteriorly palebordered and posteriorly dentate antemedial band are different from those of other species. The female has the forewings longer and narrower, with the basal edging of the antemedial band obscure and the distal edging situated beyond the middle of the wing. The hindwings are fuscous-dusted in the male, white with a postmedial fuscous band in the female. In both sexes there are seven or eight more or less distinct black terminal spots separated by silvery spots.

The male genitalia have the uncus subtriangular, narrowly rounded at the tip. The gnathos has the lateral arms wide and the median element narrow but strong, pointed and bladelike. The juxta is small and rounded. The vinculum is narrow. The valves expand evenly to a rounded tip. The penis is slender and has a narrow group of subapical spinules on each side. The female genitalia have the ovipositor lobes poorly developed, almost without setae, but the apophyses are relatively strong. The ostial chamber is wide, with a pair of lateral pouches. The ductus bursae and bursa are short and unarmed.

The early stages are unknown.

The species ranges from northern New Mexico and Arizona (Jemez Mountains and White Mountains) southward into Mexico.

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Parargyractis cronialis (Druce)

Cataclysta cronialis Druce, 1896, Biologia Centrali-Americana. Insecta. Lepidoptera-Heterocera, 2: 274, pl. 63, fig. 18.

Type-locality: Jalapa, Mexico.

This is a moderately large species (length of forewing 8–12 mm). The forewings are strongly and evenly suffused with brownish gray. The antemedial line shows as a weakly-defined pale line at the middle of the wing, almost straight, but slightly concave distad. There is an oblique, whitish discocellular bar. There are two narrow, convergent subapical wedges, whitish in color, the more basal one edged with fuscous on the basal side, the distal one on both sides. These wedges are separated by a dull-fulvous wedge and followed by a terminal band of the same color, which continues as a V-shaped tornal band. The hindwings have the basal half largely grayish-suffused, except for a somewhat paler streak along the anal fold. There is an orange, distally metallic-bordered bar just beyond the middle. The terminal black spots are in two series, fused to form a zigzag band, with metallic spots in the basal intervals and orange spots in the distal ones. A whitish field basad of the subterminal spots has a black line just basad of the spots and indented distad at about the middle of the series. Basad of this is a row of about four pupillate gray rings.

The male genitalia have the uncus moderately long and tapering to a rounded tip, the latter a little wider than in *P. avernalis*. The gnathos is relatively shorter in the present species. The juxta is quadrate, not oval. The valves are shorter and more rounded. The penis is slimmer and lacks distinct groups of spines distally. In the female the ostial chamber is conical and leads to a narrow collar. Beyond this the ductus bursae expands gradually to the teardrop-shaped bursa. At about the junction of the ductus bursae and the bursa is a spiral row of about a dozen short peglike spines.

The early stages are unknown.

The species is known to range from Nogales and the Huachuca Mountains of Arizona south into Mexico. It will be figured in a later fascicle.

Parargyractis longipennis (Hampson) PL. 7, FIGS. 13-15 (McD. 5713). Argyractis longipennis Hampson, 1906, Ann. Mag. Nat. Hist., (7) 18: 381. Type-locality: Orizaba, Mexico.

NOTE—The locality given is that of the lectotype, female, in the BMNH, hereby selected.

The species is similar in general appearance to P. cronialis, with which it was confused by Druce. It is larger (length of forewing of female 15–16 mm). The two white subapical wedges of the forewings are separated by fuscous, not fulvous. On the hindwings the apical region basad of the terminal spots is broadly and evenly fuscous-dusted, without the black line or pupillate fuscous rings of P. cronialis, and there is at most a narrow white zone immediately basad of the terminal spots. These are seven or eight in number, connected by a black line along the termen, and separated subterminally by silvery spots.

The uncus is much longer than in the previous two species and is very narrowly rounded at the tip. The gnathos is T-shaped and has the median element slender and pointed, but considerably shorter than the uncus. The juxta is short and wide. The valves are broadly

rounded, relatively larger than in *P. cronialis*. The penis has two groups of spines as in *P. avernalis*. In the female genitalia the ostial chamber is trapezoidal and sclerotized. The bursa is long, teardrop-shaped and unarmed.

The early stages are undescribed.

The species ranges from Oak Creek Canyon, Arizona, south into Mexico.

Parargyractis schaefferalis (Dyar) PL. 7, FIGS. 16, 17 (McD. 5703).

Elophila schaefferalis Dyar, 1906, Jour. New York Ent. Soc., 14: 95. Type-locality: Palmerlee, Cochise County, Arizona.

Argyractis castusalis Schaus, 1924, Proc. Ent. Soc. Washington, 26: 106. NEW SYNONYMY. Type-locality: Jalapa, Mexico.

The moth is easily distinguished by its long dull-gray wings, with infuscated bases and heavily fuscous powdered postmedial areas. The terminal spots of the hindwings are in two alternating series of four each; these black spots are small and widely separated by more extensive silvery areas. There is no orange at the termen, but traces of orange scaling precede the metallic areas.

The male genitalia have the uncus short, distally slightly spatulate and with scattered dorsal spines. The gnathos is T-shaped, with a sharp, slender median element, shorter than the uncus. The juxta is transversely oval. The vinculum is produced ventrally into a short triangular saccus. The valves are distally expanded and obliquely subtruncate. The penis is distally dilated and has three rows of spines, the median one smaller than the two lateral ones. The female genitalia have the ostial chamber trapezoidal and spinulose, followed by a moderately long sclerotized collar arising from the middle of the ostial chamber. The rest of the ductus bursae is membranous and weakly fluted, expanding gradually into the pyriform bursa. The latter has a spiral row of about 15 long slender spines.

The life history is unknown, but see notes on a larva that possibly belongs to this species in Lange (1956a: 287).

The species is not very common in collections. It ranges from southern California (Inyo, Los Angeles and Riverside Counties) to southern Arizona and south into Mexico.

GENUS *Eoparargyractis* Lange

Eoparargyractis Lange, 1956, Wasmann Jour. Biol., 14: 125. Type-species: Elophila plevie Dyar, 1917. Subsequent designation, Lange, 1956b, Pan-Pacific Ent., 32: 110.

The moths resemble *Parargyractis* in external characters except in having R_3 and R_4 completely fused in the forewings and the cell of the hindwings open, with the rudimentary posterior part of the discocellular strongly oblique. Ist A is represented by a rudiment at the termen in both forewings and hindwings, as in most species of *Parargyractis*.

In the male genitalia the uncus is long and slender, very narrowly rounded distally. The gnathos is Y-shaped, its lateral arms arising from the tegumen near the bases of the valves,

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its median part long, slender and acuminate, dorsally with a row of fine teeth. The juxta is of moderate size. The vinculum is rounded ventrally. The valves are simple, with weakly inflated costa and sacculus. The penis is cylindrical and has slender spinelike cornuti. The eighth sternite has a row of long hairs arising from a sclerotized basal rod, and there is a conspicuous row of long hairs above on the dorsal surface, overhanging the genitalia. The female genitalia have the ostial chamber enlarged, funnel-shaped, opening into a fairly wide sclerotized collar. The ductus bursae is membranous; it has a small diverticulum into which the ductus seminalis opens. The bursa is unarmed.

The early stages are unknown. The species are often found near lakes. It is likely that the larvae live on the surfaces of rocks and feed on algae in the same way as *Parargyractis* larvae.

The genus ranges from eastern Canada to Florida. There are three known species.

KEY TO NORTH AMERICAN SPECIES

I.	Black and metallic terminal markings		widely separated from termen, round	
	of hindwings not preceded basally by		and of almost equal size, except for	
	a contrasting pale, partly yellow-		the almost linear second spot which	
	tinted zone; northeastern	. plevie	joins the terminal band flor	idalis
		p. 132	p	. 132
	Black and metallic terminal markings of hindwings preceded by a contras- ting pale zone with distinct orange- yellow shading adjacent to the black subterminal spots; southeastern	2	Size smaller, length of female fore- wing under 7 mm. Forewings with basal area white, with brown band preceding and paralleling antemedial black line. Black subterminal spots of hindwings large, closely approaching terminal band, somewhat ovate, vary-	
2.	Size larger, length of female forewing		ing in size, the fourth spot the largest,	
	about 8 mm. Forewings with basal		the second spot more elongated than	
	area brown-suffused; hindwings with		the others, but not linear irror	atalis
	subterminal spots relatively small and		this	page

Eoparargyractis irroratalis (Dyar) PL. 7, FIGS. 18, 19 (McD. 5711).

Elophila irroratalis Dyar, 1917, Ins. Insc. Mens., 5: 77. Type-locality: Archer, Florida.

The moth is small and has fairly distinct brown bands and black lines on a white ground. On the hindwings the speculum consists of a row of uneven-sized, ovate, black subterminal spots, separated by a narrow silvery zone from the scalloped black terminal band. The length of the forewings varies from 5-7 mm.

The male genitalia are as described for the genus. The penis has one curved and one hooked cornutus. The female genitalia are as described for the genus. They have the ostial chamber relatively narrow and spinulose. The genitalia as a whole are relatively short and narrow.

The early stages are unknown.

The species is fairly common in Florida, from the northern part of the state at least as far south as Siesta Key in Sarasota County and the Archbold Biological Station.

Eoparargyractis floridalis Lange PL. 7, FIGS. 20, 21.

Eoparargyractis floridalis Lange, 1956, Wasmann Jour. Biol., 14: 126, fig. 127. Type-locality: Lake Okeechobee, Florida.

NOTE—The holotype was cited by Lange as being in the CNC, as it was in material lent him from that source. However, the specimen is the property of the Carnegie Museum and will eventually be deposited there under type lot no. 528, together with one of the paratypes listed by Lange. A second paratype will remain in the CNC under type no. 11,947. All three specimens are still in Professor Lange's possession at the time of writing.

The moth is larger than the preceding species, with the basal area of the forewings suffused with brown and the subterminal spots of the hindwings smaller, rounder and more nearly equal in size, except for the second spot, which is linear and joins the terminal band. The length of the forewing is about 8 mm.

The male genitalia are undescribed. The female genitalia are much like those of the previous species, but have the ostial chamber wider, rectangular and with few spinules. The whole genital tract is longer and wider than in *E. irroratalis*.

The early stages are unknown.

The types are part of a long series from Lake Okeechobee, Florida. The species has also been collected at Crystal River. It has been collected in July and October.

> *Eoparargyractis plevie* (Dyar) PL. 7, FIGS. 22, 23 (McD. 5712).

Elophila plevie Dyar, 1917, Ins. Insc. Mens., 5: 78. Type-locality: Weld, Maine.

The moth is similar to *E. irroratalis* in size and general appearance but is narrower-winged and less crisply marked. The terminal speculum of the hindwings is not preceded by a definite pale band or by yellowish suffusion as in the preceding two species. There is appreciable variation in moths from different localities. This needs to be studied on the basis of more representative material.

The male genitalia are closely similar to those of E. *irroratalis*. The female genitalia resemble those of other species of the genus. They have the ostial chamber fairly wide and without spinules.

The early stages are unknown.

The species is known from Massachusetts, Maine, Nova Scotia and Quebec and is probably more widely distributed. It flies in July and August. The type was recorded as having been taken "flying in cat-tail reeds on the lake". I took specimens at light in fair numbers at Lac à la Tortue, a shallow sandy-shored lake in boggy country near Shawinigan, Quebec. I also collected it at nearby Lac Mondor, a small rather stagnant lake in a pocket among granite hills. The Nova Scotia specimens are rather large and distinctly marked; the Quebec specimens are gray and suffused; the Cape Cod and Martha's Vineyard ones are small and pallid. GENUS Oxyelophila Forbes

Oxyelophila Forbes, 1922, Ent. News, 33: 102.

Type-species: Argyractis (Oxyelophila) callista Forbes, 1922. Monotypy and original designation.

The moths are narrow-winged, the forewings with falcate apex and the hindwings lacking a speculum, unlike other North American genera of Argyractini. The frons is smoothly scaled, rounded or somewhat flattened. The vertex is somewhat elevated but smoothly scaled. The labial palpi are upturned and acuminate, reaching or exceeding the level of the vertex. The maxillary palpi are of moderate size with smooth, tapering scaling. The proboscis is well developed, scaled at base. The eyes are large. The ocelli are absent. The chaetosemata are well developed. The antennae are smoothly scaled above, short-pilose beneath; in the male they are slightly thickened and compressed; in the female they are filiform. The forewings are narrow, with acute apex and weakly sinuated termen. R_1 arises before the anterior angle of the cell. R_2 is stalked with R_{3^+4} . R_3 and R_4 are fused. The cell is about two-thirds the length of the wing. R5 and M1 arise behind the anterior angle of the cell. The discocellular is erect anteriorly, but curves to become increasingly oblique distad in its posterior portion. M₂, M₃ and Cu₁ arise from the posterior angle of the cell and run straight and rather close together until they reach the termen. Cu₂ arises from the cell at four-fifths. 1st A is represented by a rudiment at the termen. 2nd A is well developed. 3rd A is developed as a rudiment at the base. The hindwings are narrow, with narrowly rounded apex, oblique termen and broadly rounded anal angle. Sc and R_s are fused throughout. M_1 separates from R_s at the end of the cell. The cell is a little over half the length of the wing. The discocellular is straight and erect. M₂ is absent. M₃ is stalked with Cu₁. Cu₂ arises from the cell at two-thirds. 1st A is represented by a rudiment at the termen. 2nd and 3rd A are normally developed.

The male genitalia have the uncus triangular with thickened margins, narrowly rounded at the apex. The gnathos is Y-shaped, with slender arms and median piece, the latter considerably shorter than the uncus. The vinculum is ventrally broadly flattened. The valve is lanceolate, very narrow at the base, distally rounded; the costa is narrowly tubular; the sacculus is setose; and there is a brush of setae at the middle of the mesal face. The penis is short and cylindrical and has several large cornuti. The eighth sternite has a lyre-shaped sclerotization, bearing a pair of long hair-tufts from its base. The female genitalia have a conical ostial chamber leading to a narrow sclerotized collar. Distad of this the ductus bursae expands gradually into the elongate, membranous, saclike bursa. The latter has a linear spinulose signum and a group of spinules near the opening of the ductus bursae.

The early stages are unknown.

The genus is a compact one with several species widely distributed in the neotropical region. The single North American species was described from Texas. It is known only from the type lot.

Oxyelophila callista (Forbes) PL. 7, FIG. 24 (McD. 5714). Argyractis (Oxyelophila) callista Forbes, 1922, Ent. News, 33: 102.

Type-locality: New Braunfels, Texas.

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The moth is easily distinguished from other North American Argyractini by the absence of terminal black and metallic spots on the hindwings. The falcate forewings as well as the structural characters will distinguish it from pale-colored Nymphulini, such as *Parapoynx allionealis*. The length of the forewing is about 6 mm.

The genitalia are as described for the genus.

The early stages are unknown.

The species is known to me only from the type series from New Braunfels, Texas. Forbes said the types were all females, but he figured the male genitalia. Several related species are known from tropical America. Additional material should therefore be examined critically when collected, as it is possible that other species occur within our territory.

Part 13.1B is scheduled for publication in late 1972; part 13.1C is scheduled for 1973. The final section will include the literature, plates and index material relevant to the whole part.

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Many more individuals deserve to be listed by name. More detailed acknowledgements will be found in the introductory pages to Fascicle 13.1, when these appear. Meanwhile a general expression of appreciation must suffice, because of limitations of space, not of my own gratitude.

¹To appear in Fascicle 13.1C



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