The Moths of America North of Mexico

FASCICLE 22.2

NOCTUOIDEA

Lymantriidae

DOUGLAS C. FERGUSON

1978

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

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Fascicle 21 **Sphingoidea** 30 January 1971

Fascicle 20.2A **Bombycoidea,** Saturniidae (in part)
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11 December 1972

Fascicle 20.1 **Mimallonoidea,** Mimallonidae
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Fascicle 13.1C **Pyraloidea,** Pyralidae (conclusion of Part 1)
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Fascicle 6.2 **Gelechioidea,** Oecophoridae 1 July 1974

Fascicle 13.2A **Pyraloidea,** Pyralidae (in part)
16 September 1976

Fascicle 13.2B **Pyraloidea,** Pyralidae (in part)
22 December 1976

THE MOTHS OF AMERICA NORTH OF MEXICO

The Moths of America North of Mexico

INCLUDING GREENLAND

FASCICLE 22.2

NOCTUOIDEA

LYMANTRIIDAE

DOUGLAS C. FERGUSON
SYSTEMATIC ENTOMOLOGY LABORATORY
UNITED STATES DEPARTMENT OF AGRICULTURE

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To ANDRÉ BLANCHARD of Houston, Texas,
ENGINEER, SCIENTIST,
AND LEPIDOPTERIST EXTRAORDINARY

PREFACE

This is a comprehensive revision of the nearctic Lymantriidae, which have long remained in a state of taxonomic confusion. Comparison with the McDunnough (1938) check list will show that every generic name is now different, or applied differently, with the exception of *Acsala*, which has been transferred from the Arctiidae. The family name is also different. Some of these changes were anticipated by Forbes (1948: 240–241) or Franclemont (1949), but all of the old nomenclatural problems have been re-examined. The changes that appear in the present work are either mandatory under the rule of priority, or result from the continuing process of refinement in our understanding of relationships (e.g., the combining of *Notolophus* and *Hemerocampa* under *Orgyia*).

In my investigation of the 46 recognized species and subspecies that occur in the United States and Canada, I found it necessary to review more than 250 names for correct application and citation, not including those of foreign species studied. I examined 49 holotypes or lectotypes and illustrate 37 of these, designate 15 lectotypes, and describe four new species and five new subspecies. As part of this research also I reared larvae of 16 species and subspecies and have been able to describe others from specimens and colored photographs provided by J. G. Franclemont, the late R. B. Dominick, A. B. Klots, R. O. Kendall and P. W. Schaefer. The larvae of 34 of the 46 species and subspecies are now known, an unusually high proportion for any group of moths in North America. Only four species remain entirely unknown in the larval stage. Consequently, I have been able to make extensive use of larval characters, which are usually better than adult characters in the Lymantriidae.

I give keys to genera based on adult and larval characters and to species based on larval characters only. Although more complete keys for adults could be written, I do not believe that they would be satisfactory because of the nature and variability of the species differences, particularly in the genera *Dasychira* and *Orgyia*. The moths may vary in size and color seasonally, geographically, sexually, through aging or exposure, or otherwise with respect to the presence of such markings as the dark streak on the forewing in many *Dasychira* species. Different species may have corresponding forms that are hardly distinguishable. Reference to colored illustrations or previously determined specimens is necessary for identification of these moths.

Thirty per cent of the North American Lymantriidae have been reported as pests, probably a higher proportion of economically important species than for any other family of Lepidoptera in our fauna; the gypsy moth, browntail moth, satin moth, and at least eight native species of tussock moths have at times occurred in destructive numbers. The gypsy moth, *Lymantria dispar* (L.), and the Douglas-fir tussock moth, *Orgyia pseudotsugata* (McD.), are among the most important forest insect pests in the United States. Many lymantriids are recognized as pests in other parts of the world, and particularly in this age of rapid air transport these pose an ever-present threat of accidental introduction.

AUTHOR'S ACKNOWLEDGEMENTS

This fascicle on the North American Lymantriidae was made possible through the kind cooperation of many people over a period of years. As usual I have enjoyed free access to the collections of the American Museum of Natural History, British Museum (Natural History), Los Angeles County Museum of Natural History, Peabody Museum of Natural History, to the Canadian National Collection, and others, as well as to many private collections. For generously responding to my appeals for information or specimens, I am most grateful to all of the following: André Blanchard, C. V. Covell, Jr., G. E. Daterman, the late R. B. Dominick, J. P. Donahue, D. G. Embree, D. S. Fletcher, J. G. Franclemont, Richard Heitzman, the late S. A. Hessel, R. O. Kendall, C. P. Kimball, A. B. Klots, Bryant Mather, Judson May, E. H. Metzler, E. G. Munroe, M. C. Nielsen, K. W. Philip, C. L. Remington, F. H. Rindge, J. C. E. Riotte, J. K. Ryan, P. W. Schaefer, G. Strickland, J. B. Sullivan, Allan Watson and Barry Wright.

I am most of all indebted to my colleagues and associates in this project, the late Richard B. Dominick and Tatiana Dominick, John G. Franclemont, Ronald W. and Elaine R. Hodges, Eugene G. Munroe, Eric W. Classey of E. W. Classey Limited and Basil H. Harley of The Curwen Press for assistance in many forms, for their advice and their forbearance. The color photography is of course the work of Richard B. Dominick, and nearly all the drawings, the elegant ones, are the work of Elaine Hodges. Various members of the group read the manuscript, provided important information, collected and prepared some of the best specimens available for research and illustration, or painstakingly saw the work through the publication process.

J. G. Franclemont deserves special tribute for his help in solving various bibliographic and nomenclatural problems whenever the library resources of the U.S. National Museum or U.S. Department of Agriculture failed to provide the answers. Additional aid of this nature was also given by E. G. Munroe, and by I. W. B. Nye, D. S. Fletcher and Allan Watson of the British Museum (Natural History). E. L. Todd and C. W. Sabrosky of the Systematic Entomology Laboratory, U.S. Department of Agriculture, were consulted on various matters, nomenclatural and otherwise, and Sally B. Adams provided expert curatorial and technical assistance. Gary E. Daterman of the Forestry Sciences Laboratory, U.S. Department of Agriculture, Corvallis, Oregon, and Judson E. May of the Arizona Commission of Agriculture and Horticulture, Phoenix, kindly assisted by supplying live material of western species for rearing. The monochrome photographs were made by V. E. Krantz, photographer at the National Museum of Natural History.

THE MOTHS OF AMERICA NORTH OF MEXICO

SUPERFAMILY

NOCTUOIDEA

FAMILY

Lymantriidae Hampson

Type-genus: *Lymantria* Hübner, [1819].

Bombycines (in part) Latreille, 1805.
Bombycites (in part) Latreille, 1809.
Bombycides, Bombycidae, etc. (in part) of various authors.
Arctides (in part) Leach, 1815.
Dasychirae Hübner [1819]; Packard, 1864.

NOTE—Dasychirae of [1819] is not considered to be a family name, even although Packard stated it to be. It was intended by Hübner as simply a generic name with plural spelling as indicated in the *Anzeiger der im Verzeichnisse Bekannter Schmettlinge* [sic] . . ., [1826], p. 2, where it is in the singular (see Franclemont, 1973: 25). Packard used it for a subfamily.

Arctiidae (in part) Stephens, 1828 [1829?].
Lariae Newman, 1832.

NOTE—This name is based on *Laria* Schrank, 1802, which is a junior homonym of *Laria* Scopoli, 1763, in the Coleoptera.

Liparides Boisduval, [1836].

NOTE—Liparidae, which has been widely used as the family name for this group, is unavailable because *Liparis* Ochsenheimer, 1810, with type-species *Phalaena morio* Linnaeus, 1767, is a junior homonym of *Liparis* Scopoli, 1777, in the fishes. The family name Liparidae is also used for a group of fishes.

Liparidi Stephens, 1850.
Orgyides Wallengren, 1861, 1863.

NOTE—Orgyiidae, based on Orgyides Wallengren, 1861, is the oldest valid name for the family, but Lymantriidae has been more widely used (see p. 12).

Orgyidae Wallengren, 1865.
Dasychirides [Kirby], *in* Dallas, 1865.
Orgyiidae Wallengren, 1885.
Dasychirinae Grote, 1888.
Lymantriidae Hampson, "1892" [1893].
Leucomidae Grote, 1895.
Ocneriadae Meyrick, 1895.
Hypogymnidae Grote, 1896.
Lymantriadae Hampson, 1905.

The Lymantriidae are a family of medium-sized to rather large moths, apparently related to the Arctiidae but with certain unique features that clearly distinguish most of them. Adults may usually be recognized by the position of Sc relative to Rs in the venation of the hindwing, the base of M_2 being much closer to M_3 than to M_1 in the hindwing, the absence or vestigial nature of the haustellum, the absence of ocelli, the prespiracular counter-tympanal hood, and, at least for males of most species, the one to three long, divergent spinules at the end of each antennal branch. I am aware of only one species, *Acsala anomala* Benjamin of arctic America, which has a mixture of lymantriid and arctiid characters and which cannot easily be assigned to one family or the other. The usually tufted, hairy larvae may always be distinguished from those of all other families in North America by the presence of dorsal glands, one each in the middle of the sixth and seventh abdominal segments. A tendency toward flightlessness in females is prevalent in the Lymantriidae; although such females may have fully developed wings, they seem to be too heavy bodied to fly (e.g., *Gynaephora rossii* (Curtis), *Lymantria dispar* (L.)). In a few genera (e.g., *Orgyia*, *Penthophera*), the females have greatly reduced wings that may be nearly absent. The adults of this family tend to have a characteristic resting posture by which they may often be recognized. The males especially assume a broadly triangular shape, with wings flattened and closely appressed against the substratum, and with the densely hairy forelegs extended forward in front of the head (see Holland, 1903: fig. 182). A more detailed morphological description follows.

Adults with wing expanse from 15 to 115 mm or even larger, in build varying from geometriform to very robust; females sometimes with wings reduced to small pads, nearly wanting; ocelli absent; antennae bipectinate with long branches in male, usually bipectinate with shorter branches in female (text figures 1 *a*, *c*); antennal branches of male nearly always with one to three long, divergent, bristlelike, terminal spinules (text figures 1 *c–e*); haustellum very reduced or absent (present in *Acsala* and *Gynaephora* species and *Euproctis similis* (Fuessly)); labial palpi three-segmented, well developed; maxillary palpi one-segmented or absent; epiphysis present, usually reaching end of foretibia in male, reduced or absent in female; tibial spurs short, stout, hindtibia usually with both pairs, sometimes with only one pair, and both conditions may be found within a single genus (e.g., *Orgyia*); abdomen with counter-tympanal hood prespiracular, reduced; species of some genera with dorsal tufts of modified, spatulate scales on mesoscutellum and abdominal segment two or segments two and three; females sometimes with very large anal tufts.

Venation of forewing (text figure 2) with or without an accessory cell (areole); first and second anals entirely united, not separated at base. Hindwing with Sc and R divergent at base but converging again for short distance at or before middle of discal cell where they may be closely approximate, fused, or connected by a short crossvein (believed to represent R_1); base of M_2 much closer to M_3 than to M_1; R and M_1 usually stalked.

Genitalia show nothing consistently distinctive except perhaps their simplicity. Male genitalia show trend toward reduction, loss, or fusion of parts. Uncus often large, simple; gnathos present or absent; juxta usually well developed; transtilla nearly always absent; valve and its manner of articulation highly variable, commonly reduced to a rounded, simple, weakly sclerotized lobe, but long in some genera, in others with outer margins fused together forming a ring (e.g., in *Leucoma*); valve often cleft into two lobes, a feature that runs through many genera and which perhaps comes closest to being a diagnostic genital character; costal lobe may be simple or rigidly sclerotized and developed as a strong, spatulate process or even a long, curved spine; aedoeagus variable, vesica usually large, membranous, without cornuti but often scobinate. Female genitalia simple. Eighth segment and papillae anales often very large, the latter developed as thick, fleshy, hairy lobes, sometimes elongated for specialized oviposition (e.g., in *Lymantria monacha* (L.)) but not so in the American species; pre-ostial lip of

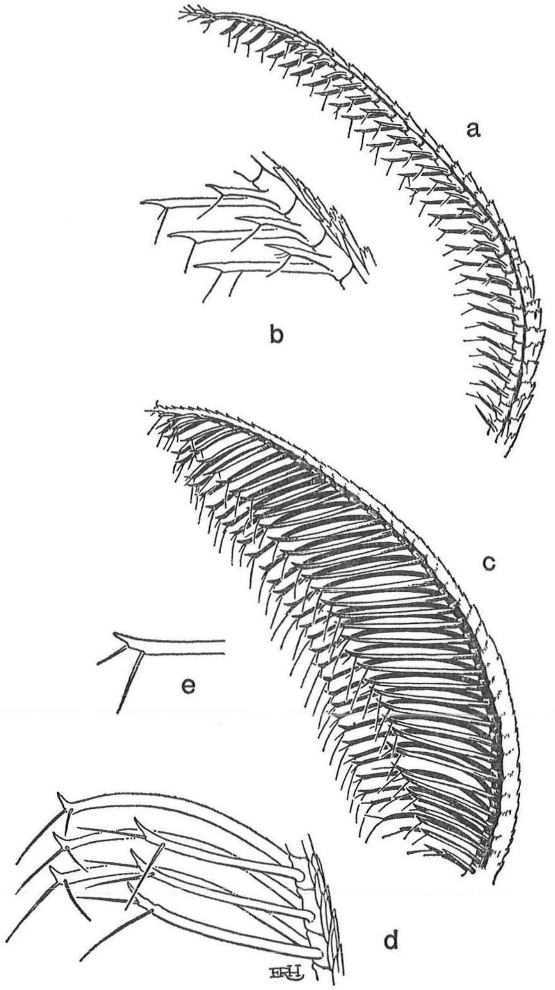

FIGURE 1: ANTENNAE OF *DASYCHIRA TEPHRA*

a. Female antenna (McClellanville, S.C.).
b. Female antenna, detail of three segments.
c. Male antenna (McClellanville, S.C.).
d. Male antenna, detail of three segments.
e. Male antenna, showing detail of spinules at end of branch.

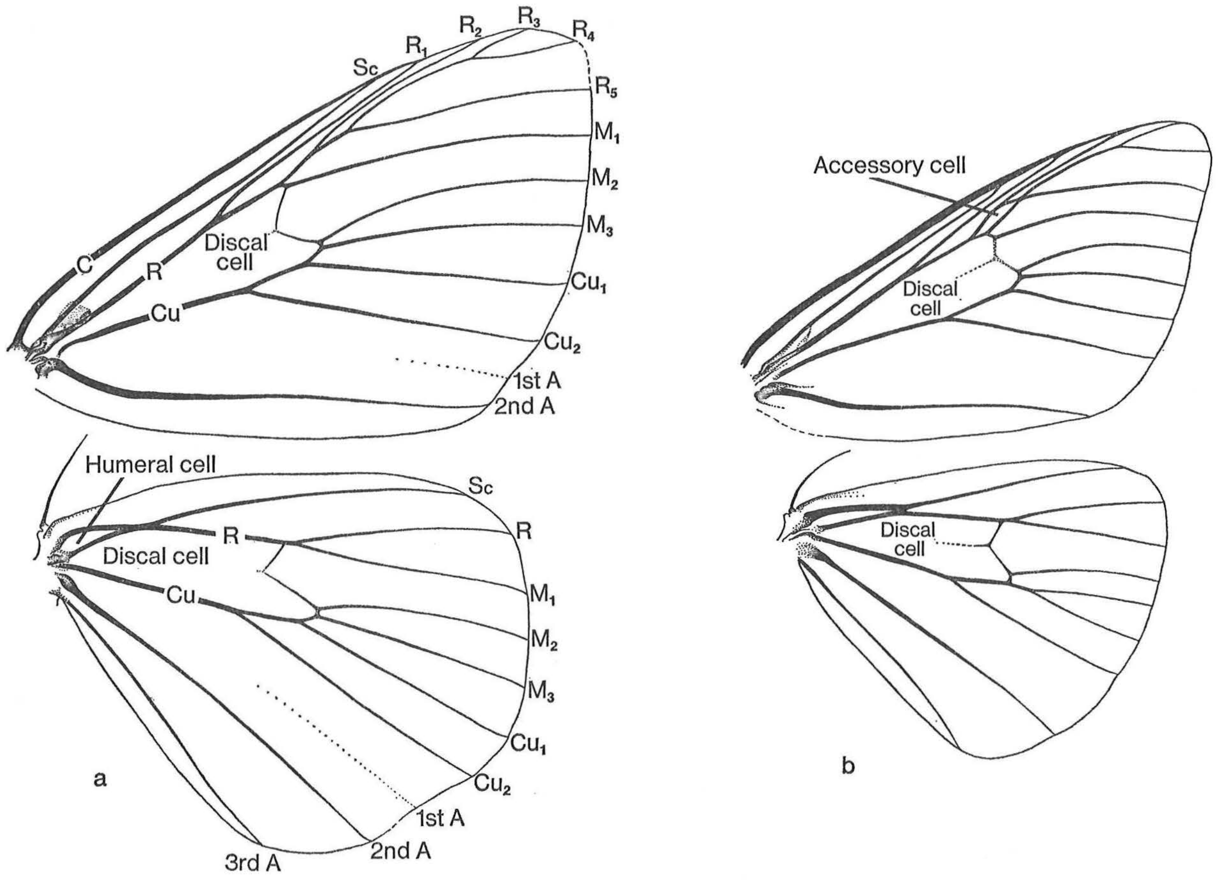

FIGURE 2: WING VENATION

a. Lymantria dispar, male (no locality). *b. Gynaephora rossii,* male (no locality).

sterigma often enlarged, hairy; bursa copulatrix simple, conventional, with or without a signum.

Egg spherical, hemispherical, or subcylindrical, that of American species globular or slightly depressed with a flattened base, the surface unsculptured; commonly deposited in large masses, covered or intermixed with hairs from the female abdomen, or with a hardened, frothy substance, or both. Eggs of *Dasychira* species deposited singly or in small groups without covering; those of *Orgyia* species in a mass on the surface of the cocoon from which the brachypterous female emerged.

Larva (text figure 3) with all legs fully developed and with abundant, long, secondary hair, often intermixed with fine, needlelike spines, arising in clumps from addorsal, subdorsal, supra- and subspiracular and subventral verrucae; with or without two anterior and two or three posterior hair pencils of long plumose hairs and low, dense dorsal tufts on at least the first four abdominal segments; two colored (pale yellow to red) dorsal glands on abdominal segments six and seven; integument sometimes with brightly colored markings; head smooth, shiny, with numerous fine setae. The two anterior hair pencils, when present, arise from the enlarged, protuberant, subspiracular verrucae of the first thoracic segment which have moved up to a position almost anterior to the spiracles. The posterolateral hair pencils arise from the supraspiracular verrucae of the ninth abdominal segment. The posterior dorsal hair pencil or tuft arises from the addorsal and subdorsal verrucae of the eighth segment which have expanded and become confluent, and the dorsal, brushlike tufts of the first four abdominal segments arise in a corresponding manner. Larvae of some lymantriids (e.g., *Euproctis chrysorrhoea*) are known to be urticating.

Pupa conspicuously hairy, the setae mostly arising from scars of larval verrucae; labial palpi usually visible (but not in *Lymantria*); maxillae short, not more than $\frac{2}{5}$ length of wings; no epicranial suture; femora of prothoracic legs not

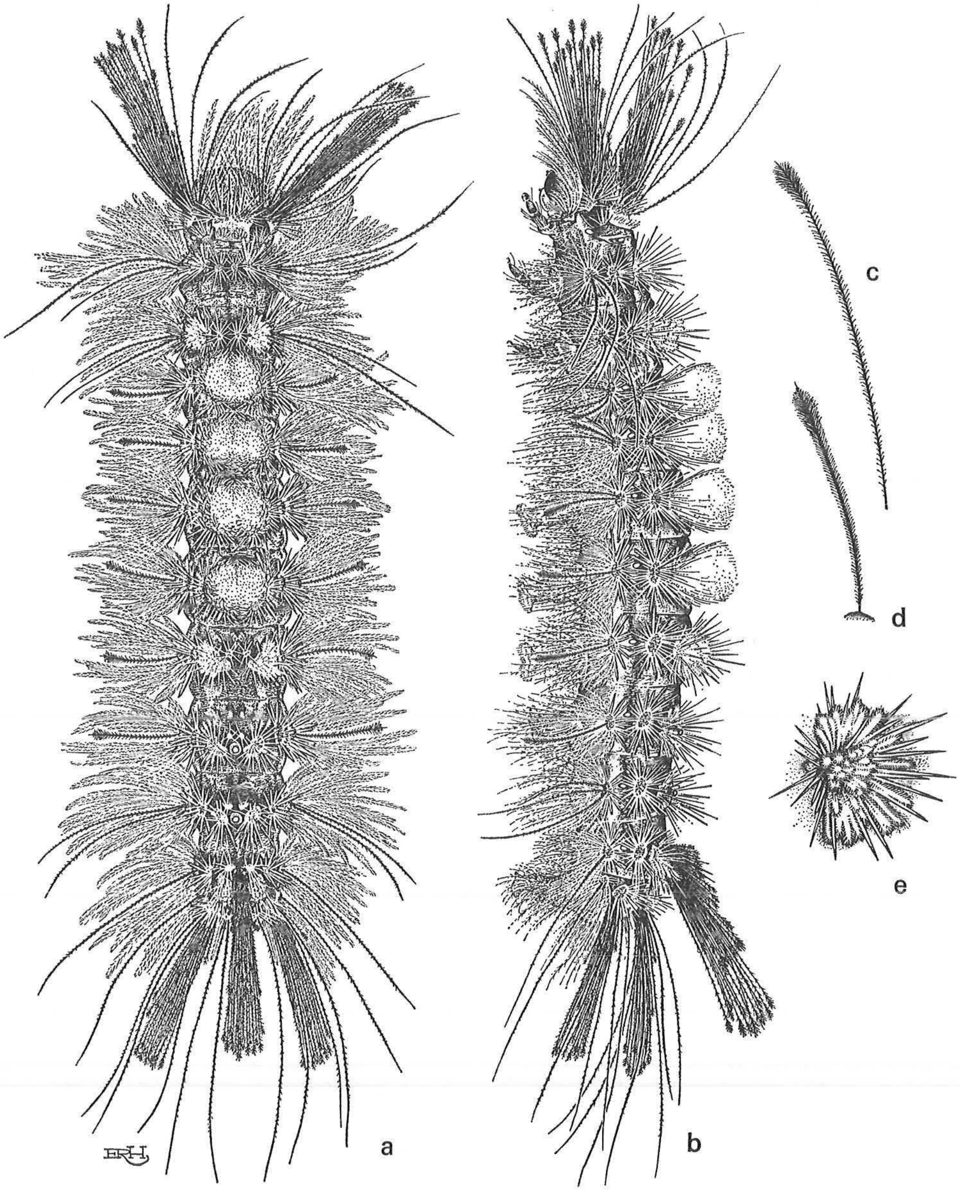

FIGURE 3: A TYPICAL LYMANTRIID LARVA—*DASYCHIRA DORSIPENNATA*, REARED FROM A FEMALE COLLECTED AT ANNAPOLIS ROYAL, NOVA SCOTIA

a. Dorsal view. Note openings of dorsal glands on abdominal segments six and seven, a diagnostic family character.
b. Lateral view.
c. Plumed hair from one of the hair pencils.
d. Plumed lateral hair from subspiracular abdominal verruca.
e. Subdorsal verruca from fifth abdominal segment with its cluster of spines and white plumose setae.

visible, a character shared with Arctiidae but not with most Noctuidae; distinct cremaster with hooks as in other Noctuoidea. Pupa of *Gynaephora rossii* densely hairy on dorsum, being the hairiest of any lepidopterous pupae seen. Lasiocampid pupae also are usually hairy and have a similar arrangement of mouthparts and appendages; however, they do not have a cremaster, the epicranial suture is always present, and the setae are not particularly associated with the scars of the larval verrucae.

DISTRIBUTION. About 200 genera and 2500 species of Lymantriidae have been described from the world fauna, mostly from the Old World tropics. The family is poorly represented in the New World, with about 16 genera and 200 species. Only four genera and 33 species are native to the

United States and Canada, but European pest species of three Old World genera have been introduced; namely, *Lymantria*, *Leucoma* and *Euproctis* species. Of the four indigenous nearctic genera, *Gynaephora* is holarctic, *Orgyia* is very widespread, occurring on all large continental land masses except Antarctica, and *Acsala* and *Dasychira* are known only from North America. *Acsala*, being Alaskan, might also be present in Siberia. The species of *Dasychira*, which inhabit temperate zone forests, mostly in eastern North America, are quite closely related to members of the Asian genus *Olene* Hübner. Nothing like them is known from the American tropics.

The Lymantriidae of the neotropics are almost completely distinct from those of the Nearctic Region. Faunal interchange between the two continents is limited to one species of *Orgyia* (*colombiensis* Dognin), which has reached Colombia, and to several neotropical elements that have extended northward as far as southern Mexico. Seven of the 12 endemic neotropical genera have species that occur in Central America, and seven species of *Orgyia*, not known either from the United States or South America, have been described from Central America and Mexico. Species of a few neotropical genera such as *Caviria* Walker and *Eloria* Walker bear a striking superficial resemblance to species of Asian and African groups, but the relationships have not been investigated in detail. The family is entirely missing from the Antilles as far as is known.

Although the Lymantriidae are predominantly a tropical group, three American species occur in the Arctic, and one of these, *Gynaephora groenlandica* (Wocke), occurs about as far north as any form of terrestrial animal life, reaching the north coast of Greenland and Ellesmere Island. Because of their extraordinary adaptations to the arctic environment, including a seven to eleven year life cycle, *G. groenlandica* and *G. rossii* have been the subjects of intensive ecological investigation.

HABITS. Lymantriid larvae are foliage feeders on a wide variety of trees and shrubs, including conifers, but the American species, at least, generally avoid herbaceous plants, unlike their relatives, the arctiids. In our fauna only *Orgyia vetusta* is known to feed regularly on a plant that is not woody stemmed (lupine). Many, such as the gypsy moth (*Lymantria dispar*), whitemarked tussock moth (*Orgyia leucostigma*), and rusty tussock moth (*O. antiqua*), are rather general feeders on trees, whereas others such as the satin moth (*Leucoma salicis*), Douglas-fir tussock moth (*Orgyia pseudotsugata*), box-elder tussock moth (*O. leuschneri*), and the jack pine tussock moth (*Dasychira pinicola*) are much more nearly host specific.

One generation annually is usual in cool temperate regions, but farther south two or more generations may occur in some species. At the opposite extreme is the greatly extended life cycle of the arctic *Gynaephora* species, mentioned earlier. Overwintering occurs in the egg or larval stage. Larvae of the indigenous North American Lymantriidae appear to be mainly solitary; although the eggs of *Orgyia* species are deposited in one large mass, the larvae soon disperse widely. Larvae of the three introduced genera, *Lymantria*, *Leucoma* and *Euproctis*, are more truly gregarious, at least during part of their development. The often ornate, elaborately tufted larvae, like those of hemileucine Saturniidae, are believed to be protected from predators by urticating hairs or spines, and probably by the two dorsal abdominal glands (only one in some Old World species such as *Elkneria pudibunda* (L.) and *E. abietis* (D. & S.)). Some people are very sensitive to the urticating hairs of *Euproctis chrysorrhoea*, developing a severe dermatitis; larvae of all species should probably be handled with caution. However, I have handled many caterpillars of *Orgyia* and *Dasychira* species without being affected.

Although the majority of the Lymantriidae are undoubtedly nocturnal as adults, males of some of the better known species are diurnal or crepuscular (e.g., *Lymantria dispar*, *Orgyia antiqua*, *O. pseudotsugata*). Nocturnal species may have very specific periods of activity; I have noted when collecting with lights at a sheet that certain of the *Dasychira* species appear rather punctually near midnight. A trend toward rust or orange-brown coloring is characteristic of the diurnal species of temperate regions, as in many Geometridae. The active male of *L. dispar* conforms to this trend, but the flightless female does not.

LITERATURE AND CLASSIFICATION. Although various attempts were made by early authors to revise the group or large sections of it (Walker, 1855; Hampson, 1892: 432–494; Dyar, 1897a), and much additional information has since accumulated, no satisfactory classification has been proposed for the Lymantriidae on a world basis. All recent treatments, including this one, have dealt only with the faunas of limited geographical areas. But when enough regional revisions have been written, it should be possible to derive a coherent world classification by synthesis.

The catalogues of Kirby (1892: 429–498) and Bryk (1934) were simply lists of names with bibliographic references and did not pretend to be revisionary. C. L. Collenette worked actively on Lymantriidae between about 1929 and 1957, but most of his papers are concerned only with description of new species; he did little revising. Collenette did revise the neotropical genus *Eloria* Walker but wrote nothing on the nearctic fauna. His papers, "Genera and Types of the Lymantriidae" (1935) (actually being additions and corrections to Bryk's catalogue of 1934), and "The Identity of *Phalaena chrysorrhoea* Linnaeus" (1947) proved to be particularly helpful. The sections of Seitz's *Macrolepidoptera of the World* by Strand (1910, 1915), Hering (1926), Schaus (1927) and Gaede (1932) are useful reference works, summarizing the classification accepted at that time and providing colored illustrations of most of the known species. Kozhanchikov's (1950) treatment, forming part of the series on the fauna of the U.S.S.R. was the first large faunal work to utilize and illustrate genitalia and certain other important structural characters, and this also proved very helpful. However, his overall classification is unconventional and undoubtedly wrong insofar as he included the noctuid subfamilies Acronictinae and Pantheinae in the Lymantriidae (as Orgyidae). He divided the group into two subfamilies, the Orgyiinae and Acronictinae. The latter included two tribes, the Momini [= Pantheinae] and Acronictini [= Acronictinae]. Kozhanchikov is the only recent major author to have used the family name Orgyiidae, although he spelled it Orgyidae.

There has been no complete review of the Lymantriidae for the United States and Canada since Schaus (1927) and no revision since Dyar (1897a). Barnes and McDunnough's (1913) revision of *Dasychira* (as *Olene*) correctly established the identity of most species and subspecies of this difficult genus, although not all the names were correctly applied. As a result of his interest in rearing, McDunnough discovered the extraordinary importance of larval taxonomy in this group and understood the species better than any subsequent author up to the present. Forbes's treatment (1948: 241–244) of the northeastern species was mainly based on McDunnough's work. J. C. E. Riotte, in a series of 11 short papers (1971–74), reviewed the species of *Orgyia* of the United States and Canada, describing several new species and subspecies, but about 50 per cent of his taxonomic changes are incorrect or unjustified.

I divide the North American members of the family into two tribes, the Orgyiini and Lymantriini. This takes for granted the existence of the nominal subfamily Lymantriinae because tribes are divisions of a subfamily in the standard hierarchical arrangement. Although only the one subfamily is presently recognized, it is likely that divergent elements exist among the African or Indo-Australian members of the family and that some of these will ultimately be assigned to one or more additional subfamilies. Meanwhile one can hardly define the subfamily Lymantriinae without comparative reference to other subfamilies; nor can one definitively characterize the family without studying all included genera.

Of several valid family names available for this group, Orgyiidae (1861) is the oldest; Dasychiridae, the next oldest, followed only three years later. Both antedate Lymantriidae by more than three decades, but they have rarely been used. In contrast, Lymantriidae has been used hundreds of times throughout the world during the present century, in taxonomic and faunistic works, in economic literature, in text books and check lists. The interests of stability would be best served by continued use of the widely applied name, and to this end an application (by D. S. Fletcher, I. W. B. Nye and D. C. Ferguson) for conservation of the family name Lymantriidae is now before the International Commission on Zoological Nomenclature. The synonymy of the family name is given in greater detail in the present work than has been customary for this series because of the importance of the group and its history of nomenclatural instability. However, the list gives only the most significant references, mainly the earliest usage for each name in its various forms.

Given below is the arrangement of tribes and genera followed.

FAMILY **LYMANTRIIDAE**

SUBFAMILY **Lymantriinae**

TRIBE **Orgyiini**
Acsala *Dasychira*
Gynaephora *Orgyia*

TRIBE **Lymantriini**
Lymantria *Euproctis*
Leucoma

SUBFAMILY

Lymantriinae Hampson

Type-genus: *Lymantria* Hübner, [1819].

All of the North American lymantriid genera may be referred to a single subfamily, the Lymantriinae, with the possible exception of *Acsala*. This arctic genus, known only from males of one species, seems unique in several respects, and it may not even belong in the Lymantriidae. However, it seems best to leave *Acsala* here until the larva and the female have been studied.

The genera treated here seem to split into two well-defined tribes based on the nature of the larval tufts and hair pencils, presence or absence of an accessory cell in the forewing, and on certain characters of the genitalia. All of the native species are Orgyiini; the three or four species introduced from Europe are Lymantriini. This division into two groups has been recognized previously; the Orgyiini correspond essentially to what were known as the Areolatae, and the Lymantriini to the Inareolatae (e.g., Strand, 1913: 111, 126), terms that do not qualify for nomenclatural purposes because they are not based on available generic names. Forbes (1948: 239–240) also used these names, but in part he emphasized the wrong characters and included *Lymantria* in the Areolatae rather than in the Inareolatae.

KEY TO GENERA OF NORTH AMERICAN LYMANTRIIDAE BASED ON SUPERFICIAL CHARACTERS OF ADULTS

1. Wings entirely or almost entirely white, without discal spots or transverse lines........2

— Wings usually gray or brown, not as described above..........................3

2. Abdomen conspicuously brown or yellow, at least at the posterior end; wing expanse less than 40 mm...................*Euproctis* p. 99

— Abdomen with white scales only (which may turn yellowish if greasy); wing expanse more than 40 mm...........*Leucoma* p. 95

3. Branches of male antenna with one to three long terminal spinules, conspicuously larger than the regular antennal setae, the longest spinule at least twice as long as the distance between the branches (text figure 1 *d*); mostly in temperate regions................4

— Branches of male antenna without conspicuously long terminal spinules; found in Arctic tundra or high alpine habitats only 7

4. Antennal branches of male with only one long terminal spinule; abdomen without dorsal tufts; females with fully developed wings, but sexes (of *dispar*) dimorphic, the male brown, the female predominantly whitish or cream colored...........*Lymantria* p. 87

— Antennal branches of male with at least two long terminal spinules (text figure 1 *c–e*); mesothorax and usually two segments of abdomen with dorsal tufts of glossy, spatulate scales except in wingless females; females with or without wings; if fully winged, coloring usually like that of male or at least not extremely different.......5

5. Wingless or nearly so...........*Orgyia* females p. 57

— Fully winged............................6

6. Body stout, width of thorax almost equal to length of antenna; usually two well-developed dorsal tufts on abdomen....*Dasychira* p. 21

— Body slender, width of thorax equal to about ½ length of antenna; usually one well-developed and one rudimentary dorsal tuft on abdomen................*Orgyia* males p. 57

7. Wings blackish, subhyaline, without a pattern; collar orange dorsally behind head; known from Alaska and Yukon only.....*Acsala* p. 15

— Wings predominantly gray or brown, not subhyaline (unless worn), often with a well-defined pattern; no orange collar; widespread in Arctic and above tree line in Rocky Mountains and northern Appalachians in New Hampshire, Maine and Quebec ....*Gynaephora* p. 17

KEY TO GENERA OF NORTH AMERICAN LYMANTRIIDAE BASED ON WING VENATION

1. Wingless or nearly so..........*Orgyia* females p. 57

— Fully winged............................2

2. Forewing without an accessory cell (text figure 2 *a*) 3
— Forewing with an accessory cell (text figure 2 *b*) 5

3. Forewing with R_2 free, R_3, R_4, R_5 stalked .... *Leucoma* p. 95
— Forewing with R_2, R_3, R_4, R_5 stalked 4

4. R_2 of forewing branching from radial stem before R_5 .... *Lymantria* p. 87
— R_2 of forewing branching from radial stem beyond R_5 .... *Euproctis* p. 99

5. M_3 and Cu_1 of hindwing well separated where they adjoin discal cell ...... *Orgyia* males p. 57
— M_3 and Cu_1 of hindwing nearly always united, touching, or at least very close together where they adjoin cell 6

6. Hindwing with Sc and R in contact, without a cross vein .... *Dasychira* p. 21
— Hindwing with Sc and R approaching closely but remaining separate, connected by a short cross vein 7

7. R_5 of forewing united with R_{3+4} for much less than $\frac{1}{2}$ its length; M_2 and M_3 of hindwing arising separately from distal margin of cell .... *Gynaephora* p. 17
— R_5 of forewing united with R_{3+4} for nearly $\frac{1}{2}$ its length; M_2 and M_3 arising from a common point .... *Acsala* p. 15

KEY TO THE GENERA OF NORTH AMERICAN LYMANTRIIDAE BASED ON LAST INSTAR LARVAE

NOTE—The larva of one nearctic genus, *Acsala*, is unknown.

1. Without large, dense dorsal tufts on first four abdominal segments, the dorsal hair being generally similar on all segments; if rudimentary enlarged dorsal tufts are present (*Euproctis*), only those on abdominal segments 1–2 are confluent across middorsal line, those on abdominal segments 3–4 remaining paired 2
— With large, modified, dense dorsal tufts on at least the first four abdominal segments, these being alike and conspicuously different from the smaller hair tufts on adjacent segments 4

2. Dorsal verrucae (tubercles) with numerous straight, rigid, needlelike spinules; the two lateral verrucae on abdominal segments 3–6, between spiracle and base of proleg, arranged one behind the other 3
— Dorsal tubercles hairy but without needlelike spinules; two lateral verrucae on abdominal segments 3–6, between spiracle and base of proleg, arranged one above the other or nearly so .... *Euproctis* p. 99

3. With series of large, very conspicuous white or cream-colored spots on dorsum; verrucae brown or reddish; on poplar and willow only .... *Leucoma* p. 95
— Without white spots; dorsum bearing bright blue verrucae anteriorly and red ones posteriorly on a finely mottled gray integument (actually a reticulate whitish pattern on black); dorsal spines black, lateral hair brown .... *Lymantria* p. 87

4. With four distinct dorsal abdominal tufts; with at least an anterior pair of long, usually blackish hair pencils; densely to sparsely hairy, usually with considerable variation in length of hair on different parts of body; temperate regions 5
— With five or more low, inconspicuous, dorsal abdominal tufts; without hair pencils; densely hairy, the hair of relatively uniform length; arctic or alpine ...... *Gynaephora* p. 17

NOTE—The type-species, *Gynaephora selenitica* (European), would not key out here because it has anterior hair pencils, one posterior hair pencil, and prominent dorsal tufts on the first five abdominal segments.

5. With many short, plumose hairs arising from subdorsal verrucae on thoracic segments 2–3 and abdominal segments 5–7; usually with either a low, dense posterior tuft resembling those on first four abdominal segments, or three long posterior hair pencils .... *Dasychira* p. 21

NOTE—The very distinctive larva of *Dasychira leucophaea*, which may sometimes have only one posterior hair pencil, is an exception, but it does have the subdorsal tufts of plumose hairs.

— Subdorsal verrucae on thoracic segments 2–3 and abdominal segments 5–7 with simple or barbed hairs only, no plumose hairs; always with one posterior hair pencil .... *Orgyia* p. 57

TRIBE

Orgyiini Wallengren

Orgyides Wallengren, 1861

Members of this tribe have an accessory cell in the forewing, certain characteristic hair pencils and dorsal tufts in the larva, and genital features of uncertain significance. Dense dorsal hair tufts on at least the first four abdominal segments of the larva, and usually a pair of anterior hair pencils and a dorsal hair pencil on abdominal segment eight, would seem to be among the more reliable characters. Lateral posterior hair pencils may also be present. The dorsal tufts are very persistent, but the hair pencils may be vestigial in some genera as in *Gynaephora*. The male genitalia of the Orgyiini tend to be more simple and conventional than those of the Lymantriini, having valves that spread apart in the usual way, although there are exceptions. A distinct gnathos is usually present (but not in *Orgyia*); all Lymantriini examined are without a gnathos.

It is doubtful whether *Acsala* should be referred to this tribe or indeed even to the family, but *Gynaephora*, *Dasychira* and *Orgyia* definitely belong here. Of the Old World genera, I would include *Olene* Hübner, *Cifuna* Walker, *Elkneria* Börner, *Dicallomera* Butler, and the various Asian and African forms that have been regarded by many authors as species of *Dasychira* (e.g., Strand, 1910; Bryk, 1934).

GENUS

Acsala Benjamin

Acsala Benjamin, 1935, *Can. Ent.*, **67**: 196.
Type-species: *Acsala anomala* Benjamin, 1935.
Monotypy.

This curious genus of a single known species appears to show a mixture of lymantriid and arctiid characters. It was formerly placed in the Arctiidae, and *A. anomala* indeed resembles a large lithosiine. It is now provisionally treated as lymantriid pending information on the female and the larva, both unknown. The venation (text figure 4 *d*) is clearly lymantriid, especially with respect to the relationship of Sc and R in the hindwing, and ocelli are lacking. Ocelli are normally present in Arctiinae, although absent in most Lithosiinae and all Lymantriidae. A small haustellum is present (supposedly absent in Lymantriidae), but I found that other lymantriids, including *Gynaephora rossii* and *Euproctis similis*, have similar haustella. The metepisternum does not have microtymbals, the presence of which is a common arctiid and especially lithosiine character, and the tympanic organs are reduced, also a non-arctiid feature. The male genitalia (text figure 4 *c*) and antennae show nothing decisive and could be either lymantriid or arctiid. The antennae (text figures 4 *a*, *b*) appear arctiid inasmuch as the branches lack long terminal spinules; however, the antennae of *G. rossii* and *G. groenlandica* similarly lack these, although *Gynaephora* is typically lymantriid in nearly all other respects (the antennae of its type-species, *G. selenitica*, are intermediate). Reduction of the antennal spinules in these lymantriids may be related to the arctic habitat. The orange collar characteristic of *anomala* is not known elsewhere in the family and would seem more likely to be an arctiid character. However, this feature has developed independently in several groups (Zygaenidae, Geometridae, Arctiidae, Ctenuchidae) and may not imply close relationship. It is thought to serve as a warning to avian predators of the presence of cervical glands in supposedly distasteful moths. The following description is of necessity based only upon the male. The female may be flightless.

Venation fully quadrifid in hindwing, quadrifid in forewing but with M_2 and M_3 well separated; R_3 and R_4 either branching near apex or united for their full length; R_2 usually touching R_{3-5} at a point just beyond end of cell to form an accessory cell, but this may be rudimentary or absent; Sc and R of hindwing separate but joined by a short crossvein (R_1); Sc somewhat enlarged near base but not swollen as in the Arctiidae; traces of first anal vein present in both wings, and one example (plate 1, figure 13) has it fully developed in hindwing, although weak. Frenulum strong.

Head hairy; palpi moderate, slender; tongue present, rudimentary, shorter than palpi; eyes reduced; front broad, wider than vertical length of eye, somewhat convex; ocelli absent; antennae bipectinate with relatively short branches that have only one short terminal spinule as in all Arctiidae examined; length of branches about 2½ times width of shaft. The general appearance of the head and its appendages closely resembles that of the arctiid, *Parasemia plantaginis* (L.), except that the latter has distinct ocelli and somewhat larger tongue and palpi. Foreleg with a slender epiphysis on the tibia, slightly over ½ length of tibia; hindtibia with spurs short, both pairs present. Tympanic organs apparently very reduced.

The male genitalia are simple and show nothing to indicate family relationship. A well-developed transtilla is present, a common feature of the Arctiidae, not the Lymantriidae, but as a transtilla may be present or absent in the Arctiidae, there is no reason to think that the same variability should not exist in the Lymantriidae.

The early stages are unknown.

A. anomala appears to be an isolated relict. It is probably both primitive and degenerate, the latter in the sense of simplification and reduction in both structure and pattern. This is a common form of specialization in arctic Lepidoptera. It superficially resembles a palearctic lymantriid, *Penthophera morio* (L.), but they are not closely related; *morio* has typical lymantriid genitalia and well-developed antennal spinules.

Acsala anomala Benjamin

PL. 1, FIGS. 13, 14. TEXT FIG. 4 (McD. 1025).

Acsala anomala Benjamin, 1935, *Can. Ent.*, **67**: 196. Type-locality: "Near Creek, Yukon, Alaska." [USNM]

This obscure and peculiar moth, so highly modified for life in the high Arctic, occurs in Alaska and the Yukon Territory. Only eight specimens are known, all males; most were reported to have been netted by day on dry, rocky hillsides with very sparse vegetation (fellfield), a habitat shared with the arctic butterfly, *Boloria distincta* (Gibson).

The head, body and legs of *anomala* are thinly clothed in dark-brown to blackish hair or hairlike scales except for an orange dorsal collar just behind the head. The wings are so sparsely covered with dark hairlike scales that they are almost completely translucent, leaving the

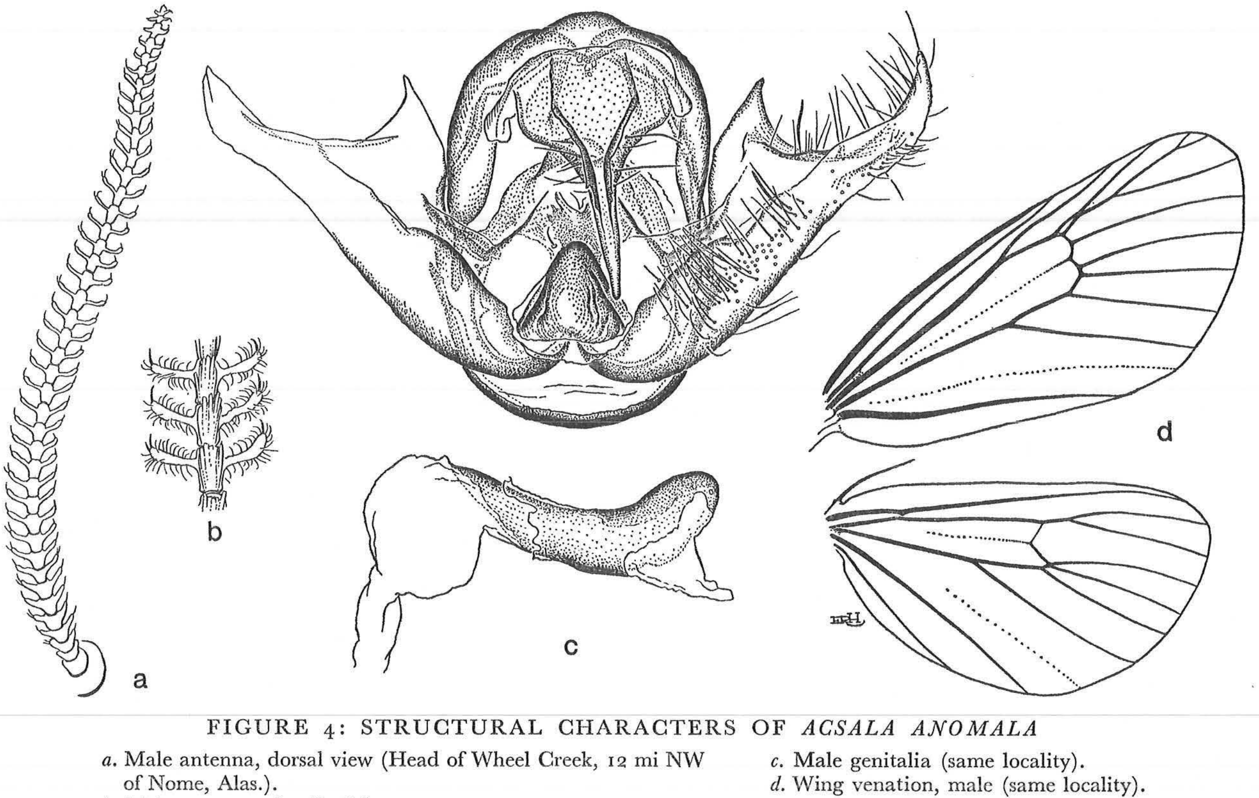

FIGURE 4: STRUCTURAL CHARACTERS OF *ACSALA ANOMALA*

a. Male antenna, dorsal view (Head of Wheel Creek, 12 mi NW of Nome, Alas.).
b. Male antenna, detail of three segments.
c. Male genitalia (same locality).
d. Wing venation, male (same locality).

venation plainly visible. Other characters were discussed under the generic heading. Examples of *Parabarrovia keelei* Gibson, a superficially similar arctic noctuid, have been confused with *A. anomala* in collections, but *keelei* lacks the orange collar, has simple rather than bipectinate antennae, and trifid rather than quadrifid venation in the hindwing.

The female and the early stages are unknown.

In addition to the type-locality and the locality 12 miles northwest of Nome, where the two illustrated specimens were taken, *anomala* has been collected in three other places: the southwest face of an unnamed mountain on the upper Dietrich River, Endicott Mountains, central Brooks Range, Alaska, 3800 feet (17 June 1971); on the west spur of Als Mountain, above Ernie Creek, also in the Endicott Mountains, about 25 miles east and 6 miles south of Anaktuvuk Pass village, 5200 feet (21 June 1971); and Klondike River [near Dawson], Yukon Territory (one paratype, CNC). Four were taken in the locality near Nome.

The flight period, based on specimens actually caught, is from 29 May to 21 June, although several sight records by K. W. Philip (Head of Wheel Creek, 12 mi NW of Nome, 3 July 1971; 14 mi NW of Nome, 720′, 4 July 1971; near Chandler L., 6000′, W of Anaktuvuk Pass, Brooks Range, 18 July 1972) would extend this into July (K. W. Philip, *in litt.*, 5 September 1971 and personal communication).

GENUS
Gynaephora Hübner

Gynaephora Hübner, [1822], *Verzeichniss Bekannter Schmettlinge* [sic], 161.
Type-species: *Phalaena selenitica* Esper, 1789. Designated by Kirby, 1892, *Synonymic Catalogue of the Lepidoptera Heterocera*, **1**: 473.

Cladophora Geyer, 1832, *in* Hübner, *Zuträge zur Sammlung Exotischer Schmettlinge* [sic], **4**: 33.
Type-species: *Phalaena selenitica* Esper, 1789. Designated by Collenette, 1935, *Stylops*, **4**: 243.

Dasorgyia Staudinger, 1881, *Stettiner Ent. Zeitung*, **42**: 406.
Type-species: *Dasorgyia pumila* Staudinger, 1881. Monotypy.

Byrdia Schaus, 1927, *in* Seitz, *Die Gross-Schmetterlinge der Erde*, **6**: 537.
Type-species: *Laria rossii* Curtis, 1835. Original designation.

Konokareha Matsumura, 1928, *Insecta Matsumurana*, **2**: 120.
Type-species: *Konokareha daisetsuzana* Matsumura, 1928, now considered to be a Japanese subspecies of *Gynaephora rossii* (Curtis). Monotypy.

NOTE—The palearctic *Dicallomera fascelina* (L.) is so closely related to the species of *Gynaephora* that it should perhaps be put with them. In that event, *Dicallomera* Butler, 1881, with type-species *fascelina*, would become another synonym of *Gynaephora*.

Gynaephora is a small genus of seven or eight species occurring from cool temperate to high arctic zones in the Palearctic and Nearctic Regions. The two American species are exclusively arctic or alpine, one or both of them reaching Ellesmere Island and northernmost Greenland. The females have fully developed wings but probably do not fly; the males of our species fly very actively by day, and it seems likely that those limited to montane habitats are also diurnal. In addition to the type-species, *selenitica*, Old World representatives include *sincera* Kozhanchikov, *alpherakii* Grum-Grzhimailo, *pumila* (Staudinger), and *selenophora* Staudinger. Of these, I have examined only *selenitica* and *alpherakii*.

In our fauna *Gynaephora* is most closely related to *Dasychira*, but the two genera differ in many ways: body in both sexes of *Gynaephora* somewhat stouter in proportion to wings, and wings narrower; head, body and legs hairier; metallic tufts on thorax and abdomen wanting; antenna of male bipectinate with long, setose branches, which in the American species and the Himalayan *alpherakii* lack the two or three terminal spinules as does *Acsala anomala*. *Selenitica* has reduced spinules and with respect to that character is intermediate between *rossii* or *groenlandica* and the usual lymantriid condition found in *Dasychira*. Female antenna biserrate (*selenitica*) or bipectinate with short branches (*rossii*); palpi hairy, short, not or hardly exceeding the hairy front; compound eyes very reduced in both sexes; male foreleg with epiphysis variable, being fully as long as tibia in *selenitica*, about half as long in *rossii*. *Alpherakii* has the male foretibia curiously modified—abnormally short, bearing a pair of stout, sharp, curved terminal spines and with no epiphysis apparent. Hindtibia with one pair of spurs only.

Venation with accessory cell in forewing and like that of *Dasychira* except that M_3 and Cu_1 of the hindwing are stalked.

Male genitalia simple; valve short and broad, with no accessory lobes; saccus rounded, not produced as in *Dasychira*; gnathos present, similar to that of *Dasychira*; uncus consisting of a very reduced process and a stout, rather inflated base with a mesial depression dorsally, the visibility of which depends on how the genitalia are mounted; juxta rather large and expanded laterally; aedoeagus normal; vesica delicate, simple, not scobinate as in *Dasychira*.

The dark-brown, hairy larva of *Gynaephora* is unique for the North American lymantriid fauna in having at least five, rather than four, dorsal abdominal tufts (the "toothbrush tufts" of Forbes, 1948: 238–245). In the type-species, *selenitica*, these tufts are well developed and one can clearly see that there are five. In *rossii* and *groenlandica*, however, they are short and not well developed, the tufts on abdominal segments one to five not appearing significantly different from those on the three following segments. A conspicuous feature of the dorsal tufts is that they are dark in the middle and contrastingly light colored laterally, being flanked with white in *selenitica* and yellow in *rossii*. Only the five well-differentiated tufts are flanked with white in *selenitica*, but in *rossii* incipient tufts on segments six and seven, as well as a somewhat denser dorsal posterior tuft on segment eight, are flanked with yellow, giving the caterpillar the appearance of having eight dorsal tufts instead of five. The American species have relatively short hair of an even, clipped appearance; that of *selenitica* is longer and less even. Also, the American species have no hair pencils; *selenitica* has very obvious anterior hair pencils, but none posteriorly.

In the larval stage, as in characters of the genitalia, *Gynaephora* appears most closely related to the European *Dicallomera fascelina* (L.), and it is questionable whether the latter should be maintained in a separate genus. *Fascelina* also has five black and white dorsal tufts very similar to those of *selenitica*; anterior hair pencils are missing as in *rossii*, although *fascelina* does have a rudimentary dorsal posterior hair pencil, unlike *Gynaephora* species. Larger eyes in the adult suggest that *D. fascelina* is adapted for nocturnal activity.

An unusual feature of the life history of *Gynaephora* species in North America, at least in the Canadian Arctic Islands, is the duration of the larval stage—seven to eleven years (J. K. Ryan, personal communication). Thus *G. rossii* and *G. groenlandica* are not only the largest invertebrates and very nearly the only Lepidoptera in the northernmost localities in which they occur, they are probably the longest-lived species of Lepidoptera known. For high altitude localities in which *rossii* occurs farther south, as in the Rocky Mountains and northern Appalachians of New England, the larval life span is not known.

Gynaephora rossii (Curtis)

PL. 1, FIGS. 15–24. TEXT FIGS. 2 *b*, 5 *a* (McD. 3941).

Laria rossii Curtis, 1835, *in* Sir John Ross, *Narrative of a Second Voyage in Search of a North-west Passage, and of a Residence in the Arctic Regions during . . . 1829–33 . . . Including the Reports of J. C. Ross*, **2** (appendix): lxx, pl. A, fig. 10.
Type-locality: Fury Beach, Somerset House, N. Somerset [N of Creswell Bay on the E coast of Somerset Island, Northwest Territories, Canada].

Dasychira rossii relictus Bang-Haas, 1927, *Horae Macrolep.*, **1**: 77, pl. 10, fig. 6. PALEARCTIC SUBSPECIES.
Type-locality: "Sajan mont.: Turan, südwestl. Irkutsk."

Konokareha daisetsuzana Matsumura, 1928, *Insecta Matsumurana*, **2**: 120. PALEARCTIC SUBSPECIES.
Type-locality: Hokkaido, Japan.

Gynaephora lugens Kozhanchikov, 1948, *Trudy̆ Zool. Inst. Leningrad*, **7** (3): 151.
Type-locality: "Siberian Arctic from Urals to Chukhotsk Peninsula and Kamchatka; Yablonov ridge (Dzhelinda)" (translation).

This species, widely known in the past as *Byrdia rossii*, is primarily an inhabitant of the arctic tundra from Labrador to Alaska in the North American part of its range; but it reappears southward at high elevations in the Rocky Mountains of Wyoming and Colorado, and above tree line on the highest mountains of the northern Appalachian system in Quebec, Maine and New Hampshire. It also occurs in Japan and Siberia, but in Greenland is entirely replaced by *G. groenlandica*. *G. rossii* is not likely to be confused with any other species from arctic America except *groenlandica*, from which it differs in having a better developed pattern on the forewing and a dark marginal band on the hindwing. Downes

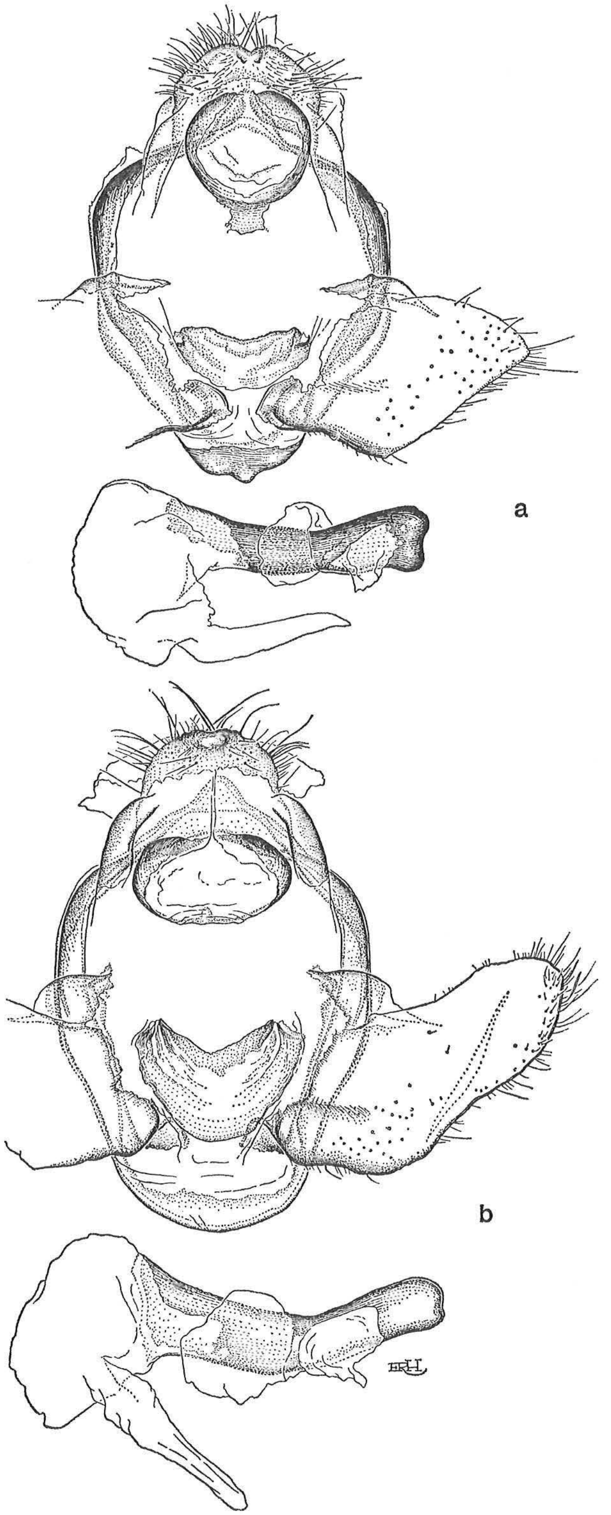

FIGURE 5: MALE GENITALIA OF *GYNAEPHORA* SPECIES

a. Gynaephora rossii (Point Barrow, Alas.).

b. Gynaephora groenlandica (Holman, Victoria Island, N.W.T.; aedoeagus from a different specimen, Nedre Midsommer, Greenland).

(1964: pl 2, figs. 1–4) gave fine colored figures of both species from Hazen Lake, northern Ellesmere Island, indicating clearly that both may occur in the same locality.

In addition to the differences in pattern, the two species may be distinguished by several characters in the male genitalia. *Rossii* has a shorter and stouter valve, without a deeply concave costal margin, a smaller juxta, a more narrowed and distinctly bifid apex on the uncus, and a less uniformly sclerotized eighth tergite.

The available material of this species shows a noticeable degree of geographical variation from south to north and probably east to west. Specimens from the extreme north, as from the north slope of Alaska or from Ellesmere Island, tend to be larger, grayer, paler and more thinly scaled than more southern examples. As well as being smaller and darker, eastern specimens often have the pale area of the hindwing in the male quite yellowish. Those from Baffin Island, the mainland of the Northwest Territories and the Yukon Territory are intermediate. Males examined from Colorado resemble the eastern form but have the hindwing largely suffused with blackish.

The basic characteristics of the larva were given in the generic discussion. In the last instar it appears to differ from that of *groenlandica* by being more densely clothed in plumose hair of shorter, more even length and usually of darker, grayer coloring. The dorsal abdominal tufts are very dense, broad and uniform in length, are comprised of a mixture of bristlelike and plumose hairs, and toward the base at each side are colored a bright sulphur yellow. All of the thoracic tufts are a mixture of bright-yellow and brown hair. The larva of *groenlandica* (based on cast skins) appears to be a generally lighter brown and to have longer and more simple (less plumose) hair. Its dorsal tufts are blackish brown and comprised of only barbed or weakly plumose hair; the tuft on abdominal segment eight is slightly elongated as a rudimentary hair pencil, which is not the case in *rossii*. However, I am advised by J. K. Ryan (*in litt.*, 31 August 1974) that the differences in coloring are unreliable, especially inasmuch as cast skins always bleach to a lighter, orange-brown color. The tendency of *rossii* to have more plumed hairs than *groenlandica* is confirmed by Ryan's observations on live larvae of both species on Devon Island.

The only published report that I found of specific host plants for *rossii* is that by Curtis in the original description, where he mentioned that the larvae fed mostly on *Saxifraga tricuspidata* Rottb. and *S. oppositifolia* L. Ryan (*in litt.*) reports that the two species are ecologically similar and will feed on *Salix arctica* Pall., *Saxifraga oppositifolia* L., and *Dryas integrifolia* Vahl; he successfully reared them in the laboratory on *Prunus* leaves. One preserved larva in the U.S. National Museum is labelled as having been found on spruce. It appears that they may be rather general feeders on whatever is available. On Ellesmere Island the larvae live, like those of *groenlandica,* in sparsely vegetated, dry and exposed habitats, and are thus subjected to great extremes of climatic variation, in the winter being covered by only a few inches of snow or none at all. They thus live in one of the severest habitats occupied by arctic insects, and it is very likely that they become frozen in winter. There is evidence that they can suspend activity and overwinter in any instar, whenever conditions become unfavorable; and probably there is also an obligate diapause, in the last instar in *rossii* and in the penultimate instar in *groenlandica.* Larval development may take as long as eleven years, probably varying with conditions. Larvae of both species become active as soon as the snow melts in the spring, and *rossii* thus tends to pupate and emerge earlier than *groenlandica* (Oliver, *in* Oliver, Corbet and Downes, 1964: 138). Larvae of *rossii* may be locally abundant. Curtis (1835) mentioned that about 100 caterpillars were collected at the type-locality on 16 June 1832.

Although limited to essentially treeless arctic and alpine zones, *rossii* is still somewhat more southern in distribution than *groenlandica. Rossii* occurs at or near sea level on the Atlantic coast as far south as southern Labrador (specimen from Belle Isle in AMNH). Farther south, it has been collected at about 3200 feet on Mount Albert, Gaspé Peninsula, Quebec, and near the treeless summits of Mount Katahdin, Maine (4500 feet), and Mount Washington and Mount Jefferson (above 5000 feet) in the White Mountains, New Hampshire. From the Rocky Mountain region there are specimens labelled Jackson, Wyoming, Rocky Mountain National Park, Colorado (AMNH), near Chasm Lake, Colorado (LACM), and Summit Lake, 12,800 feet, Mount Evans, Colorado (CNC). Most of the material in collections has been reared from larvae, which are relatively easy to find. Adult males fly rapidly and are rarely captured; females apparently do not fly at all.

Emergence begins in the Arctic in late June, as early as 17 June at Rampart House, Yukon Territory, 19 June at Point Barrow, Alaska, and 16 June at Nain, Labrador. Although there are records for as late as 29 July, most fall within the first ten days of July. In alpine habitats southward the flight period seems later, extending from about 4 to 28 July, with one very late record for 23 August (Jackson, Wyoming).

A figure given by Curtis with the original description unmistakably represents a male of the present species, and there is no question about its identity. Curtis described both sexes, but the example he figured should be regarded as the type.

Gynaephora groenlandica (Wocke)

PL. I., FIGS. 25–30. TEXT FIG. 5 *b* (McD. 3942).

Dasychira groenlandica Wocke, *in* Homeyer, 1874, *Die Zweite Deutsche Nordpolarfahrt in den Jahren 1869 und 1870 . . .,* **2**: 409 (Geographische Gesellschaft, Bremen).
Type-locality: [E. Greenland].

G. groenlandica has a more limited distribution than *rossii,* being known only from Greenland and from a few widely separated localities in the far northern Canadian Arctic. It has been found to occur together with *rossii* on some of the Canadian Arctic Islands, but in Greenland only *groenlandica* is present. It resembles *rossii* in size and shape but has lost nearly all of the wing pattern. In most examples only the discal spot of the forewing remains; sometimes the antemedial and postmedial lines show faintly. There is no black border on the hindwing. The wings also are more translucent (thinly scaled) than those of *rossii.* In the male genitalia, *groenlandica* is most readily distinguished by the much larger juxta and by the larger, less angulate valves. The eighth tergite is more fully sclerotized, with the sides nearly straight. In *rossii* the sides are concave.

Some Canadian specimens of *groenlandica* are of a more brownish color than those from Greenland; others are just as gray and could hardly be distinguished. The female figured (plate 1, figure 29) from northwestern Yukon is of a lighter brown than any other specimen seen, but as it also happens to be the only specimen seen from the Yukon or from anywhere on the mainland of North America, the significance of this color variation remains unknown.

G. groenlandica is widely distributed in Greenland, occurring on the east coast from the region of Scoresby Sund to Germania Land, on the west coast from Ivigtut north to Tasiussaq, and on the north coast from the vicinity of Thule to Peary Land and Independence Fiord (Wolff, 1964: 26, fig. 30). In the Canadian Arctic, the species has been taken at Hazen Lake, Eureka and Ward Hunt Island, Ellesmere Island (CNC), Resolute Bay, Cornwallis Island (AMNH), Devon Island (J. K. Ryan), Holman, Victoria Island (CNC), and Firth River, British Mountains, Yukon Territory (plate 1, figure 29). It is noteworthy that Ward Hunt Island (lat. 83° 5′ N) is the most northerly land of Canada, embedded like a nunatack in the northern Ellesmere ice sheet, and that *groenlandica* probably shares the distinction of having the most northerly distribution of all Lepidoptera with only one other species also found there, the geometrid, *Psychophora sabini* (Kirby) (Downes, 1964: 288). Judging by the distribution maps published by Wolff (1964), *groenlandica* is the only lepidopterous insect recorded from the northernmost part of Greenland (Kap Neumayer, 83° 18′ N, west of Kap Morris Jesup). Good samples of both species of *Gynaephora* from Ellesmere Island (CNC) indicate that the period of activity for adults of *groenlandica* (27 June–11 August) is slightly later than that of *rossii* (18 June–22 July).

In a discussion of the insects of the Queen Elisabeth Islands, Bruggemann (1958: 698) wrote: "By far the most common caterpillars [at Eureka, Ellesmere Island] are those of *Byrdia groenlandica.* They can be collected by the score, but the moths are seldom seen and still more rarely taken, especially the males. They fly high, fast and erratically. . . . The females apparently do not fly at all. One was found that had deposited all its eggs on the cocoon from which it had emerged." The larvae were found to be very difficult to rear. As they take several years to mature, only those fully grown and ready to pupate could be induced to complete their development. Also, a high proportion were parasitized. Larvae of *rossii* were also collected at Eureka, but were rare. The larval characters were mentioned under *G. rossii* and the life history described in the generic discussion. The larva of *groenlandica* is reported to feed by preference on *Salix* in Greenland (Wolff, 1964: 27), but for other food plants reported for both species refer to the discussion of *rossii.*

GENUS
Dasychira Hübner

Dasychira Hübner, [1809], *Sammlung Exotischer Schmetterlinge*, **1**: pl. [178].
Type-species: *Dasychira tephra* Hübner, [1809]. Monotypy.

NOTE—The single most rewarding result of my research on the Lymantriidae was the rediscovery of *D. tephra* Hübner, which had remained unknown and unrecognized as a species from 1809 until the present. Identification of *tephra* as a North American species is significant because of the persistent misapplication of the name *Dasychira* to more than 400 Old World species that are not congeneric with it. Hübner gave no locality for *tephra,* and the name was bypassed by subsequent authors who considered the species unidentifiable (e.g., Barnes & McDunnough, 1913: 49; Franclemont, 1949: 6). The reason for this was simply that so little material was available from the southern states that such a species was not known to exist. More intensive collecting in recent years has now revealed that *tephra* is one of the common lymantriids of the Southeast and a species that Hübner could very well have received from John Abbot of Georgia. In May 1976 I saw the original pattern plate for *D. tephra* in the Library of the BMNH and consider that Hübner's illustrations of *tephra* are unmistakable.

European authors have attributed *Dasychira* to Stephens, 1829, with type-species *pudibunda* L. (e.g., Kozhantschikov, 1950: 249). This Old World group, for which the name *Elkneria* Börner, 1932 (type-species: *pudibunda* L.), is available, is very distinct from *Dasychira.* The male genitalia are extremely dissimilar, with all components differently shaped, and the uncus missing in *pudibunda.* This species and its well-known European relative, *abietis* (Denis & Schiffermüller), also differ in having only one dorsal abdominal gland in the larva; *Dasychira* species and all other known North American Lymantriidae have two glands.

The generic name *Olene* Hübner, 1823, *Zütrage zur Sammlung Exotischer Schmettlinge* [sic], **2**: 19, was used for this group (i.e., for the species of *Dasychira* Hübner, [1809]) following Neumoegen and Dyar (1894), and thence at least until Forbes (1948: 241) reinstated *Dasychira.* *Olene* has remained a familiar name to North American lepidopterists because it was used in the McDunnough checklist (1938: 136). The type-species is a Southeast Asian moth, *Olene mendosa* Hübner, 1823, designated by Moore, 1883, *Lepidoptera of Ceylon*, **2**: 96. Although many obvious similarities indicate a close affinity to the North American species, I doubt that *Olene* and *Dasychira* should be regarded as congeneric. *O. mendosa* is highly polymorphic and tends to have a quite different wing pattern. In the male genitalia the uncus, saccus, and costal lobe of the valve are differently shaped, and the gnathos is rudimentary in *mendosa*, well developed in *Dasychira*. The female genitalia are extremely close.

The Oriental or Indo-Australian species represented by *O. mendosa* appear to be the closest living relatives of the American ones treated here under *Dasychira*, but the taxonomic relationship does need further investigation. For the present I reserve *Dasychira* for the New World species and would use *Olene*, *Elkneria*, and whatever other generic names may be available for the Old World forms. In any event *Dasychira* Hübner is the oldest name involved and its availability for species of the American fauna will remain unaffected.

Parorgyia Packard, 1864, *Proc. Ent. Soc. Philadelphia*, **3**: 332.
Type-species: *Phalaena achatina* J. E. Smith, 1797. Designated by Kirby, 1892, *A Synonymic Catalogue of Lepidoptera Heterocera*, **1**: 471. (The name *achatina* is a homonym and refers to the taxon described in the present work as *D. meridionalis memorata* Ferguson.)

This is a closely knit complex of 16 North American species limited to the United States and Canada. None is known from Mexico or the West Indies, although species do occur in southern Florida and within sight of the Mexican border in Texas. The distribution spans nearly the whole temperate zone from the subtropics north at least to the beginning of the Hudsonian Zone in Canada, although the largest concentration of species occurs in the eastern deciduous forest. Both sexes fly actively and are collected at light; they are strictly nocturnal.

Moths of medium size for Lymantriidae, females often almost twice as large as males, about 25 to 30 per cent larger and stouter bodied than species of *Orgyia*, both sexes with fully developed, ample wings. Dorsal tufts of lustrous, metallic scales present on metathorax and usually on second and third abdominal segments; male antenna (text figures 1 *c–e*) bipectinate with very long branches, each bearing two well-developed terminal spinules; female antenna (text figures 1 *a, b*) bipectinate with short branches, each bearing one or two long terminal spinules; palpi densely scaled, slightly exceeding front, laterally compressed and rather rounded in profile, especially those of male, about as wide as compound eye; eyes large and protuberant in male, about as wide as front, somewhat smaller in female; epiphysis as long as foretibia in male; hindtibia with both pairs of spurs in both sexes.

Venation (text figure 6) with accessory cell in forewing; hardly differing from that of *Orgyia*; M_3 and Cu_1 of hindwing arise together from end of cell nearly as in *O. antiqua*, not separately as in other species, but R and M_1 are short-stalked, more like those of *O. leucostigma.*

The male genitalia are extremely uniform from species to species, rather generalized, without any very specialized features. Saccus somewhat produced; juxta ringlike, partially encircling aedoeagus; gnathos well developed, forming a complete loop; uncus with base broadly fused to tegumen and hardly differentiated from it; process of uncus usually broad, stout, rounded, slightly recurved; valve bilobed, with main lobe broad, rounded, almost membranous, and costal lobe sclerotized, in the form of a linear process, rounded at the end, somewhat incurved; aedoeagus with a bulbous vesica having a small accessory lobe on one side, and with most of its surface minutely scobinate.

The form of the valve, with its distinct costal lobe, suggests a relationship to *Orgyia* and to *Olene*, both of which have valves with costal lobes. *Orgyia* has a much longer costal lobe and of course differs in so many ways that there is no difficulty in recognizing distinctions between the two genera. *Olene* is close to *Dasychira*, but the overall shape of the several components of the male genitalia, such as the valve, uncus, saccus, and aedoeagus is significantly different, and *Olene* has only a vestigial gnathos, perhaps the most obvious difference. *Elkneria pudibunda* (L.) and its congeners, often included in *Dasychira* by European authors, are so far removed in every character of the male genitalia that there is no choice but to regard them as representing another genus only remotely related to *Dasychira.*

The female genitalia are also extremely uniform throughout the genus and are of little value for distinguishing species. They hardly differ from those of *Olene mendosa*, even having the same kind of signum. They are also quite similar to those of *Orgyia* species, although the latter have lost the signum. Bursa copulatrix membranous with a transversely elongated signum bearing a sharp tooth at each end; ductus bursae sclerotized, short but often thick, laterally very compressed; ostium with a large V-shaped or U-shaped, heavily setose preostial lip, sometimes a small, setose postostial lip, and, immediately posterior to that, a shallow, rounded, invaginated pouch; ovipositor lobes broad and flattened; apophyses moderately long, linear, normal.

The larvae of *Dasychira* (text figure 3) are typically lymantriid, sharing most of their characters with the species of such genera as *Orgyia, Elkneria, Dicallomera* and *Gynaephora,* but differing considerably from *Lymantria, Leucoma, Euproctis* and *Penthophera* in the greater development of tufts and hair pencils. *Dasychira* has two dorsal abdominal glands, the usual number; *Elkneria* has only one, that on the seventh segment. Like *Orgyia* and *Elkneria,* it has large dorsal tufts on the first four abdominal segments; *Gynaephora* and *Dicallomera* have such tufts on at least the first five abdominal segments. Positively determined larvae of *Olene* have not been available for study. Certain species of *Dasychira* are the only Lymantriidae seen with a full complement of two long, black anterior and three posterior hair pencils; not all species have both the posterior dorsal and lateral pencils; but the anterior pair is always present. Unlike that of *Orgyia,* the eighth abdominal segment may have a low, dense, dorsal tuft similar to those on segments one to four; the dorsal hair pencil, if present, arises from this tuft. Also, the larvae of *Orgyia* are more slender, and they always seem to lack the posterior lateral hair pencils. Otherwise the larvae of *Dasychira* and *Orgyia* are much alike.

In one respect the life history of *Dasychira* differs sharply from that of *Orgyia*; all species apparently overwinter as partly grown, diapausing larvae, not as eggs. The larvae feed mostly on deciduous trees of many species, but one widespread group of five species has become specialized on coniferous trees. At least three occur periodically in destructive numbers—*D. pinicola* and *D. grisefacta* on pine, and *D. basiflava* on oak. *D. pinicola* (Dyar), the pine tussock moth, was formerly confused with, and misidentified as *D. plagiata* (Walker), but it is a distinct species.

KEY TO LAST INSTAR LARVAE OF THE GENUS *DASYCHIRA*

NOTE—The larvae of *D. mescalera* and *D. matheri* are unknown. All other species (but not all subspecies) are included in this key.

1. Dorsal tuft of eighth abdominal segment short, brushlike, similar to those on first four abdominal segments or only slightly longer. . . . 2

— Dorsal tuft of eighth abdominal segment consisting of or including a full-length hair pencil similar to the anterior lateral hair pencils 8

2. Posterior lateral hair pencils absent or much reduced; eastern. 3

— Posterior lateral hair pencils well developed, about as large as anterior ones; eastern and western 5

3. Lateral, club-shaped, black plumose hairs absent on thoracic segments 2–3 and abdominal segments 1–8; first dorsal abdominal tuft darker than succeeding three, colored like posterior dorsal tuft (color difference not always apparent in preserved specimens); larva otherwise of quite uniform grayish-brown coloring; posterior lateral hair pencils lacking. . . . . *obliquata* p. 48

— Lateral, club-shaped, black plumose hairs present on thoracic segments 2–3 and abdominal segments 1–8 or on most of these segments; dorsal tufts on first four abdominal segments uniformly colored; general coloring of larva silver gray, resulting from the presence of numerous short, pure white plumed hairs; short or rudimentary posterolateral hair pencils sometimes present. 4

4. Anterior hair pencils short, much less than $\frac{1}{3}$ length of body; integument dark gray or blackish; widespread in eastern United States. . . . .*cinnamomea* p. 45

— Anterior hair pencils very long, more than $\frac{1}{3}$ length of body; integument pale, nearly white, with a blackish reticulate and dotted pattern; South Carolina and Arkansas southward. . . . . *atrivenosa* p. 43

5. Supraspiracular abdominal verrucae each with at least one broadly club-shaped, black plumose hair; southeastern. 6

— Supraspiracular abdominal verrucae nearly always without black plumose hairs (sometimes present on one or two verrucae, rarely on all); long, black lateral hairs normally arising from subspiracular verrucae only; widespread. 7

6\. Plumose hairs comprising hair pencils entirely black; widespread in Southeast except southern Florida............*meridionalis* ssp. *memorata* p. 39

— Plumose hairs comprising hair pencils at least in part with brown or yellowish shafts and black tips; central and southern Florida..........................*meridionalis* ssp. *meridionalis* p. 39

7\. Black subspiracular plumose hairs mostly distinctly clavate toward ends; brushlike dorsal tufts of abdomen rather light in color, brownish or grayish; plumose hair and barbed spines of body mostly pure white, thus larva appearing very pale; dorsal glands coral red in life; Canadian and Transition Zones, eastern and western....*vagans* p. 29

— Black subspiracular plumose hairs often more lanceolate than clavate, long, slender, but sometimes more or less clavate; brushlike dorsal tufts of abdomen very dark, nearly blackish; plumose hair of body mostly light gray or brownish, spines brown with black tips, thus general aspect of larva brownish gray, much darker than *vagans*; dorsal glands whitish or yellowish in life; Transition Zone southward; eastern..*basiflava* p. 34

NOTE—Larvae of *vagans* and *basiflava* are extremely similar, and preserved specimens, especially those in alcohol, may be impossible to identify with certainty.

8\. Hair entirely light yellowish brown except for the contrasting black anterior and posterior hair pencils; integument light gray green to yellowish brown; southeastern to southern New Jersey.......*leucophaea* p. 46

— Much darker larvae with a mixture of gray and black hair, at least one lateral row of black plumose hairs, and with dark or variegated integument; widespread..........9

9\. Clavate, plumose, black lateral hairs of abdomen arising from subspiracular verrucae only, i.e., as a single lateral row.......10

— Clavate, plumose, black lateral hairs of abdomen arising from both subspiracular and supraspiracular verrucae on most segments, i.e., as two lateral rows (sometimes a partial third row ventrolaterally)..........15

10\. Clavate, plumose, black lateral hairs wanting on abdominal segments eight and nine (and often also on seven) and usually on thoracic segments also, being replaced by more slender, plumed or barbed black hairs; on broad-leaved trees...............11

— Clavate, plumose, black lateral hairs present on abdominal segments 7–9 and on thoracic segments 2–3; on coniferous trees...12

11\. Anterior and posterior hair pencils comprised in large part of plumose hairs that have yellowish shafts and are black only toward the tips, resembling those of *dominickaria*; posterior lateral hair pencils weak or nearly wanting; southeastern, Maryland and Ohio to Texas............*tephra* p. 25

— Hair pencils entirely blackish; posterior lateral hair pencils usually well developed, similar to the anterior ones; mainly northeastern but west to North Dakota....*dorsipennata* p. 28

12\. Anterior and posterior hair pencils comprised in large part of plumose hairs that have yellowish shafts and are black only toward tips, resembling those of *tephra*; lateral sclerites on abdominal legs dark and contrasting; on bald cypress, southeastern ....*dominickaria* p. 49

— Hair pencils entirely blackish; lateral sclerites on abdominal legs pale, not contrasting; on other conifers; southeastern and northeastern........................13

13\. Barbed spines black; on pine; Maryland southward on piedmont and coastal plain..*manto* p. 57

— Barbed spines mostly pale, varying from white to brownish; on pine and other conifers; Canada to New Jersey and in the Appalachians to North Carolina and Tennessee.............................14

14\. On *Pinus banksiana*, *P. rigida*, and probably *P. virginiana*..........................*pinicola* p. 53

— On *Pinus strobus*, spruce, fir, hemlock and larch (larvae of *plagiata* and *pinicola* probably distinguishable in life, perhaps not as preserved specimens)...........*plagiata* p. 51

15\. Clavate, plumose, black lateral hairs large and very numerous, 3–8 from each verruca, but those on first abdominal segment not forming tuft conspicuously larger than others; on spruce, pine, fir, Douglas fir and other conifers; northern Great Plains and Rocky Mountains to Oregon, Washington, British Columbia .... *grisefacta* p. 54

— Clavate, plumose, black lateral hairs relatively sparse, mostly 1–3 from each verruca, but forming lateral tuft of six or more on first abdominal segment; on broad-leaved trees (oak, pecan, etc.); Texas only .... *meridionalis* ssp. *kerrvillei* p. 41

Dasychira tephra Hübner

PL. 2, FIGS. 1–12. TEXT FIGS. 1, 6, 7 *a–c.*

Dasychira tephra Hübner, [1809], *Sammlung Exotischer Schmetterlinge*, **1**: pl. [178].
Type-locality: Not given (believed to be Georgia).

NOTE—Hübner's figures of *tephra*, both male and female, upperside and underside, are accurate representations of unbanded specimens of the present species in every visible detail. There can be little doubt that this is the species he had. Although no locality was given, Hübner obtained material of many species from John Abbot of Georgia, including others illustrated in the same work, and it seems safe to assume that this was the source of *tephra*. It is interesting to note that McDunnough (1938: 137) and Forbes (1948: 243) agreed in regarding *dorsipennata* as the species most like Hübner's figures of *tephra*; *dorsipennata* is indeed the species to which *tephra* is most closely related.

D. tephra is a southeastern species that has never been correctly associated with the name or recognized as distinct since the time of its original description. Although not an uncommon species where it occurs, it was overlooked by Barnes and McDunnough (1913) and all subsequent authors, who may have confused it with *obliquata*. *Tephra* is likely to be confused with *obliquata* and *dorsipennata*, although most of its range is more southern. Its distribution overlaps that of *obliquata* in Maryland, northern Virginia, Ohio, and probably in

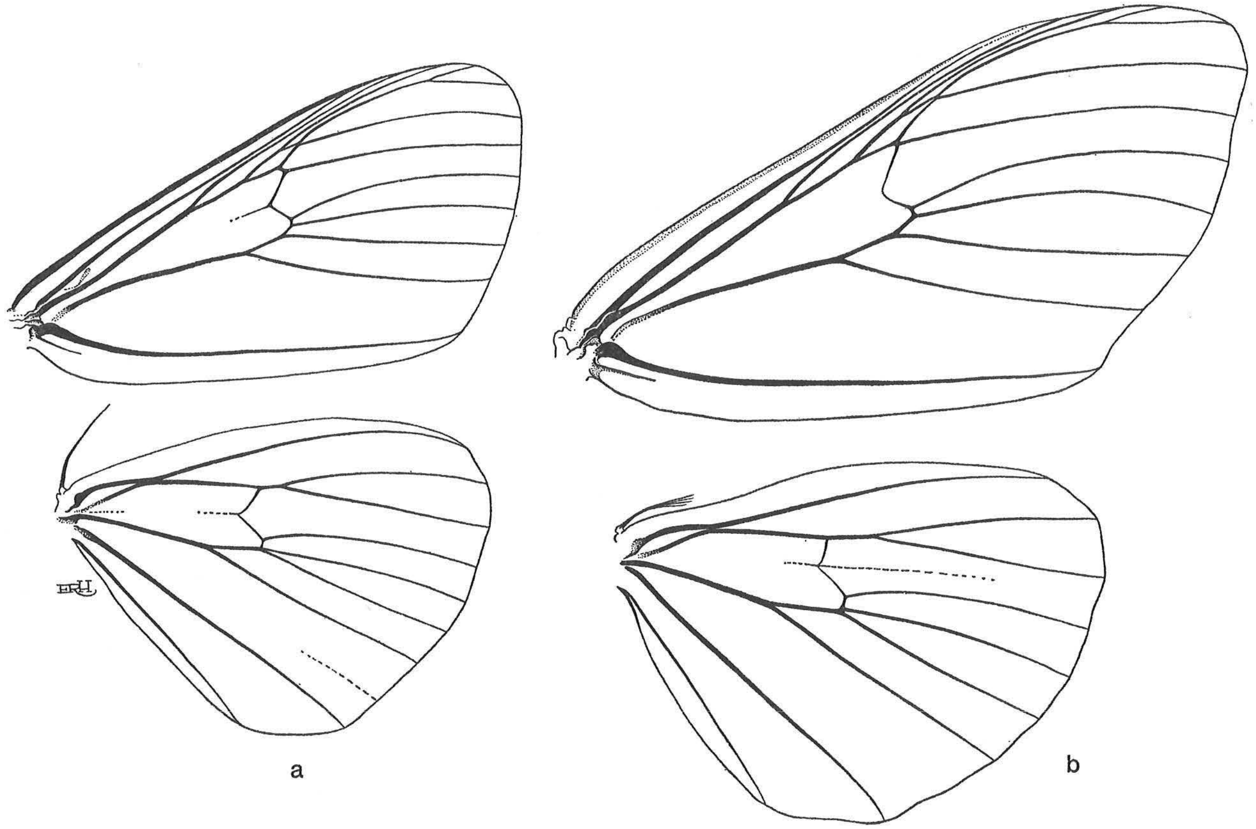

FIGURE 6: WING VENATION OF *DASYCHIRA TEPHRA*
a. Male (McClellanville, S.C.). *b.* Female (McClellanville, S.C.).

Kentucky, Missouri and Arkansas. *Dorsipennata* is a Canadian Zone species that probably does not overlap with *tephra*.

Like *obliquata*, *basiflava* and several other species, *tephra* is dimorphic in both sexes with regard to the presence of the black bar or stripe between the base and tornus of the forewing. This dark band, when present, is relatively wide, and rounded or truncated at the tornal end, never a thin, tapered, sharp-pointed streak as in males of *obliquata* (some females of *obliquata* may have a wider bar; e.g., see plate 2, figures 25, 26). Thus males of *tephra*, when so marked, are readily distinguishable from the correspondingly marked males of *obliquata*, and also, of course, from males of *dorsipennata*, which never possess a dark stripe. Whether striped or unstriped, *tephra* tends to be very evenly colored, especially the male, with relatively little of the contrast between brown and grayish areas of the wing characteristic of *obliquata*. It is a rather uniformly olivaceous gray-brown species, often with a violaceous sheen, especially in the median space of the forewing (most evident in Floridian specimens). Males of both *tephra* and *dorsipennata* tend to have the diffuse pattern of the hindwing somewhat better developed than usual. The antemedial line of the forewing, as in *dorsipennata*, is weakly and roundly crenulated; in *obliquata* this line is more nearly dentate. The underside of the male also is like that of *dorsipennata*, with the postmedial band straight or evenly concave on the forewing, usually evenly convex on the hindwing. In *obliquata* the band on the underside of the forewing tends to be feebly S-shaped, with a concavity opposite the discal spot and a convexity in the cubital area; the band of the hindwing is often slightly irregular, especially in the cubital area. Northern *tephra*, from the zone of overlap with *obliquata*, look less like the latter species than do Floridian ones. Unbanded males may be virtually indistinguishable from males of *dorsipennata*, but, as already indicated, the ranges are probably entirely allopatric, *dorsipennata* at the southern end of its range being confined to the Appalachians at elevations never reached by *tephra*.

Although *tephra* seems to be quite uniform throughout most of its range, specimens from Florida differ in coloring, and at first I mistook these for a different species. Florida specimens are paler, and the contrast between the greenish-gray median space and brown-shaded basal and postmedial areas tends to be more accentuated. Under magnification the scales of the forewings of these specimens show an unusually strong violaceous iridescence. Also, Floridian examples very rarely possess the longitudinal black band on the forewing (2 out of 30 examined), and they average smaller in size. Of all material examined from elsewhere, exactly 50 per cent had black-banded forewings. Specimens from South Carolina, Texas and Missouri are essentially similar, although two males that I collected at Beltsville, Maryland, 14 June 1970, have an unusually dark, greenish-gray appearance, with the antemedial and postmedial lines rather strongly outlined with black. Both have prominent black bands on the forewings. I examined a total of 106 specimens of *tephra* from 27 localities.

There appears to be nothing in the male genitalia that would distinguish *tephra* from closely allied species. The female genitalia are also extremely similar, although *tephra* seems to have a more heavily sclerotized ductus bursae than does *obliquata*. The ductus bursae is about the same length in *tephra* and *obliquata* but is slightly shorter in *dorsipennata*. The postostial pouch is wider and more shallowly invaginated than in either of the other species.

The larva, with its long, dorsal, posterior hair pencil, well-developed lateral black and subdorsal whitish plumed hairs and bright-red dorsal glands, is strikingly different from that of *obliquata*, which it might have been expected to resemble. Comparison of the larvae leaves little doubt that *tephra* is very closely related to *dorsipennata*. The hair pencils, tufts, and plumed hairs are structurally about the same in the two species, and the dorsal glands are red in both. The larvae do present a different aspect with regard to coloring, *dorsipennata* being gray, black and white, *tephra* pale yellow brown with dark plumed hairs. The hair pencils of *tephra* are not solidly black but, as in *dominickaria*, are yellow, becoming black toward the tips; the lateral hair that is gray in *dorsipennata* is light yellow brown in *tephra*, and the pale, short, plumed hairs arising from the subdorsal tubercles are a still paler yellow brown, not pure white as in *dorsipennata*. Of all species studied in which these tufts of contrastingly pale plumed hairs occur, *tephra* is the only one in which they are not white.

The only reported hosts are species of oaks. A brood was reared at McClellanville, South Carolina, on water oak, *Quercus nigra* L., by R. B. Dominick in 1971. On 6 June 1972 I had a specimen emerge that had been found 8 April as a very young larva on laurel oak, *Q. laurifolia* Michx., at Welaka, Florida. This larva completed its development on white oak, *Q. alba* L., and produced an unusually large adult.

D. tephra occurs in the area from southern Maryland to Dade County, Florida, thence west to Benton County, Missouri, and Anderson, Walker and Harris Counties in eastern Texas. In addition to the states mentioned, I have seen it only from

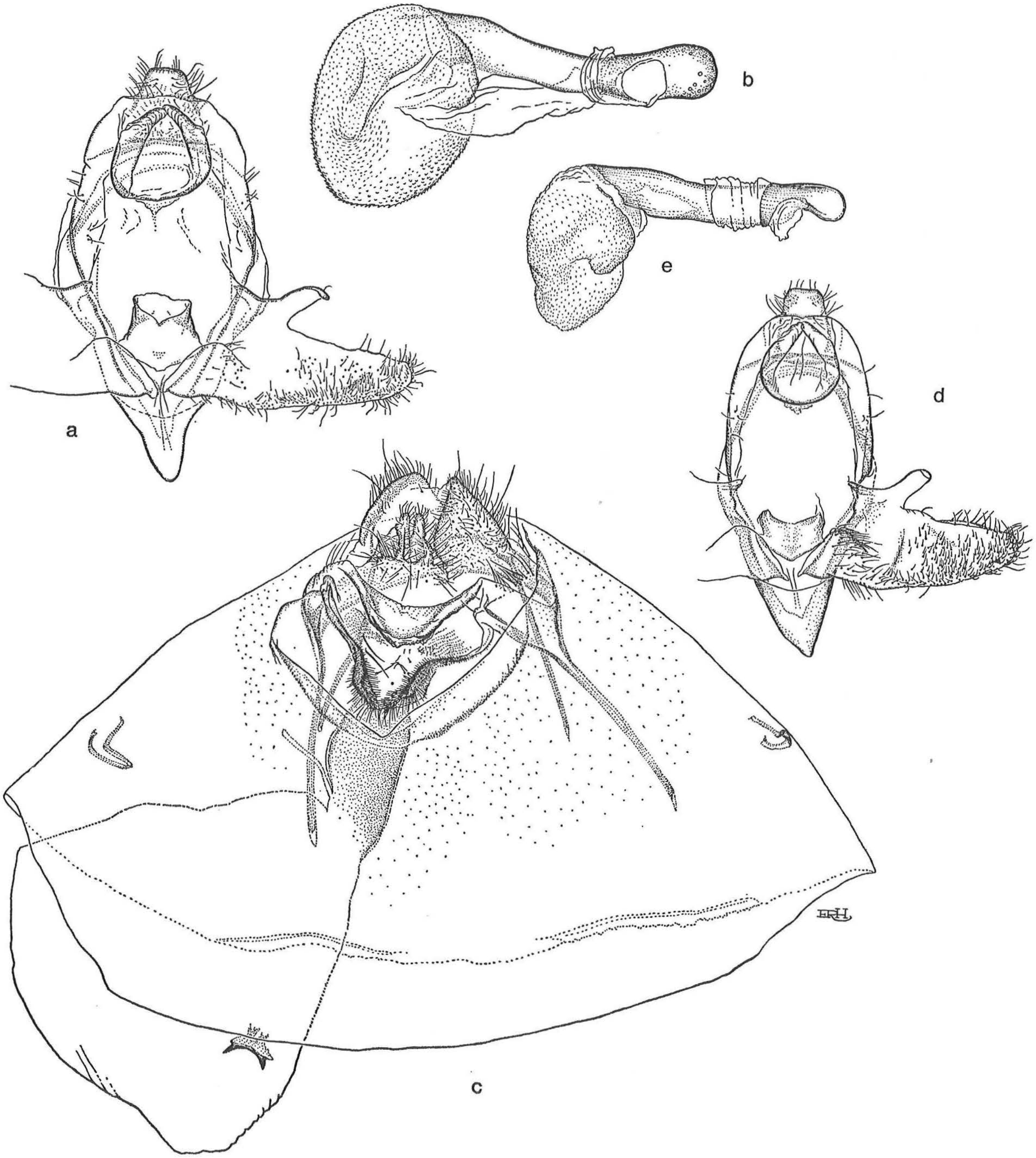

FIGURE 7: GENITALIA OF *DASYCHIRA* SPECIES

a. Dasychira tephra, male (McClellanville, S.C.).
b. Aedoeagus of same specimen.
c. Dasychira tephra, female (McClellanville, S.C.).
d. Dasychira dorsipennata, male (Annapolis Royal, N.S., reared).
e. Aedoeagus of same specimen.

South Carolina, Mississippi, Ohio and Kentucky. It is probably absent from the southern Appalachians, but extends north at least to Meade County, Kentucky, and Vinton County, Ohio, west of the mountains. Most of the material studied was from South Carolina and Florida.

The species is double brooded in most of its range, the flight periods being as follows: South Carolina and Mississippi, 10 May–11 June and 30 July–3 October; Missouri, Kentucky and Maryland, 29 May–14 June and 8 August–10 September; Texas, 22 April–6 June and 21 September–13 October. In Florida there are three main flight periods: 28 March–15 May, 13 September–14 October, and 15 November–31 December, but I have seen single records for 4 February, 6 June (reared), and 14 August.

Dasychira dorsipennata (Barnes and McDunnough)

PL. 5, FIGS. 24–34. TEXT FIGS. 3, 7 *d*, *e* (McD. 3955).

Dasychira atomaria Walker, 1856, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **7**: 1739. NEW SYNONYMY and HOMONYM (see note below).
Type-locality: Not given. [BMNH]

NOTE—*D. atomaria* Walker, 1856, is a primary homonym of *D. atomaria* Walker, 1855, *op. cit.*, p. 866, from South Africa. I examined the type of *atomaria*, 1856, which is a female, not a male as stated in the original description, and found that it agrees exactly with females of *dorsipennata* from Nova Scotia, which I regard as the probable type-locality. All other authors, following Barnes and McDunnough (1913: 67), have considered *atomaria*, 1856, to be the same species as *obliquata*.

Olene dorsipennata Barnes and McDunnough, 1919, *Can. Ent.*, **51**: 102.
Type-locality: Chelsea, Ottawa Co., Quebec. [USNM]

Although long ago recognized as distinct and correctly characterized by Barnes and McDunnough, this species has been very widely misunderstood. It has been misidentified in collections as *obliquata*, *plagiata*, *vagans* or *basiflava*, all somewhat similar looking moths that occur in the Northeast. On the basis of the larva, however, it is much more closely related to *tephra* than to any other. *Dorsipennata* is paler than *obliquata*, with less of the brown shading in the basal and postmedial areas of the forewing, and a less dentate antemedial line. It is also paler and usually better marked than *vagans*, with a less regular postmedial line, and is larger, paler and grayer than *plagiata*. At least in the males, the postmedial band on the underside of the forewing has a strong tendency to be concave; in all other northeastern species (including *basiflava*) this line is usually straight or convex. The 11 figures on plate 5 cover the range of variation fairly well. *Dorsipennata* apparently never has a black bar on the forewing, unlike most other species including *tephra*.

Specimens of *dorsipennata* collected in Nova Scotia tend to be paler and more diffusely marked than those from Maine, Quebec and elsewhere although reared examples from the same area (plate 5, figure 27) are darker and greener than caught ones.

It is doubtful whether the male genitalia can be distinguished from those of closely related species, although the female genitalia show minor characters. The ductus bursae is more extensively sclerotized than that of *obliquata* but not as wide as in *vagans*; the postostial pouch is closely similar to those of *obliquata* and *cinnamomea*, but larger than that of *plagiata* and smaller than that of *vagans*. In *plagiata* the setose ostial fold is less deeply depressed in the middle. This character is quite uniform in the other species. All of the species are so variable that it is doubtful if much reliance can be placed on individual genital characters.

The last instar larva of *dorsipennata* (text figure 3) is very distinctive for the region in which it occurs. Only those of the more southern *tephra* and *kerrvillei* are similar. Larvae of a brood that I reared in 1967 from Annapolis Royal, Nova Scotia, agree with those described by Barnes and McDunnough (1918: 130, as *willingi*, corrected 1919: 103) and are described as follows: Head and integument of body very dark; prothoracic plate light brown; dorsal glands red; two long, black hair pencils anteriorly and three posteriorly; the usual rosette-like cluster of white plumed hair arising from brownish subdorsal verrucae; hair otherwise gray, including dorsal tufts on abdominal segments one to four, except for a few long, lateral black hairs, very narrowly plumose or merely barbed, one or two arising from each subspiracular verruca. One larva of this brood was more brownish than the others, and the posterior dorsal hair pencil was brown. It should be noted that all other species on deciduous trees in the Northeast, occurring where they are likely to be sympatric with *dorsipennata*, lack the posterior dorsal hair pencil.

The larvae reared from Nova Scotia would feed on various deciduous trees and shrubs, including species of *Quercus*, *Corylus* and *Amelanchier*, but seemed to do best on willow (an unidentified, narrow-leaved species, possibly *Salix interior* Rowlee, growing in the woods at Hamden, Connecticut). In the U.S. National Museum there are five specimens from Lincoln, Maine, reared on oak by A. E. Brower, another reared by me from a larva found in Nova Scotia on birch, and four specimens of a series reared from eggs on Chinese elm, *Ulmus pumila* L., in McHenry County, North Dakota, by A. D. Tagestad. The "Type ♀" of *vagans*, which is actually a specimen of *dorsipennata*, was reared from a larva on beech at Windsor Mills, Quebec, by A. F. Winn. Barnes and McDunnough (1919: 103) reported finding larvae on oak, beech and hazel, and empty cocoons on poplar. J. C. E. Riotte (*in litt.*) found a larva on aspen at Chaffey's Locks, near Kingston, Ontario, on 15 May and reared the adult 15 June. The North Dakota larvae went into diapause in the second or third instar but were successfully kept overwinter, completing their development the following season. Those that I reared were kept from diapausing by exposure of the larvae to artificial daylight in the laboratory for 12 hours each day. They matured without interruption and yielded adults in October.

Dorsipennata occurs from Nova Scotia, Maine and southern Quebec west through Ontario, Wisconsin and Minnesota at least to Brandon, Manitoba, and McHenry County, North Dakota, and southward in the Appalachians to Balsam, Jackson County, North Carolina (3200 feet). Although I examined a total of 100 specimens from 40 localities, mostly from Nova Scotia, Maine and Quebec, I saw only seven from Ontario, five from the Appalachian region (Virginia, West Virginia, Kentucky, North Carolina), and none from the coastal United States between Maine and Virginia.

Dorsipennata is single brooded. The flight period in Nova Scotia, judging from many specimens collected over a period of 20 years, is 3 July to 2 August. Nearly all other records fall within this period except for records as early as 21 June in Oneida County, Wisconsin, and 27 June in Pendleton County, West Virginia. The Minnesota and Manitoba records are for late July; the Virginia record is for 9 July, the Kentucky record for 14 July, and the North Carolina record for 4 July, the last specimen being so worn as to indicate emergence several days previously.

Dasychira vagans (Barnes and McDunnough)

PL. 3, FIG. 19; PL. 4, FIGS. 18–36; PL. 5, FIGS. 1–13. TEXT FIG. 8 *a* (McD. 3954).

Olene vagans Barnes and McDunnough, 1913. *Contrib. Nat. Hist. Lep. N. Am.*, **2**: 60.
Type-locality: St. Johns, Quebec. [USNM]

NOTE—*Vagans* was described from two males and two females without designation of a holotype. I hereby designate as lectotype the specimen labelled "Type ♂" (plate 4, figure 18). The "Type ♀", from Windsor Mills, Quebec, is a specimen of *dorsipennata*.

Olene vagans grisea Barnes and McDunnough, 1913, *Contrib. Nat. Hist. Lep. N. Am.*, **2**: 63. SUBSPECIES.
Type-locality: Eureka, Utah. [USNM]

NOTE—*Grisea* was described from ten males and one female now in the USNM. No holotype was indicated, and I designate as lectotype the "Type ♂" herein illustrated (plate 5, figure 7).

Olene vagans willingi Barnes and McDunnough, 1913, *Contrib. Nat. Hist. Lep. N. Am.*, **2**: 64. NEW SYNONYMY.
Type-locality: Humboldt, Saskatchewan. [USNM]

NOTE—*Willingi* was described from two males, a "Type" and "Cotype", of which I hereby designate as lectotype the specimen labelled "Type ♂", herein illustrated (plate 5, figure 1).

D. vagans is the most widely distributed species of the genus, occurring across southern Canada from Newfoundland to Vancouver Island, and southward in the mountains to North Carolina in the east and Utah in the west. The adults are so variable that it is difficult to characterize the species, although there are many subtle characters that enable one, with practice, to recognize the species almost every time. It is most likely to be confused with *basiflava* or *dorsipennata* in the East; in the West there is less difficulty because it is usually sympatric only with the quite different looking *grisefacta*. *Vagans* is limited to more northern regions or higher altitudes than *basiflava*, and there may be no overlap. The postmedial line on the underside of the forewing is usually straight or convex in *vagans*, often distinctly concave in *dorsipennata*. Although some specimens of the two species may look quite alike, eastern *vagans* is commonly a much darker moth than *dorsipennata*; in males the postmedial line on the underside of the forewing is characteristically more regular than in most other species; females commonly

FIGURE 8: GENITALIA OF *DASYCHIRA* SPECIES

a. Dasychira vagans vagans, male (L. Kejimkujik, N.S.).
b. Dasychira mescalera, male (Big Bend Natl. Park, Tex.).
c. Dasychira mescalera, female (Big Bend Natl. Park, Tex.).
d. Dasychira meridionalis memorata, male (McClellanville, S.C.).

have extensive dark shading beyond the postmedial line like many *basiflava* but unlike *dorsipennata.* A form with a black bar on the forewing (plate 4, figure 22) occurs only rarely in the East, apparently never in the West.

In the male genitalia the uncus tends to be wider than that of *basiflava* but not as wide as that of *dorsipennata.* In the female, the ribbonlike, sclerotized part of the ductus bursae is wider than in either *basiflava* or *dorsipennata.*

The larva of *vagans* is easily distinguished from all others except that of *basiflava.* Both species lack the dorsal posterior hair pencil, having a low dorsal tuft only, but they do differ in several minor details, as indicated in the key, as well as in distribution. *Vagans* is evidently single brooded throughout its range.

Although five or six somewhat different populations of *vagans* may be distinguished, most of these are inadequately understood or do not have distributions that would seem to make much sense from the subspecies standpoint. I therefore recognize as subspecies for the present only the two major divisions; namely, the populations of the eastern region as *vagans,* and those of the western region as *grisea.*

Dasychira vagans vagans (Barnes and McDunnough)

PL. 3, FIG. 19; PL. 4, FIGS. 18–36. TEXT FIG. 8 *a* (McD. 3954).

Olene vagans vagans Barnes and McDunnough, 1913, *Contrib. Nat. Hist. Lep. N. Am.,* **2**: 61. Type-locality: St. Johns, Quebec. [USNM]

The nominate subspecies of *vagans* occurs in eastern Canada and the northeastern United States, southward in the Appalachians to North Carolina. The boundary between *vagans* and *grisea* seems to be the eastern edge of the Great Plains. I refer specimens from Minnesota to nominate *vagans,* but those from Manitoba and the Black Hills of South Dakota westward are *grisea.* Eastern *vagans* is highly variable, with a strong trend toward a melanistic appearance near the extremities of its range. Males from the central area, as in southern Quebec, adjacent Ontario, and New England, are relatively pale (plate 4, figures 18–22, 24–26); those from Nova Scotia and Newfoundland are nearly all extremely dark (figures 30, 31, 33), although a few paler ones do occur. The examples shown on plate 4, figures 28–31 and 32–34 are two series chosen to demonstrate the full range of variation to be expected in those provinces. Specimens resembling figures 30 and 31 are commonest in both regions. Females do not vary concordantly, the darkest ones seen being from the Catskill Mountains (plate 4, figure 27) and Adirondack Mountains, New York, New Hampshire, and Quebec. Very dark males have also been taken in Ontario (Hymers) and in the southern Appalachian region (plate 4, figure 23). Minnesota specimens are about the same as those from Maine or Quebec.

The last instar larva resembles that of *basiflava* but is extremely pale, the lateral tufts of hair being nearly white except for the few central, black, clavate, plumose hairs, variable in number, arising from the subspiracular verrucae. There is usually one black hair per verruca, but the number varies from naught to three except on the first abdominal segment, which may have five or six. The abdominal verrucae of the supraspiracular row are normally without black plumose hairs, but one individual of 36 in a reared brood was reported to have a full complement (Brittain and Payne, 1919: 66). The dorsal tufts consist of brown hair, varying from almost black to light brown, usually plentifully intermixed with white. The four hair pencils are well developed, blackish, and 6–8 mm long, the anterior ones averaging about 1 mm longer than the posterior ones. As in *basiflava,* the posterior dorsal hair pencil is lacking, being replaced by a low dorsal tuft similar to those on the first four abdominal segments but narrower and darker. The dorsal glands are coral red, unlike those of *basiflava* which are yellow or whitish. The skin of the body is grayish mottled with black. The lateral hair is unusually long, like that of *basiflava,* giving the caterpillar a very wide, flattened appearance. This description is based on a paper by Brittain and Payne (1919) describing the life history of the Nova Scotian population, on preserved larvae from the Barnes collection (USNM), and colored photographs of larvae of subspecies *grisea* obtained at Big Timber, Montana, by G. L. Godfrey and J. G. Franclemont. Larvae of the two subspecies are evidently very similar. Larvae of subspecies *vagans* feed on a variety of deciduous trees, including apple, white birch, willow, aspen and balsam poplar. Species of Salicaceae seem to be preferred. Larvae were also reported from several conifers by Prentice *et al.* (1962: 265), but I consider coniferous food plants highly improbable; the records may have been based on misidentified specimens.

Vagans is a ubiquitous and often common species in southeastern Canada and northern portions of adjacent states, but farther south it seems limited to mountainous areas. The most easterly record is for Gander, Newfoundland; the most westerly that I have seen for subspecies *vagans* is from Beltrami County, Minnesota. In addition to those areas in the eastern United States already mentioned, I have seen it from New Hampshire, Vermont, Massachusetts, from Litchfield County, Connecticut, Plattsburg, New York, New Brighton, Pennsylvania, Oneida County, Wisconsin, Schoolcraft County, Michigan, Pendleton County, West Virginia, Montgomery County, Virginia, and Henderson County, North Carolina. Even in the northern Appalachians it reaches fairly high elevations. I collected *vagans* at about 4000 feet on Mount Mansfield, Vermont, and 3000 feet at Jefferson Notch, in the Presidential Range, New Hampshire. *Vagans* is a late evening flyer and usually does not appear at light until about midnight. Then many, mostly males, may come within a brief period. However, there is one published report of two males being attracted to a caged female about midday (Brittain and Payne, 1919: 68).

In the northern part of its range generally, subspecies *vagans* flies from about 20 June to early August; most have been taken in July. The southernmost records known, those from Bat Cave, Henderson County, North Carolina, were taken 9 June (3 specimens).

Dasychira vagans grisea (Barnes and McDunnough)

PL. 5, FIGS. 1–13 (McD. 3954a).

Olene vagans grisea Barnes and McDunnough, 1913, *Contrib. Nat. Hist. Lep. N. Am.*, **2** (2): 63. Type-locality: Eureka, Utah. [USNM]

Olene vagans willingi Barnes and McDunnough, 1913, *Contrib. Nat. Hist. Lep. N. Am.*, **2** (2): 64. NEW SYNONYMY. Type-locality: Humboldt, Saskatchewan. [USNM]

Grisea is a fairly well differentiated subspecies of the Great Plains and Rocky Mountain regions westward, probably reaching the Pacific Coast in British Columbia, Washington and Oregon. The males are lighter, grayer and more evenly colored than those of subspecies *vagans*, although the median third of the forewing is often noticeably paler than the antemedial and postmedial areas. The females often show strong contrast between the pale median third of the forewing and the unusually dark antemedial and postmedial thirds (plate 5, figures 10, 11), although they are highly variable; many are more evenly grayish than eastern females. *Grisea* evidently never has a black bar on the forewing. This subspecies may be rather common, at least locally in suitable habitats; North American collections in general contain many more specimens of *grisea* than of subspecies *vagans*. In southern Utah and Colorado *grisea* may be confused with the very similar *D. mescalera*, a new species herein described.

There is some color variation within subspecies *grisea*; specimens from cooler, wetter, usually more northern areas are darker than those from more arid regions. Specimens from the Prairie Provinces of Canada were described as unusually dark (*willingi*), but of a large number examined there was little variation that I could see from the usual form occurring farther south. Material from the Black Hills, South Dakota, and the vicinity of Corvallis, Oregon, averages as dark as material from Saskatchewan, if not darker. One male from Estes Park, Colorado, 7800 feet, is also very dark. Males from Sweetgrass County, Montana (a more arid area), are paler, however, almost the same as those from Utah, although Montana females tend to remain quite dark. The palest specimens of both sexes are those from Utah. The genitalia of *grisea* are similar to those of eastern *vagans*.

My knowledge of the larva of *grisea* is based mainly on a brood from Big Timber, Montana, reared from eggs by G. L. Godfrey. Preserved larvae and colored photographs of this brood, supplied by J. G. Franclemont, agree almost exactly with the description given by Barnes and McDunnough for *willingi* (1913: 64), and also with the description of Nova Scotian larvae of the eastern subspecies (Brittain and Payne, 1919: 65). The striking feature of *vagans* larvae is that the hair is predominantly white, except for the darker dorsal tufts, the two pairs of black hair pencils, the row of long, clavate, plumed, black hairs arising from the subspiracular tubercles, and of course the grayish integument. A more detailed description is given under subspecies *vagans*.

The larvae from Montana were fed on one of the cottonwoods, a *Populus* species. Poplar was also mentioned as the food plant in the original description of *willingi*. One specimen that I identified had been reared from a larva on *Alnus* in British Columbia (CNC), and in that province it has also been reported on apple and wild rose (Llewellyn-Jones, 1934: 31). Prentice *et al.* (1962: 265) gave a list of host records for *vagans* but did not distinguish between the eastern and western subspecies. Some of these records, especially the ones from conifers, seem most unlikely. It is apparent that *Populus* and *Salix* species are preferred foods of *vagans*.

D. vagans grisea is known to occur from southern Manitoba and South Dakota west to Vancouver Island, British Columbia, and Corvallis, Oregon. The northern and southern limits are uncertain; I have seen specimens from as far north as Edmonton, Alberta, and as far south as Florissant, Teller County, Colorado. *D. mescalera* extends north into central Colorado, where the two species may meet or overlap. *Grisea* is single brooded and flies mostly in the month of July throughout its range. Surprisingly, both the earliest and latest dates are for northern localities. The range of dates for British Columbia is 14 June to 20 August; for Alberta, Saskatchewan and Manitoba, 17 June to 5 August; for Utah, Nevada and Colorado, 1 July to 9 August. In the Black Hills, South Dakota, fresh adults were collected throughout July; near Big Timber, Montana, fresh material was collected from 1 July to 18 August. It should be noted that *D. mescalera*, the species most likely to be confused with *grisea*, is later, flying mostly in August; the only other western species, *D. grisefacta*, flies about the same time as *grisea*.

Dasychira mescalera Ferguson, NEW SPECIES
PL. 5, FIGS. 14–20. TEXT FIGS. 8 *b*, *c*.

Dasychira mescalera Ferguson.
Type-locality: MacKittrick Canyon, Guadalupe Mts., Culberson Co., Texas. [USNM]

This species first came to my attention in material sent for study by André Blanchard, who had collected 23 specimens in West Texas. I subsequently found others in various collections from New Mexico, Colorado and Utah, extending the known range considerably. The male most closely resembles that of *D. vagans grisea*, whereas the female is not at all like *grisea*, having more the appearance of *basiflava*. The description follows:

MALE. Most similar to that of *D. vagans grisea* but with pattern more diffuse and simplified and with the gray-brown ground color generally more uniform; antemedial line usually prominent, and coarsely, irregularly and obtusely dentate, that of *grisea* being more often merely crenulate; postmedial line unusually regular, evenly curved and prominent in costal half of wing, often fading out toward inner margin; basal, median and outer thirds of forewing essentially concolorous, except for some slight brown shading basally and a weak concentration of whitish scaling toward costa and about discal spot; median space without the greenish tint characteristic of *D. meridionalis kerrvillei*; basal third not contrastingly darker, as is frequently the case in other species, including *vagans*; submarginal band and other markings of outer third very weak or obsolete except for thin, black, interrupted subterminal line; fringes noticeably checkered, light and dark brown; hindwing as in *grisea*. Underside of both wings as in *grisea*, averaging a little less heavily marked than in *kerrvillei*. Dorsal mesothoracic tufts of glossy, spatulate scales much more prominent than those of *grisea*, slightly more prominent than those of *kerrvillei*, and usually including a greater mixture of light, tan colored scales than either of the others; dorsal abdominal tufts somewhat larger than those of *grisea* or *kerrvillei*, black intermixed with a few brown scales of a brighter shade than is usual in the other species; vestiture of head and body as in *grisea* except that palpi are more uniformly colored a light gray brown; those of both *grisea* and *kerrvillei* have lateral patches of contrastingly darker scales on all three segments. Length of forewing: holotype, 17 mm; of male paratypes, 17–18 mm.

Male genitalia with stouter uncus and longer, more slender aedoeagus than either *vagans* or *meridionalis*; gnathos also unusually stout; valve rather angulate, costal lobe unusually long, curved.

FEMALE. Much closer in general appearance to females of *basiflava* and *meridionalis* than to those of *vagans*; forewing longer and more pointed, outer margin more nearly straight than in subspecies of *vagans*; markings somewhat more diffuse; antemedial line, as in male, with tendency to be more strongly dentate than in *vagans* or *meridionalis*, postmedial line about the same, perhaps more nearly parallel with outer margin than that of *vagans*; basal third with some brown shading like that of *basiflava*; median third gray brown as in male, with some white scales around discal spot and toward costa, faintly bluish or greenish but never as prominently tinted with green as *kerrvillei*; outer third with dark shading much reduced; dark submarginal patch or band beyond postmedial line, often intensely dark and prominent in *meridionalis* subspecies, very reduced, usually fragmented into two or more blackish patches or streaks connected by lighter brown shading; subterminal line and fringes as in male; hindwing darker, browner, more faintly and diffusely marked than in either *meridionalis* or *vagans*. Underside uniformly darker, dusky brown, with postmedial lines and discal spots more diffuse and obscure than in *vagans* or *meridionalis*, both of which tend to have ground color of underside lighter and more luteous. Vestiture of head and body and dorsal tufts as in male. Length of forewing: 22–25 mm.

Female genitalia extremely close to those of *D. vagans grisea*, perhaps indistinguishable. Laterally compressed, sclerotized ductus bursae about the same in *grisea* and *mescalera*, distinctly narrower in *meridionalis*.

TYPES. Holotype: ♂. MacKittrick Canyon, Guadalupe Mts., [Culberson Co.], Texas; 29 Sept. 1967; A. and M. E. Blanchard. Type no. 73,776, USNM (plate 5, figure 15). Allotype: ♀. Basin, Big Bend National Park Texas; 11 July 1964; same collectors. USNM. Paratypes: 39 ♂♂, 7 ♀♀. Bear Canyon, 5700′, Guadalupe Mts., Texas; 3, 4, 5 Sept. 1969 (7 ♂♂). Same locality; 2 Oct. 1969 (1 ♂, 1 ♀). MacKittrick Canyon, Guadalupe Mts., Texas; 29 Aug. 1967 (6 ♂♂). Same locality; 29 Sept. 1967 (4 ♂♂, 1 ♀). Green Gulch, Big Bend National Park, Texas; 27 June 1965 (1 ♂). Same locality; 27 Aug. 1965 (1 ♂). Same locality; 2 Oct. 1966 (1 ♀). Basin, Big Bend National Park, Texas; 4 Aug. 1964 (1 ♂, 3 ♀♀). Same locality; 10 Aug. 1964 (1 ♀). Same locality; 24 Sept. 1963 (1 ♂). Same locality; 2 Oct. 1967 (1 ♂). (All taken by A. and M. E. Blanchard). McGaffey, Zuni Mts., McKinley Co., New Mexico, 7500′; 20–24 July 1962; E. and I. Munroe (5 ♂♂). Cimarron Canyon, 7900′, Sangre de Cristo Mts., Colfax Co., New Mexico; 10 July 1962; E. and I. Munroe (1 ♂). 2 mi E of Ute Park, Colfax Co., New Mexico; 15–18 July 1974; E. L. Todd (8 ♂♂). 5 mi E of Beaver, Utah, 6300′; 28 Aug. 1965; D. F. Hardwick (1 ♂). Dalton Sprs. Camp, 5 mi W of Monticello, San Juan Co., Utah, 8500′; 13 July 1963; F., P. and M. Rindge (1 ♂). Paratypes to USNM; AMNH; AB; CNC.

DISTRIBUTION. In addition to the type material listed, I have seen specimens with the following data: Mescalero Indian Reservation, White Mountains, New Mexico; West of Wetmore, Custer County, Colorado, 11 August 1957, Margot May; Rock Green Canyon, Colorado Springs, Colorado, 13 August–3 September 1957–58, Margot May; Mount Evans, Clear Creek County, Colorado, 24 August 1957, Margot May. The Colorado series includes both sexes, and the specimens agree exactly with those from Texas and New Mexico. One of the several examples from the Zuni Mountains (CNC) is abnormally dark.

REMARKS. Nothing is known about the early stages of *D. mescalera*. Although most specimens of this species have been taken in August and September, unlike *D. vagans grisea*, which flies mostly in July, the wide range of dates from 27 June to 2 October suggests two or more generations, at least in West Texas.

Dasychira basiflava (Packard)

PL. 3, FIGS. 16–18, 20–27 (McD. 3952).

Parorgyia basiflava Packard, 1864, *Proc. Ent. Soc. Philadelphia*, **3**: 333.
Type-locality: Nonantum [vicinity of Boston], Massachusetts. [MCZ]

NOTE—*Basiflava* was based on a male from the Harris collection, now in the MCZ, but reported to be in poor condition. I have not seen the specimen but consider it highly probable that it has been correctly identified.

Parorgyia clintoni Grote and Robinson, 1866, *Proc. Ent. Soc. Philadelphia*, **6**: 3, pl. 1, figs. 2, 3.
Type-locality: Seekonk, Rhode Island. [AMNH]

NOTE—*Clintoni* was described from one male and one female, now in the AMNH. As the female is in better condition and was originally described in greater detail than the male, I hereby designate it as the lectotype (plate 3, figure 22). It bears the following labels: "E.S.", "No. 23088 Grote & Robinson Collection", "This is probably the ♀ type of *clintoni*. Compare with illustration Pr. Am. Ent. Soc. VI Pl. 1 fig. 3" [McDunnough's handwriting], "Photograph Pl. 1 No. 4", "TYPE No. [blank] A.M.N.H.", "♀ Genitalia mounted F.H.R. no. 13,590", "LECTOTYPE Parorgyia clintoni G. & R. By Ferguson, '76", "Figured in MOTHS OF AMERICA NORTH OF MEXICO." It was also figured by Barnes and McDunnough, 1913, pl. 1, fig. 4. Although faded, the lectotype agrees

> well with the Grote and Robinson figure, and there would seem to be no doubt that this is the same specimen on which their drawing was based.

Although accurately characterized by Barnes and McDunnough (1913), *D. basiflava* has continued to be misunderstood and misidentified. In the present study it proved to be a difficult species to describe, indeed probably more difficult than was realized by McDunnough. Large samples reveal more variability than was formerly known, some of the forms showing a striking resemblance to those of other species. Its relationship to *vagans* is surprisingly close, but most adults are immediately distinguishable; there is no evidence of intergradation in the limited zone of contact between the two species. It is especially closely related to *D. meridionalis* (Barnes and McDunnough), formerly regarded as a southern subspecies of *basiflava*, and to *D. matheri*, a new species known only from the vicinity of Vicksburg, Mississippi. *Meridionalis* now has the rank of a separate species, with *kerrvillei* assigned to it as one of two Texas subspecies. *Basiflava* may at times be commoner than any other species of *Dasychira*, the larva sometimes even occurring as a pest defoliating oaks.

Despite their variability and confusing resemblance to those of other species, adults of *basiflava* commonly have a characteristic appearance that I hope may be appreciated by reference to the colored illustrations. The specimens shown on plate 3, figures 16, 17, 20, 21 are fairly typical of the species throughout most of its range. Males of the "normal" form may be paler, darker or more greenish than these but commonly retain the characteristic pattern of yellow-brown patches, especially a mesial, elongated patch near the base of the forewing. However, in those examples of both sexes with a black bar on the forewing, the yellowish markings are reduced, and the patch at the base of the forewing is obliterated altogether. The form with a black bar (plate 3, figures 18, 23, 25–27) occurs throughout the range of the species but is much rarer in males than in females; it appears to be the prevalent female form from Maryland to North Carolina. Figures 24 and 25 represent "normal" and barred males (somewhat dwarfed) reared from the barred female shown in figure 23. The pale median area just behind the costa of the forewing may be suffused with white or yellowish. The postmedial line tends to be nearer the outer margin than in *meridionalis* and more sinuous than in either *meridionalis* or *vagans*. The scales comprising the dorsal abdominal tufts are usually a mixture of black and yellow and broadly spatulate in *basiflava* and *meridionalis*, all black and very slender in *vagans*, but these characters are not entirely reliable.

Males of *basiflava* with the black bar may be almost indistinguishable from the very rare, similarly marked males of *D. vagans vagans*. For example, I believe that the male shown on plate 3, figure 18, is *basiflava* and figure 19 is *vagans*. Females without a black bar are quite easily distinguished from those of *vagans* but may closely resemble females of *dorsipennata*. Confusion between these two species is likely only along the northern periphery of the range or in the Appalachians. Since black-barred females of *vagans*, *dorsipennata* and *meridionalis memorata* are unknown, females of *basiflava* with this marking should present few problems. Such specimens could be confused with similarly marked females of *tephra* in the South or with *obliquata* elsewhere, although the latter usually has a thinner bar and looks different in other respects.

Specimens from Missouri and Arkansas are more greenish than northeastern examples, with the pale area of the median space largely suffused with gray-green scales. Females from that region, which are unusually dark and greenish, differ more from the eastern form than do the males, all of which have the characteristic yellow basal patch on the forewing and are immediately recognizable as *basiflava*. In a reared brood of 9 males and 14 females from Beaver Lake, Madison County, Arkansas (*ex* Heitzman collection), only one specimen, a female, had the black bar on the forewing. However, two females from Iowa both have this marking.

I found nothing in the genitalia of either sex to distinguish *basiflava* from *meridionalis*. However, in the male the uncus is narrow; that of *vagans* is slightly wider and of *dorsipennata* usually much wider. In the female, the ribbonlike, sclerotized part of the ductus bursae is not as wide as that of *vagans* but about the same as in *dorsipennata*.

Variation in the larva of *basiflava* is perplexing and in need of further study. The last instar larva (see key page 24) is almost exactly like that of *vagans* except for its generally darker, grayer color, and at least in the northern part of its range where it might occur in contact with *vagans*, its long, slender, black, plumose, subspiracular hairs instead of the stoutly club-shaped hairs of *vagans*. Larvae of *basiflava* that I reared in Maryland had distinctly club-shaped black lateral hairs, suggesting that this character is geographically variable. However, they were longer than those of *vagans*. In a larva from Arkansas these hairs vary from slender to intermediate and are unusually numerous. *D. meridionalis memorata* has a coarser, bulkier looking larva with longer hair, and with full complements of both subspiracular and supraspiracular black plumose hairs that are all stoutly club shaped. The larva has been reported on hickory and oak, mostly on the latter. In 1972 it was common enough to be regarded as a pest on oak in Washington County, Arkansas, the larvae maturing early in the season and producing adults in June. It has been reared on white oak in Massachusetts and Maryland. A brood of larvae that I reared from Beltsville, Maryland, fed in the first instar on sweet gum, willow and various oaks but refused black cherry. They showed a distinct preference for white oak. A hymenopterous parasitoid, *Enicospilus glabratus* (Say) (Ophionidae), was reared from one of the Arkansas larvae.

Basiflava occurs from Massachusetts and southern Ontario (near Kingston) south at least to North Carolina, and west to Iowa (Sioux City), Missouri, and Arkansas. I have seen two specimens resembling the usual northeastern form labelled "Cass. Fla.", a male and female dated 15 April 1950 and 24 February 1951 respectively, but this locality record needs verification. North of the District of Columbia *basiflava* has been taken 10 June to 12 August, but mostly in late June and July. The collection dates farther south (except Florida) are 9 June to 22 July. These dates indicate that the species is single brooded.

Dasychira matheri Ferguson, NEW SPECIES
PL. 3, FIGS. 28, 29. PL. A, FIGS. 1, 2.

Dasychira matheri Ferguson
Type-locality: Bovina, Warren Co., Mississippi. [USNM]

This species is known from about 25 specimens, all collected near Vicksburg, Mississippi. At first, having seen only a few males, I regarded it as a dark form of *basiflava* with unusually bright yellowish-brown markings—perhaps a subspecies. However, three females believed to be correctly associated with the males were later collected; these are very dark and large, indeed at 29 mm (wing length) the largest specimens of *Dasychira* known, even more distinct from the corresponding sex of *basiflava* or *meridionalis* than are the males. A population of *D. basiflava* in northwestern Arkansas, the nearest known locality, appears normal for that species in every respect, showing no signs of intergradation to the Mississippi form. *D. basiflava* is not a southern species, occurring generally northward of the region occupied by *meridionalis*, and the presence of an isolated colony in the Gulf States would not be expected. I therefore believe that the Mississippi population is best treated as a closely related but distinct species, and I describe it as follows:

MALE. Similar to male of *basiflava* except for the following differences: median space of forewing between reniform and inner margin solidly or extensively shaded with dark gray brown, approaching in color a deep slate gray with a slight greenish or bluish tint; basal and outer thirds of forewing also partly shaded with the same color, which is decidedly darker than that usually found in *basiflava*; antemedial and postmedial lines as in *basiflava* except that the antemedial is often less distinct, tending to fade out mesially where it gives way to encroachment of yellow-brown shading from mid-basal area; yellow-brown markings of forewing as in *basiflava* but brighter and more prominent; these consist of a large mid-basal patch, a patch of yellowish scales associated with the reniform, and irregular, fragmented components of a submarginal band between postmedial line and outer margin; hindwing generally darker than that of *basiflava*; underside of hindwing with postmedial band tending to be closer to and more nearly parallel with outer margin. Males of *matheri* differ from those of *D. meridionalis memorata* in their consistently larger size, more obvious yellow-brown markings, and usually less distinct antemedial and postmedial lines on forewing. Of 22 males examined none has a dark longitudinal bar on the forewing. Length of forewing: 16–19 mm.

Male genitalia similar to those of both *basiflava* and *meridionalis*.

FEMALE. Forewing with median space between reniform and inner margin, as well as part of outer third, heavily suffused with dark slate as in male; brown patches in mid-basal area, just beyond reniform, and in outer third present as in male but mostly of a much darker reddish brown, rather than light yellowish brown; antemedial line weak as in male, but postmedial line rather heavy and blackish; submarginal band in outer third consisting in part of one to five blackish spots or elongate streaks, of which the innermost may form a roundish subtornal spot as in some *basiflava*; these dark submarginal markings prominent in two females but not in third, and if well developed may be more prominent than in *basiflava* or *meridionalis*; no longitudinal dark bar on forewing; hindwing and underside about as in *basiflava*.

In general female differs from that of *basiflava* in its larger size, dark slate-gray shading with a bluish sheen (lighter and greenish in *basiflava*), and somewhat warmer, reddish- to yellowish-brown tints in basal area, outer third, and vicinity of reniform (pale shading around reniform whitish in *basiflava* and *meridionalis*). Female of *matheri* differs from that of *D. meridionalis memorata* in having a much darker median space which, in *memorata*, tends to be contrastingly pale. Basal and outer thirds of forewing in *memorata* often have more black scaling than in *matheri*, increasing the effect of contrast. Except for limited pale area near reniform, *matheri* shows no strong contrast between basal, median and outer thirds of forewing. Length of forewing: holotype, 17 mm; of female paratypes, 18, 19 mm.

Female genitalia not examined.

LIFE HISTORY. Unknown, except that only one generation is indicated, adults flying from 24 June to 30 July.

TYPES. Holotype: ♀. Bovina, Warren Co., Mississippi; 26 July 1972; Bryant Mather. Type no. 73,777, USNM (plate A, figure 2). Allotype: ♂. Same locality and collector; 19 July 1971. [AMNH]. Paratypes: 15 ♂♂, 2 ♀♀. Same locality and collector; 24 June–30 July 1971–73. Paratypes to USNM; AMNH; CNC; BM.

DISTRIBUTION. Known only from the type-locality.

REMARKS. I am pleased to name this species after Bryant Mather of Clinton, Mississippi, who collected all of the known specimens and kindly made these available for study.

Dasychira meridionalis (Barnes and McDunnough). NEW STATUS

PL. 3, FIGS. 30–40; PL. 4, FIGS. 1–17. TEXT FIG. 8 *d* (McD. 3952a).

Phalaena achatina J. E. Smith, 1797, *in* Abbot and Smith, *The Natural History of the Rarer Lepidopterous Insects of Georgia*, **2**: 153, pl. 77. HOMONYM.
Type-locality: *ipso facto* Georgia. [lost].

NOTE—It is difficult to identify the Abbot figures. The male would be a fair representation of *D. meridionalis memorata* were it not that it had a dark bar on the forewing, mentioned in the text as being a "very distinguishing character". Nominate *meridionalis* and subspecies *memorata* apparently never have this marking. The female figure also shows a dark bar and is even more difficult to identify. It is possible that what Abbot had was *basiflava*, although this species is otherwise not known from that region. The larval illustration does not show the distinguishing details and could easily refer to either species. Fortunately, this problem is of little consequence because the name *Phalaena achatina* is preoccupied. It is a junior homonym of *Ph*[*alaena*] *N*[*octua*] *achatina* Sulzer, 1776, *Abgekürtze Geschichte der Insecten*, **1**: 160; **2**: pl. 22, fig. 4, and of *Phal*[*aena*] *Noct*[*ua*] *achatina* Cramer, [1780], *Uitlandsche Kapellen voorkomende in de drie Waereld-Deelen Asia, Africa en America*, **3**: 173 (index), pl. 273.E, 288.A.

Olene basiflava meridionalis Barnes and McDunnough, 1913, *Contrib. Nat. Hist. Lep. N. Am.*, **2** (2): 58, pl. 2, figs. 3, 4.
Type-locality: Lakeland, Florida. [USNM]

NOTE—*Meridionalis* was described from a "Type ♂" and "Type ♀" from Lakeland and at least eight "cotypes" (in this case the equivalent of paratypes) from several Florida localities. The type series includes two subspecies. The Type ♂ from Lakeland is referable to the pale subspecies of southern Florida, whereas three males labelled as cotypes from Island Grove and Hogart Land [Hogarth Landing] are clearly of the dark northern subspecies. The other cotypes are females, mostly from Lakeland. Inasmuch as the terms "Type ♂" and "Type ♀" were used by Barnes and McDunnough in the sense of holotype and allotype, and since the distinguishing characters of the females are uncertain, I consider that there is no option but to choose the male as the lectotype and hereby do so. This establishes the pale Floridian form as the nominate subspecies. The lectotype and the "Type ♀" were figured by Barnes and McDunnough and are again illustrated in the present work (plate 4, figures 10, 14).

Olene kerrvillei Barnes and McDunnough, 1913, *Contrib. Nat. Hist. Lep. N. Am.*, **2** (2): 59, pl. 1, figs. 7–9. SUBSPECIES.
Type-locality: Kerrville, Texas. [USNM]

NOTE—*Kerrvillei* was described from a "Type ♂" and "Type ♀", and one male and two female cotypes. I designate the "Type ♂" as the lectotype. Both "Types" were figured by Barnes and McDunnough and are figured in color in the present work (plate 3, figure 38; plate 5, figure 22).

Dasychira meridionalis memorata Ferguson. SUBSPECIES.
Type-locality: Wedge Plantation, McClellanville, Charleston Co., South Carolina. [USNM]

Dasychira meridionalis pallorosa Ferguson. SUBSPECIES.
Type-locality: Welder Wildlife Refuge, Sinton, San Patricio Co., Texas. [USNM]

That section of the genus *Dasychira* formerly included under the names *basiflava* (Packard), *kerrvillei* (Barnes & McDunnough), and *meridionalis* (Barnes & McDunnough), comprises a difficult complex, indeed the most confusing group of North American Lymantriidae with the possible exception of the *Orgyia vetusta* complex of California. Analysis of many hundreds of specimens revealed six recognizably distinct taxa rather than three, although all seem to belong to only three species. Two of these, *basiflava* and *matheri*, are not subdivided, but the third, *meridionalis*, is polytypic with four very different subspecies which might have been thought to be distinct species, depending upon how much weight one wishes to place on certain differences found in the larvae. Apparent zones of intergradation in central Florida and East Texas led me to conclude that they are subspecies. *Meridionalis* and *kerrvillei* were of course described and long regarded as belonging to different species, but the remaining two were until recently undiscovered or unrecognized.

Two of the species of this group, *basiflava* and *meridionalis*, seem to have mutually exclusive distributions, the former more northern, the latter southern. But *matheri*, which is most closely related to *basiflava*, occurs locally well within the range of *meridionalis* and in apparent sympatry with it. Although a contact zone between *basiflava* and *meridionalis memorata* must exist somewhere in the general latitude of North Carolina and Arkansas, no evidence of intergradation is known. *D. meridionalis*, in its various forms, occurs from North Carolina to southern Florida, west to southern Arkansas and to eastern and southern Texas. It has two or more generations annually, whereas *basiflava* and *matheri* appear to be univoltine.

It is difficult to characterize the species *meridionalis* because of its polytypic nature and because structural differences between adults of this group, such as might be expected in the genitalia, are nebulous at best. Excepting subspecies *kerrvillei*, which may be fully as large, *meridionalis* is a smaller species than *basiflava* or *matheri*. The median space of the forewing is much more likely to be extensively paler than the rest of the wing, forming a broad band of contrastingly lighter color across the middle; this is especially true of females of all subspecies of *meridionalis*, which are rather alike with respect to this character and usually at once distinguishable from females of *basiflava* and *matheri*. Females of all subspecies except *pallorosa* tend to be much darker in the basal and outer thirds of the forewing, increasing the effect of contrast. I found no useful characters in the genitalia.

As larvae, *memorata* and nominate *meridionalis* differ from *basiflava* in lacking most or all of the black plumose hairs on the supraspiracular abdominal verrucae, having such hairs on the subspiracular verrucae only. *Kerrvillei* differs from *basiflava* and all other known larvae of the group in having a partially developed to moderately long dorsal posterior hair pencil, a fact that casts some doubt on whether it should be referred to the same species as *memorata* and *meridionalis*. In the larval stage, nominate *meridionalis*, *memorata* and *kerrvillei* are not only distinguishable from *basiflava*, but from one another (see key page 23), an unusual situation for subspecies.

Subspecies *memorata*, whose distribution is contiguous to that of *basiflava*, differs most obviously from the latter in its smaller size, darker color of the male, more contrastingly colored female, and the consistent lack of a dark bar on the forewing in both sexes. *Memorata* differs from *matheri*, with which it is sympatric, by its smaller size, different pattern of yellowish markings in the male, and contrastingly pale median space on the forewing in the female. Males of the nominate subspecies of *meridionalis* (plate 4, figures 10–13) from southern Florida are so much lighter in color that they are more likely to be mistaken for *tephra*. However, *meridionalis* males usually have a well-defined, double antemedial line on the forewing and a median space of a different color from the rest of the wing, often shaded with gray green.

Establishing the relationship of *kerrvillei*, the distinctive Texas population, proved most troublesome. Spring brood adults in Texas are large, pale and greenish, and may somewhat resemble *basiflava*, even to the extent of possessing a dark bar on the forewing unlike other subspecies except *pallorosa*. East Texas specimens that I believe represent the summer and fall broods of the same species are smaller, darker, and closely resemble subspecies *memorata*. Later broods in central and southern Texas more nearly resemble the spring brood, and the transition to this situation may be clinal. The larva is most like that of *memorata* but has one conspicuous character by which it differs from both *basiflava* and *memorata*—a dorsal posterior hair pencil. Since the zone of intergradation as indicated by adults in eastern Texas links *kerrvillei* to *D. meridionalis memorata* rather than to *D. basiflava*, and its multiple-brooded life history and larval characters also are more like those of *meridionalis*, the treatment of *kerrvillei* as a Texas subspecies of *meridionalis* seemed to offer the best solution. *Meridionalis* again becomes strikingly pale in southern Texas, but in a way that looks very different from the pale Florida subspecies. I describe this pale Texas form as *pallorosa*, new subspecies, and the familiar form with dark males, widespread across the southeastern states, as *memorata*, new subspecies.

Dasychira meridionalis meridionalis (Barnes and McDunnough), NEW STATUS

PL. 4, FIGS. 10–15 (McD. 3952a).

Olene basiflava meridionalis Barnes and McDunnough, 1913, *Contrib. Nat. Hist. Lep. N. Am.*, **2** (2): 58, pl. 2, figs. 3, 4.
Type-locality: Lakeland, Florida. [USNM]

Nominate *meridionalis* is the light-brown form that occupies the southern half of peninsular Florida, north at least to Tampa Bay on the west coast and to Titusville, 22 miles northwest of Cape Canaveral, on the east coast. I have seen specimens from as far south as Collier Seminole State Park and Miami. Although the exact southern and northern limits are uncertain, it is definitely replaced in northern Florida as far south as Alachua and Putnam Counties by the more northern subspecies, *memorata*, which evidently does not occur as far south as Tampa and Cape Canaveral. Of many specimens examined from Gainesville, all are clearly *memorata* except two which look more like the nominate subspecies. Specimens resembling both subspecies have been taken in Volusia County, and this must therefore be within the zone of transition.

Most males of nominate *meridionalis* should be easily recognized from the colored figures, although some may be confused with males of *tephra*. However, *meridionalis* is lighter and less evenly colored, and its lines tend to be more prominent and more nearly straight. Also, nominate *meridionalis* evidently never has a black bar on the forewing. There is a slight possibility of confusion with males of *leucophaea*, especially if worn. Females are like those of subspecies *memorata* except that they tend to be slightly smaller and browner, with less black shading beyond the postmedial line. Females should be readily distinguished from those of all other Floridian species except that worn or faded examples might be confused with those of *leucophaea*.

Preserved larvae examined from Lakeland and Highlands Hammock State Park agree in having the shafts of the plumed hairs comprising the hair pencils light brown or yellowish, becoming black only toward the tips. In subspecies *memorata* the hair pencils are entirely black. There seem to be no other significant differences. The black and yellowish hair pencils resemble those of two other southern species—*tephra* and *dominickaria*. The only reported food plant is oak (species unspecified).

Of 60 light-collected specimens of nominate *meridionalis* studied, all but a few were taken in the period from January to May, mostly in February, March and April. There were single records for June, July and December, and two each for September and November.

Dasychira meridionalis memorata Ferguson, NEW SUBSPECIES

PL. 3, FIGS. 30–37; PL. 4, FIGS. 3, 8, 16, 17. TEXT FIG. 8 *d*.
Type-locality: The Wedge Plantation, McClellanville, Charleston Co., South Carolina. [USNM]

Phalaena achatina J. E. Smith, 1797, *in* Abbot and Smith, *The Natural History of the Rarer Lepidopterous Insects of Georgia*, **2**: 153, pl. 77. HOMONYM.
Type-locality: Georgia. [lost].

My identification of the type of *meridionalis* and restriction of that name by lectotype designation to the light-colored form from central and southern

Florida left the better known dark form of most of the southern states without a subspecific name. This dark subspecies is generally the commonest representative of the genus in collections from the region between the Carolinas and eastern Texas, and it has usually been identified as *meridionalis*. Barnes and McDunnough themselves confused the two forms in the type series, having inadequate material of the pale form and no knowledge of the subspecific differences. By chance they selected as "Type ♂" of *meridionalis* their only light-colored male (plate 4, figure 10), clearly representative of the southern subspecies, perhaps because it seemed the best-marked example or was part of a reared lot. I describe the common, dark subspecies as follows:

MALE. Upperside of forewing usually very dark with an area of whitish or light-yellowish scales in median space toward costa, usually encompassing discal spot; with or without patches of light brown to buff yellow near base, tornus, and in median space near inner margin; basal yellowish area may be a regular, ovoid patch in middle of antemedial space as in *basiflava*; basal space otherwise dark greenish or grayish brown except for antemedial band comprised of two separated dark lines with cocoa-brown shading between; median space largely filled with dark-greenish scaling, generally much darker than in nominate subspecies; postmedial third of wing dark suffused, varying through shades of brown and greenish gray to blackish, much of the dark scaling in fresh specimens with a purplish sheen; antemedial band and postmedial line about as in nominate subspecies, the latter tending to be more regular than in *basiflava*. Hindwing as in nominate subspecies but slightly darker. Underside light yellowish brown as in nominate subspecies, paler than underside of *basiflava* despite darker upperside; postmedial line on underside of forewing in both subspecies usually more strongly concave than in *basiflava*. Dorsal tufts of glossy scales on mesothorax and abdomen mostly black, with variable proportions of light brown to yellowish scales mixed in; yellow scales fewer than in nominate subspecies. Wing length of holotype: 15.5 mm; of male paratypes: 13–17 mm.

Male genitalia as in *basiflava*.

FEMALE. Similar to female of nominate subspecies but often darker, with a tendency to have more blackish or dark-brown shading in outer third of forewing; distinguished from *basiflava* by more regular, evenly concave postmedial line and by greater contrast between pale median space and dark basal and distal thirds of forewing. Many females would be indistinguishable from those of nominate subspecies or of subspecies *kerrvillei*. Wing length of allotype: 21 mm; of female paratypes: 18–25 mm. The size varies greatly. The female from which the holotype and allotype were reared, at 18 mm, is one of the smallest examples seen, although her 22 offspring are all of average size.

Female genitalia similar to those of *basiflava*.

LIFE HISTORY. Subspecies *memorata* has been reared from eggs several times, and its early stages are relatively well known. The caterpillars are commonly found on the trunks of oak trees, or sometimes crawling on the sides of buildings where they seek places to pupate or hibernate. It has been reared in Louisiana from larvae on Chinese elm. The last instar larva is easily distinguished from most larvae of *basiflava* by the presence of one to several club-shaped, black plumose hairs arising from each supraspiracular tubercle. It also tends to have the black subspiracular hairs shorter, more clavate and less numerous, but these characters are variable in *basiflava*. The distinguishing characters appear to be more constant in *memorata*. It differs from the nominate subspecies in having the hair pencils entirely jet black, not partially brown or yellowish. Subspecies *kerrvillei* differs in having a long dorsoposterior hair pencil. The larvae feed upon various species of oaks. Those that I reared were taken to Connecticut where they were fed *Quercus coccinea* Muench.

Memorata has at least two broods. Specimens of the spring brood are generally larger than examples collected in summer and fall but otherwise appear no different. The brood that I reared from a female taken in South Carolina in August 1968 yielded adults in October and November of the same year, although in nature these larvae probably would have diapaused partly grown and produced the spring brood the following year.

In coastal South Carolina there are two separate flight periods, judging from 43 adults collected in a light trap operated throughout the season at McClellanville. The moths occurred from 7 May to 19 June and 11 August to 7 October. The latter period may of course include a partial third brood. The dates for the northern half of Florida are 3 April to 27 May and 5 July to 14 October. Dates for Mississippi and Louisiana seem to fall into three periods, 28 April–8 June, 6 July–18 August and 7 September–18 October. For eastern Texas there are records for May, June, August and September.

TYPES. Holotype: ♂. Wedge Plantation, McClellanville, Charleston Co., South Carolina; 31 Oct. 1968; reared *ex ovo* on *Quercus coccinea* Muench.; D. C. Ferguson. Type no. 73,778, USNM (plate 3, figure 31). Allotype: ♀. Same data but em. 4 Nov. 1968. USNM (plate 3, figure 32). Paratypes: 79 ♂♂, 24 ♀♀. Same data as holotype but em. 26 Oct.–15 Nov. 1968 (11 ♂♂, 9 ♀♀). Same locality and collector; 19 Aug. 1968; (parent of reared brood) (1 ♀). Same locality and collector; 18, 19, 22 Aug. 1968, 25 Sept. 1969, 19, 21 Aug. 1971 (6 ♂♂, 2 ♀♀). McClellanville, South Carolina; 7 May–19 June and 11 Aug.–7 Oct. 1967–74; R. B. Dominick (35 ♂♂, 6 ♀♀). Charleston, South Carolina; no date or collector given (1 ♂, 2 ♀♀). Southern Pines, North Carolina; 24–31 July; Barnes coll. (1 ♂). Clinton, Hinds Co., Mississippi; 8 June, 12 July 1972; Bryant Mather (2 ♂♂). Jackson, Hinds Co., Mississippi; 25 Sept. 1971; B. Mather (1 ♂). Biloxi, Harrison Co., Mississippi; 6 July 1964; B. Mather (1 ♀). Bovina, Warren Co., Mississippi; 19 May, 7, 12 Sept. 1972, 29 Aug., 10, 20, 21, 24 Sept., 1, 3 Oct. 1973; B. Mather (15 ♂♂). Baton Rouge, Louisiana; 21 May, 25 July 1969, 19 May, 22, 23 July, 8 Oct. 1971; Gayle Strickland (5 ♂♂, 1 ♀). Same locality and collector; reared from larvae on Chinese elm; 29 April, 2 May 1969 (1 ♂, 2 ♀♀). Chemin à Haut State Park, Morehouse Parish, Louisiana; 18 Oct. 1970; G. Strickland (1 ♂). Paratypes to USNM; AMNH; CNC; LACM; WPC; BM; GS.

DISTRIBUTION. Southern Pines, North Carolina, to northern Florida, west to Arkansas County, Arkansas, and eastern Texas. The transition from the nominate subspecies to *memorata* must occur within a narrow belt between the latitudes of Orlando and Lake George, Florida, but few specimens have been seen from this zone. In Texas the range of *memorata* extends about to Houston, but immediately west of that area the population appears transitional to subspecies *kerrvillei*, with examples of the spring brood being large and pale (approaching *kerrvillei*) and those of the summer or fall broods retaining the appearance of *memorata*.

REMARKS. *D. matheri*, a large, dark species, occurs within the range of *memorata* and might be confused with it, although *matheri* is thus far known only from Mississippi. *D. meridionalis memorata* and *D. basiflava* both occur in Arkansas but perhaps not in actual sympatry.

The dark longitudinal bar of the forewing rarely if ever occurs in subspecies *meridionalis* or *memorata*, although it does occur commonly in subspecies *kerrvillei* and *pallorosa* and in *D. basiflava*.

Dasychira meridionalis kerrvillei (Barnes and McDunnough), NEW STATUS

PL. 3, FIGS. 38–40; PL. 4, FIGS. 1, 2, 4–6, 9; PL. 5, FIGS. 21–23 (McD. 3953).

Olene kerrvillei Barnes and McDunnough, 1913, *Contrib. Nat. Hist. Lep. N. Am.*, **2** (2): 59, pl. 1, figs. 7–9.
Type-locality: Kerrville, Texas. [USNM]

This is the subspecies that occurs in much of central Texas, from Anderson County and the vicinity of Houston west and south to Kerrville, and to the valley of the Rio Frio in Uvalde County. It is probably more widely distributed than available records indicate.

Kerrvillei is the largest subspecies of *meridionalis*, and the males, with a forewing length of up to 18 mm, are about the size of the largest males of *basiflava*. Full-size females have a wing length of about 25 mm and differ less from the corresponding sex of subspecies *memorata* than do the males. Males are lighter in color than those of *memorata*, with less contrast between light and dark areas of the median space. Fresh specimens of both sexes tend to have a strong greenish tint, and males especially may appear greener than any other species of *Dasychira*. Females have the median space mostly suffused with gray-green scales. A peculiar feature of *kerrvillei* is that up to ¼ or ⅓ of both sexes may be marked with a black bar on the forewing, a character shared with subspecies *pallorosa* but not known to occur in the other subspecies of *meridionalis*. In the male this black bar may be rather heavy, like that of *tephra*, or a little thinner, as in *basiflava*; in the female (plate 5, figure 23) it is like that of *basiflava* but more clearly defined and prominent. Some specimens do indeed closely resemble those of *basiflava*, but larval characters and other factors discussed elsewhere seem to link this subspecies to *meridionalis*.

The geographical and seasonal variation of *kerrvillei* proved very difficult to interpret, but fortunately some excellent Texas material has been available for study. In the approximate vicinity of a north–south line passing through Houston and extending for some distance on both sides there appears to be a zone of transition between *memorata* and *kerrvillei*. Within this zone spring brood specimens are large and may have the appearance of topotypical *kerrvillei*, whereas summer or fall brood specimens are small and dark and may still resemble normal *memorata*. Occasional examples that otherwise resemble *memorata* may have the black bar of *kerrvillei*. In south-central Texas spring and summer brood specimens of *kerrvillei* may appear much alike. Several males and one female from San Patricio County which are small and very pale, do not look much like either *memorata* or *kerrvillei*, and I describe this form as a new subspecies, *D. meridionalis pallorosa*. It appears to be a South Texas population related to *kerrvillei* in somewhat the same way as nominate *meridionalis* of Florida is related to subspecies *memorata*. Spring and fall specimens of this pale form are similar and may occur with or without the dark bar on the forewing.

The typical form of *kerrvillei* as it occurs near Kerrville or San Antonio is very distinctive, and it has been treated as a separate species since the time of its discovery. A male specimen that I reared in 1972 from a larva found on the campus of Trinity University, San Antonio, is almost an exact match for the lectotype (plate 3, figure 38), except that the forewings are a brighter mossy green, more distinctly so than those of any other specimen I have seen. The lectotype and the other male of the type lot were probably this color when fresh. The greenish tints of the females figured (plate 5, figures 21–23) have undoubtedly also faded. Were it not for the apparent intergradation in east Texas, I would have continued to treat *kerrvillei* as a distinct species.

Other species of *Dasychira* from Texas are *manto*, *dominickaria*, *tephra*, *atrivenosa* and *mescalera*, most of which are easily distinguished from *meridionalis* and its subspecies. Some males of *tephra* may appear similar, but this species is very evenly colored, virtually without any pale shading in the median space toward the costa. Some females of *kerrvillei* may be hard to distinguish from those of *mescalera* as, for example, the two shown on plate 5, figures 21 and 22; the two species are probably nowhere in contact, *mescalera* occurring in the mountains of west Texas.

I have studied three preserved larvae from a brood reared at San Antonio by Roy O. Kendall. These seem to agree almost exactly with the larvae of subspecies *meridionalis* or *memorata* except that the dorsal tuft of the eighth abdominal segment is produced to form a definite hair pencil about equal in length to the posterolateral hair pencils. The latter are slightly shorter than in *memorata*, however. The shafts of the hairs comprising the hair pencils are brownish, more like those of nominate *meridionalis* than like the solid black hairs of *memorata*; but there is the possibility that this could at least in part be a result of fading in preserved specimens. Adults obtained from this brood agree with the type material of *kerrvillei*. The larvae fed on *Juglans microcarpa* Berland. The one larva that I found was on the side of a building but had evidently come from oak trees nearby.

Subspecies *kerrvillei* has two broods per season, separated by a long interval; one brood flies in the spring mostly between 22 April and 2 June, the other in the fall mostly between 7 September and 13 October. One example was taken 20 November. Specimens reared from spring females may emerge in August or even earlier, but there seems to be no evidence of a midsummer brood in nature.

Dasychira meridionalis pallorosa Ferguson, NEW SUBSPECIES

PL. 4, FIG. 7. PL. A, FIGS. 3–6.

Dasychira meridionalis pallorosa Ferguson
Type-locality: Welder Wildlife Refuge, Sinton, San Patricio Co., Texas. [USNM]

In southern Texas occurs a small, very pale form most closely related to *kerrvillei*, but so different in general appearance that it might easily be mistaken for a different species. Its relationship to *kerrvillei* seems to correspond to that between the pale Florida subspecies, *D. meridionalis meridionalis*, and *D. meridionalis memorata*, but in some respects *pallorosa* is more extreme. A few examples from Bell County, Texas (plate 4, figure 5), are pale and appear transitional, although these retain the larger size and normal female coloring of *kerrvillei*.

MALE. Color of forewing light greenish gray, paler in and around reniform and toward costa;

lines distinct, black, slightly sinuous, about as in *kerrvillei*; yellow-brown patches in mid-basal area and outer third very weak; forewing with or without a prominent black longitudinal bar between base and subtornal spot. Hindwing variegated with light and darker brown, being paler near outer margin and around discal spot so that postmedial band and discal spot stand out rather distinctly. General aspect of upperside like that of *kerrvillei* but much paler. Underside pale yellowish brown with markings as in *kerrvillei* except postmedial line on forewing nearly always convex; much more commonly straight or concave in *kerrvillei* and *memorata*. Length of forewing: holotype, 15 mm; of male paratypes, 14–16 mm.

FEMALE. Differs from corresponding sex of *kerrvillei* much as does the male but even more distinct. Median space pale greenish gray, paler toward costa and whitish around reniform; basal third light greenish gray with a vague, light-brown mesial longitudinal streak or shade; outer third similarly greenish gray, shaded with light brown and with four small dark-brown streaks, the latter being all that remains of the much more extensive, dark-brown submarginal patch of other *meridionalis* subspecies; antemedial line brown, sinuous but not deeply so; postmedial line thinner, black, more distinct and contrasting than that of *kerrvillei* but similar in form. The one available female does not have a black longitudinal streak on the forewing. Hindwing light gray brown, paler than that of *kerrvillei*, with a diffuse postmedial band and weak discal spot. Underside like that of *kerrvillei* but a little paler; postmedial bands distinct only near costa, that of forewing nearly straight. Length of forewing: allotype, 20 mm.

LIFE HISTORY. Unknown.

TYPES. Holotype: ♂. Welder Wildlife Refuge, Sinton, San Patricio Co., Texas; 13 May 1963; A. and M. E. Blanchard. Type no. 73,779, USNM (plate 4, figure 7). Allotype: ♀. Same locality and collectors; 5 July 1975. USNM (plate A, figure 6). Paratypes: 4 ♂♂. Same locality and collectors; 5 April 1972, 4 May 1967, 5 July 1975, 10 Oct. 1964. Paratypes to USNM; AB.

DISTRIBUTION. The records given above are all that is known of the distribution of *pallorosa*.

REMARKS. This subspecies, like *kerrvillei* but unlike *memorata* and nominate *meridionalis*, may have a black streak between the base and subtornal spot of the forewing, judging from the one male paratype (plate A, figure 5) that is so marked. Although at least three broods are indicated, seasonal variation is not evident in the specimens examined.

Dasychira atrivenosa (Palm)

PL. 3, FIGS. 10–15. TEXT FIG. 9 (McD. 3957).

Parorgyia atrivenosa Palm, 1873, *Jour. New York Ent. Soc.*, **1**: 21, pl. 1, fig. 5.
Type-locality: Red River region, Arkansas [types labelled "South West Ark."]. [AMNH]

NOTE—*Atrivenosa* was described from one ♂ and one ♀, both of which are figured in this work. I hereby designate as lectotype the ♂, plate 3, figure 10.

This is the smallest species of the genus, hardly larger than species of the genus *Orgyia* but with stouter body, three distinct abdominal scale tufts and of course fully developed wings in the female. The moth is distinctive in appearance and easily recognized. The forewing is rather evenly grayish brown, weakly variegated with pale gray and brown shades, and with the cubital and medial veins outlined with dark brown. The antemedial and postmedial lines are weak, the former often missing altogether, and the tornal spot is undeveloped. The sexes are alike in color and pattern, and I have seen no evidence of polymorphism or geographical variation. The forewing length of males is 13–17 mm (usually under 15 mm), of females, 17–20 mm. Reared specimens tend to be larger and darker than caught ones.

The dark-lined cubitus is perhaps the most characteristic feature of the pattern. Although these veins may be similarly dark in some variants of *obliquata*, such specimens also have a prominent dark streak or bar in the fold between the cubitus and the second anal, a marking which is evidently never present in *atrivenosa*. *Atrivenosa* is also the only known species of *Dasychira* in which the dorsal abdominal tufting of the adult is uniformly light brown, with none of the usual dark scales mixed in, and with the tufts so strongly developed as to be confluent or nearly so on the first three segments. They tend to be repeated in much reduced form on the following two or three segments. The tufts are the longest of any

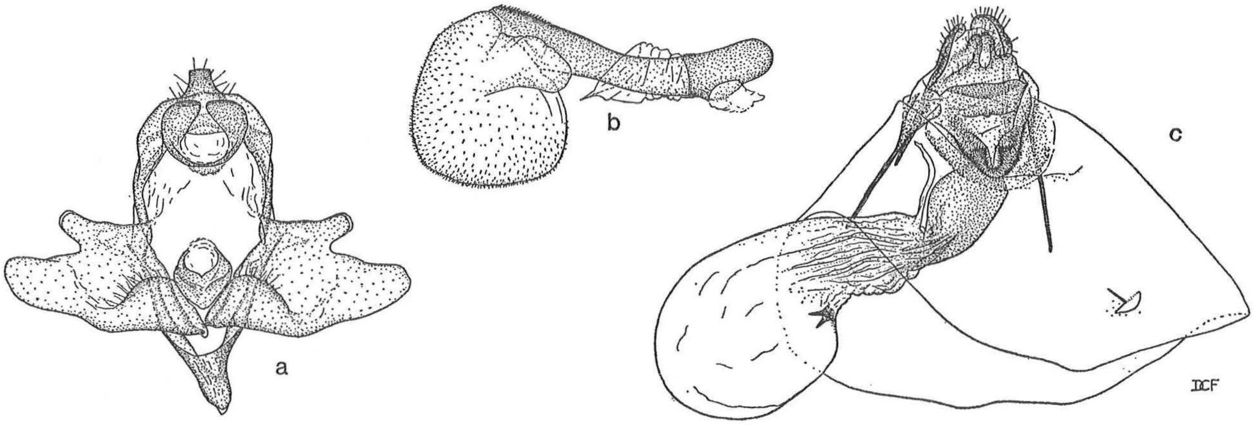

FIGURE 9: GENITALIA OF *DASYCHIRA ATRIVENOSA*
a. Male (McClellanville, S.C., reared). *b.* Aedoeagus of same specimen.
c. Female (McClellanville, S.C., reared).

species examined, rounded, and composed of narrowly spatulate scales.

The male genitalia are characterized by an unusually long and slender aedoeagus which bears, apically, a dense patch of small dorsal teeth. Although a few small teeth may occur at this location in other species, the character was not found to be as highly developed in any other species examined with the exception of *dominickaria*. The everted vesica of *atrivenosa* shows a lateral diverticulum of somewhat different shape from that found in other species. There is nothing very distinctive in the female genitalia. The ductus bursae is moderately and uniformly sclerotized, compressed and ribbonlike in the usual way but unusually wide. The preostial pouch is unusually shallow, and the configuration of the setose fold around the ostium differs somewhat from that of other species.

The mature larva is clothed in a mixture of black and white hair, giving it a silver-gray appearance. The dorsal tufts are brownish in some specimens, nearly black in others. It most closely resembles the larva of *basiflava*, having the same low, dense, dorsal, posterior tuft, but the lateral posterior hair pencils are vestigial or wanting, and the lateral hair of the body is not as long, giving the larva a more slender appearance. The rudimentary lateral hair pencils on the first abdominal segment, characteristic of *basiflava*, are wanting, and the dorsal glands appear transparent and colorless in life, unlike those of all other species examined (yellow in *basiflava*). The anterior hair pencils are coal black (fading to brown in preserved specimens), and 10–11 mm long, this being longer than the hair pencils of most other species in proportion to the smaller body length of only 22–27 mm.

I reared a large brood of *atrivenosa* from a female taken at McClellanville, South Carolina, on 10 August 1968. These completed development without diapausing and the adults emerged in mid-October. It seems likely that these would have overwintered as larvae in nature. They were reared on sweet gum, *Liquidambar styraciflua* L., and did extremely well on this food, producing offspring larger than the parent. It is not known whether sweet gum is the only host.

Atrivenosa has long remained an extremely rare species in collections. Prior to 1964 only four specimens were known to have been taken, including the two types. Since that time many more have been collected, especially in South Carolina and eastern Texas; I have examined about 50 specimens. In addition to the type-locality I have seen specimens from the following places: Cartaret County, North Carolina; Florence and McClellanville, South Carolina; Welaka, Putnam County, Florida; Bovina, Warren County, Mississippi; Hope, Arkansas; Baton Rouge, Louisiana; Town Bluff, Tyler County, Spring, Harris County, and Conroe, Montgomery County, Texas. There appear to be two broods, flying from 17 May to 25 June and again from 10 August to 6 September in the Carolinas, and from 28 April to 25 May and 8 to 28 September in Florida, Mississippi, Louisiana and Texas. There are single records for 19 and 24 July for Florence, South Carolina, and Hope, Arkansas, respectively.

Dasychira cinnamomea (Grote and Robinson)

PL. 2. FIGS. 28–36. TEXT FIG. 10 (McD. 3959).

Parorgyia cinnamomea Grote and Robinson, 1866, *Proc. Ent. Soc. Philadelphia*, **6**: 6, pl. 1, fig. 6.
Type-locality: Seekonk, Rhode Island. [AMNH]

NOTE—Grote and Robinson described *cinnamomea* from "many specimens", specifying no holotype. I hereby designate as the lectotype the male figured on plate 2, figure 28, of the present work. It has become badly faded with age.

Olene atomaria form *aridensis* Benjamin, 1922, *Can. Ent.*, **54**: 197. NEW SYNONYMY.
Type-locality: "Brown's Mills in the Pines", New Jersey. [USNM]

NOTE—*Aridensis* appears to be normal *cinnamomea* in every respect but was based on second brood reared specimens.

The cinnamon-brown coloring of this species, especially in the basal area and shading beyond the postmedial line of the forewing, and the general shade of the hindwing, make *cinnamomea* one of the more readily recognized members of the genus. Also, fresh specimens show more than the usual amount of bluish or greenish coloring in the median area of the forewing relative to other species found in the Northeast. Males are most likely to be confused with those of *obliquata*, but *cinnamomea* has a more contrastingly blue-gray median space, usually a less sharply dentate antemedial line, a somewhat more diffuse, less sharply defined postmedial line, and never a longitudinal black streak on the forewing in either sex. The males may look like those of *leucophaea* but usually lack the well-developed black and white tornal spot. Females may very closely resemble those of *leucophaea* but are generally browner, with the median space not as contrastingly pale, and they almost lack the diffuse, dark, postmedial band on the hindwing characteristic of *leucophaea* females. The dorsal abdominal scale tufts in both sexes tend to be only

FIGURE 10: MALE GENITALIA OF *DASYCHIRA CINNAMOMEA*

a. Washington, Conn., 8 Aug. 1965.
b. Washington Conn., 21 July 1967. These two examples are illustrated to show the nature of the variation that is to be expected. Other species of *Dasychira* show similar variation in the male genitalia.

about half as large as those of *leucophaea.* Although *cinnamomea* has a generally more northern distribution than *leucophaea,* the species do overlap in southern New Jersey.

It is doubtful whether the genitalia can be distinguished from those of *obliquata,* although, in the female, the laterally compressed ductus bursae appears wider and more heavily sclerotized.

Colored photographs of larvae reared at Putnam, Connecticut, were kindly provided by A. B. Klots. These show a distinctive caterpillar that need not be confused with those of *obliquata* or *leucophaea.* It is predominantly gray except for the rosettes of pure white, short, plumose hairs arising from the subdorsal tubercles of the thorax and abdominal segments five to eight, and a nearly full complement of short, black hair pencils. The posterolateral hair pencils, although reduced, are clearly present, and the posterior dorsal tuft is composed of a short gray anterior half, matching the dorsal tufts of the first four abdominal segments, and an elongated, black posterior half in the form of a half-developed hair pencil. From each of the subspiracular tubercles there arises, in addition to gray hair, a single, black, clavate, plumose hair and two or three long, slender, black, barbed hairs. The dorsal glands are red, the integument blackish, and the hair in general not as dense or long as in *obliquata.* In the collection of the U.S. National Museum there is an inflated larva of the brood from which *aridensis* was described, and this agrees with the above description except that it has become somewhat faded.

Cinnamomea was successfully reared from eggs on oak by A. B. Klots. It has also been reported on apple, and M. C. Nielsen reared an adult from a larva found feeding on a species of sedge in a Michigan bog.

The distribution is northeastern and relatively limited. It occurs in the east coast region from Bangor, Maine, to the New Jersey pine barrens, and reappears westward in Michigan, Wisconsin and Minnesota. The only reported occurrence that I found for the intervening region is for Sardinia, Erie County, New York. There are no known Canadian records although it occurs at least as far north as Clare County, Michigan. The most westerly record examined was from Anoka County, Minnesota (Heitzman collection). Most material in collections is from Connecticut, Massachusetts and New Jersey. I have seen a few specimens from Florida that resemble *cinnamomea* closely and which could easily be misidentified as this species. However, I believe that they are really variants of *leucophaea.*

The unusually long flight period follows the same pattern as for *obliquata* and, similarly, may represent only one extended brood. The capture dates for New Jersey alone, 17 July–6 September, span almost the entire recorded flight period, the only earlier date noted being one from Bangor, Maine, for 16 July.

Dasychira leucophaea (J. E. Smith)

PL. 3, FIGS. 1–9. TEXT FIGS. 11 *a, b* (McD. 3956).

Phalaena leucophaea J. E. Smith, 1797, *in* Abbot and Smith, *The Natural History of the Rarer Lepidopterous Insects of Georgia,* **2**: 155, pl. 78. Type-locality: Georgia [lost].

NOTE—Abbot (1797, pl. 78) illustrated the larva, pupa, and adult male and female. None of his figures of this species is especially good, but I believe that the female unquestionably represents the present species, the male less definitely so. I therefore designate as lectotype of *leucophaea* the female specimen drawn by Abbot, figured at the lower right corner of pl. 78. I examined two copies of this work and noted that the copy in the Beineke Rare Book Library at Yale University has the text and plates for *leucophaea* and *achatina* reversed; that is, the plate for *leucophaea* appears opposite the text for *achatina.* The arrangement in the USDA (Barnes) copy is correct.

D. leucophaea has remained a generally misunderstood and little-known species despite the early publication by Barnes and McDunnough (1913) of a reasonably accurate diagnosis. The adults are deceptively similar to those of other species, especially *cinnamomea,* having much the same bluish or greenish-gray median area and brown transverse bands associated with the antemedial and postmedial lines. However, the larva is the most easily recognized of all species in the genus. One need only rear *leucophaea* to appreciate its distinctness.

Sexual dimorphism is unusually well developed. The adult female, although resembling the same sex of *cinnamomea,* may nearly always be recognized by its unusual paleness. Extensive white scaling and a contrasting blue-gray to whitish subterminal area on the forewing are characteristic, the latter forming a uniformly pale outer band which is especially useful in distinguishing the females of this species from those of *cinnamomea, basiflava,* and *meridionalis.* Females of *leucophaea* also have a

FIGURE 11: MALE GENITALIA OF *DASYCHIRA* SPECIES

a. Dasychira leucophaea (McClellanville, S.C., reared).
b. Dasychira leucophaea, uncus and saccus of another specimen from the same reared lot to show variation in these structures.
c. Dasychira obliquata (Lakehurst, N.J.).

relatively well-defined, dusky, postmedial shade traversing the hindwing. Males have been confused with those of other species in virtually all collections as they show hardly any resemblance to the females. A rounded, black and white spot near the tornus of the forewing is characteristic of both sexes, however, and this is the only obvious distinguishing feature of the male. It has the appearance of a rudimentary eyespot. Such a spot is rarely evident, or as well developed, in males of any other species, although it may be present in females of *basiflava* and *cinnamomea*. *Leucophaea*, like *cinnamomea*, apparently never has the full-length black dash running from the wing base to the position of the tornal spot that is characteristic of dimorphic forms of several other species. It usually has a short basal dash ending at the antemedial band. The dorsal abdominal tufts in both sexes are normally larger than those of *cinnamomea*, the second tuft being as large as the first or nearly so.

I can see nothing in the male genitalia that would distinguish this species from *cinnamomea* or *obliquata*, the variation within each being such that minor differences that may be apparent in the first one or two dissections prove inconsistent when more are examined. The female has a short, wide ductus bursae, much as in *cinnamomea*, but it differs in having a ribbed, sclerotized constriction at the juncture of the ductus and the corpus bursae. This was not apparent in any other species although it may not prove constant.

The light yellowish-brown coloring of the larva is unlike that of any other known species. It has an anterior pair of long, black hair pencils, but the posterior pencils are variable. All of those in a large brood from South Carolina had only the dorsal posterior hair pencil, but Barnes and McDunnough (1913: 66) described larvae reared from Southern Pines, North Carolina, as having the full complement of three black posterior hair pencils. The integument is mostly pale except for a variable brown to blackish dorsal stripe on abdominal segments five to nine, and a similar but narrower stripe present or absent on thoracic segments two and three. The abdominal stripe may be reduced to a series of spots or nearly absent. These dark markings may fade out completely in alcohol. The dorsal glands in my reared brood were yellowish, not red as in most species; the lateral sclerites of the prolegs were described as dark by Barnes and McDunnough, but in my larvae they were pale, nearly concolorous with the adjacent yellowish integument.

Abbot's figure of the larva (1797: pl. 78) would seem to agree more closely with the present species than any other, except that the integument as shown appears too dark and bluish, and the dorsoposterior hair pencil is drawn in such a way as to appear double, which it is not. Abbot's figure also shows three posterior hair pencils, agreeing with the larvae described by Barnes and McDunnough but not with mine. The hair pencils in the figure in the U.S. Department of Agriculture copy of this work appear too pale, possibly a result of fading pigments which are now 180 years old.

The only known larval food plant is oak, except for one preserved larva labelled as having been reared from poplar. The brood that I reared accepted a variety of deciduous oaks and was fed mostly on *Quercus coccinea* Muench. Abbot (1797: 155) noted: "Feeds on the Live Oak and other Oaks." Kimball (1965: 158) reported a specimen reared from a larva on live oak at Oneco, Florida.

This species is known from surprisingly few localities. It has been taken at Lakehurst and Tom's River in the New Jersey pine barrens region, at Southern Pines, North Carolina, McClellanville, South Carolina, and at various places in Georgia and Florida at least as far south as Sarasota and Miami. One female and a preserved larva (from poplar), from the F. M. Jones collection, are labelled Martha's Vineyard, Massachusetts. It is of course to be expected from coastal Maryland and Virginia and from the Gulf States west of Georgia. North of Florida there are two broods. It has been taken in late June and early July and again in early September in New Jersey, and from 9 May to 1 June and 11 to 20 August in South Carolina and Georgia. In Florida, with records for February, March, April, May and December, the number of broods is not clear. Abbot (1797: 155) reported: "Spun up in a thin pale-brown web April 29th, and came forth on the wing the 9th of May." The brood that I reared from a female taken in South Carolina on 19 August reached larval maturity in mid-October and yielded adults in November of the same year. In nature these larvae would probably have diapaused partially grown to produce the spring brood the following May.

Dasychira obliquata (Grote and Robinson)

PL. 2, FIGS. 13–27. TEXT FIG. 11 *c* (McD. 3958).

Parorgyia obliquata Grote and Robinson, 1866, *Proc. Ent. Soc. Philadelphia*, **6**: 4, pl. 1, fig. 4.
Type-locality: Seekonk, Rhode Island. [AMNH]

Parorgyia parallela Grote and Robinson, 1866, *Proc. Ent. Soc. Philadelphia*, **6**: 5, pl. 1, fig. 5.
Type-locality: Seekonk, Rhode Island. [AMNH]

Olene lemmeri Barnes and Benjamin, 1927, *Bull. Brooklyn Ent. Soc.*, **22**: 226. NEW SYNONYMY.
Type-locality: Lakehurst, New Jersey. [USNM]

D. obliquata is usually regarded as the commonest species of the genus in the northeastern United States. It is most likely to be confused with *dorsipennata* and *tephra*, although the former is mainly more northern and the latter more southern. Females may be especially difficult to distinguish, particularly from those of *tephra*, and are sometimes best identified through their geographical and seasonal association with the more readily recognized males. Both sexes are highly variable and occur with or without a dark longitudinal line from base to tornal spot on the forewing marking the fold between the cubital vein and the second anal. In those males so marked, the dark line is a thin, sharp streak in *obliquata*, never a thick bar or dash as in *tephra* and *basiflava*. *Dorsipennata* and *cinnamomea* evidently never have this marking at all. *Obliquata*, with or without the dark streak, may usually be recognized by its coloring and general appearance, as should be evident from the colored figures. Fifteen examples are shown, covering the usual range of variation. The type of *obliquata* (plate 2, figure 20) appears unusually pale only because it has faded.

The genitalia are probably indistinguishable from those of the most closely related species. The male genitalia are like those of *tephra* except for a slightly stouter shape; they seem to differ from those of *dorsipennata* in having a larger gnathos, larger vesica, and a less acutely pointed saccus. They appear indistinguishable from those of *cinnamomea*. The female genitalia hardly differ from those of *tephra* except that the ductus bursae is not as fully sclerotized.

Obliquata has been reared and the larva described several times (Seifert, 1887; Dyar, 1894: 136; Barnes and Benjamin, 1927). It is one of the most easily recognized of all lymantriid larvae, being entirely clothed in light grayish-brown hair except for the two anterior black hair pencils and the usual dorsal tufts, which may be blackish; there are no black or white plumose hairs and no posterior hair pencils. The dorsal tufts on abdominal segments one and eight are often darker than those on segments two to four. The dorsal glands have been described as whitish or amber colored, but in colored photographs that I have studied they appeared faintly pinkish. No other species of *Dasychira* examined lacks posterior hair pencils entirely, although they may be very reduced in *atrivenosa*. *Tephra*, *cinnamomea* and *dorsipennata*, despite close similarity in adult characters, have extremely different larvae. I have not reared *obliquata* but have studied preserved larvae and photographs of a brood reared by J. G. Franclemont at Ithaca, New York. The preferred food plant is oak, but it has been reported that the larvae would also feed on hickory, beech, elm, birch and black cherry.

Obliquata occurs throughout the northeastern United States, southern Quebec and southern Ontario, west to Minnesota, Iowa, Nebraska, Missouri and, in the mountains, south at least to Macon County (3865 feet), North Carolina, Oconee County (2000 feet), South Carolina, and the Boston Mountains, Washington County, Arkansas. On the coastal plain or piedmont it is known only from as far south as Maryland and northern Virginia. Northeastward, it reaches Lincoln, Penobscot County, and Mount Desert Island, Maine, but is not known from nearby New Brunswick or Nova Scotia.

This species seems to emerge over an unusually long period wherever it occurs, but there is no clear evidence that more than one brood is involved. About 75 per cent of the adults examined were collected in August, but the frequency of earlier and later records, from mid-June to mid-September, with little regard to latitude or altitude, indicates continuous flight activity during that period. The earliest dates noted are for Bat Cave, Henderson County, North Carolina, 10 June, and Constance Bay, Ontario, 29 June; the latest is from Long Island, New York, 14 September. This information is based on data from about 200 caught specimens; reared ones were disregarded as they do not emerge at normal times. The long period of adult activity suggests that larvae may diapause in different instars.

This is the species that was known for many years as *Olene atomaria* (e.g., Barnes and McDunnough, 1913: 67; McDunnough, 1938: 137). However, when I examined the type of *D. atomaria* Walker, 1856, I was convinced that it had been misidentified and is really a specimen of the same species as *dorsipennata* (B. & McD.) (see discussion under *dorsipennata*). *D. obliquata* was treated by Holland (1903 and later editions: 308, pl. 38, fig. 9) as *O. achatina*. The name *parallela* refers to the form of *obliquata* with the dark streak on the forewing. *Lemmeri* was based on a reared brood that emerged in the fall, the authors evidently being misled by the slightly intensified coloring and reduced size that commonly result in reared material of this genus. Caught specimens from the type-locality of *lemmeri* are normal (plate 2, figures 19, 22, 23).

Dasychira dominickaria Ferguson, NEW SPECIES

PL. 6, FIGS. 1–9. TEXT FIG. 12.

Dasychira dominickaria Ferguson.
Type-locality: Wedge Plantation, McClellanville, Charleston Co., South Carolina. [USNM]

This unusually distinct species of the Southeast was entirely overlooked until 1968. It is one of the two most easily recognized members of the genus, the other being *atrivenosa*. The greenish-gray coloring of the forewing, shaded with reddish brown, and the simplified pattern are characteristic and apparently constant. The antemedial line is distinct in the male only, reduced in the female; the postmedial line is obsolescent in both sexes. The black dash between the base and subtornal spot is always present (although it may appear absent in worn specimens), and it nearly always has the form of a thin streak as in *obliquata*, not a heavy bar as in *tephra*. I first became aware of this species when shown material collected near McClellanville, South Carolina, by R. B. Dominick and C. R. Edwards. A manuscript description, first drawn up in 1969, was withheld for publication in the present work; it has since been amplified by the addition of much new information. Dr. Dominick and I succeeded in rearing the species in 1971, discovering the food plant, bald cypress, through guesswork and a process of elimination. This moth is rare in collections, and only a very few have turned up from other areas.

MALE. Upperside of forewing greenish gray with some reddish-brown shading basally, postmedially, and occasionally suffusing entire mesial area of wing from antemedial line to outer margin, leaving only costa and inner margin grayish (plate 6, figure 3); basal third with oval reddish-brown area mesially, bisected by longitudinal black dash; antemedial line thin, black, well defined, boldly crenulate, forming 2½ rounded lobes outwardly; basal line absent; postmedial line obsolete, often

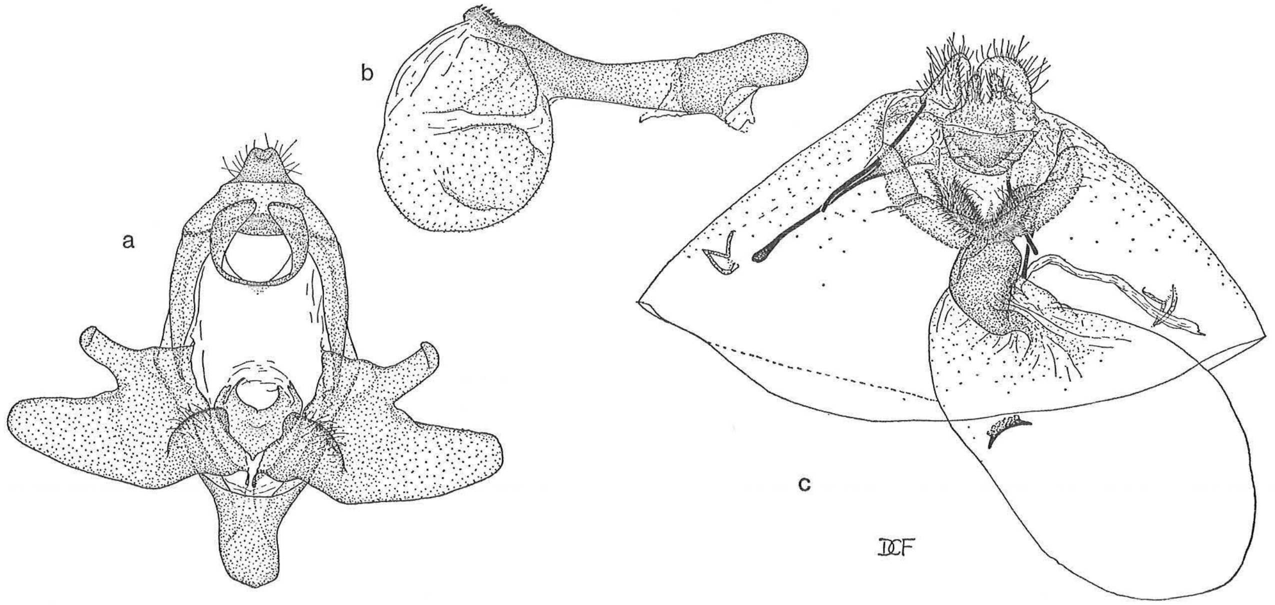

FIGURE 12: GENITALIA OF *DASYCHIRA DOMINICKARIA*

a. Male (McClellanville, S.C.). *b.* Aedoeagus of same specimen.
c. Female (Weeki Wachee Sprs., Fla.).

indicated only by a minute blackish spot at costa; submarginal band obsolescent but with its position marked vaguely by the usual dark spot with white outer edging near tornus, and three or four black dashes or points that reach or approach outer margin between radius and Cu_1; fold between Cu_2 and 2nd A marked by a thin, tapering, black streak running from base to the above mentioned subtornal spot, where it ends abruptly as in other species; discal spot poorly defined, usually surrounded by a few whitish scales, and with a faint black margin inwardly; fringes concolorous with adjacent wing, or brown, diffusely checkered with a lighter shade. Upperside of hindwings dusky brown, almost unmarked, about as in related species. Underside of both wings light dusky brown, with weak discal spots and diffuse postmedial bands of a darker shade, that of the forewing being usually slightly concave.

Vestiture of head and palpi light gray brown, the latter marked with darker scales laterally; scales of patagia light gray brown, hairy, usually with a small area of white, narrowly spatulate scales laterally near base of forewing; legs pale brownish, their heavy dorsal vestiture diffusely marked with darker shades; abdomen nearly concolorous with underside of wings, dorsal tufts dark, contrasting, larger than in any other species except *atrivenosa*; the two tufts about equal in size, dense, hemispherical in profile, touching and nearly confluent, composed mostly of blackish spatulate scales with a few yellowish ones mixed in; mesothoracic tuft similar but scales narrower, more yellowish.

Length of forewing: holotype, 18.5 mm; of male paratypes, 16–19 mm.

Male genitalia with costal lobe of valve larger than in any other species examined, and with the row of subapical teeth on the aedoeagus better developed; everted vesica also substantially larger than in any other species, but with no apparent differences in its form or finely scobinate surface.

FEMALE. Similar to male in color and pattern but with markings still further reduced. Antemedial line of forewing nearly wanting except near costa; longitudinal black streak extending from base tending to be thinner than that of male, sometimes faint; dark submarginal dashes prominent to much reduced; hindwings a little more reddish than those of male. Underside of female as in *basiflava* and other species, with slight dusting of grayish scales toward costa, and with postmedial bands incomplete, being distinct near costa on both wings, fading out before inner margin.

Length of forewing: 20–24 mm.

Female genitalia differ from those of other species by the ductus bursae meeting the corpus bursae to one side, leaving part of posterior, ribbed portion of bursa continuing beyond ductus as a blind pouch; ductus bursae and sterigma unusually heavily sclerotized.

LIFE HISTORY. Over 200 eggs of *dominickaria*, laid by a female taken at McClellanville, South Carolina, in 1971, were divided between R. B. Dominick and the writer, and the larvae reared as two separate lots. Of various plants offered, only bald cypress, *Taxodium distichum* (L.) Richard, seemed to be acceptable, and the larvae were successfully reared to maturity on foliage of this tree. Inasmuch as all known records are for places where cypress occurs, it seems likely that this is the natural host.

Last instar larva predominantly gray in general appearance, with strong mixture of darker hair; very spiny, being more formidably armed with long, black spines than any other species studied. Head dark brown, variegated with a lighter shade; body integument blackish, mottled with whitish, especially laterally; dorsal glands yellow; full complement of two anterior and three posterior hair pencils of moderate length, the longer plumed hairs comprising them bright yellow, becoming blackish only toward tips; dorsal tufts gray, with a mixture of some darker and some white hair at the outer edges; most of the long hair dorsally and laterally pale gray, except for the usual shorter, plumed white hairs of the dorsal tubercles, the unusually numerous, long, rigid, dark spines arising from the dorsal and supraspiracular tubercles, and two to four long, black, plumed, lateral hairs arising from each subspiracular tubercle. The color of the hair pencils, comprised of black-tipped yellow hairs, is distinctive. I have seen such hair pencils elsewhere only in *D. tephra* and nominate *D. meridionalis*, species not at all closely related to *dominickaria* on the bases of other characters, although they may occur in the same areas.

TYPES. Holotype: ♂. McClellanville [Charleston Co.], South Carolina; 30 May 1969; at light; R. B. Dominick and C. R. Edwards. Type no. 73,780, USNM (plate 6, figure 1). Allotype: ♀. Same locality; reared *ex ovo* on *Taxodium distichum*; 27 Nov. 1971; D. C. Ferguson. USNM (plate 6, figure 7). Paratypes: 29 ♂♂, 14 ♀♀. Reared; same data as allotype; em. 27 Nov.–28 Dec. 1971 (8 ♂♂, 5 ♀♀). WPC and USNM. Same locality and collectors as holotype; 3 May 1968, 11 May 1970, 12 May 1969, 14 May 1970, 18 May 1969, 23 May 1971, 27 May 1970, 28 May 1970, 30 May 1968, 2, 3, 9 June 1970, 6 June 1968, 10 June 1968, 1, 29 Sept. 1968, 13, 18 Sept. 1971, 3 Oct. 1967 (18 ♂♂, 2 ♀♀). WPC and USNM. Wedge Plantation, South Santee R., Charleston Co., South Carolina; 25 Aug. 1967; James W. Porter (1 ♂). YPM. Weems Property, Red Water L., Putnam Co., Florida; 29 July 1967; H. V. Weems, Jr. (1 ♀). JRH. Cassia, Lake Co., Florida; 10 May 1964; Taylor (1 ♀). BM. Weeki Wachee Sprs., Hernando Co., Florida; May 1955; J. F. May (1 ♂). CPK. Same locality and collector; 5–30 May 1956 (1 ♀). AMNH. Bayou Cong, St. Martin Parish, Louisiana; 5 June 1937; F. R. Arnhold (1 ♀). YPM. Bonnet Carre Spilway, St. Charles Parish, Louisiana; 2 May 1971; E. H. Metzler (1 ♀). Metzler coll. Edgard, Louisiana; 11 May 1973; V. A. Brou (1 ♂). Brou coll. Sunshine, Louisiana; 6 May 1972; V. A. Brou (1 ♀). Brou coll. Town Bluff (Dam B), Tyler Co., Texas; 22 Sept. 1970; A. and M. E. Blanchard (1 ♀). AB.

DISTRIBUTION. *D. dominickaria* has been taken only in coastal South Carolina, Florida, Louisiana, and eastern Texas.

REMARKS. I am pleased to name this extraordinary species after Richard B. Dominick, who supplied most of the material, including the eggs from which the reared brood was obtained. Because of his intensive field work and fortunate location, *dominickaria* has already become well known. One of the specimens collected in the large, walk-in light trap at the Wedge Plantation is most unusual in having its entire head still encased in the last instar larval head capsule, although it is otherwise a normally developed adult. It seems incredible that such a moth would have been attracted to light with the eyes and antennae aborted in that way.

Dasychira plagiata (Walker)

PL. 6, FIGS. 10–31 (McD. 3961).

Edema ? plagiata Walker, 1865, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **32**: 427.

Type-locality: "Orilla, West Canada" [Orillia, Ontario]. [BMNH]

NOTE—Described from one specimen which is a female, not a male as stated by Walker. The type was illustrated by Barnes and McDunnough (1913: pl. 7, fig. 3).

Olene montana Beutenmüller, 1903, *Bull. Amer. Museum Nat. Hist.*, **19** (23): 585. NEW SYNONYMY.
Type-locality: Summit of the Black Mts., North Carolina, altitude about 6000′ to 6715′. [AMNH]

NOTE—*Montana* was described from five larvae collected by Beutenmüller on June 7, probably of 1903, and from two adults, a male and a female, that he reared from them. The immature larvae were beaten from branches of "Balsam fir . . . and black spruce . . ." [actually Fraser fir, *Abies fraseri* Poir., and red spruce, *Picea rubens* Sarg.]. The female type (plate 6, figure 30) is in better condition than the male, and I hereby designate it as the lectotype of *montana*. Both types were figured by Barnes and McDunnough (1913: pl. 6, figs. 8, 9). Three other examples from the mountains of North Carolina are illustrated in the present work (plate 6, figures 22, 24 and 31).

Olene interposita Dyar, 1911, *Proc. Ent. Soc. Washington*, **13**: 18. NEW SYNONYMY.
Type-locality: Tryon, North Carolina. [USNM]

NOTE—Described from one male and one female. I hereby designate as the lectotype the male, herein figured (plate 6, figure 22). Both types are in good condition and are undoubtedly the same species as *plagiata*.

Olene pini Dyar, 1911, *Proc. Ent. Soc. Washington*, **13**: 19.
Type-locality: North Saugus, Massachusetts. [USNM]

NOTE—Described from nine males and eight females reared from larvae on pine (species unspecified). I designate as lectotype the male herein illustrated (plate 6, figure 17).

D. plagiata is the most northern of the conifer-feeding species of this genus in the eastern half of the continent, occurring in the Transition, Canadian and Hudsonian Zones from Newfoundland and Goose Bay, Labrador to Alberta, southward to Massachusetts and central New York and at higher elevations in the Appalachians to the Great Smoky Mountains, North Carolina. A series of 19 that I studied from Marquette, Roscommon, Schoolcraft, Otsego, Chippewa and Cheboygan Counties, Michigan, were all normal *plagiata*, but one from Rogers City, Presque Isle County, plus all of those seen from Wisconsin, are referred to *pinicola*. *Plagiata* is the only eastern species of the genus known to feed on spruce, fir, larch and hemlock, although it evidently also feeds on species of pine as do *pinicola* and *manto*. Near the southern edge of its range *plagiata* has been and will continue to be confused with the closely similar *pinicola*, which appears to be a distinct species. Very little overlap in distribution would be expected between *plagiata* and the more southern *manto*, although both have been collected at an elevation of 3865 feet at Highlands, North Carolina. The western limits of *plagiata* are uncertain because of confusion with *grisefacta*. Although a distribution map published by the Canadian Forest Insect Survey (Prentice *et al.*, 1962: 267) shows numerous records for Saskatchewan and Alberta which may well be correct, I have seen definite records only from as far west as Manitoba.

Plagiata has many forms, and it is difficult to specify definite characters by which it may be recognized. It averages smaller than *pinicola* and is commonly darker and browner in coloring. The heavy frosting of white scales so common in *pinicola* is rare and never as highly developed in *plagiata*, although the latter does have a form with a contrastingly pale median space (plate 6, figures 15, 16). Although variable in both species, the postmedial line of the forewing near the costa in *plagiata* is commonly recurved opposite the discal spot to meet the costa at an angle of less than 90° (i.e., an acute angle on distal side of line); in *pinicola* the postmedial line tends to be less curved on approaching the costa so that it usually makes an angle of 90° or more (thus a right angle or obtuse angle on distal side of line). With respect to this character *manto* resembles *pinicola*, and *grisefacta* is like *plagiata* or intermediate.

The male genitalia are indistinguishable from those of *pinicola* but seem to differ from those of *grisefacta* in their slightly shorter aedoeagus and from *manto* in the shape of the valve, uncus and juxta. The female genitalia hardly differ from those of *pinicola*, but the transverse, troughlike cavity immediately anterior to the V-shaped, setose rim of the ostial opening tends to be deeper in *plagiata*, forming a large fold which may partly or entirely cover the ostium. Unfortunately, this character is highly variable in both species. *Grisefacta* and *manto* both differ in having much heavier anterior apophyses which are broadly flattened. Also, the latter has a more heavily sclerotized ventral pouch posterior to the ostium, and the former has a longer ductus bursae.

The highly developed variation of *plagiata* is partly but not entirely geographical. Melanic individuals (plate 6, figures 25, 28) occur widely, but those of certain northern or high altitude populations tend all to be dark suffused. This is the case in Newfoundland and the Gaspé Peninsula (plate 6, figures 10, 12) and perhaps also on the highest mountains of North Carolina (plate 6, figures 24, 30). In southern New England and central New York *plagiata* is unusually small and rather clearly marked (plate 6, figures 17–21), with a high proportion having a dark basal dash that appears only rarely in Canadian specimens. The form with the pale median band (plate 6, figures 15, 16) is prevalent in northern New England but rare elsewhere.

The larva of *plagiata* is characteristic of the group, being predominantly dark grayish in color, with a full complement of two anterior and three posterior black hair pencils which tend, however, to be short and sparse. The large dorsal brushlike tufts are grayish brown with a few white plumed hairs interspersed, and, at the lateral edges, tufts of short, pure-white plumed hairs arise from the subdorsal tubercles on thoracic segments two and three and abdominal segments five to eight, the tuft on segment five being largest. There is a single lateral row of black, club-shaped, plumed hairs arising from the subspiracular tubercles, one or two from each tubercle except that on the first abdominal segment which may have three or four. The dorsal glands are red as in closely allied species. I am not sure that the larva of *pinicola* is distinguishable, but that of *manto* has much longer and fuller hair pencils, longer spines, and darker dorsal tufts on the first four abdominal segments. The larvae of *grisefacta* studied were conspicuously different from all three eastern members of this group in their coloring and in having two lateral rows of black clavate hairs.

This species has been reported feeding on white, black and red spruce, balsam fir, Fraser fir, eastern larch, eastern hemlock, jack pine, white pine and red pine, and it is to be expected that it will feed on any species of these genera. The greatest number of host records reported by the Canadian Forest Insect Survey (Prentice *et al.*, 1962: 267) were for white spruce and balsam fir. I have found adults abundant at light in many places where fir and species of spruce would have been the only available hosts. However, where adults have been collected many times near Ithaca, New York, the food plants must be hemlock or white pine, and at Concord, New Hampshire, I once collected specimens in an almost pure stand of white pine, the only suitable host in evidence. The status of the population that occurs as a serious pest of jack pine in Wisconsin and Minnesota and which has been reported in the literature under the name *plagiata* is still somewhat in doubt, but for purposes of the present work I treat it as a distinct species, *D. pinicola.*

Plagiata has one brood and the larvae hibernate partly grown, completing their development in May and June. The adults fly mostly in July (30 June–5 August), but in Connecticut I collected a few specimens as early as 21 June.

Dasychira pinicola (Dyar), NEW STATUS
PL. 6, FIGS. 32–47 (McD. 3961a).

Olene pinicola, new variety of *pini* Dyar, 1911, *Proc. Ent. Soc. Washington*, **13**: 20.

Type-locality: Douglas Co., Wisconsin. [USNM]

NOTE—*Pinicola* was described from eight male and fifteen female syntypes, all reared. I hereby designate as lectotype a male dated 20 July 1910, bearing Carl Heinrich's genitalia slide number 14 Oct. 1930 #2 and my lectotype label.

This long overlooked species of the pine-feeding group averages larger than *plagiata*, tends to be heavily dusted with white scales and to be grayer, less brownish in coloring. Both species are highly variable, but their ranges of variation are different, each having forms that do not occur in the other, as I have tried to indicate by the specimens selected for illustration. Females of *pinicola* do not have the contrasting patch of white scales surrounding the discal spot, so characteristic of *plagiata*, or at least it does not stand out as a prominent feature. Some females look quite like those of *dorsipennata*, whereas *plagiata* females should never be mistaken for *dorsipennata.*

Differences in the postmedial line on both the upperside and underside of the forewing are at least of statistical significance for distinguishing this species. The postmedial line of the upperside in *pinicola* tends to be straight or only slightly curved on approaching the costa; it is more often strongly bent inward in *plagiata* (both sexes). This line on the underside of males of *pinicola* is usually concave; it is more frequently straight or convex in *plagiata.* Of more than 100 males of each species examined for this character, the postmedial of the underside of the forewing was distinctly concave in 80 per cent of the *pinicola* but in only 40 per cent of the *plagiata. Pinicola* is easily distinguished from *manto*, which is a less variable but more contrastingly marked southeastern species with darker, more heavily brown-shaded basal and outer areas. Characters of the genitalia were discussed under *plagiata*.

Specimens from the Great Lakes region average darker than those from New Jersey and Massachusetts, and the postmedial line of the forewing tends to have more of an inward curve at the costa; otherwise the moths from the two areas appear so similar that they must be regarded as the same species. The extremely dark form from Nelson County, Kentucky (plate 6, figures 32, 33) is distinctive, and I am not entirely certain that it belongs here.

The larva is evidently similar to that of *plagiata*, although little material has been available for study. A brood that I reared from Lakehurst, New Jersey, differed from at least some *plagiata* in having longer, better developed hair pencils. Although they were from a population associated with *Pinus virginiana* and *P. rigida*, these larvae were successfully reared on *P. banksiana*, the host of the Wisconsin and Minnesota populations.

D. pinicola has a narrow and seemingly disjunct distribution that lies between that of the more boreal *plagiata* and the more southern *manto*. It occurs in association with *P. rigida* Mill. or *P. virginiana* Mill. in an East Coast zone that includes the New Jersey pine barrens, Long Island, and the Cape Cod region of Massachusetts, and with *P. banksiana* Lamb. in the Great Lakes pine forest of northern Wisconsin and Minnesota. I have also seen a few specimens from Rogers City and Ironwood, Michigan, a series of 64 from One Sided Lake, in the Kenora-Lake of the Woods district of western Ontario, and those already mentioned from Kentucky. It is interesting to note that specimens from southeastern Massachusetts (East Wareham and Martha's Vineyard) are *pinicola*, whereas those from North Saugus, north of Boston (types of *pini* Dyar), and from Litchfield County, Connecticut, are *plagiata*.

Collectors should look for *pinicola* in other northeastern pine forest areas such as the pitch pine woods of Rhode Island, Connecticut, Pennsylvania, and the vicinity of Albany, New York. The species that I collect near my home in Maryland is *manto*, not *pinicola*, although this locality is hardly more than 100 miles WSW of the New Jersey pine barrens where *pinicola* is abundant. In northern New England and the Atlantic Provinces only *plagiata* has been taken, but in the Great Lakes region there are areas where both *pinicola* and *plagiata* should be present.

In New Jersey *pinicola* is double brooded, but in Massachusetts and the Great Lakes region it appears to be single brooded. The first brood in New Jersey flies from the last week of May to mid-June, and the second brood in August, with occasional first brood stragglers in the intervening period. Those that I reared from a spring brood female in 1956 emerged 9 to 16 August. The Massachusetts records are for 29 June to 11 August, and in Michigan, Wisconsin, Minnesota and southwestern Ontario the emergence time is probably about the same, the available records being for 5 to 31 July. The species overwinters as a first or second stage larva.

This species may be extremely abundant where it occurs, and there have been periodic outbreaks of two or three years duration resulting in serious defoliation of jack pine in Wisconsin and Minnesota. Many thousands of acres were so affected in Douglas, Bayfield, Polk and Burnett Counties, Wisconsin, and Pine, Carleton and Crow Wing Counties, Minnesota, between 1950 and 1970. A light infestation was also reported in a planting of red pine in Oneida County, Wisconsin (unpublished Insect Pest Survey reports, U.S. Department of Agriculture, under the name *Dasychira plagiata*).

Dasychira grisefacta (Dyar)

PL. 7, FIGS. 10–21. TEXT FIG. 13 *a* (McD. 3963).

Olene grisefacta Dyar, 1911 (31 March), *Proc. Ent. Soc. Washington*, **13**: 20.
Type-locality: Glenwood Springs, Colorado. [USNM]

NOTE—*Grisefacta* was described from two males and three females, of which I hereby designate as lectotype the male figured on plate 7, figure 10. It is labelled "Glenwood Spgs. Colo.", "Aug. 16–23", "Collection Dr. W. Barnes", "Probably Cotype, FHB, 1933". A lectotype label has been added. I have determined that this specimen is one of the five syntypes, all of which are in the USNM.

Olene styx Barnes and McDunnough, 1911 (October), *Psyche*, **18**: 159, pl. 13. HOMONYM.
Type-locality: Duncan [Vancouver Island], British Columbia. [USNM]

NOTE—When assigned to the genus *Dasychira*, the name *styx* of Barnes and McDunnough becomes a secondary homonym of *D. styx* Bethune-Baker, 1911, *Ann. Mag. Nat. Hist.*, series 8, **7**: 550, from Angola, Africa. Both descriptions were published in the October 1911 numbers of their respective journals, and I have not been able to determine which is the older. Consequently, I follow Bryk (1934: 58) in treating *styx* Barnes and McDunnough as a junior homonym and in using *ella* Bryk as a replacement name.

Olene bonniwelli Barnes and Benjamin, 1924, *Contrib. Nat. Hist. Lep. N. Am.*, **5** (3): 185. NEW SYNONYMY.
Type-locality: High Rolls, New Mexico. [USNM]

Dasychira ella Bryk, 1934, *Lepidopterorum Catalogus*, **62**: 58. SUBSPECIES.
Type-locality: Duncan [Vancouver Island], British Columbia. [USNM]

NOTE—This was proposed as a replacement name for *D. styx* (Barnes and McDunnough), which was regarded by Bryk as a junior secondary homonym of *D. styx* Bethune-Baker, 1911. *Ella* assumes the same type and type-locality as the name that it replaces.

D. grisefacta is the widely distributed conifer-feeding species of the West. The adults differ from those of the closely allied eastern species in their more uniform grayish coloring, except for subspecies *ella* which is melanistic, and the larva differs most noticeably in having two lateral rows of black, clavate, plumed hairs. The only other member of the genus likely to be found with *grisefacta* throughout most of its range is *D. vagans grisea*, which should be readily distinguished by reference to the illustrations. Like *manto*, *D. grisefacta* is relatively constant in color and pattern in any given locality. The great range of variability characteristic of *plagiata* and east coast *pinicola* is entirely lacking, although there is some geographical variation. I recognize two subspecies.

Dasychira grisefacta grisefacta (Dyar)

PL. 7, FIGS. 10–17. TEXT FIG. 13 *a* (McD. 3963).

Olene grisefacta Dyar, 1911, *Proc. Ent. Soc. Washington*, **13**: 20.
Type-locality: Glenwood Springs, Colorado. [USNM]

Olene bonniwelli Barnes and Benjamin, 1924, *Contrib. Nat. Hist. Lep. N. Am.*, **5** (3): 185. NEW SYNONYMY.
Type-locality: High Rolls, New Mexico. [USNM]

The nominate subspecies should be recognized easily by reference to the figures, if one bears in mind that throughout most of its range it is sympatric only with one other species of this genus, *D. vagans grisea*. In southern Colorado and New Mexico *grisefacta* evidently comes into contact

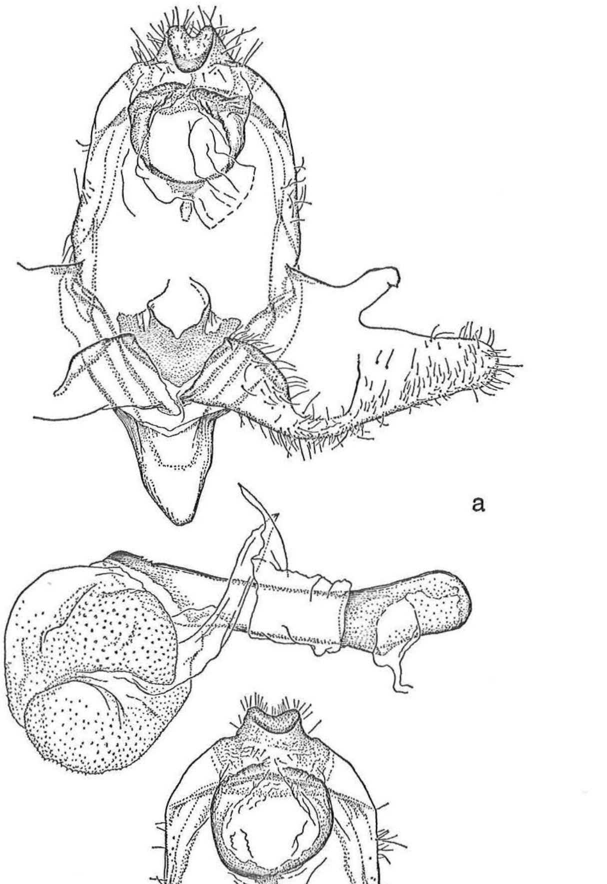

FIGURE 13: MALE GENITALIA OF *DASYCHIRA* SPECIES

a. Dasychira grisefacta, lectotype (Glenwood Sprs., Colo.).
b. Dasychira manto (Welaka, Fla., reared).

with *D. mescalera* which, like *grisea*, has a still more even, less variegated, grayish or gray-brown coloring (in males) and a more regular postmedial line. Females of these two species have the postmedial line generally almost straight, although somewhat waved; that of *grisefacta* is decidedly curved. It is to be expected also that *grisefacta* overlaps with *plagiata* in Alberta or Saskatchewan, where the latter species reaches its western limits. Nominate *grisefacta* is of course immediately distinguishable from its very dark colored north Pacific Coast subspecies, *ella*. The New Mexican population described as *bonniwelli* is slightly darker than most *grisefacta*, with the lines thicker and more diffuse, but is hardly separable. I do not think that the minor differences emphasized in the original description are of specific or even subspecific significance.

The male genitalia of *grisefacta* show a tendency to have a slightly larger, wider costal process on the valve than do those of *plagiata* or *pinicola*, and the patch of small teeth near the end of the aedoeagus seems to be better developed. Female differences are slight, but the apophyses are stouter than in *plagiata* and *pinicola*, nearly the same as in *manto*, and the sclerotized ductus bursae seems longer than in any of the allied species.

Larvae of *grisefacta* reared on pinyon pine in Arizona by J. G. Franclemont are described as follows: Body integument blackish, mottled with yellow brown; dorsal brushlike tufts rather light brown, uniformly colored; all hair pencils black, long, well developed as in *manto*; lateral, club-shaped, black plumose hairs arising from both supraspiracular and subspiracular tubercles, sometimes one but more often three or more from each tubercle, thus much more numerous than in any of the allied species; subdorsal tufts of short, pure white, plumed hairs relatively conspicuous, especially on thoracic segments two and three, and longer lateral whitish hairs from supra- and subspiracular tubercles also quite numerous and conspicuous; dorsal glands bright red; quill-like spines black. The more numerous or conspicuous plumed hairs, both black and white, especially the double lateral row of black clavate hairs, give the larva of *grisefacta* a relatively distinctive appearance. One preserved larva from Mandan, North Dakota, seems to agree with the foregoing description except that it has additional black clavate hairs arising from the ventrolateral tubercles of thoracic segment three and abdominal segments one to three, but this may be an abnormality.

Nominate *grisefacta* has been reported mainly from Douglas fir, western hemlock, white and Engelmann spruce, alpine fir and western larch in British Columbia and southern Alberta (Prentice *et al.*, 1962: 268), from ponderosa pine in eastern Montana and South Dakota, spruce at Mandan, North Dakota, and piñon (*Pinus edulis* Engelm.) in Arizona. Like *D. plagiata*, this species will evidently feed on a wide range of coniferous hosts. It may occasionally be of some economic importance. A U.S. Forest Service insect survey summary reported the defoliation of about 42,000 acres of ponderosa pine near Ashland and Fort Howes, Montana, in 1965 by a *Dasychira* species, which must have been *grisefacta*.

The nominate subspecies of *grisefacta* occurs at least from central British Columbia and the mountains of Alberta south throughout the Rocky Mountain system to Arizona and New Mexico. I have taken it in the Black Hills, South Dakota, and it evidently occurs as far east as Mandan, North Dakota, based on the one preserved larva mentioned (USNM). It is single brooded and flies from early July to the first week of August throughout most of its range, but the capture of fresh specimens as late as 21 August in Walnut Canyon, near Flagstaff, Arizona, suggests the possibility of two broods in that region.

Dasychira grisefacta ella Bryk, NEW STATUS PL. 7, FIGS. 18–21 (McD. 3962).

Olene styx Barnes and McDunnough, 1911, *Psyche*, **18**: 159, pl. 13. HOMONYM.
Type-locality: Duncan [Vancouver Island], British Columbia. [USNM]

Dasychira ella Bryk, 1934, *Lepidopterorum Catalogus*, **62**: 58.
Type-locality: Same as for *Olene styx.*

This is an almost black, melanic form known only from the north Pacific Coast region, where it evidently replaces the normal form. The usual lines and discal spot of the forewing show only faintly or not at all, but the white tornal spot is usually distinct. The hindwings are not black but are a darker brown than those of nominate *grisefacta.*

I have been able to examine only one very poor preserved larva of *ella*, from Junction City, Oregon, and such characters as could be seen were undoubtedly those of *grisefacta*. This larva had the double lateral row of black, clavate, plumed hairs characteristic of that species. It had been found on blue spruce. No other specific host information is available.

Most material of *ella* in collections is from Vancouver Island, but I have also seen specimens from Thurston, Cowlitz and Wahkiakum Counties, Washington, Benton County, Oregon, and the one larva mentioned from Junction City, also in the Willamette Valley, Oregon. The collection dates mostly fall within the period 3 July to 9 August, but I have seen examples taken as late as 19 August at Cathlamet, Washington, and 21 August at Duncan, Vancouver Island.

Dasychira manto (Strecker)

PL. 7, FIGS. 1–9. TEXT FIG. 13 *b* (McD. 3960).

Parorgyia manto Strecker, 1900, *Lepidoptera, Rhopaloceres and Heteroceres, indigenous and exotic,* Suppl. **3**: 29.
Type-locality: Stewart Co., Georgia. [FMNH]
NOTE—Described from one male which was figured by Barnes and McDunnough (1913: pl. 7, fig. 4).

This southeastern species is easily distinguished from *pinicola* and *plagiata* by its appearance, which is characterized mainly by heavier markings and more intense brown shading before the antemedial line and beyond the postmedial line. The outwardly sinuous brown band immediately beyond the postmedial tends to be unusually well defined, contrasting sharply with the pale-shaded submarginal area, and the entire basal area tends to be suffused with dark scales. The postmedial line is usually not strongly curved inward toward the costa, in this respect resembling that of *pinicola* rather than *plagiata*. *Manto* is relatively constant, lacking the wide range of color forms found in the other two species. There is considerable size variation, late summer specimens being smaller than early ones, but the largest examples of *manto* exceed in size by a substantial margin all other moths of the conifer-feeding complex in this genus. There is little evidence of geographical variation.

In the male genitalia, *manto* differs from *plagiata* and *pinicola* in having longer, less pointed and more heavily sclerotized valves, each with a longer costal process. The female genitalia of these three species hardly differ, although in *manto* the apophyses are stouter and flattened as in *grisefacta*, and the setose lip of the ostium seems unusually large, being longer from side to side than the length of the sclerotized section of the ductus bursae. Unfortunately such characters are so variable that they are unreliable, as one female *plagiata* from Newfoundland that I dissected had the sclerotized lip even larger than that of *manto*.

The larva of *manto* has very long and full hair pencils, and the barbed, quill-like spines are blackish and tend to be longer than in *pinicola* or *plagiata*. It is geographically variable. Of broods that I reared from Welaka, Florida, and Beltsville, Maryland, those from Florida had longer spines and longer hair in general, and the subspiracular black plumose hairs were sharp pointed, being more lanceolate than clavate. These hairs were clavate in the Maryland larvae, nearly as stoutly so as in *pinicola*, although the larvae did differ from *pinicola* in having black spines and more black barbed hairs. *Manto* probably feeds on any of the southern species of pine. The larvae seem to be easily reared on whatever is available, and mine were fed *Pinus virginiana* and *P. banksiana*.

The species is known to occur from Beltsville, Maryland, and Harlan, Kentucky, to Miami, Florida, and westward to the vicinity of Houston, Texas. It is often a common species in the pine woods of the Deep South but has never to my knowledge been reported as a pest. There are at least two and possibly three broods. In South Carolina the main flights occur in April to May and September to October, but scattered records extend over long periods, as follows: 29 March–25 May, 10 June, 30 July, 28 August, 17 September–24 October. In Texas there are two well-defined flight periods, 22 March–15 May and 13 September–13 October. In Maryland I have taken it in June and August.

Manto and *plagiata* come into contact at moderate elevations in the southern Appalachians, although their flight periods probably do not coincide. The Franclemont collection contains examples of both species from Highlands, Macon County, North Carolina, although *manto* is represented by only one second brood specimen taken 27 August 1958, over a month later than the midsummer flight period of *plagiata*, which is univoltine.

GENUS
Orgyia Ochsenheimer

Orgyia Ochsenheimer, 1810, *Schmett. Eur.*, **3**: 208.
Type-species: *Phalaena antiqua* Linnaeus, 1758. Designated by Curtis, 1831, *British Entomology*, **8**: 378.

Notolophus Germar, 1812, *Syst. Gloss. prodromus . . .*, **3**: 35.
Type-species: *Phalaena antiqua* Linnaeus, 1758. Designated by Kirby, 1892, *A Synonymic Catalogue of Lepidoptera Heterocera*, **1**: 493.

Trichosoma Rambur, 1832, *Ann. Soc. Ent. France* (1), **1**: 272.
Type-species: *Trichosoma algiricum* Lucas, 1849, now regarded as a synonym of *Orgyia dubia* (Tauscher, 1806). Monotypy.

NOTE—*Trichosoma* Rambur is preoccupied by *Trichosoma* Rudolphi, 1819, in the worms.

Acyphas Walker, 1855, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **4**: 797.
Type-species: *Acyphas fusca* Walker, 1855. Designated by Kirby, 1892, *A Synonymic Catalogue of Lepidoptera Heterocera*, **1**: 472.

Teia Walker, 1855, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **4**: 803.
Type-species: *Teia anartoides* Walker, 1855. Monotypy.

Clethrogyna Rambur, 1866, *Cat. Syst. Lép. Andalousie*, (2): 281.
Type-species: *Clethrogyna splendida* Rambur, 1842. Designated by Kirby, 1870, *Zoological Record*, **6**: 389.

Micropterogyna Rambur, 1866, *Cat. Syst. Lép. Andalousie*, (2): 281.
Type-species: *Phalaena antiqua* Linnaeus, 1758. Original designation.

Thylacigyna Rambur, 1866, *Cat. Syst. Lép. Andalousie*, [2]: 283.
Type-species: *Orgyia ericae* Germar, *in* Ahrens, [1824]. Designated by Kirby, 1870, *Zoological Record*, **6**: 389.

Apterogynis Guenée, 1875, *Statist. Sci. d'Eure & Loire*: 78.
Type-species: *Phalaena antiqua* Linnaeus, 1758. Designated by Bryk, 1934, *Lepidopterorum Catalogus*, **62**: 367.

Hemerocampa Dyar, 1897, *Can. Ent.*, **29**: 13.
Type-species: *Phalaena leucostigma* J. E. Smith, 1797. Original designation (p. 15).

NOTE—For many years the American species were placed in two genera, *Notolophus* or *Orgyia* (usually *antiqua* only), and *Hemerocampa* (all others). *Antiqua* usually has a lateral hair pencil in the larva and only one pair of spurs on the male hindtibia of the adult; these characters were thought to be of generic significance. Both characters are so variable, however, that they should be regarded as of only minor importance. The lateral hair pencils are lost in some subspecies of *antiqua*, and the preapical pair of hindtibial spurs may be present or absent in some species (e.g., *definita*), or represented by a single spur as in some examples of *pseudotsugata* and *leuschneri*. *Vetusta*, *magna* and *cana* have only one pair of hindtibial spurs which would seem to relate them to *antiqua*, but the larvae as far as known do not have lateral hair pencils and on this basis would have been assigned to *Hemerocampa*. Therefore division of the species into two genera is untenable, and the oldest name, *Orgyia*, must be used for all.

This genus differs from all others in our fauna in having wingless females, or rather females with the wings reduced to small, inconspicuous pads like those of *Phigalia* Duponchel or *Operophtera* Hübner in the Geometridae. Surprisingly for a group with its dispersal capabilities thus impaired, *Orgyia* is the most widely distributed of all lymantriid genera, occurring from the tropics to cool temperate regions in the Americas, Africa, Eurasia and Australia. About 60 species are known, ten of which are treated in this work; eight additional New World species have been described but are known only from the Central American region from Mexico to Colombia. The genus is not known to have penetrated any farther into South America, except that *O. antiqua* occurs in southern South America where it was evidently introduced. *Antiqua* is naturally holarctic, being found across the whole of northern Eurasia, Iceland, and North America; all others in our fauna are exclusively American.

Despite the curious character of wing reduction in females, *Orgyia* clearly fits into that complex of genera that includes *Dasychira*, *Olene*, *Gynaephora*, and others of the real tussock moth group with the conspicuous larval tufts and hair pencils for which they have been named.

These are the smallest North American Lymantriidae, wing expanse 35 mm or less, commonly 25–30 mm. Adult male with body relatively slender, wings ample, habitus almost geometriform. Male with dorsal tufts of lustrous, metallic scales on mesoscutellum and second abdominal segment; antenna bipectinate with very long branches, each bearing two long terminal spinules and usually a short third one; palpus heavily scaled, laterally compressed, often quite broad and rounded in profile, variable in size but at the longest exceeding front by about ½ its length; eye variable, large and protuberant and as wide as front in nocturnal species such as *leucostigma*, reduced to half width of front in diurnal species such as *antiqua*; foreleg with epiphysis reaching end of tibia; hindtibia with one or two pairs of spurs, sometimes with only one spur of preapical pair present, thus having three spurs.

Venation almost exactly like that of *Dasychira*; often with a larger, better developed accessory cell in forewing. Relationship between R and M_1, and M_3 and Cu_1, in hindwing may vary; e.g., the former pair may have a very short stalk as in *leucostigma* (text figure 14 *b*) or a long stalk as in *antiqua* (text figure 14 *a*), and the latter pair may be well separated as in *leucostigma* or arise from the cell in close proximity as in *antiqua*.

Male genitalia basically of the same type as those of *Dasychira* and *Olene*, with distinct costal lobe on valve; structurally very uniform throughout the American species. Both lobes of valve more elongated than in other genera, the costal lobe sclerotized, incurved, and variable from a slender, pointed spine to a flattened, almost spatulate or ribbonlike process rounded at the end. Saccus rounded, not produced; anellus incompletely sclerotized but with juxta as a well-developed, convex plate, deeply incised on posterior side; process of uncus much longer than that of *Dasychira*; gnathos completely lost; aedoeagus characteristically with a movable, sclerotized, distal flap dorsally which is hinged to the main part of the aedoeagus like a lower jaw. This flap opens when the vesica is everted in all species studied except *leucostigma*, in which it seems to be too rigidly articulated to permit the eversion of the vesica in dissection. Vesica often large, elongate rather than bulbous, but nearly globular in *pseudotsugata*.

Female almost wingless, with wings reduced to small, rudimentary, hairy pads concolorous with body; abdomen six to eight times larger than that of male, shrinking to two to three times larger following oviposition; body entirely hairy, light gray or gray brown, no metallic dorsal tufts; antenna bipectinate with very short branches, each bearing one terminal spinule; palpus more slender than that of male, hairy, usually very

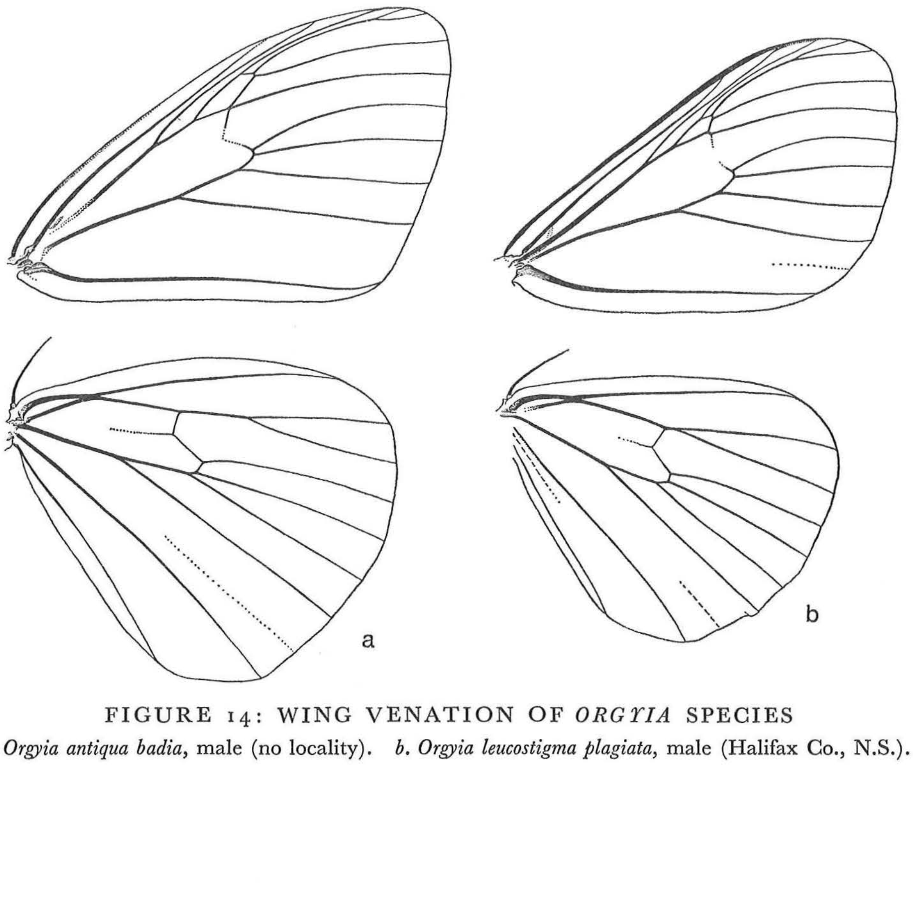

FIGURE 14: WING VENATION OF *ORGYIA* SPECIES

a. Orgyia antiqua badia, male (no locality). *b. Orgyia leucostigma plagiata,* male (Halifax Co., N.S.).

decumbent in preserved specimens; female eye much reduced, $\frac{1}{3}$ as wide as front or smaller, little more than a narrow slit in *O. falcata,* which represents the most extreme case of eye reduction noted in any North American species of Lepidoptera; hindtibia with end spurs only; legs somewhat reduced in size, femora swollen. Female genitalia not studied but evidently closely similar to those of *Dasychira.*

The larva of *Orgyia* again is most like that of *Dasychira* in the American fauna but shows several consistent differences. The general form is more slender, and it is not as densely hairy or spiny. The rigid, barbed spines with which *Dasychira* larvae are well supplied are relatively sparse in *Orgyia,* being mostly reduced to delicate, barbed hairs rather than spines; the most spine-like of these arise from the dorsal verrucae. The dense dorsal tufts on the first four abdominal segments are like those of *Dasychira* but not as wide; the similar low tuft commonly present on the eighth segment in *Dasychira* is wanting or rudimentary in *Orgyia,* although the long hair pencil on the same segment is very well developed as are the anterior hair pencils; lateral posterior hair pencils are absent. One species in our fauna, *antiqua,* may have a short but distinct, lateral, black hair pencil on the second abdominal segment; it is our sole representative of an Old World group in which this character appears frequently. Abdominal segments six and seven bear the usual dorsal glands which may be red, yellow or whitish. As a corollary of their relatively sparse covering of hair and greater body exposure, larvae of *Orgyia* tend to have a more colorful integument than those of *Dasychira,* ornamented with subdorsal and lateral stripes or spots and bright red, orange or yellow verrucae. The head, always brown or blackish in *Dasychira,* may be red, yellow or dark brown.

Larvae of *Orgyia* feed on a great diversity of trees and shrubs and even on some herbaceous plants. *Antiqua* and *leucostigma* are highly polyphagous on both broad-leaved trees and conifers; *pseudotsugata* is limited to just a few conifers only. One western species that I reared, *O. leuschneri,* would accept only one host species, box-elder (*Acer negundo* L.).

The life history of *Orgyia* species differs significantly from that of their nearest relatives. They are the only North American Lymantriidae except *Lymantria dispar* to overwinter in the egg stage. The eggs are deposited by the flightless female in a single mass covering the outside of the cocoon from which she emerged. The eggs are usually covered by a frothy protective coating to which hairs from the female body often adhere, although at least one species, *antiqua,* leaves them fully exposed. Females of *L. dispar* leave the site of emergence and crawl up tree trunks to lay their eggs in crevices in the bark or elsewhere, not on the cocoon. The soft, hairy, gray or light brownish cocoons of *Orgyia* females, with the adhering egg mass, thus differ from all other known Lepidoptera in North America and are easily recognized.

KEY TO LAST INSTAR LARVAE OF *ORGYIA*

1. Subspiracular verruca of second abdominal segment with a tuft of black plumed hairs, usually forming a conspicuous lateral hair pencil (sometimes lost, especially in subspecies *badia*—see couplet 9) 2

— Second abdominal segment without a black hair pencil 3

2. Distribution eastern or northern . . . . *antiqua nova* p. 63

— Distribution in Pacific Coast region only, British Columbia to California . . . . . *antiqua badia* p. 63

3. Body integument predominantly pale, either yellow or greenish or, if darker, with a pair of wide, even, uninterrupted, subdorsal yellow stripes on abdominal segments 5–8; supraspiracular verrucae on abdominal segments yellow or whitish in life, about same size as subspiracular verrucae 4

— Body integument predominantly dark, gray or blackish; pale subdorsal stripes on abdominal segments 5–8, if present, thin, irregular, or broken into a series of spots or dashes; supraspiracular verrucae on abdominal segments red or orange in life (usually also in preserved specimens), larger than subspiracular verrucae 8

4. Body mostly pale yellow or greenish, head yellow or pale yellowish brown 5

— Body darker or, if predominantly yellowish, head red or black, not yellow 7

5. Dark anterior and posterior hair pencils well developed; middorsal band on abdominal segments 4–7 blackish, uninterrupted if present, sometimes obsolescent 6

— Dark anterior and posterior hair pencils short, very weak or wanting; middorsal band on abdominal segments 4–7 yellow, interrupted by black spots intersegmentally and expanded to form a large subtriangular yellow patch in the middle of each segment; New Mexico, Arizona, Utah.... *leuschneri* p. 79

6. Dorsal tufts on abdominal segments 1–4 nearly white; dark middorsal band tending toward obsolescence, may be present or absent; east of Great Plains only........ *definita* p. 77

— Dorsal tufts on abdominal segments 1–4 brownish; dark middorsal band well developed; southern Arizona, Mexico...... *falcata* p. 86

7. Head red, broad lateral band above spiracles gray or obsolescent, hair mostly yellow or white, the four dorsal tufts white; eastern, widespread....... *leucostigma leucostigma* and *leucostigma intermedia* (subspecies *oslari* not seen) pp. 82, 83

— Head dark brown to black (rarely red), broad lateral band above spiracles blackish, dorsal tufts on abdominal segments 1–4 gray; hair mostly dark, brown or blackish, the four dorsal tufts gray; seen from Nova Scotia and New Brunswick only.................................. *leucostigma plagiata* p. 84

8. Dorsal and dorsolateral verrucae deep yellow or orange; eastern and western..............9

— Dorsal and dorsolateral verrucae mostly bright red, conspicuous; western............10

9. Body predominantly blackish (rarely yellow); head dark brown; prothoracic shield orange, divided into two spots by a wedge-shaped medial encroachment of the dark ground color; transcontinental in Canada, northern United States................ *antiqua* this page

(Those that have lost the lateral hair pencil should key out here)

— Body predominantly gray, head red, prothoracic shield red, not divided into two spots; eastern and southeastern......... *detrita* p. 75

10. Body normally without conspicuous yellow markings; dorsal tufts of abdominal segments 1–4 very large, about as long as diameter of body, white, tipped with light tawny brown; lateral verrucae with a few very long blackish hairs, their length about twice diameter of body; on conifers...... *pseudotsugata* p. 70

— Body with conspicuous bright yellow markings; dorsal tufts of abdominal segments 1–4 of normal size, white, tipped with gray or a mixture of tawny brown and gray brown; lateral verrucae without long black hairs twice as long as diameter of body; not on conifers................... *vetusta* complex p. 65

Orgyia antiqua (L.) (Rusty Tussock Moth*; Chenille à Houppes Rousses, f., Fr.)

PL. 8, FIGS. 58–71. TEXT FIGS. 14 *a*, 15 (McD. 3943).

Phalaena antiqua Linnaeus, 1758, *Systema Naturae* (edit. 10), **1**: 503.
Type-locality: Not given [Sweden?].

Phalaena paradoxa Retzius, 1783, *Genera et Species Insectorum e Generosissimi Auctoris Scriptis . . .*: 36.
Type-locality: Not given.

Orgyia nova Fitch, 1863, *Trans. New York State Agricultural Society*, **22**: 675. Reprinted in 1865, *Reports on the Noxious, Beneficial and other Insects of the State of New York*, **6–9**: 193. SUBSPECIES.
Type-locality: Albany, New York. [USNM]

Orgyia badia Henry Edwards, 1874, *Proc. California Acad. Sci.*, **5**: 186. SUBSPECIES.
Type-locality: Victoria, British Columbia. [AMNH]

Orgyia confinis Grum-Grschimailo, 1891, *Hor. Soc. Ent. Ross.*, **25**: 463.
Type-locality: "In regione Amdo dicta, in montibus ad flumen Chuan-Che reperta."

Orgyia antiqua var. *modesta* Heyne, 1899, *Societas Entomologica*, **14**: 98.
Type-locality: "Orel (zentrales Gross-russland, 198 m)."

Orgyia antiqua ab. *infernalis* Rebel, [1909], *Schmetterlingsbuch*, edit. 9: 114.
Type-locality: Yorkshire, England (by reference to Barrett, 1895, *The Lepidoptera of the British Islands*, **2**: pl. 83, fig. 2a).

Orgyia antiqua var. *bukovina* Strand, 1910, *in* Seitz, *Die Gross-Schmetterlinge der Erde*, **2**: 117.
Type-locality: Bukowina.

Orgyia antiqua form *dilutior* Schultz, 1910, *Ent. Zeits.*, **24**: 35.
Type-locality: Hertwigs-Waldau, Germany.

Orgyia antiqua form *grisea* Denso, 1912, *Iris*, **26**: 132.
Type-locality: Dresden, Germany.

Orgyia antiqua form *manchurica* Matsumura, 1933, *Insecta Matsumurana*, **7**: 142, pl. 3, fig. 13.
Type-locality: Kangtung, Manchuria.

Orgyia antiqua septentrionalis Rangnow, 1935, *Ent. Rundschau*, **52**: 189, pl. 1, fig. 10.
Type-locality: Northern Lapland.

Orgyia antiqua lindrothi Bryk, 1943, *Göteborgs Vetensk. Samh. Handl.*, (6) **B2**: no. 9.
Type-locality: Iceland.

Orgyia antiqua ab. *ovomaculata* Schnaider, 1950, *Polskie Pismo Ent.*, **19**: 252.
Type-locality: Poland.

Orgyia antiqua f. *bicolor* Lempke, 1959, *Tijdschr. Ent.*, **102**: 121.
Type-locality: Weesp, Netherlands.

Orgyia antiqua f. *approximata* Lempke, 1959, *Tijdschr. Ent.*, **102**: 121.
Type-locality: Putten, Netherlands.

Orgyia antiqua f. *delineata* Lempke, 1959, *Tijdschr. Ent.*, **102**: 121 (HOMONYM of *Orgyia recens* f. *delineata* Lempke, *ibid.*, p. 119).
Type-locality: Breda, Netherlands.

Orgyia antiqua argillacea Ferguson. SUBSPECIES.
Type-locality: Matanuska Valley, Alaska. [USNM]

NOTE—The names *leucantiqua* and *vetantiqua* Klemann were applied to hybrids between this species and *leucostigma* and *vetusta* respectively, and they have no standing in zoological nomenclature.

This well-known holarctic species is the most northern and most widely distributed member of the genus. It may have the greatest distribution of all Lymantriidae, occurring across northern North America and Eurasia to Iceland (but not Greenland), and in North America south to the Middle Atlantic States and northern California. In the collection of the U.S. National Museum there are even two specimens labelled Santiago, Chile, where it may have been introduced; these appear to be of the European subspecies. *Antiqua* is almost exclusively diurnal in its activity, unlike most other species of *Orgyia* on this continent.

Males of *O. antiqua* differ most conspicuously from those of other species of the genus in the bright rust-brown coloring of both wings, evident in most subspecies, in the complete absence of the pair of spurs near the middle of the hind tibia (also absent in the *vetusta* complex; present in variable degree in all others), and in the reduced eyes, correlated with its diurnal habits. The eye is decidedly smaller and less protuberant than that of related species, appearing as little more than a quarter of a sphere when viewed dorsally. The male eye of all other species in our fauna appears more nearly as a full hemisphere.

Unlike the females of most species of *Orgyia*, those of *antiqua* may be identified with a fair degree of certainty: the antenna is bipectinate with branches at least twice as long as the diameter of the shaft. In other species it may be vestigially bipectinate, with shorter branches, but more often it appears hardly more than serrate, or even simple. Also, if the female is found in association with her cocoon and the egg mass covering it, the latter provides a diagnostic character, at least for the region in which *antiqua* occurs. The layer of eggs is fully exposed, not covered with dried froth or hair.

The male genitalia closely resemble those of *pseudotsugata* and *vetusta*, differing only in minor characters of the juxta, valve shape, and in the shorter, stouter aedoeagus. One peculiarity of *antiqua* is the darker coloring usually apparent in the sclerotin of the male genitalia and to a lesser degree in the abdominal integument. As this coloring has been noted in the external genitalia and integument of other diurnal species, it is thought to be correlated with exposure to sunlight, possibly serving to filter out ultra violet. The female genitalia have not been studied.

O. antiqua differs conspicuously from all other American species in the larval stage by the usual presence of a pair of lateral hair pencils arising from subspiracular verrucae on the second abdominal segment. I have been unable to check the first instar, but the hair pencils normally occur in all later instars of the nominate subspecies and of subspecies *nova*; occasionally they are missing, and this seems to be the case rather frequently in subspecies *badia*. These hair pencils consist of tufts of black plumed hairs, expanded at the tips, and are similar to the anterior hair pencils immediately behind the head. A smaller tuft of white hair commonly arises from the corresponding verrucae of the first abdominal segment. The body is predominantly blackish, with orange or yellow spots and gray or whitish hair, very sparsely intermixed with black. The hair pencils of course are mainly black, and the four dorsal abdominal tufts may be light brown or whitish.

The head is nearly black, the legs and underside light yellowish or green. The prothoracic shield is orange yellow, divided or nearly divided into two spots by an obtusely wedge-shaped, blackish, middorsal encroachment from the posterior margin. *Antiqua* is the only species with the prothoracic shield marked in this way.

This species has an extremely wide range of food plants, having been reported on most deciduous trees and shrubs and nearly all conifers including eastern white and western red cedar (but not *Juniperus* species). Among the foodplants most commonly noted are species of fir, spruce, larch, pine, hemlock, Douglas fir, birch, alder, willow, poplar, maple, elm, apple and cherry.

Throughout most of its range *antiqua* is univoltine, with adults occurring in August and September, the eggs overwintering, and the larvae feeding from spring into summer. A few records of adults for July in the southern part of the range of subspecies *nova*, and of *badia* on the Pacific Coast, suggest that two broods may occur.

I recognize the following three subspecies in North America.

Orgyia antiqua nova Fitch

PL. 8, FIGS. 58–63, 65. TEXT FIG. 15 (McD. 3943).

Orgyia nova Fitch, 1863, *Trans. New York State Agricultural Society*, **22**: 675. Reprinted in 1865, *Reports on the Noxious, Beneficial and other Insects of the State of New York*, **6–9**: 193.
Type-locality: Albany, New York. [USNM]

All North American specimens of *antiqua* are here referred to subspecies *nova* except those of the Pacific Northwest from British Columbia to northern California, which are *badia*, and a population in south-central Alaska which is described as a new subspecies, *argillacea*. *O. antiqua nova* differs only slightly from the nominate subspecies of Europe. The wings of the male tend to be of a darker brown color, not as bright and rusty a shade as those of European specimens, and the markings of the forewing tend to be more distinct. These are tendencies only; some American specimens could not be distinguished from European ones. *Badia* and *argillacea* are more clearly definable as subspecies. *Nova* is about the same size as *leucostigma*, with which it is sympatric throughout nearly all of its range east of the Rocky Mountains. I found no way to distinguish among females of the various subspecies.

The larva and hosts are discussed for the species. A substantial bibliography on the early stages may be found in Tietz (1972: 99).

O. antiqua nova is found from Newfoundland and Labrador at least to central Alaska, as far north as the MacKenzie Delta, Northwest Territories, and south to Massachusetts, central New York, Pennsylvania (Scranton), Michigan, Iowa, Montana and Idaho. So little material is available from Idaho and Montana that it is uncertain whether this should be referred to *nova* or *badia*. But it is definitely replaced in southern British Columbia, Washington, Oregon, and northern California by subspecies *badia*, and evidently in a limited area of south-central Alaska by subspecies *argillacea*. Specimens from localities on the Yukon River in Alaska are *nova*, but those from the valleys at the head of Cook Inlet are *argillacea*.

O. antiqua nova has a life history similar in most respects to those of northern populations of *leucostigma*, *definita* and *pseudotsugata*. The eggs overwinter, the larvae hatch in the spring and pupate about midsummer. Adults emerge from early August to mid-September, with the peak of adult activity near the middle of this period. The time of emergence is remarkably constant almost everywhere. It seems to vary significantly only toward the southern fringe of the range in the East, where a few early summer records suggest that there may sometimes be two broods. J. G. Franclemont has collected fresh males in the McLean Bogs Reserve, Tompkins County, New York, as early as 6 and 9 July and as late as 23 September. Another curious feature of these New York records is that the specimens were collected at light. I have never taken *antiqua* at light and had supposed that the males were strictly diurnal. I have seen them flying in early afternoon in Nova Scotia.

Orgyia antiqua badia Henry Edwards

PL. 8, FIGS. 66–71. TEXT FIG. 14 *a* (McD. 3943a).

Orgyia badia Henry Edwards, 1874, *Proc. California Acad. Sci.*, **5**: 186.
Type-locality: Victoria, British Columbia. [AMNH]

The form of *antiqua* that occurs west of the Rocky Mountains, at least from Prince Rupert, British Columbia, to Monterey County, California, differs from *nova* in its larger size and tendency for the basal and outer thirds of the forewing to

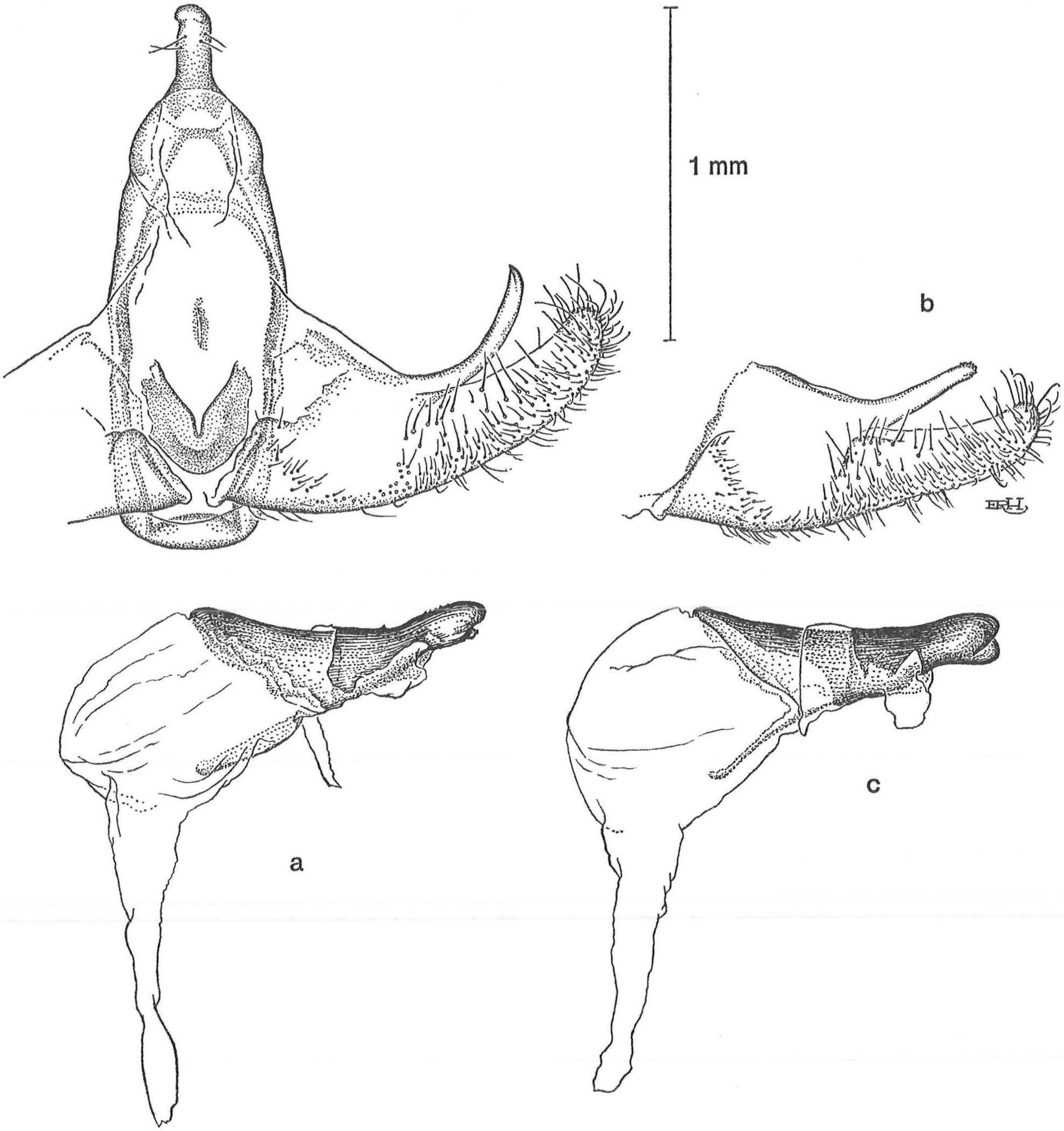

FIGURE 15: MALE GENITALIA OF *ORGYIA ANTIQUA NOVA*

a. Male genitalia of holotype (Albany, N.Y.). *b*. Valve of another specimen (White Mts., N.H.). *c*. Aedoeagus from the same specimen as figure 15 *b*.

be rather uniformly suffused with deep reddish brown, leaving the median space contrastingly paler. This is subspecies *badia*. Plate 8, figures 66, 67 and 70 are characteristic of the subspecies, although the type (figure 66) is very worn. Figures 68 and 71 are variants that do not show the subspecies characters as distinctly. The moth often differs markedly from eastern *antiqua*, although not constantly so.

Most material available is from Vancouver Island and the coastal regions of Washington and Oregon, but specimens with well-developed *badia* characters have been taken as far inland as Glacier National Park, Montana, and Truckee, California. The full distribution is not known in detail; e.g., few specimens have been seen from California. Adequate samples have been seen only from British Columbia and Oregon. It appears that at least 80 per cent of the males from the central part of the range are immediately distinguishable as *badia* by characters of size and coloring. The female probably cannot be distinguished from those of other *antiqua* subspecies, and the same applies to the male genitalia.

The larva is similar to that of *nova* except for a tendency toward loss of the lateral hair pencils. This was also noted by Dyar (1896: 341). A series of freeze-dried specimens from Corvallis, Oregon, in the U.S. National Museum exhibits wide variation in the color of the body integument, from mostly yellow to mostly black. The diversity of recorded hosts is probably as great as for *nova*; I have examined specimens reared from the following: *Alnus* species, *Pyracantha* species, *Salix* species, cranberry, cultivated *Geranium*, *Larix occidentalis* Nutt., *Picea glauca* (Moench) Voss, *Picea pungens* Engelm., *Abies lasiocarpa* (Hook.) Nutt., and *Tsuga heterophylla* (Raf.) Sarg.

The dates of capture for *badia* mostly range from 30 July to 22 September, with the peak in August. A few specimens bear earlier dates in July and even in late June, but it is uncertain whether these data are reliable.

Orgyia antiqua argillacea Ferguson, NEW SUBSPECIES

PL. 8, FIG. 64. PL. A, FIG. 7.

Orgyia antiqua argillacea Ferguson.
Type-locality: Matanuska Valley, Alaska. [USNM]

This subspecies resembles *nova* in size and markings, but the males have lost nearly all of the rust coloring, this being replaced, particularly on the forewing, with a drab, gray brown. The appearance of *argillacea* is distinctive, and if it were not for two or three examples of the type series with somewhat intermediate coloring, I would have thought that it was a good species. The paratype figured (plate 8, figure 64) is not as dull colored as the holotype or as most others of the type lot. I did not make this specimen the holotype because a better one with more complete data was subsequently found. The specimen shown on plate 8, figure 65, although from Alaska, is placed with *nova* because it and several others from the drainage area of the Yukon River clearly have the coloring of that subspecies, not *argillacea.*

MALE. The holotype is a large specimen of a dull leather-brown shade, without obvious reddish tints on the forewing but with a slightly more reddish shade on the hindwing, with thin, darker brown antemedial and postmedial lines and a large, well-defined, white tornal spot. The median space is paler in the holotype and in the male paratype shown, but in some examples it is nearly concolorous with the basal and distal thirds of the forewing. The underside is an almost unicolorous brown, about the same shade as the upperside of the hindwing. Length of forewing: holotype, 16 mm; of male paratypes, 14–16 mm.

The male genitalia are similar to those of subspecies *nova.*

FEMALE. Unknown.

TYPES. Holotype: ♂. Butte area, Matanuska Valley, Alaska; 11 Sept. 1944; J. Chamberlin. Type no. 73,781, USNM. Paratypes: 10 ♂♂. Matanuska, Alaska; 25 Sept. 1945; J. Chamberlin (1 ♂). Alaska; USNM Acc. 18,491; genitalia slide CH no. 6; 21 Sept. 1928 (1 ♂) (plate 8, figure 64). Cosmos, Alaska; 1886; Geo. M. Stoney; USNM Acc. 18,491 (8 ♂♂).

DISTRIBUTION. As given for the types. One very worn male from Mount McKinley National Park also appears to belong to this subspecies, but specimens from Skagway and the Valley of the Yukon River, Alaska, and from the Yukon Territory, Canada, are subspecies *nova.* Subspecies *argillacea* seems to have a curiously restricted distribution.

Orgyia vetusta Boisduval (Western Tussock Moth*)

PL. 8, FIGS. 14–27 (McD. 3947).

Orgyia vetusta Boisduval, 1852, *Ann Soc. Ent. France*, (2) **10**: 322.
Type-locality: California. [USNM]

Orgyia gulosa Henry Edwards, 1881, *Papilio*, **1**: 61.
Type-locality: Contra Costa Co., California. [AMNH]

NOTE—In the original description Edwards did not specify types or the number of specimens on which *gulosa* was based. I hereby designate as lectotype a male (plate 8, figure 16) in the AMNH. It is labelled "788", "California", "No. 7628 Collection Hy. Edwards.", "Orgyia gulosa Hy. Edw. (Type)", and "TYPE No. [blank], A.M.N.H." A lectotype label has been added.

Although I have segregated and treated as identifiable species two elements of the *vetusta* complex, *cana* and *magna*, those that remain and which are herein discussed collectively as *vetusta* may still represent more than one species. These were indeed regarded as two species long ago by Henry Edwards (1881: 60–62) who treated them as *vetusta* and *gulosa*, describing the larvae as being lupine and oak feeders respectively. However, the type of *vetusta* in the U.S. National Museum clearly belongs to what Edwards recognized as the oak-feeding form, and thus *gulosa* is unequivocally a junior synonym of *vetusta*. The lupine-feeding form, of which I have seen reared specimens, seems to be visibly different but not much so; it tends to be a darker brown with less distinct lines. I could find no satisfactory characters for distinguishing the two as species but have had no opportunity to investigate adequately the larval differences which were believed by Edwards to be significant.

The male of *O. vetusta* averages slightly smaller than that of *cana* and much smaller than that of *magna*. In general coloring it is more reddish brown than *cana*, including the hindwings which may be largely of a rust-brown shade. In pattern and color it is very similar to *magna*, although perhaps not as variable despite the light and dark forms supposedly associated with different food plants; bright, clearly marked extremes that are common in *magna* (plate 8, figures 31, 33) are relatively rare in *vetusta*. *O. vetusta* differs significantly from *cana* in the reduced eye of the male, this being little more than ¼ of a sphere or less; the eye of *cana* represents decidedly more than ¼ of a sphere, appearing more protuberant and globular. *O. magna* is intermediate in this respect.

The illustrated males on plate 8, figures 14–17, are characteristic of what I believe to be the oak-feeding form; figures 21–23 represent a closely similar but more plainly marked minor subspecies that occurs on Santa Catalina Island; figures 19 and 24–26 represent the form obtained from lupine-feeding larvae. Figure 27, a specimen reared from an *Atriplex* species with a label notation that the larva would not eat oak or lupine, I had thought was *cana*, but it has very reduced eyes unlike that species. Its identity is uncertain.

Average forewing length of *vetusta* males (of 47): 12.4 mm.

The male genitalia of *vetusta*, *magna* and *cana* are barely distinguishable. Those of *magna* and *vetusta* do not seem to differ except in size, the genitalia of *magna* being larger. *Vetusta* differs slightly from *cana* in the following details: valves tend to be longer; vesica larger in proportion to size of aedoeagus; the flexible, sclerotized dorsal appendage of aedoeagus nearly always without teeth, which are commonly present in *cana*. The male genitalia of these three western species are very similar to those of *detrita* which, of all other members of the genus, seems most closely related.

The female of *vetusta* has antennal branches (not including terminal setae) that are decidedly shorter than the antennal segments; in *cana* they are as long or longer. The female of *magna* is unknown.

In my key to larvae reference is made only to the "*vetusta* complex" (*vetusta*, *magna*, *cana*). The larva of *cana* is known, but it was uncertain whether the available larvae of *vetusta* were correctly identified (see comments under *O. cana* page 70). The larva of *magna* is unknown. The larvae of this group are typical of the genus with respect to their well-developed, black anterior and posterior hair pencils and four light-brownish to gray dorsal abdominal tufts. The clumps of hair arising from the verrucae are mostly whitish, with a few dark hairs mixed in. They are among the most colorful of the group with respect to their red and yellow markings. The subdorsal and dorsolateral verrucae and prothoracic plate are bright red. The body is marked by one or two pairs of bright-yellow subdorsal spots on each segment, a series of yellow lateral, subspiracular spots or bars, and often also a dorsolateral series of yellow spots or blotches. The subspiracular series may be nearly confluent, forming a yellow lateral stripe, above which is a black, somewhat interrupted, spiracular line. Otherwise the integument is blackish, including that of the underside. The head is dark brown, nearly black. Judging from preserved specimens (without adequate data) in the collection of the U.S. National Museum, the younger larvae up to the penultimate instar are more heavily marked with yellow spots than are those of the last instar. The larva of the *vetusta* complex differs most conspicuously from that of the relatively closely related, eastern *O. detrita* in its blackish rather than gray ground color, in the numerous yellow markings entirely wanting in *detrita*, and in its black head.

Harrison G. Dyar, after publishing papers describing the early stages of what were thought to be *cana* (1892) and *gulosa* (1893), rescinded his earlier views as to their standing as species after rearing several generations (1896: 340). He wrote: "I recognize but one species in California [*vetusta*]. I have bred a large number of the larvae of the lupine feeding form (*vetusta*) raised from eggs.... They do not differ from those of *N*[*otolophus*] *gulosa* which I have already described and I found them by no means fastidious as to their food plants. The characters noted by the late Henry Edwards to separate them, I find to be only individual ones, present in varying degrees in different examples from broods of both *vetusta* and *gulosa*. The differences in the moths also are of the same character. I formerly stated (*Psyche*, vi, 40) that Mr. Edwards had confounded the moths. I see now that this was probably not the case, but that he bred from larvae on lupine the form that I bred from larvae on oak, and the contradiction was due to insufficiency of material in both Mr. Edwards' hands and my own."

My investigation would seem to confirm that Dyar was correct with respect to the oak- and lupine-feeding forms. However, he seems to have misunderstood *cana*, and of course *magna* was unknown to him.

Despite the preoccupation of early collectors with supposed oak- and lupine-feeding forms, or species, it is now apparent that the host preferences are not that well defined. Many food plants have been given in the literature, including species of *Arctostaphylos*, *Cassia*, *Crataegus*, *Juglans*, *Lupinus*, *Malus*, *Photinia*, *Prunus*, *Pyrus*, *Quercus*, *Rhamnus*, *Rubus* and *Salix*. *O. vetusta* has been regarded as a pest of economic importance, especially on fruit trees, and a list of references to host information may be found in Tietz (1972: 671). Some published records may of course refer to *cana* or even other species because of the long-standing problems of identification in the tussock moths. I have seen specimens from oak (*Quercus agrifolia* Née), *Lupinus* species, *Franseria chamissonis* Less. (San Clemente, Orange County), *Ceanothus* species (Los Angeles County), and *Atriplex* species (Santa Monica, figured on plate 8, figure 27). The identity of the last two specimens is doubtful.

O. vetusta occurs from the region around San Francisco Bay and the counties immediately to the north southward to San Diego, California, and in the U.S. National Museum there is one specimen from Colnett Wash, Distrito Norte, Baja California, Mexico. It is present on the Channel Islands of San Clemente and Santa Cruz. All Californian specimens examined are from counties on or near the coast except two from Truckee [Nevada County], a locality record that needs to be verified. The inland limits of its distribution are unknown. *Vetusta* does not occur as widely as *cana*, which reaches Utah and Oregon.

The adults occur from early May to late June or perhaps early July; the one Mexican record was taken 19 April. The eggs overwinter, and the larvae hatch when the leaves come out in the spring. Like all other western species of the genus, *vetusta* appears to have only one generation.

Males of this species vary sympatrically from bright forms with contrasting markings to those that are much more heavily clouded with brown, although such variation is hardly as extreme as that of *magna*. As indicated earlier, those that I have seen reared from lupine are dark, but I do not know whether this has any significance. A series of specimens from Santa Catalina Island have a consistently dull, poorly marked appearance (plate 8, figure 22) and may represent an insular subspecies. However, an example from Laguna Beach (plate 8, figure 21) on the nearby mainland looks much like them. The specimen from Baja California is of normal appearance.

Orgyia magna Ferguson, NEW SPECIES
PL. 8, FIGS. 28–33. TEXT FIGS. 16 *a*, *b*.

Orgyia magna Ferguson.
Type-locality: Rancho La Sierra, Riverside Co., California. [AMNH]

Specimens of an unusually large form from southern California appear to represent an undescribed species for which I propose the above name. All of the material seen is from Los Angeles, Riverside, San Bernardino and San Diego Counties. These specimens resemble large, mostly light-colored *vetusta*, although the forewing has a tendency to be grayer, its appearance in some instances approaching that of *cana*. The dark postmedial line is generally not as distinct as that of *cana*, but the white subtornal spot tends to be more distinct. As in *vetusta*, the basal ⅔ of the hindwing are usually a dull rust brown, leaving the outer third as a darker border, but the dark border tends to be more even and distinct. The underside

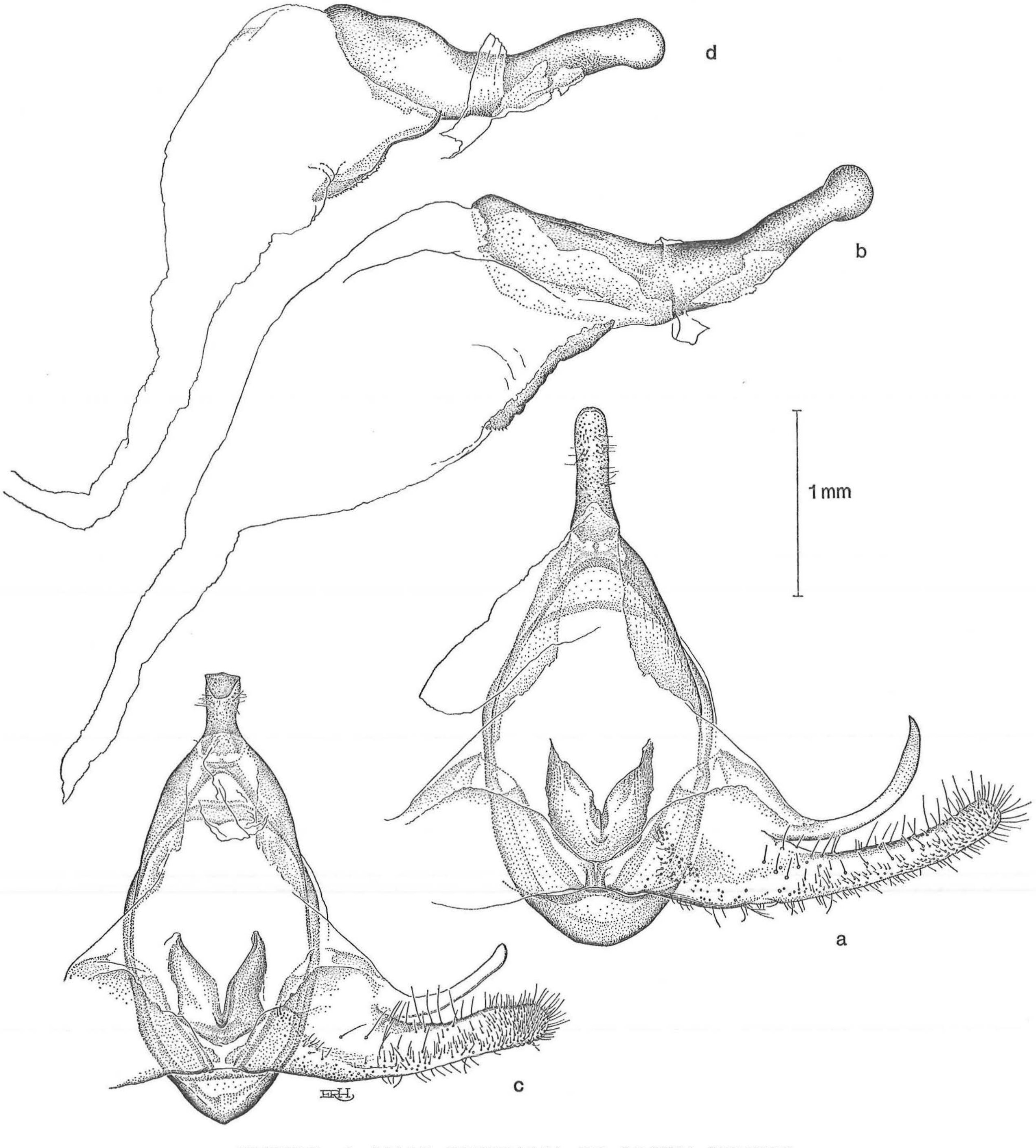

FIGURE 16: MALE GENITALIA OF *ORGYIA* SPECIES

a. Orgyia magna (San Diego, Calif.).
b. Aedoeagus of same specimen.
c. Orgyia cana (Inyo Co., Calif.).
d. Aedoeagus of same specimen.

is rust brown as in *vetusta*, except that the costal area toward the apex tends to be grayish like that of *cana*. The outer third of each wing beneath is marked off in the usual way by a dark, incomplete, evenly excurved postmedial band that fades out toward the inner margin. The male eye is less protuberant than that of *cana*; the species is about intermediate in this respect between *cana* and *vetusta*, although eye size varies somewhat in all three species. Length of forewing: holotype, 17 mm; other males, 13–18 mm; average wing length (of 37), 15.5 mm.

The male genitalia do not seem to differ from those of other species in the *vetusta* complex. The female and the early stages are unknown.

TYPES. Holotype: ♂. Rancho La Sierra [Arlington], Riverside Co., California; at light; 18 May 1939; Fred H. Rindge. AMNH (plate 8, figure 33). Paratypes: 81 ♂♂. Same locality; 13 April–27 June 1938–39, 1941, 1949, 1950–53; collected by A. H. Rindge (60 ♂♂). Lake View Mts., Riverside Co., California; 27 May 1950; C. W. Kirkwood (1 ♂). Soboda Hot Sprs., Riverside Co., California; 28 May 1949; C. W. Kirkwood (1 ♂). Box Spr., Riverside, California; 14 April 1934; Grace H. and John L. Sperry (3 ♂♂). Gavilan Hills, near Perris, Riverside Co., California; 27 May 1952; R. H. Reid (4 ♂♂). Perris, California; 3 May 1953 (1 ♂). Riverside, California; 16 June 1933; C. Dammers (2 ♂♂). Temescal, Riverside Co., California; 28 March 1954; W. A. Rees (1 ♂). Claremont, California; no date (1 ♂). Loma Linda, San Bernardino Co., California; 16–23 May, 1–7 June (2 ♂♂). San Diego, California; 4, 14 June 1920; E. Piazza (3 ♂♂). San Diego, California; 31 May 1909; Geo. H. Field (1 ♂). San Diego; no date; Karl R. Coolidge (1 ♂). Paratypes to AMNH; LACM; USNM.

The type data includes all localities from which this species is known. Nearly all records are for April, May and June, indicating one generation, although two old specimens in the U.S. National Museum are labelled West Riverside, California, 25 and 26 February 1906.

Although usually large, this species varies considerably in size, and I have figured two small specimens (plate 8, figures 28, 29) which I believe to belong to it, but these are not included in the type series. I considered the possibility that *magna* may be only a seasonal form of *vetusta*; however, this seemed unlikely because normal, small *vetusta* fly in the same areas at about the same time. Some of the specimens were collected at light, and thus the species would seem to be at least partly nocturnal.

Orgyia cana Henry Edwards, REVISED STATUS

PL. 8, FIGS. 34–46. PL. A, FIG. 8. TEXT FIGS. 16 *c*, *d* (McD. 3947a).

Orgyia cana Henry Edwards, 1881, *Papilio*, **1**: 62. Type-locality: Havilah, California. [AMNH]

NOTE—I hereby designate as the lectotype of *cana* one of the two syntypes; this is the specimen labelled "Havilah, California," "6872", "No. 7629 Collection Hy. Edwards", "TYPE No. [blank], A.M.N.H.", "*Orgyia* (*Type*) *cana* Hy. Ed." and "Genitalia prep. Lep. #11–308 J.C.E. Riotte". It agrees well with the specimens figured, perhaps especially with that shown on plate 8, figure 40, and is easily identified.

This species usually may be distinguished from its close relatives by a combination of subtle characters in the males; the females perhaps cannot be distinguished at all. Although variable in shade, the forewing is commonly a rather even bluish gray with the median space and reniform not conspicuously paler than the rest of the wing. The white subtornal spot tends to be less developed than that of any other Californian species. The sharply defined, blackish antemedial and postmedial lines are unusually complete and prominent; the antemedial is sinuous, the postmedial dentate. The forewing resembles that of Californian *O. pseudotsugata* except that the lines are usually better developed and the white subtornal spot less so. Note also that *cana*, like others of the *vetusta* complex, differs from *pseudotsugata* in having only one pair of spurs on the hind tibia. One of the best distinguishing features is the color of the hindwing, which is a dusky gray brown like that of *leucostigma*, nearly always without the rusty tints prevalent in *vetusta* and *magna* except in some paler specimens from desert areas. *O. cana* also resembles *leucostigma* in size, averaging larger than *vetusta* and smaller than *magna*. The undersides of both wings are normally also dusky brown rather than rust. The male of *cana* has larger eyes than that of *vetusta*, each being about the equivalent of a full hemisphere; the eye of *vetusta* is little more than $\frac{1}{4}$ of a sphere. *Magna* is intermediate. The male genitalia differ from those of *vetusta* and *magna* in several subtle details: the valves tend to be shorter and stubbier, the vesica is smaller in proportion to the size of the aedoeagus, and the flexible, sclerotized, dorsal appendage of the aedoeagus usually bears small teeth which appear only rarely in the other two species.

Although I figure three females believed to belong to this species (plate 8, figures 39, 42, 46), I found no characters that clearly distinguish them from females of related species except that they are paler than most *vetusta* and much paler than *pseudotsugata*. The antennal differences mentioned under *vetusta* may also be of significance.

In 1976 I reared broods of *O. cana* on an artificial laboratory diet. These were from two sources: ten miles south of Reno, Nevada, where the food plant was bitterbrush, *Purshia tridentata* DC., and six miles south of Idaho City, Boise County, Idaho, where they were reported to have been associated with a *Ceanothus* species or *Purshia tridentata* (G. E. Daterman, *in litt.*). As it has not been possible to compare these with positively determined larvae of *vetusta* or *magna*, a proper evaluation of characters cannot be made. Preserved larvae in the U.S. National Museum from San Francisco, California, believed to be of *vetusta*, are more heavily and brightly marked with yellow, have a more predominantly red prothoracic plate, an entirely dark brown or blackish head, and somewhat shorter hair pencils. *Cana* tends to have a brownish prothoracic plate, and a red lateral patch on the head, largely concealed beneath the anterior hair pencils. The verrucae and dorsal glands are bright red in both species.

Dyar (1892) described as *cana* the early stages of a species from Yosemite, California, the reported food plants being *Quercus kelloggii* Newb., *Q. chrysolepis* Liebm., and *Rhamnus californica* Eschsch. Eleven inflated larvae and some associated adults of *cana* preserved in the U.S. National Museum may be from that brood, although they have no locality data. These inflated larvae agree exactly with those I reared from Idaho and Nevada. Also in the collection of the U.S. National Museum are other adults of this species reared from larvae on "wild cherry" (plate 8, figures 41, 42) and bitterbrush, *Purshia tridentata* DC. (plate 8, figures 44–46).

O. cana is known to occur from San Diego, California, to Klamath County, Oregon, Boise County, Idaho, Reno, Nevada, Ormsby County, Nevada, and at Ogden, Utah, if those from the last locality really belong to the same species. It is widespread and evidently sometimes common in California; I have seen material from localities in San Diego, Riverside, Los Angeles, San Bernardino, Inyo, Ventura, Amador, Santa Barbara, Sonoma, Mendocino, Placer, Siskiyou, and Shasta Counties.

Dates of capture for adults range from 27 May to 18 August, but most were taken in the period from mid-June to late July. Allowing for regional differences in altitude and climate, these dates indicate that the species has only one brood.

As will be apparent from the series of figures, *O. cana* shows considerable variability, especially between the lightest and darkest specimens. Those from inland desert areas seem to be smaller and paler, as for example the specimens shown from Nevada and Utah (plate 8, figures 43–45), but the available material and habitat data are inadequate for purposes of describing such variation with certainty.

This species has been a difficult one to characterize because of the subtlety of the adult characters and poorly known larval characters as they relate to larval characters of other members of the *vetusta* group. However, adult males that I have assigned to *cana* in collections are consistent in their general appearance and large eye size, and segregating them from the rest of the complex was relatively simple; *cana* is indeed the most satisfactory to differentiate of the three or four elements in the *vetusta* group, and I have no doubt that it represents a distinct species.

The specimen figured as *vetusta* by Holland (1903: pl. 38, fig. 19) is actually *cana*, although a rather dark one.

Orgyia pseudotsugata (McDunnough)
(Douglas-fir Tussock Moth*)

PL. 8, FIGS. 49–57. TEXT FIG. 17 (McD. 3945).

Hemerocampa pseudotsugata McDunnough, 1921, *Can. Ent.*, **53**: 54.
Type-locality: Chase, British Columbia. [CNC]

Orgyia pseudotsugata morosa Ferguson. SUBSPECIES.
Type-locality: Thetis Island, Strait of Georgia, British Columbia. [USNM]

Orgyia pseudotsugata benigna Ferguson. SUBSPECIES.
Type-locality: Onion Saddle, 7600′, Chiricahua Mts., Arizona. [JGF]

This relatively distinct species, a notorious pest of fir and Douglas fir, is widespread in the mountain regions of the West from southern British Columbia to southern Arizona. The rust-brown hindwing and grayish forewing of the male, with its almost straight antemedial line, are characteristic, although the colors may be subdued by black suffusion in the melanistic subspecies, *morosa*. *Pseudotsugata* has a slightly longer forewing than any other species of *Orgyia* in our fauna except *falcata*. It most closely resembles the western species of the *vetusta* complex, but these have only one pair of hind tibial spurs, whereas *pseudotsugata* males have two pairs or at least three spurs, one spur of the preapical pair being often missing. The

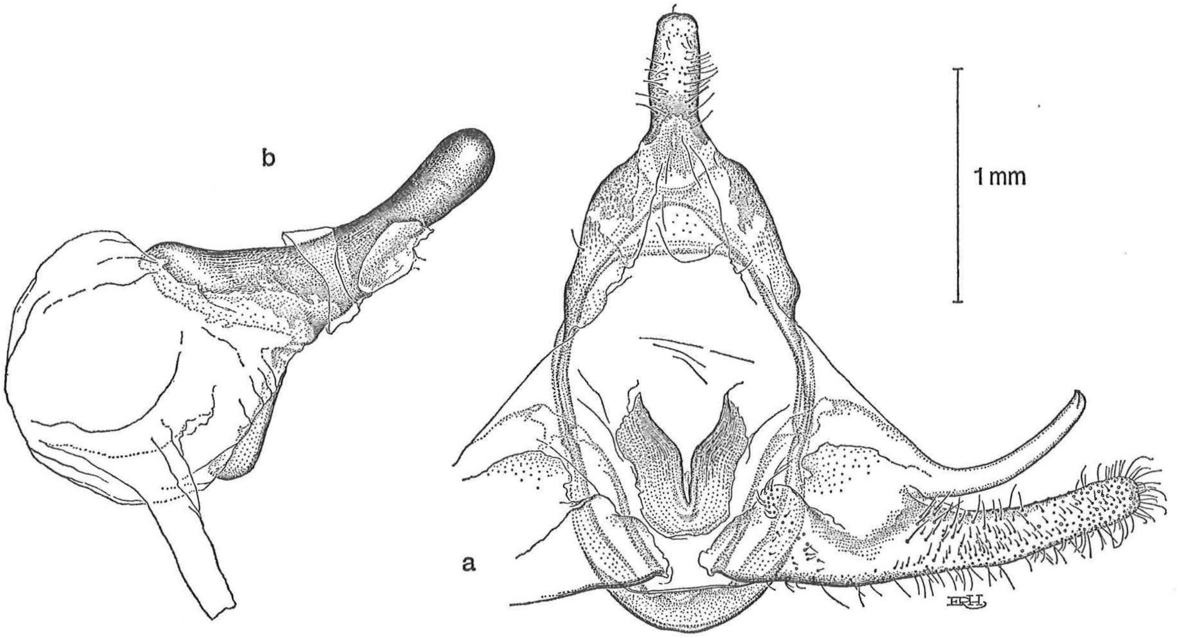

FIGURE 17: MALE GENITALIA OF *ORGYIA PSEUDOTSUGATA*

a. Orgyia pseudotsugata benigna (Onion Saddle, Chiricahua Mts., Ariz.).
b. Aedoeagus of same specimen.

more nearly straight antemedial line of the forewing is one of the best distinguishing features, and in addition the rust-brown hindwing will help to differentiate it from *cana*, which otherwise is the most closely similar species. The dusky gray-brown female of *pseudotsugata* is darker than that of any other species of *Orgyia* studied.

The male genitalia of *pseudotsugata* are extremely similar to those of *vetusta*, *cana* and *magna*, but may be distinguished by the shape of the vesica, if it is properly everted and inflated. The vesica of *pseudotsugata* is more compact, almost globular in shape; those of the *vetusta* group are larger and more extended. The juxta of *pseudotsugata* is narrower, but this difference is slight.

This species shows some well-developed geographical variation, summarized briefly here and discussed in greater detail under the individual subspecies. Specimens from the northern Pacific Coast area from Vancouver Island through western Washington and Oregon to Modoc County, California, are large and very dark (plate 8, figure 49); this is subspecies *morosa*. Those from the region of the type-locality in the Okanagan Valley of interior British Columbia are smaller and paler, more like the Californian specimens illustrated (plate 8, figures 50, 51). This lighter form occurs from south-central British Columbia southward through western Montana and Idaho to Colorado, Nevada, and through the Sierra Nevada system to the San Bernardino Mountains, California. A larger, more colorful and distinctly marked subspecies occurs in Arizona (plate 8, figures 53–57). *Pseudotsugata* also occurs in the mountains near Santa Fe and Las Vegas, New Mexico, but as I have seen only reared females from that area, it remains uncertain whether this population is more closely related to those of Arizona or Colorado. I have not seen *pseudotsugata* from the Coast Ranges of northern California, or from Utah or Wyoming, although it would be expected to occur there.

Large gaps exist in our knowledge of the geographical variation of *pseudotsugata*. Despite the many economically motivated studies on this species, taxonomic and zoogeographic research has been limited by an astonishing scarcity of fine quality specimens in collections. When I began this investigation, the collection of the U.S. National Museum contained only two or three males considered good enough for photographic illustration.

The larva may be recognized by its predominantly whitish hair, dark skin and red tubercles, and unusually large, brown-tipped dorsal tufts. It lacks or nearly lacks the bright-yellow spots of the *vetusta* group, and of course does not have the lateral hair pencils that usually distinguish *antiqua*. Other far western species, *leuschneri* and *falcata*, have very different, pale-yellow larvae. The body integument of *pseudotsugata* is gray, mottled or reticulated with black and with the usual wide, black, middorsal band, which is flanked by a pair of weak, dull whitish or yellowish subdorsal stripes. The body is paler laterally and ventrally, and there may be thin, broken, dorsolateral and lateral black lines and a subspiracular orange line. The verrucae (tubercles) and dorsal glands are bright coral red. The anterior and posterior hair pencils are black, but the posterior one is immediately preceded and adjoined by a light brown tuft half the length of the black hair pencil. The dorsal tufts on abdominal segments one to four are white basally, tipped broadly with light tawny or pale cinnamon brown in Arizona larvae (light or dark chestnut brown in British Columbian larvae according to McDunnough's description, 1921: 56). The hair of the body is otherwise pure white except that one to five very long black hairs, as long or longer than twice the diameter of the body, arise from each of the lateral and dorsolateral verrucae. Balch (1932: 1145) reported that the larvae were of two color forms: the gray one marked with black as described above, and a form in which the integument was light fawn marked with brown rather than black. The brown ones seemed larger, and it was thought that they might be female larvae, although this was not proved.

The larval food plants are species of *Pseudotsuga*, *Abies*, and sometimes also *Picea*. The species is a major pest of Douglas fir, *Pseudotsuga menziesii* (Mirb.) Franco, and grand fir, *Abies grandis* (Dougl.) Lindl. in the northern part of its range, and of white fir, *Abies concolor* (Gord. & Glend.) Lindl. in south-central Oregon, the Sierra Nevada region of California, and Arizona. Moths have also been reared from larvae defoliating alpine fir, *Abies lasiocarpa* (Hook.) Nutt. at Jarbridge, Nevada, where the first reported outbreak in the United States occurred in 1927 (Balch, 1932: 1144), on blue spruce, *Picea pungens* Englm., in Colorado and Montana, and hemlock *Tsuga* species, in Idaho. Under conditions of deprivation, as when the preferred trees have been stripped, the larvae were found to be able to feed on new foliage of ponderosa pine (Mason and Baxter, 1970: 1257), and upon red fir, sugar pine, Jeffrey pine, western hemlock and western larch. McDunnough (1921: 53) indicated that larvae he reared would not feed on pine, and fed poorly on hemlock, eating only the blossom buds. As the rearing was done at Ottawa, the tree species were probably eastern, and the pine may have been white pine.

The adults fly from early August to mid-September in the Northwest, late August to late September in California, and were collected 24 July to 2 September in Arizona. The larvae feed from late spring to midsummer. It thus appears to be single-brooded throughout its range, with the eggs overwintering.

In part of its range, if not everywhere, *pseudotsugata* is mainly a diurnal and crepuscular species. The flight behavior of a population of the Blue Mountains, northeastern Oregon, was discussed in a paper by Wickman, Mason and Paul (1975). The total daily flight period (22–23 August) extended from 9:00 a.m. PST until shortly after dark, none being collected after 10:30 p.m. The peak of activity was in the period 3–6 p.m., and it dropped sharply at dusk, although some males were collected in light traps between 8:15 and 10:30, nearly all before 8:45. There is of course no certainty that this pattern will prevail in other populations. Most material in collections was taken at light, with no data given on flight time. The Arizona subspecies has a slightly larger eye than the others, suggesting that it might be more nocturnal.

Destructive outbreaks of *O. pseudotsugata* have occurred in British Columbia, Idaho, Washington, Oregon, Nevada, California and Arizona. This would include the Arizona subspecies and the more widely distributed nominate subspecies, but I have been unable to determine whether subspecies *morosa* has been involved. Outbreaks seem to develop almost explosively, reaching a peak in about two years, then subsiding abruptly in a year or two as parasites and disease organisms increase. These large infestations probably develop from more normal, low-level populations that may always be present in suitable habitats. As the females are wingless, rapid dispersal is entirely dependent on young, wind-blown larvae. Serious defoliation by the Douglas-fir tussock moth may kill from 20 to 75 per cent of the merchantable white fir and Douglas fir, and in some years, as in 1973, it was regarded as the most serious forest insect pest in the western United States.

An extensive economic literature relates to this species; e.g., Balch, 1932; Eaton and Struble, 1957; Sugden, 1957; Mason and Baxter, 1970;

Wickman, Trostle and Buffam, 1973; Wickman, Mason and Thompson, 1973; Mason, 1974; Wickman, Mason and Paul, 1975. Additional references may be found in these papers, especially in that by Wickman, Mason and Thompson.

I recognize the following three subspecies of *Orgyia pseudotsugata*:

Orgyia pseudotsugata pseudotsugata (McDunnough)

PL. 8, FIGS. 50–52 (McD. 3945).

Hemerocampa pseudotsugata McDunnough, 1921, *Can. Ent.*, **53**: 54.
Type-locality: Chase, British Columbia. [CNC]

The nominate subspecies of *pseudotsugata* has a distinct pattern on the forewing, unlike the blackish-suffused *morosa*, but it is not as boldly marked as *benigna*. Transverse lines blackish, usually thin and distinct, on a grayish background; general appearance of forewing much like that of *O. cana*. Reniform usually filled with pale-grayish or ochreous scales lighter than ground color, not highly conspicuous; white subtornal spot may be present or obsolete and tends to be smaller than that of subspecies *benigna*. Hindwing above rust colored with dark shading toward outer margin, often forming a more or less well-defined dusky marginal band on outer third; subspecies *pseudotsugata* only rarely has a dark median band on the upperside of hindwing, unlike *benigna* in which such a band is normal. Underside of both wings rusty, with or without a weak brownish postmedial band. Nominate subspecies averages smaller than the others, and apex of forewing is usually less acute than that of *morosa*. Length of forewing: 13–17 mm; average (of 51), 14.44 mm.

No differences in the male genitalia are apparent among the subspecies. Also, I found no characters to distinguish females, in color, size or external structure. Although subspecific differences may occur in the larvae, such characters have not been investigated because of insufficient material. It would be desirable to rear larvae of the three subspecies at the same time for critical comparison.

Although described from the southern interior of British Columbia, the nominate subspecies is the prevalent form throughout most of the range of *pseudotsugata*, south through Idaho, western Montana, probably eastern Washington and Oregon, Colorado, Nevada, and the Sierra Nevada system to the San Bernardino Mountains, California. It may also occur in New Mexico, but is replaced in Arizona by subspecies *benigna* and in coastal British Columbia and western Washington and Oregon by subspecies *morosa*.

A few specimens examined from Dayton, Columbia County, Washington, and Baker County, Oregon, are somewhat suffused with blackish, approaching subspecies *morosa*, but they are within the smaller size range of the nominate subspecies, and I classify them as such. However, I have seen what appear to be both subspecies from Modoc County, California, an area where there may be a zone of intergradation.

Subspecies *pseudotsugata* flies from early to late August throughout its range, even in southern California, but may extend into September in some areas. It has been taken at least as late as 23 September (Placer County, California).

Orgyia pseudotsugata morosa Ferguson, NEW SUBSPECIES

PL. 8, FIG. 49.

Orgyia pseudotsugata morosa Ferguson.
Type-locality: Thetis Island, Strait of Georgia, British Columbia. [USNM]

This subspecies has the appearance of a melanic form of *pseudotsugata*, but it replaces the nominate subspecies in a rather well-defined geographical area in the Pacific Northwest. This is approximately the same region occupied by *Dasychira grisefacta ella*, another melanic subspecies. *Morosa* differs from the nominate subspecies not only in its dark coloring, but also in size, its wing length averaging 2.31 mm greater than that of subspecies *pseudotsugata*, and in the slightly more pointed shape of the forewing.

MALE. Upperside of forewing with usual pattern almost completely obscured by blackish suffusion, leaving the antemedial and postmedial lines only faintly visible; a few whitish scales just basad of antemedial line, in median space, and again forming a faint subterminal line; reniform often standing out prominently as a contrasting, rust-brown or ochreous patch; white subtornal spot present or absent, most often present but quite reduced. Forewing usually with outer margin nearly straight, and apex a little more produced and pointed than that of nominate subspecies, resulting in noticeable difference in wing shape. Hindwing rust brown with a diffuse band of darker brown occupying outer third; sometimes hindwing almost entirely suffused with dusky brown; a separate postmedial band across hindwing, characteristic of *benigna*, not present in any of the examples seen. Underside of both wings rust colored but usually darker than in nominate subspecies, often darkening to dusky brown before outer margin, especially on forewing. None of the specimens examined has a dark median band on underside of hindwing, and only one has such a band, although weak, on forewing. Length of forewing: holotype, 17 mm; other males, 16.0–17.5 mm; average (of 8), 16.8 mm.

Male genitalia probably not distinguishable from those of other subspecies.

FEMALE. Apparently indistinguishable from that of nominate *pseudotsugata*.

LIFE HISTORY. As relatively little information is available for *morosa*, it is not known whether its life history differs in any way from that of subspecies *pseudotsugata*. The only reared specimens seen with host data were on *Abies concolor* (Gord. & Glend.) Lindl.; these are from Modoc County, California (1975) but agree with subspecies *morosa*.

Adults of *morosa* seem to fly unusually late, the known dates of capture ranging from 30 August to 14 October, and the late specimens are fresh. This may be related to a longer season in the coast region.

TYPES. Holotype: ♂. Thetis Island, Strait of Georgia, British Columbia; 9 Sept. 1966; Richard Guppy. Type no. 73,782, USNM (plate 8, figure 49). Paratypes: 9 ♂♂, 1 ♀. Same locality and collector; 9 Sept. 1966, 30 Aug. 1967, 1, 2 Sept. 1967 (4 ♂♂). McMinnville, Oregon, em. 30 Aug. 1943; R. E. Rieder (1 ♂, 1 ♀). Dayton, Yamhill Co., Oregon; 18 Sept. 1960; R. Albright (1 ♂). Oak Crk. gate, elev. 500′, McDonald For., 5 mi NW Corvallis, Benton Co., Oregon; 19 Sept. 1962; UV light; N. McFarland (1 ♂). Vic. Firwood Road, 4 mi W Oregon City, Clackamas Co., Oregon; 14 Oct. 1971; S. G. Jewett, Jr. (2 ♂♂). Paratypes to USNM; AMNH; LACM; CNC.

Two reared examples from Modoc County, California, are not included in the type series.

DISTRIBUTION. As given for type series and in introductory discussion of the subspecies.

REMARKS. I reviewed the history of Douglas-fir tussock moth outbreaks in the western United States and could find no positive record of this subspecies being involved; nearly all published reports clearly refer to the nominate subspecies or to subspecies *benigna*. However, outbreaks in Chelan County, Washington (1972), Modoc County (1964–65) and Siskiyou County (1970), California, may have involved *morosa*. It is relatively rare in collections, and the limits of its distribution are not definitely known. Similarly, nearly all of the many records of the Canadian Forest Insect Survey are for the interior of British Columbia and refer to the nominate subspecies.

Orgyia pseudotsugata benigna Ferguson, NEW SUBSPECIES

PL. 8, FIGS. 53–57. TEXT FIG. 17.

Orgyia pseudotsugata benigna Ferguson.
Type-locality: Onion Saddle, 7600′, Chiricahua Mts., Cochise Co., Arizona. [JGF]

This is the largest and most brightly marked of the three subspecies; it is so different in appearance that it might have been assumed to be a distinct species. However, the male genitalia, larva, and food plants agree with those of *pseudotsugata*.

MALE. Pattern of forewing like that of nominate subspecies, but antemedial and postmedial lines much more prominent, being two to three times wider; whitish- or ochreous-filled reniform paler and more conspicuous, and subtornal spot usually somewhat larger. Usual rust-brown coloring of hindwing often in large part obscured by diffuse dusky-brown shading, primarily forming a wide outer-marginal band, a diffuse median band, and an area of similar dusky shading again toward wing base; proportion of rust brown to dusky brown highly variable. The diffuse median band, rarely present in other subspecies of *pseudotsugata*, is normal feature of *benigna*. Underside rust colored with a wide, diffuse, dusky-brown postmedial band on both wings, usually well developed, sometimes incomplete. A well-developed, complete median band on the underside also rarely occurs in the other subspecies. Length of forewing: holotype, 18.5 mm; other males, 16.0–18.5 mm; average (of 29), 17.1 mm.

The four males illustrated were chosen to show the full range of variation, although examples as dark as those in figures 55 and 56 are unusual; the other two are typical.

Male genitalia probably not significantly different from those of nominate subspecies, although seemingly with a slightly narrower, more deeply cleft juxta.

FEMALE. Not noticeably different from female of nominate subspecies, except that it is larger. Only two specimens examined, both reared from white fir near Globe, Gila County, Arizona.

LIFE HISTORY. Like the nominate subspecies, *benigna* seems to occur either at low population levels or in epidemic abundance. White fir, *Abies concolor* (Gord. & Glend.) Lindl., is reported to be the preferred host in Arizona (Wickman, Trostle and Buffam, 1973: 1), although Douglas fir, growing mostly at higher elevations, serves as an alternative host. I have seen colored photographs of the larvae of this and the nominate subspecies but could not be certain that there were any significant differences. The entire life history is probably similar. The larva is described in the discussion of the species. By a small margin, the flight period seems to extend over the longest period of any of the three subspecies—10 July to 23 September.

TYPES. Holotype: ♂. Onion Saddle, 7600′, Chiricahua Mts., Cochise Co., Arizona; 22 Aug. 1966; J. G. Franclemont. JGF. Allotype: ♀. Globe, Arizona; "4-16-58"; *Abies concolor*, Hopk. U.S. 37205-L. USNM. Paratypes: 135 ♂♂, 1 ♀. Same locality and collector as for holotype; 10 July–3 Sept. 1966 (100 ♂♂). Same locality and collector; 29 July 1967 (1 ♂). E. Turkey Creek, 6400′, Chiricahua Mts., Cochise Co., Arizona; 25 July–21 Aug. 1966; J. G. Franclemont (11 ♂♂). Same locality and collector; 30 July–18 Aug. 1967 (13 ♂♂). Pinery Canyon, 7000′, Chiricahua Mts., Cochise Co., Arizona; 11 Aug. 1966; J. G. Franclemont (6 ♂♂). Same locality and collector; 25 Aug. 1967 (1 ♂). W. Fork, 6500′, 16 mi SW Flagstaff, Coconino Co., Arizona; 13 Aug. 1961, 17 Aug. 1964; J. G. Franclemont (3 ♂♂). Same data as for allotype (1 ♀). Paratypes to JGF.

REMARKS. The subspecies occurring in New Mexico has not been identified; no adult males have been available for study. Similarly with a population known to occur at Mount Charleston, Clark County, Nevada, where *pseudotsugata* has been reported as a pest. A few of the specimens seen from Colorado show traces of *benigna* characters, and a zone of intergradation may exist in southern Colorado or northern Arizona.

Orgyia detrita Guérin-Méneville

PL. 8, FIGS. 10–13. PL. A, FIG. 9. TEXT FIGS. 18 *a*, *b* (McD. 3949).

Orgyia detrita Guérin-Méneville, [1832], *Iconographie du Règne Animal de G. Cuvier*, Livraison [21?], Insectes, pl. 87, fig. 4. "1829–1838" [1844], *ibid.* (text): 511.
Type-locality: "Hab. l'Amérique septentrionale." [USNM]

NOTE—In the collection of the USNM I found a rubbed specimen (plate 8, figure 10; text figure 18 *a*, *b*) from the Boisduval collection so closely matching Guérin-Méneville's figure of *detrita* that I am certain that it is the long-lost type. However, an identification label on the specimen states only: "Degens Bd. Am. B", this apparently being an unpublished name. It also bears the usual printed labels indicating that it has been in the Boisduval, Oberthür and Barnes collections. Guérin-Méneville attributed *detrita* to Boisduval, who evidently did not publish this name either. I respread the specimen for illustration.

Orgyia inornata Beutenmüller, 1890, *Psyche*, **5**: 300.
Type-locality: Enterprise, Florida. [AMNH]

Orgyia (*Hemerocampa*) *definita kendalli* Riotte, 1972, *Ent. Zeits.*, **82** (13): 144. NEW SYNONYMY.
Type-locality: Welder Wildlife Foundation Refuge, 7 mi NE of Sinton, San Patricio Co., Texas. [LACM]

Although obviously distinct in larval and genital characters, this species is not always easily recognized by the appearance of the adult. Males have most often been confused with the nominate form of *leucostigma* which occurs in the same areas, and sometimes with males of *definita*. Like *leucostigma* but unlike *definita* and western species of the *vetusta* complex, males of *detrita* usually have a complete complement of well-developed hind tibial spurs. *Detrita* has a slightly broader forewing with a more rounded apex and more obtuse outer margin; the postmedial line is thin, clearly defined, and finely and evenly dentate; the whitish tornal spot is missing or nearly so; the discal spot usually has a pale filling and a nearly complete, thin blackish margin, and tends to stand out more prominently than in the other species. *Detrita* lacks the purplish sheen characteristic of *definita* and Floridian specimens of *leucostigma*, and its forewing shows little color contrast, the median

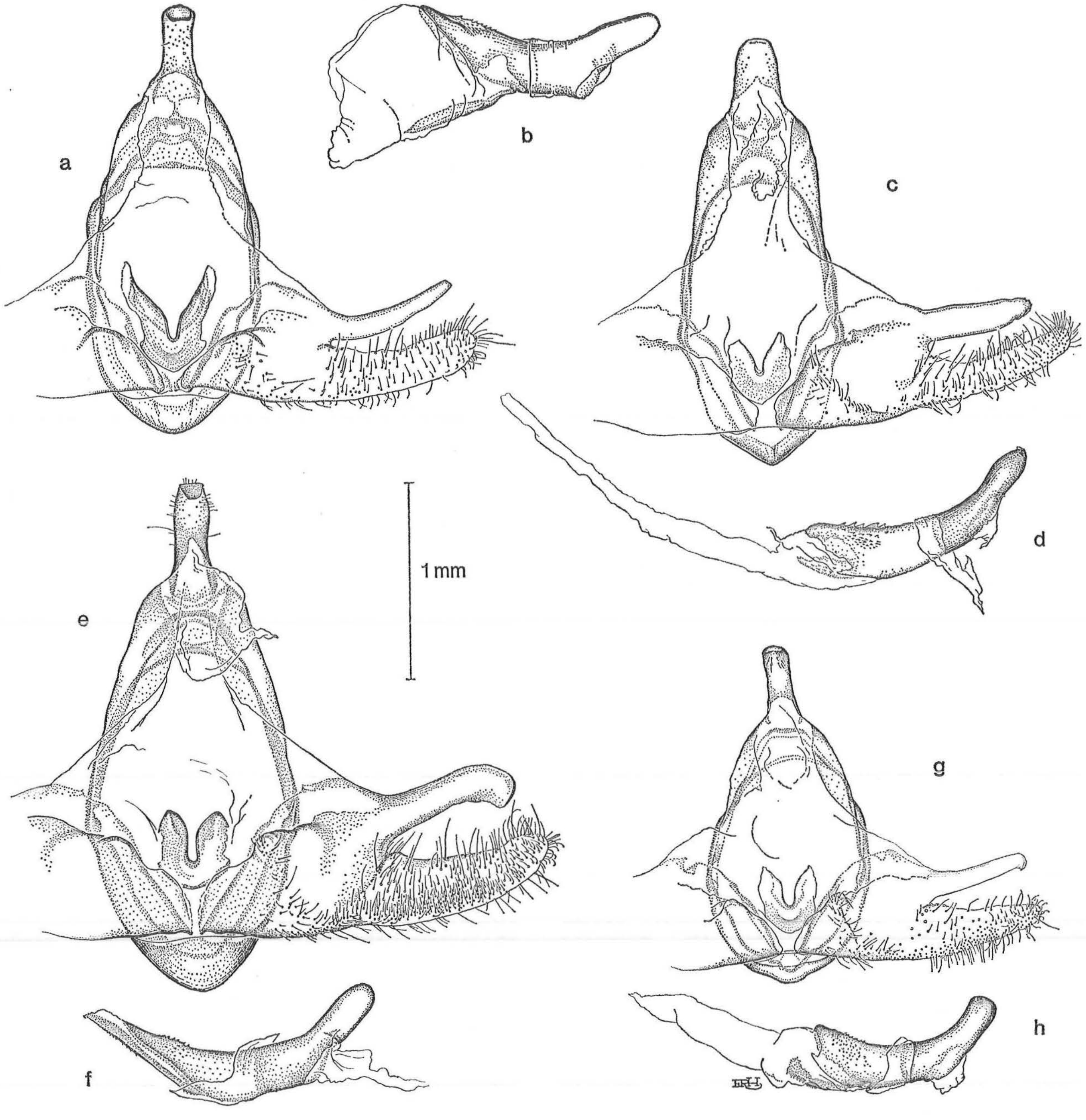

FIGURE 18: MALE GENITALIA OF *ORGYIA* SPECIES

a. Orgyia detrita, holotype.
b. Aedoeagus of same specimen.
c. Orgyia leuschneri rindgei (Gila Natl. Monument, N.Mex.).
d. Aedoeagus of same specimen.
e. Orgyia leucostigma leucostigma (Thompson's, Fort Bend Co., Tex.).
f. Aedoeagus of same specimen.
g. Orgyia definita (Lakehurst, N.J.).
h. Aedoeagus of same specimen.

space being nearly as dark as the basal and outer thirds; the forewing nevertheless has a rather vague, coarsely variegated pattern when compared to the more smoothly textured appearance of *leucostigma* or *definita*. This coarse-textured appearance, plus the broad, rounded forewing and absence of a pale tornal spot, usually enables one to recognize *detrita*. Two males from South Carolina (e.g., plate 8, figure 13) are darker than any others examined. I have not determined how to recognize the female of this species except by association with the larva.

The male genitalia are similar to those of *definita* except that the juxta is nearly twice as large, the uncus is a little stouter, the aedoeagus is larger toward the end, with a larger vesica, and the free sclerotized flap extending from the dorsal side of the aedoeagus onto the vesica is without teeth or nearly so (densely covered with small teeth in *definita*). Both *detrita* and *definita* have a ventral patch of small teeth toward the tip of the aedoeagus, distinguishing them from the species of the *vetusta* complex which otherwise have extremely similar genitalia. The aedoeagus figured for this species by Riotte (as *leucographa*, 1972a: fig. 7, left) is that of *leucostigma*.

The larva of *detrita* is easily recognized. It resembles the larva of *leucostigma* except that the entire dorsolateral area, between the thin, dark lateral line and the black dorsal stripe, is mouse gray, and all of the tubercles within this gray area are bright orange. The four large whitish dorsal tufts are larger, or at least wider, than those of *leucostigma*. The yellow subdorsal stripes flanking the black middorsal stripe, characteristic of *leucostigma*, may occasionally show in part, but if so they are irregular and fragmented. The ventrolateral area may also be somewhat grayish, the ventral area yellowish green. The anterior and posterior hair pencils are long and black, and the head and prothoracic shield bright coral red, as in *leucostigma*. This description is based in part on 14 preserved larvae in the collection of the U.S. National Museum from Tampa and Daytona [Beach], Florida, and Bellport, Long Island, New York. The larva was first described by Beutenmüller in the original description of *inornata* and again several years later (1899: 157). The only recorded foodplants are live oak (*Quercus virginiana* Mill.) and cypress (*Taxodium distichum* (L.) Rich.).

Most material of *detrita* in collections is from Florida, where it evidently is not uncommon. Otherwise I have seen this species only from the following places: Bellport, Long Island, New York; Lakehurst, New Jersey; Charleston and McClellanville, South Carolina; East Baton Rouge and Orleans Parishes, Louisiana; Montgomery, Brazoria and San Patricio Counties, Texas. Recorded dates of capture are all for the month of May except the following: 9 August 1955 (Lakehurst, New Jersey); 12 June 1971 (McClellanville, South Carolina); 15, 21 April 1912 (South Florida); 24 February 1962 (San Patricio County, Texas). *Orgyia detrita* is rare in collections and I have seen only 20 adult specimens, which did, however, include the holotypes of all three names.

Orgyia definita Packard

PL. 8, FIGS. 1–9. TEXT FIGS. 18 *g*, *h* (McD. 3950).

Orgyia definita Packard, 1864, *Proc. Ent. Soc. Philadelphia*, **3**: 332.

Type-locality: Boston, Massachusetts. [lost?]

NOTE—The types of *definita* have not been found and may be lost. The larva was not known to Packard at the time of the original description, but there would seem to be little doubt that his characterization of the adult fits the present species.

O. definita is an eastern species that is much commoner in collections than *detrita*, although not nearly as abundant or as widely distributed as *leucostigma*. The adult male may be recognized by the more heavily marked, although diffuse, antemedial and postmedial lines on the forewing, stronger contrasts between light-brown, dark-brown and whitish areas of the forewing, and two especially well-defined whitish or light-gray streaks toward the apex. The postmedial line opposite the discal spot is more roundly convex, not angled as in *leucostigma*. The white tornal spot is often prominent, being as well developed as that of *leucostigma*. Fresh specimens may have a slight purplish sheen in the median space, unlike *detrita* and northern specimens of *leucostigma*. Many males have the preapical pair of hind tibial spurs reduced in size, with one of the two spurs apparently missing or so short and slender as to be inconspicuous. Other specimens may have both pairs as well developed as those of *leucostigma* or *detrita*. I have found no satisfactory means of distinguishing the females of this species except by association with males or larvae.

The male genitalia are closest to those of *detrita* among the eastern species, but they may at once be distinguished by the much smaller juxta, more slender uncus, and, in the aedoeagus, by the smaller vesica and the presence of numerous small teeth on the sclerotized flange, or flap, that extends from the end of the aedoeagus onto the dorsal side of the vesica (when everted).

In the larval stage, *definita* is easily distinguished from the other three eastern species by its light-yellow color. It has the appearance of an extremely pale *leucostigma* with head, prothoracic plate and dorsal glands all yellow, not red or orange, and with the dark markings of the body limited to a very reduced black dorsal stripe. This stripe may persist as an almost complete band on abdominal segments four to eight, but just as often it is entirely lost on those segments, persisting only as two to four crescent-shaped segments between or associated with the dorsal tufts on abdominal segments one to four. The anterior hair pencils are blackish, like those of *leucostigma* but not as full; the posterior hair pencil is also weak, and may consist of a mixture of dark and light hair. Otherwise the hair of the body is entirely whitish, and the verrucae from which the tufts arise are pale yellow. The larva superficially resembles that of the southwestern *O. leuschneri* Riotte, but otherwise there is nothing with which it need be confused. This description is based on 21 last instar larvae from Albany, New York, and New Brighton, Pennsylvania, preserved in the collection of the U.S. National Museum, and it was checked against the published descriptions of Packard (1890: 561), Dyar (1891a: 111 and 1891b: 390) and Riotte (1972a: 20).

O. definita evidently feeds on a wide variety of trees including willow, oak, linden (basswood), elm, white birch, red maple, and witch hazel (Thaxter, 1891: 34; Packard, 1890: 561; Dyar, 1891a: 112; Prentice, 1962: 263; Riotte, 1972a: 25). Packard quoted Otto Seifert as reporting that the species fed only on willow. Seifert reared *definita* from eggs collected in Big Indian Valley, Catskill Mountains, New York. Various other host records given in the literature must be disregarded because of the widespread misidentification of species in this genus.

The egg masses deposited on the outside of the cocoons may in part be identified as follows: *definita* and *detrita* cover the eggs with a dense mat of hair from the body of the mother moth; *leucostigma* covers them with a white froth without hair, or at most a very few hairs; *antiqua* deposits them in a single, dense layer adhering to the cocoon but without any covering.

O. definita is known to occur from Enfield, Penobscot County, Maine, southern Quebec, and the vicinity of Ottawa, Ontario, south to McClellanville, South Carolina, Vicksburg, Mississippi, and St. Charles Parish, Louisiana. Most material in collections has come from New England and the Middle Atlantic States. But from the South I have seen good samples from the Carolinas, two from Kentucky, and one each from Mississippi and Louisiana. I have seen none from Florida although it has been reported from there in the literature. All such records that I have been able to reexamine proved to refer to the dark Floridian form of *leucostigma*, immediately distinguishable upon genitalic dissection.

The seasonal regimen of *definita* has thus far defied analysis, and I cannot say with certainty how many broods the species has. In most of the Northeast the main flight period is in the fall, from late August to early October, but there are also spring and summer records for some areas. In Tompkins County, New York, one of the most heavily collected areas in North America, only fall specimens have been taken, mostly in September. In the central part of the range, New Jersey and Maryland, possibly extending west to Kentucky, there is a full midsummer brood flying from about 20 June to 29 August (most taken in July) and relatively few fall records, although there are some New Jersey captures for 2 September to 20 October, and one for 24 May. Nearly all summer specimens from New Jersey are of an extremely small, usually brightly marked form (plate 8, figures 8, 9) which I considered as possibly a distinct species, although I could find no morphological characters other than size to distinguish it. I have seen specimens of this form also from Beltsville, Maryland, and Powell County, Kentucky. The fall specimens and the one spring specimen from New Jersey are all of the large, more widespread form. To complicate matters further, summer specimens of the large form have been seen from Berkshire County, Massachusetts (20–28 June), Dutchess County, New York (14 July), New Brighton and Goldsboro, Pennsylvania (8–23 July), Jerseyville, New Jersey (6 August), and Wolfe County, Kentucky (15 July). Some of this material was probably reared and the dates may be unreliable.

The small, pale form is not known from farther south. All of the material from the Carolinas and Gulf States is of the large form, resembling that from New England and New York. In the South there are two clearly separated flight periods, 18 May–17 June and 30 August–28 November. At Highlands, North Carolina, in the Canadian Zone of the Appalachians, it has been taken 19 August to 8 September.

This species was known for many years as *Hemerocampa plagiata* (Walker), as a result of an incorrect identification of the type by McDunnough (1914: 203). The type of *plagiata* involved here (not to be confused with *Dasychira plagiata* (Walker)) is not *definita* but *leucostigma*.

Orgyia leuschneri Riotte, NEW STATUS
(Box-elder Tussock Moth)

PL. 8, FIGS. 47, 48. PL. A, FIGS. 10, 11. TEXT FIGS. 18 *c*, *d*.

Orgyia (*Hemerocampa*) *definita leuschneri* Riotte, 1972, *Ent. Zeits.*, **82** (13): 138.
Type-locality: Lodge, Zion National Park, Washington Co., Utah, 4400′. [LACM]

Orgyia (*Hemerocampa*) *definita rindgei* Riotte, 1972, *Ent. Zeits.*, **82** (13): 140. SUBSPECIES.
Type-locality: Cherry Creek Camp, 13 mi N Silver City, Grant Co., New Mexico, 6900′. [AMNH]

This recently discovered species is known only from Utah, Arizona, and New Mexico, where it has on several occasions been reported as a pest, defoliating box-elder (*Acer negundo* L.). The males are broader winged than those of *pseudotsugata*; that is, with the apex of the forewing less produced; the apex is as rounded as that of *vetusta* or more so. The bright rust-colored hindwings, about the same color as those of *antiqua*, plus forewings with a gray median space and browner basal and outer thirds, are characteristic. The antemedial line, forming the outer margin of the dark-brown basal third of the forewing, may be roundly curved or angled, never straight like that of *pseudotsugata*. The dark outer third is usually bisected down the middle by a paler band which, toward the anal angle, encompasses the weak but usually distinct, pale, tornal spot. The discal spot, or at least the visible portion of it, is less elongated than in most other species, including *pseudotsugata*, *vetusta* and *definita*. On the hind tibia of the male, *leuschneri* has one or no preapical spurs; *vetusta* has none; *pseudotsugata* and *definita* have one or both.

The female of *leuschneri* is very pale, almost white, with the eyes normally developed for a female of this genus, not reduced like those of *pseudotsugata*. The antennae are almost pectinate, the length of the rami being 1½ to 3 times the thickness of the shaft. In allied species the length of the rami is hardly more than ½ the width of the shaft.

The male genitalia are easily distinguished from those of *vetusta* and *pseudotsugata* by the following features: valve with costal lobe stout and nearly straight, not recurved; uncus shorter, stout, often tapered from base; juxta small, its length about equal to ½ width of valve; aedoeagus with a linear, double, serrate row of relatively large ventral teeth near distal end, and more slender overall, with a very much smaller vesica. As was noted by Riotte, the genitalia more closely resemble those of *definita*. However, they present a generally stouter, more robust aspect. The components of the valve and the uncus are much broader; the juxta is slightly larger; the aedoeagus is more elongated and differently shaped, the ventral part toward the tip being more produced than the straplike dorsal extension, the reverse of what one usually finds in *definita*. Also, the teeth on the aedoeagus are larger than those of *definita*. The vesica, where it emerges from the tip of the aedoeagus, is less expanded, more tubelike in *leuschneri*.

The larva of *leuschneri* is predominantly pale yellow and very similar in appearance to that of the eastern *O. definita*, except that the black posterior hair pencil is lacking or very nearly so, and a series of three black, dorsal, intersegmental spots posterior to the last of the four dorsal tufts replace the dark dorsal stripe often present in *definita*. The larva is described in more detail under the nominate subspecies.

Although relatively little material of *O. leuschneri* has been available for study, the species seems to occur as two recognizably distinct populations which I treat as the following subspecies.

Orgyia leuschneri leuschneri Riotte, REVISED STATUS

PL. 8, FIGS. 47, 48. PL. A, FIGS. 10, 11. TEXT FIGS. 18 *c*, *d*.

Orgyia (*Hemerocampa*) *definita leuschneri* Riotte, 1972, *Ent. Zeits.*, **82** (13): 138.
Type-locality: Lodge, Zion National Park, Washington Co., Utah, 4400′. [LACM]

This subspecies differs from *rindgei* most obviously in its much larger size, the males having a forewing length of 15–16 mm. It also differs somewhat in pattern and coloring, most notably in the course of the antemedial and postmedial lines which tend to be more evenly curved (often angled in *rindgei*), and in its more distinct and brighter pattern, with the grayish median area of the forewing standing out in greater contrast. I found no structural differences between the subspecies, nor any differences in the larvae.

The larva of *leuschneri*, like that of *definita*, is largely pale yellow, with a light yellowish-brown head, orange-yellow prothoracic shield, and entirely whitish hair except for the weak anterior hair pencils which contain a few dark plumose hairs; the usual black dorsal posterior hair pencil is lacking. The body is marked for most of its length by a pair of quite wide, but diffuse, gray or dull blackish subdorsal stripes, immediately laterad of the whitish dorsal tufts. These stripes are variable and may be indistinct; they seemed best developed in the largest larvae, probably females. Some larvae have traces of a thin, dark spiracular line. The wide, dark dorsal band, common in other species of the genus, is lacking, although there is a thin blackish middorsal stripe on thoracic segments two to three, plus subdorsal and dorsolateral black dots or streaks on these same segments (making a transverse row of four black spots on the dorsum of each of these segments, divided mesially by the middorsal line), and a series of dorsal, intersegmental black spots beginning between the first and second dorsal tufts and terminating between abdominal segments six and seven. The four dorsal tufts and two bright-orange dorsal glands are centered in large segmental spots of light lemon yellow, varying in shape sequentially (posterad) from almost circular to bell shaped. The verrucae are mostly lemon yellow; those on the dorsum of the thorax are whitish. This description is based on last instar larvae of a brood that I reared in 1973 from eggs collected by Judson E. May in Oak Creek Canyon, Coconino County, Arizona.

Both subspecies of *O. leuschneri* have attracted the attention of forest entomologists because of their periodic and sometimes severe defoliation of box-elder (*Acer negundo* L.). Host plant experimentation with the brood that I reared indicated that the larvae could not feed satisfactorily on any of the other common trees that were offered such as species of oak, cherry and red maple, and it appeared that all would have died had box-elder not been provided. Thus *O. leuschneri* may have a higher degree of host specificity than any other species of the genus in North America.

I have seen subspecies *leuschneri* only from Zion National Park, Utah, and from Coconino County, Arizona. In the original description Riotte reported it also from East Verde River and Sycamore Forest Camp, both near Payson, Gila County, Globe, Gila County, and West Canyon, Pinaleno Mountains, Graham County, Arizona. Although difficult to ascertain from reared material, it would seem that there may be at least two broods, adults appearing in early summer and again in late summer or fall.

Orgyia leuschneri rindgei Riotte, REVISED STATUS

PL. 8, FIGS. 47, 48. PL. A, FIG. 12. TEXT FIGS. 18 *c*, *d*.

Orgyia (*Hemerocampa*) *definita rindgei* Riotte, 1972, *Ent. Zeits.*, **82** (13): 140.
Type-locality: Cherry Creek Camp, 13 mi N Silver City, Grant Co., New Mexico, 6900′. [AMNH]

This subspecies, known only from the valleys of the uppermost tributaries of the Gila River in Grant and Catron Counties, New Mexico, is smaller than nominate *leuschneri*; the males have a forewing length of only 12–14 mm. The general coloring is duller, and, although highly variable, the antemedial and postmedial lines of the forewing have more of a tendency to be abruptly angled near the costa, rather than evenly curved. The male genitalia do not differ.

A single larva from Whitewater Creek, New Mexico, preserved in the collection of the U.S. National Museum, shows no apparent differences from the larva of the nominate subspecies. Like the latter, *rindgei* has been reported as defoliating box-elder (*Acer negundo* L.).

I have seen *rindgei* only from the type-locality in Grant County and from the Gila National Monument, 6000 feet, and the Whitewater Campground, Gila National Forest, northeast of Glenwood, both in Catron County, New Mexico. Males have been collected, probably at light, on 4 and 9 July 1964 and 20 October 1940. Thus, as with the nominate subspecies, at least two broods are indicated.

Orgyia leucostigma (J. E. Smith) (Whitemarked Tussock Moth*; Chenille à Houppes Blanches, f., Fr.)

PL. 7, FIGS. 22–46. PL. A, FIGS. 13, 14. TEXT FIGS. 14 *b*, 18 *e*, *f* (McD. 3948).

Phalaena leucostigma J. E. Smith, 1797, *in* Abbot and Smith, *The Natural History of the Rarer Lepidopterous Insects of Georgia*, **2**: 79.
Type-locality: Georgia. [lost]

Cladophora leucographa Geyer, 1832, *in* J. Hübner, *Zuträge zur Sammlung Exotischer Schmetterlinge*, **4**: 33, pl. [128], figs. 745, 746.
Type-locality: Georgia.

Acyphas plagiata Walker, 1855, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **4**: 799. SUBSPECIES

Type-locality: Not given but believed to be Nova Scotia. [BMNH]

Orgyia leucostigma var. *intermedia* Fitch, 1856, *Trans. New York State Agricultural Society*, **15**: 445. Reprinted in 1856, *Reports on the Noxious, Beneficial and other Insects of the State of New York*, **1–2**: 213. SUBSPECIES
Type-locality: Southern New York. [USNM]

Orgyia leucostigma var. *borealis* Fitch, 1856, *Trans. New York State Agricultural Society*, **15**: 445. Reprinted in 1856, *Reports on the Noxious, Beneficial and other Insects of the State of New York*, **1–2**: 213.
Type-locality: Northern New York. [USNM]

Orgyia leucographa var. *obliviosa* Henry Edwards, 1886, *Ent. Americana*, **2**: 13.
Type-locality: New Jersey. [AMNH]

Orgyia oslari Barnes, 1900 (Feb. 9), *Can. Ent.*, **32**: 45. SUBSPECIES
Type-locality: Poncha Sprs., Colorado. [USNM]

Orgyia libera Strecker, 1900 ("March 9"), *Lepidoptera, Rhopaloceres and Heteroceres, indigenous and exotic*, Suppl. **3**: 29.
Type-locality: Colorado (from Bruce). [FMNH]

Orgyia (*Hemerocampa*) *wardi* Riotte, 1971, *Ent. Zeits.*, **81** (11): 106. NEW SYNONYMY (= subspecies *plagiata*).
Type-locality: Prospect Road [near Halifax], Nova Scotia. [ROM]

Orgyia meridionalis Riotte, 1974, *Ent. Zeits.*, **84** (9): 94. NEW SYNONYMY (= subspecies *leucostigma*).
Type-locality: Kissimmee, Osceola Co., Florida. [ROM]

NOTE—The name *olivacea*, attributed to Henry Edwards by Bryk (1934: 79), appears to be a misprint for *obliviosa*; it is a fictitious name.

The whitemarked tussock moth is the most widely distributed and perhaps the commonest species of lymantriid in the eastern half of the continent, occurring from Florida and southern Texas northward into Canada and from Newfoundland to Alberta and Colorado. The males are easily recognized by their color and pattern throughout most of this region, although in the southeastern coastal states from New Jersey to Texas *O. detrita* and *leucostigma* have often been confused. Some of the lighter colored or faded southern specimens of the latter (e.g., plate 7, figure 30) are indeed almost indistinguishable, and dissection of the genitalia may be necessary for positive determination. Males of *leucostigma* characteristically lack the heavy, diffuse blackish bands or completely suffused median space of *definita*, although such bands may occur in rare aberrations such as the type of *oslari*. Also, *leucostigma* does not have such a sharply contrasting pale border around the discal spot. The fourth species of *Orgyia* occurring in the East, *antiqua*, is of a bright, rusty brown color and need never be confused with *leucostigma*. At the western edge of its range in the Rocky Mountains, *leucostigma* probably occurs together with *pseudotsugata*, a species that differs there in its more extensively gray forewing and rusty brown hindwing. *Leucostigma* has a fully developed complement of hind tibial spurs as is usually the case in *detrita* also, but not in *definita*, *antiqua* or *pseudotsugata*, which have the preapical pair reduced or incomplete.

I found no satisfactory way to identify females, although egg masses of *leucostigma* may be recognized by their covering of white froth, without hair from the body of the female (see discussion under *definita*, p. 78).

O. leucostigma may at once be distinguished from all other species by the male genitalia, in which the aedoeagus is tapered to a point apically. As in other species, the tip of the aedoeagus is split into a movable dorsal lip and a fixed ventral one, between which the vesica may be everted. *Leucostigma* is unusual in that the movable component is much the longer and in that the two halves of the split apex tend to remain closed so that it is difficult to evert the vesica in dissection. The aedoeagus may bear few to many small teeth toward the distal end, with a small, serrate, ventral ridge of larger teeth preapically. This varies greatly, and southern specimens tend to have the most prominently dentate aedoeagus. *Leucostigma* also commonly has the long costal process of the valve expanded and inwardly concave distally, in spoonlike fashion, but this also is highly variable.

The mature larva has a sharply defined, rather regular, black dorsal band extending from the tuft on the first abdominal segment to the posterior dorsal tuft, flanked by a pair of yellow subdorsal stripes. Usually it has a wide, gray dorsolateral band above the spiracles, but this may be black (in subspecies *plagiata*) or wanting. The head is normally red, but it is black or dark brown in subspecies *plagiata*; the prothoracic plate is red. The anterior and posterior hair pencils are black and rather long, the dorsal tufts white to gray, the dorsal glands red, and the verrucae light yellow, not red or orange as in *antiqua* and *detrita*. *O. definita* differs in having a more predominantly yellow larva with greatly reduced dark markings, yellow dorsal glands and prothoracic shield, and a yellow or pale-brownish head. The larvae of *leucostigma* feed on an extremely diverse range of trees and shrubs, including conifers.

This species may be subdivided into at least four recognizably distinct geographical populations which I treat as subspecies. Three of these were originally described as species but are here reduced in rank.

Orgyia leucostigma leucostigma (J. E. Smith), REVISED STATUS

PL. 7, FIGS. 22–31. PL. A, FIG. 14. TEXT FIGS. 18 *e*, *f* (McD. 3948).

Phalaena leucostigma J. E. Smith, 1797, *in* Abbot and Smith, *The Natural History of the Rarer Lepidopterous Insects of Georgia*, **2**: 79.
Type-locality: Georgia. [lost]

NOTE—Abbot and Smith figured a male, female, larva, and male and female pupae, which may not all be conspecific. To conserve the traditional name of this familiar species, I hereby designate as the lectotype the larva figured by Abbot and Smith. It is easily recognized as the present species, whereas the adults probably cannot be satisfactorily identified. I think that the male figured is *O. definita*. Hence future confusion is likely to be avoided by selection of the larva as type.

Cladophora leucographa Geyer, 1832, *in* J. Hübner, *Zütrage zur Sammlung Exotischer Schmetterlinge*, **4**: 33, pl. [128], figs. 745, 746.
Type-locality: Georgia.

NOTE—Similarly, under the name *Cladophora leucographa*, Geyer confused two species, figuring adults of *leucostigma* and describing a larva that would seem to be that of *O. detrita*. As he attributed the name to Abbot in a footnote, "*Abb. Lep. Leucographa" (p. 34), it is clear that this was not intended as the description of a new species; *leucographa* was either a *lapsus calami* or an unjustified emendation of *leucostigma*, and as such is an isotypic objective synonym of *leucostigma* with the same type and type-locality. Most authors have disposed of the name in this way, but some have interpreted the situation differently and would apply the name *leucographa* to the species I have identified as *detrita*, arguing that Geyer's larval description is easily understood as referring to that species (e.g., Riotte, 1971d). To cover this contingency in the interest of nomenclatural stability, I propose that the male illustrated in the *Zuträge* (fig. 745) be designated as the lectotype of *leucographa*, should Geyer's treatment be construed as an original description. The problem may thus be resolved either way without any changing of names. Curiously, Geyer's figure looks less like a southeastern specimen than like a northeastern one, but it is obviously *leucostigma*.

Orgyia meridionalis Riotte, 1974, *Ent. Zeits.*, **84** (9): 94. NEW SYNONYMY.
Type-locality: Kissimmee, Osceola Co., Florida. [ROM]

Nominate *leucostigma* is the subspecies of the Deep South, from South Carolina, Georgia and Florida through the Gulf States to eastern and southern Texas. The males tend to be very dark and uniform, with the markings relatively obscure and the median space of the forewing entirely suffused with brown scales or nearly so. Very fresh specimens may have a purplish tint, especially in the median area. As in all populations of *leucostigma*, however, there is great variability, and occasional examples may have the median space almost as pale as that of subspecies *intermedia* or *plagiata*. Many are intermediate, with pale, grayish shading toward the costa only. Some specimens are hard to distinguish from *detrita*, but the latter tends to have a more sharply defined postmedial line, paler median space with more white scales around the discal spot, and a generally more variegated pattern, the details of which are subtle and not easily described. The dark shading associated with the antemedial band of the forewing is differently arranged, as may be seen in the figures.

In the male genitalia, the ventral row or cluster of teeth on the aedoeagus is usually better developed than in *intermedia* and much better developed than in *plagiata*. This character is clinal.

Some geographical variation is apparent within the distribution of the nominate subspecies. Specimens from southern Florida average larger than those from northern Florida and most of the Gulf States, although similarly large specimens may occur elsewhere (plate 7, figures 30, 31). Thirty-five examples of normal size from Cameron County, southern Texas, are uniformly of a lighter, more reddish-brown color, as though they were faded; another, reared and fresh, from Fort Bend County, near Houston, also shows this character. Material from east of Houston is normal for the region of the Gulf States, Georgia, and coastal South Carolina.

Larvae studied from Hidalgo County, Texas, and Charleston County, South Carolina, do not seem to differ significantly from those of subspecies *intermedia.* Much less is known about the food plants of subspecies *leucostigma,* but they are probably similarly diverse. It is reported from willow, "salt cedar" (USNM), *Iris* (WPC), live oak, redbud, apple, *Pyracantha coccinea* M. Roem., *Gordonia lasianthus* L. and *Mimosa* (Kimball, 1964: 157).

Two long flight periods occur annually, which obviously represent two or more broods. Large samples from South Carolina, Mississippi and Louisiana were mostly collected in the periods April to June and September to December, but a few specimens were taken in July and August. Texas records for April to May and November also fit this pattern. Most available Florida records are for the spring period from March to June, plus one or two for September and January; this may only be a reflection of collecting activity.

It is assumed that the type-locality for *leucostigma* is in Screven County, Georgia, where most of Abbot's collecting is believed to have been done. Examination of two topotypical males (plate 7, figure 22), another from Athens, Georgia, and many from South Carolina, Mississippi, and Florida seemed to leave no doubt that these all represent the same, essentially homogeneous and recognizably distinct, southeastern population. As the type-locality lies within its range, there is no choice but to treat this population as the true *leucostigma*—the nominate subspecies, with *meridionalis* Riotte as a synonym.

Orgyia leucostigma intermedia Fitch, NEW STATUS

PL. 7, FIGS. 32–37.

Orgyia leucostigma var. *intermedia* Fitch, 1856, *Trans. New York State Agricultural Society,* **15**: 445. Reprinted in 1856, *Reports on the Noxious, Beneficial and other Insects of the State of New York,* **1–2**: 213.
Type-locality: Southern New York. [USNM]

Orgyia leucostigma var. *borealis* Fitch, 1856, *Trans. New York State Agricultural Society,* **15**: 445. Reprinted in 1856, *Reports on the Noxious, Beneficial and other Insects of the State of New York,* **1–2**: 213.
Type-locality: Northern New York. [USNM]

Orgyia leucographa var. *obliviosa* Henry Edwards, 1886, *Ent. Americana,* **2**: 13.
Type-locality: New Jersey. [AMNH]

This subspecies is the whitemarked tussock moth of most of the economic literature, occurring in the East and Midwest except for the Deep South, which is occupied by subspecies *leucostigma,* and the Atlantic Provinces of Canada, which are occupied by *plagiata.*

The median space of the forewing is commonly paler, more extensively gray than that of subspecies *leucostigma,* and the basal and outer thirds of the wing contrastingly darker. The markings are not as boldly emphasized as in *plagiata,* however, and tend toward obsolescence. The antemedial and postmedial bands often disappear toward the inner margin but remain distinct toward the costa. When large samples of males are compared, *intermedia* appears distinctly lighter and grayer than subspecies *leucostigma,* also lighter and grayer than *plagiata* but not as well marked. In *plagiata* and to a lesser extent in nominate *leucostigma,* a wide, contrastingly colored, reddish- or yellowish-brown band beyond the postmedial line is not uncommon (plate 7, figure 41), but in *intermedia* this either does not occur or is much rarer; in several hundred specimens examined there was none in which it was well developed.

The male genitalia are rather variable, even locally, but in such characters as vary geographically, this subspecies is intermediate between the northern *plagiata* and the southern *leucostigma.* This is especially apparent with respect to the subapical row of teeth on the ventral side of the aedoeagus. These are usually present but very small, not as well developed as in subspecies *leucostigma.* Also, the juxta averages smaller than that of the nominate subspecies but slightly larger than that of *plagiata.* These must be viewed as trends only; all individuals of a given population cannot be expected to conform.

The larva was described under the species heading and should key out easily. It is similar to that of nominate *leucostigma* but quite different in appearance from the larva of *plagiata,* being paler and with a red rather than a black head. It is a general feeder on deciduous and coniferous trees, shrubs and many herbaceous plants. At least 140 different food plants have been reported in the literature. Long lists of specific hosts may be found in Prentice, 1962: 263, and in Tietz, 1972: 391. Life history information, most of it pertaining to subspecies *intermedia,* has been published in more than 100 papers. References to the majority of those published prior to 1950 were given by Tietz (1972: 389–391).

At least throughout most of its range, *intermedia* has two broods, the adults occurring in July and again in September and October. Northward, in northern New England, New York and Ontario, there appears to be a major period of emergence in August and September and relatively few records for July, suggesting a partial early brood. Although it is usually the egg stage that overwinters in the North, some immature larvae may also overwinter. This would explain the early season adult broods.

Subspecies *intermedia* occurs at least from Orono, Maine, and central Ontario to Virginia, west across the Great Plains to Alberta and Kansas. It is replaced in the extreme Northeast (Nova Scotia, New Brunswick), the Deep South and the Rocky Mountains (Colorado) by other subspecies. The taxonomic status of those from western Canada is uncertain. The male figured from Manitoba (plate 7, figure 46) more closely resembles *plagiata*. Those from Iowa, Missouri and Kansas are normal *intermedia*, but specimens from Madison County, Arkansas, are subspecies *leucostigma*.

Orgyia leucostigma plagiata (Walker), REVISED STATUS

PL. 7, FIGS. 40–45. TEXT FIG. 14 *b*.

Acyphas plagiata Walker, 1855, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **4**: 799.
Type-locality: Not given, but believed to be Nova Scotia. [BMNH]

NOTE—The type of *plagiata* was loaned to me from the BMNH, and I was able to make very critical comparisons with large samples of males from various localities in the United States and Canada. It was immediately apparent that it is *leucostigma*, not *definita* as misidentified by McDunnough (1914: 203). The type is poor, without abdomen and with the left forewing and hindwings somewhat bleached, but it had been a rather dark, richly colored, contrastingly marked specimen with a contrasting brown band just beyond the postmedial line and a prominent white tornal spot. It agrees most closely with Nova Scotian specimens and was found to match some of those in the USNM almost exactly. Microscopic scrutiny revealed that it is mounted on a pin similar in every detail to that used for the type of *Dasychira atomaria* Walker, 1856, which I had shortly before identified as a Nova Scotian female of *D. dorsipennata* (B. & McD.). The unusually poor style of mounting is also similar. This suggests that the two specimens were spread by the same person at around the same time and may have come from the same source. By 1855 Walker had begun to receive and describe a large number of species collected in Nova Scotia by Lt. Redman, and it seems reasonable to suppose that these lymantriids were among them but for some reason went unlabelled. I therefore believe that *plagiata* Walker, 1855, is available for the taxon described as *O. wardi* by Riotte in 1971.

Orgyia (Hemerocampa) wardi Riotte, 1971, *Ent. Zeits.*, **81** (11): 106. NEW SYNONYMY.
Type-locality: Prospect Road [near Halifax], Nova Scotia. [ROM]

This form, distinguished by its very dark, rather melanic, black-headed larva, has a curiously limited distribution, being known with certainty only from Nova Scotia and New Brunswick. Adults from Prince Edward Island also appear to be *plagiata*, and it is to be expected in nearby areas of Quebec or northern Maine, although those samples seen from Maine are almost pure *intermedia*. The only specimen available from Newfoundland, an adult male, is unusually large but is probably *plagiata*. This subspecies was recently redescribed as a full species (*wardi* Riotte), but I think it is more appropriately treated as a subspecies.

Adult males tend to be a little more heavily and contrastingly marked than those of *intermedia*, with the median space of the forewing narrower, and with more of a brown tint to the general coloring, often especially evident in a wide, light reddish-brown band immediately distad of the postmedial line. This lighter brown band is relatively conspicuous in over ten per cent of the moths (plate 7, figures 41, 42), but rarely if ever occurs in *intermedia*.

The male genitalia cannot be reliably distinguished from those of *intermedia*, but they do show a tendency toward loss of the group of small teeth on the ventral surface of the aedoeagus. These are slightly better developed in *intermedia* and best developed in subspecies *leucostigma*. I have not studied the female genitalia.

The larva is like that of *intermedia* and nominate *leucostigma* except that the head is nearly always dark brown, nearly black, the normally gray, dorsolateral band is blackish, and other blackish areas of the body are more extensive, a condition that amounts to melanism. The dorsal tufts also tend to be darker, being smoky gray rather than whitish. The unspecialized feeding habits of *plagiata* are characteristic of *leucostigma* generally, and the larvae may be found on almost any tree or shrub, including fruit trees, shade trees and most conifers. At times I have found them most abundant on the birches, alders, willows, *Myrica pensylvanica* Loisel, and *Pinus strobus* L., but it is unlikely that such preferences are consistent. Severe damage has also been reported on larch, *Larix laricina* (DuRoi) Koch, and balsam fir, *Abies balsamea* (L.) Mill. It is regarded as perhaps the most destructive pest of commercially grown balsam fir Christmas trees in Nova Scotia.

Like *O. pseudotsugata*, *O. antiqua* and *O. leucostigma intermedia*, this subspecies at intervals builds up very large populations that may persist for two or three years before they collapse from disease and parasitism. During one especially memorable outbreak in the late 1930's I amused myself, as a boy, by collecting these caterpillars by the bucketful from the trunks of white pine trees near Halifax, Nova Scotia. I have never since seen them in such numbers, but in 1973 larvae were plentiful in the same area. *O. leucostigma plagiata* is single brooded, the adults occurring from 17 August to 9 October but mostly in the last half of August and early September.

Some intergradation between *plagiata* and *intermedia* is apparent in samples from New Brunswick and Maine, and to a lesser extent even in Nova Scotia, but the boundary between the two subspecies is remarkably abrupt. It seems to be somewhere in the vicinity of the Maine-New Brunswick border. Samples of about 25 larvae each from three reared broods from Orono, Maine, indicate that the population there is almost pure *intermedia*. These broods varied somewhat; one consisted of lighter colored larvae than the other two. Of the broods of darker larvae, about 10 or 15 per cent are about as dark as *plagiata*, but nearly all retain the red head characteristic of *intermedia*. Only one of approximately 75 larvae from Orono has a blackish head. Of three immature larvae examined from Charlotte County, New Brunswick, one has a red head and gray dorsolateral band and two have blackish heads and black dorsolateral bands. Of five larvae from Westmorland County, New Brunswick, one has a red head, but all, including the red-headed one, have very dark body markings typical of *plagiata*. Pale larvae of the *intermedia* type do occur in Nova Scotia also but are rare, certainly amounting to fewer than one per cent of the population. One of the examples figured (plate 7, figure 42) was reared from such a larva, yet as an adult it retains the general appearance of *plagiata*. This larva was unusually light, even for *intermedia*, having extra wide, subdorsal yellow stripes, and yellow dorsal tufts on abdominal segments one to four. No note was made of the color of its head. Riotte (1971a; 1971b) maintained that two species are present sympatrically in Nova Scotia, but I could find no evidence to support this. The variation and apparent mixing of characters is exactly what one would expect of a contact zone between two subspecies.

O. leucostigma plagiata is another addition to a growing list of endemics of the Gulf of St. Lawrence region. I believe that these are relicts of a Pleistocene fauna that survived glaciation on the Grand Banks Refugium and other offshore banks near Nova Scotia while these shallow-water areas were above sea level during the Wisconsin Period. Most of the endemics of this area are very distinct subspecies; a few are species. Curiously, a unique male (plate A, figure 13) from Sable Island, Nova Scotia, an isolated refugium for some of these relicts, is unlike *plagiata*, being indistinctly marked, dull rust brown, almost the color of *antiqua*. The genitalia are normal. It could be a subspecies or an aberration; more specimens are needed.

Orgyia leucostigma oslari Barnes

PL. 7, FIGS. 38, 39 (McD. 3944, 3946).

Orgyia oslari Barnes, 1900 (Feb. 9), *Can. Ent.*, **32**: 45.
Type-locality: Poncha Sprs., Colorado. [USNM]

Orgyia libera Strecker, 1900 ("March 9"), *Lepidoptera, Rhopaloceres and Heteroceres, indigenous and exotic*, Suppl. **3**: 29.
Type-locality: Colorado (from Bruce). [FMNH]

NOTE—The type of *libera* was figured by Riotte (1971: 197). I have not seen it, but it appears to be very similar to the example shown on plate 7, figure 39. Riotte reported that the genitalia were like those of *leucostigma*. The type of *oslari* (plate 7, figure 38) also has the genitalia of *leucostigma*, although it happens to be a specimen with unusually prominent antemedial and postmedial lines. I do not think that there is any doubt that *oslari* and *libera* represent the same taxon, a subspecies of *leucostigma*; both names have been widely misapplied in the past, usually to *pseudotsugata*.

This Rocky Mountain subspecies is thus far known only from five male specimens. These include the holotypes of *oslari* and *libera*, one specimen in the American Museum of Natural History from Capulin Mountain National Monument, Union County, New Mexico, 16 August 1971, and two other specimens in the U.S. National Museum—one without data (plate 7, figure 39), and another from Plainview, Jefferson County, Colorado, 7–8000 feet, 9–14 August 1922. The last-mentioned example is an almost unicolorous dark brown with the usual lines of the forewing just slightly more distinct than those of the specimen shown in figure 39. Although the color may vary from rather dark brown to a lighter, reddish brown (in part due to fading), and the lines may vary in intensity, all five specimens agree in having the pattern much more simplified than in the other subspecies; except for the two lines and a weak, pale tornal spot, the pattern of the forewing is nearly obliterated. I figure a variant of *plagiata* (figure 40) that closely approaches *oslari* in appearance, but such specimens are rare in the eastern populations.

The genitalia of the type of *oslari* appear to be normal for *leucostigma* in every respect. The cluster of small teeth on the ventral surface of the aedoeagus is well developed, resembling that commonly found in the nominate subspecies.

The early stages, host plants, and full distribution of *oslari* are unknown.

Orgyia falcata Schaus

PL. 8, FIGS. 72–74. TEXT FIG. 19.

Orgyia falcata Schaus, 1896, *Jour. New York Ent. Soc.*, **4**: 153.
Type-locality: Jalapa, Mexico. [USNM]

This relatively distinctive species is presumed to be mainly Mexican in distribution but recently has been found to occur not uncommonly in the Huachuca and Santa Rita Mountains, Arizona. It is the only species of *Orgyia* known from these areas. Males of *falcata* have an elongated wing shape, the forewing being narrower and the apex more produced than is usual in this genus; the antemedial line is abruptly angled just costad of the middle; the postmedial line is thin, sharply defined and dentate; the median space and outer $\frac{1}{2}$ of the outer $\frac{1}{3}$ is blue-gray, contrasting with the browner basal area and a brownish band just distad of the postmedial line. The hindwings and underside are dark dusky brown, not reddish as in *pseudotsugata*. It has only one pair of hind tibial spurs. The female is very pale, almost cream colored, and is generally similar to others of the genus except for one distinctive feature: the eyes are extremely reduced, persisting as narrow slits only.

The male genitalia are very much like those of *pseudotsugata* except that the globular part of the everted vesica is smaller, the part of the tegumen toward the uncus is differently formed, and the juxta is more rounded and less deeply cleft, being nearly heart shaped.

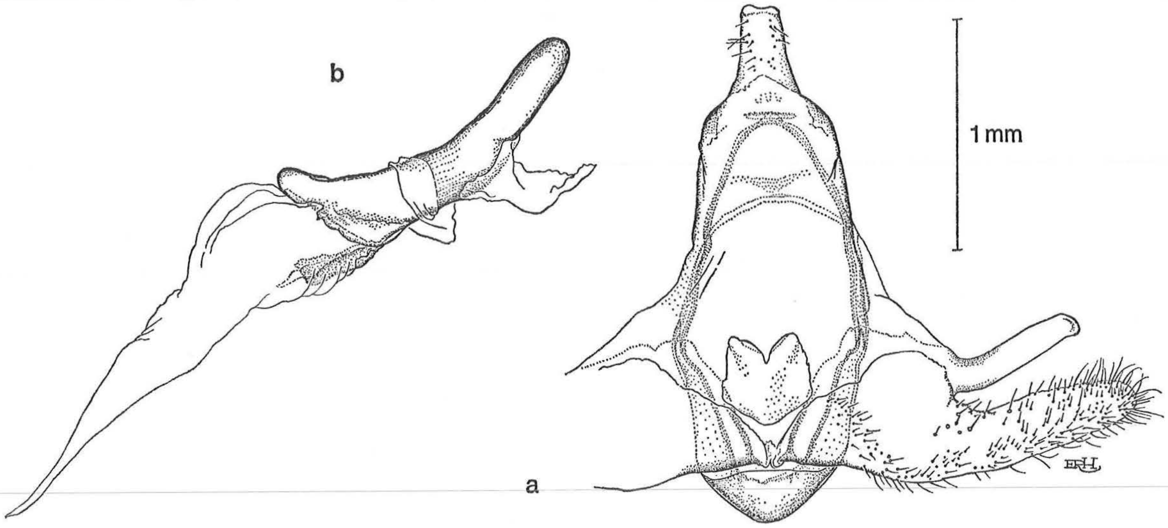

FIGURE 19: MALE GENITALIA OF *ORGYIA FALCATA*
a. Male genitalia of holotype (Jalapa, Mex.). *b*. Aedoeagus of same specimen.

The larva, as far as can be seen from a colored photograph provided by J. G. Franclemont, rather closely resembles that of *O. leuschneri.* It is predominantly light yellow with yellowish tubercles and whitish hair, except for the anterior and posterior hair pencils which are brown (not black), and the large dorsal tufts which are deeper yellow; the black dorsal band is distinct, being much better developed than in *leuschneri*; the dorsal glands are orange. There is a pair of thin dark dorsolateral lines; the head and prothoracic plate also appear to be pale and concolorous with the general body coloring. The cocoon is thin, flimsy, rather large, and light yellow, with the hair of the caterpillar woven into it.

The Franclemont collection contains 101 adults collected in Madera Canyon, Santa Rita Mountains, Santa Cruz County, in 1959 and 1965, some of these having been reared from larvae on *Quercus hypoleuca* Engelm. Series in the American Museum of Natural History and Canadian National Collection were collected in Ramsey, Carr, Parker and Garden Canyons, Huachuca Mountains, and others have been reported from Sunnyside, west side of the Huachuca Mountains, Cochise County. It has been collected 9–10 April, 2 July–30 August, and 16 September–5 November, which would seem to represent three broods.

I illustrate the genitalia of the holotype of *falcata*, with which the specimens from Arizona were found to agree. The collection of the U.S. National Museum has only eight other Mexican specimens, all from Jalapa and Mexico City.

TRIBE

Lymantriini Hampson

Lymantriidae Hampson, "1892" [1893].

Members of this tribe usually do not have an accessory cell in the forewing, and in the larval stage usually do not have hair pencils or dense dorsal tufts on the first four abdominal segments, although there are exceptions in every case. One specimen of a series of *Penthophera morio* (L.) examined had a well-formed accessory cell, normally lacking in this species. Some species of *Lymantria* may have weak anterior or anterior and posterior hair pencils (e.g., *L. mathura* Moore and *L. fumida* Butler) but no dorsal tufts. Some species of *Euproctis* (e.g., *E. subflava* Bremer) may have weak dorsal tufts on the first two or three abdominal segments, but no hair pencils. Most Orgyiini have both hair pencils and tufts.

The male genitalia of Lymantriini tend to be less conventional than those of Orgyiini, often bizarre. For example, the valves are often rather rigidly articulated or even fused so that they cannot be spread apart easily or in the usual direction (*Leucoma*, *Lymantria* and *Ocneria* species). Also, the valves are entirely sclerotized in all species examined, without a semi-membranous lobe like those of *Dasychira* or *Orgyia.* The gnathos is nearly always missing, and the process of the uncus is often directed immovably inward or is in some other respect abnormal.

This tribe includes many of the Old World genera such as *Leucoma*, *Lymantria*, *Ocneria* and *Euproctis* of Hübner, and *Arctornis* and *Penthophera* of Germar. No Lymantriini are native to North America or perhaps even the New World, although well-known, economically important species of three genera have been introduced. The affinities of the several peculiar neotropical genera (*Eloria*, *Caviria* and *Sarsina* of Walker, *Thagona* Moeschler, etc.) have not been investigated, but it appears that at least some of these may belong to other tribes not yet recognized.

GENUS

Lymantria Hübner

Lymantria Hübner, [1819], *Verzeichniss Bekannter Schmettlinge* [sic]: 160.
Type-species: *Phalaena monacha* Linnaeus, 1758. Designated by Moore [1883], *The Lepidoptera of Ceylon*, **2**: 99.

NOTE—Hübner included only *monacha* and *eremita* Hübner in *Lymantria.* Inasmuch as *eremita* is now regarded as a color form of *monacha*, the generic name is in effect monotypic.

Liparis Ochsenheimer, 1810, has been used for this genus by some authors following Swinhoe, 1923, *Ann. Mag. Nat. Hist.*, (9) **11**: 424, who designated as type-species *Phalaena monacha* Linnaeus, 1758. Hampson (1918, *Novit. Zoologicae*, **25**: 384) had earlier designated *Phalaena morio* Linnaeus, 1767, as type-species, and *Liparis* Ochsenheimer therefore refers to the same genus as *Penthophera* Germar, 1811. However, the name is not available for either group because it is preoccupied by *Liparis* Scopoli, 1777, in the fishes.

Porthetria Hübner, [1819], *Verzeichniss Bekannter Schmettlinge* [sic]: 160.
Type-species: *Phalaena dispar* Linnaeus, 1758. Designated by Kirby, 1892, *A Synonymic Catalogue of Lepidoptera Heterocera*, **1**: 475.

NOTE—*Porthetria* was originally published just above *Lymantria* on the same page of the *Verzeichniss*, and they were maintained as two genera by many subsequent authors. Walker (1855: 870) first combined them as a single genus, for which he used *Lymantria* with *Porthetria* Hübner listed in the synonymy. The *International Code of Zoological Nomenclature*, Article 24, specifies that "If more than one name for a single taxon, or identical names for different taxa, are published simultaneously, whether in the same or different works, their relative priority is determined by the action of the first reviser." As Walker appears to qualify as the first reviser, I follow his adoption of *Lymantria* for the genus that results from the union of *Porthetria* and *Lymantria*. *Lymantria* has been used most consistently in the countries of Europe, Africa and Asia during this century while *Porthetria* was being used in North America for the introduced gypsy moth. The problem of the correct name was also discussed by Collenette (1933: 21–22), and recently by me (1976). In his treatment of the Russian fauna, Kozhanchikov (1950: 350) treated this group as a single genus but went even further, including *Ocneria* Hübner with type-species *rubea* (F.). He furthermore used *Ocneria* as the name for the genus because it has page priority ([1819], *Verzeichniss Bekannter Schmettlinge* [sic]: 153). I have examined *rubea* and other species of *Ocneria* and do not consider them congeneric with *Lymantria*.

Hypogymna Billberg, 1820, *Enumeratio Insect. Mus. G. J. Billberg*: 84.
Type-species: *Phalaena monacha* Linnaeus, 1758. Designated by Curtis, 1839, *British Entomology*, **16**: 767.

Sericaria Berthold, *in* Latreille, 1827, *Natürliche Familien des Thierreichs . . .*: 480.
Type-species: *Phalaena dispar* Linnaeus, 1758. Designated by Blanchard [1846], *in* Cuvier, *Règne Animal* (Disciples Edition), **4** (*Insectes*), *Atlas*: legend, pl. 152.

Psilura Stephens, 1828, *Illustrations of British Entomology, Haustellata*, **2**: 57.
Type-species: *Phalaena monacha* Linnaeus, 1758. Monotypy.

Erasta Gistl, 1848, *Naturgeschichte des Thierreichs für höhere Schulen*: 9.
Type-species: *Phalaena monacha* Linnaeus, 1758. Intended as a new name for *Liparis* Ochsenheimer, 1810, preoccupied.

Morasa Walker, 1855, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **4**: 859.
Type-species: *Morasa modesta* Walker, 1855. Monotypy.

Enome Walker, 1855, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **4**: 883.
Type-species: *Enome ampla* Walker, 1855. Monotypy.

Palasea Wallengren, 1863, *Wiener Ent. Monat.*, **7**: 142.
Type-species: *Palasea albimacula* Wallengren, 1863. Monotypy.

Pegella Walker, 1866, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **35**: 1922.
Type-species: *Pegella curvifera* Walker, 1866. Monotypy.

Sarothropyga Felder, 1874, *in* Felder, Felder and Rogenhofer, *Reise der Österreichischen Fregatte Novara um die Erde . . .* (*Zool.*), (2) **2**: Lepid., Atlas, pl. 100, fig. 23.
Type-species: *Sarothropyga rhodopepla* Felder, 1874 (=*Morasa modesta* Walker, 1855). Monotypy.

Nagunda Moore, 1879, *Descriptions of new Indian Lepidopterous Insects from the Collection of the late Mr. W. S. Atkinson*: 53 (Asiatic Society of Bengal, Calcutta. Part 1, xi + 88 pp., 3 pls.).
Type-species: *Alope semicincta* Walker, 1855. Original designation.

Barhona Moore, 1879, *Descriptions of new Indian Lepidopterous Insects from the Collection of the late Mr. W. S. Atkinson*: 55 (Asiatic Society of Bengal, Calcutta. Part 1, xi + 88 pp., 3 pls.).
Type-species: *Barhona carneola* Moore, 1879. Monotypy.

Pyramocera Butler, 1880, *J. Linn. Soc. London* (*Zool.*), **15**: 85.
Type-species: *Pyramocera fuliginea* Butler, 1880. Monotypy.

A proper definition of this genus would entail careful review of all the world species, perhaps as many as 150. As no species of *Lymantria* is native to the Western Hemisphere, such a task is hardly justified for purposes of the present work. This discussion is therefore concerned mainly with the matter of distinguishing the gypsy moth from all species of the American lymantriid genera. But in anticipation of inquiries that may be elicited by publication of this work, or rather by its acceptance of *Lymantria* over *Porthetria* for the gypsy moth, I have made some effort to resolve the important question upon which the choice of a generic name depends, that is, whether (*Porthetria*) *dispar* and (*Lymantria*) *monacha* are congeneric. This was done by a character survey of a selected cross-section of Asian species such as *mathura* Moore, *concolor* (Walker), *lunata* Stoll, and *fumida* Butler, as they relate to *dispar* and *monacha*. Many other species were examined superficially.

Diversity in Eurasian *Lymantria* species ranges from the relatively conservative species of the *dispar* complex to such colorful and divergent forms as *mathura*, *concolor* and *singapura* Swinhoe. Although species from opposite ends of this series might be thought to represent different genera on the bases of color, pattern and genitalia, they are tied together by interconnecting forms of every degree. For example, such a species as *lunata*, from the Philippines and islands of Indonesia, appears intermediate between *dispar* and *mathura* in many respects. *Monacha* is derived from an Asiatic complex in which both sexes usually have a black and white pattern, with relatively little sexual dimorphism, and the abdomen is often brightly colored with red or pink. One of the species examined, *L. concolor* of China and northern India, is closely related to *monacha*. Of the several species studied, *mathura* and *fumida* have male genitalia least like those of *dispar*, with extra spinelike processes on the valve and tegumen, suggesting *Ocneria*. *Lunata* is clearly intermediate in genitalia, although in habitus of both sexes it is closer to *dispar* than to *mathura* or to the species of the *monacha-concolor* group. *Monacha* and *concolor* have male genitalia extremely close to those of the *dispar* group, showing no sign of the characters that distinguish *mathura* and *fumida*, although in wing pattern they are more similar to *mathura* than to *dispar* (the female genitalia show greater differences). The larvae of *dispar* and *monacha*, both of which I have seen, show no differences of generic significance.

If the preceding paragraph is confusing, then I have made my point. The jumble of overlapping characters is such that there would seem to be no reasonable way of splitting off as genera any of the species groups of *Lymantria* discussed here. I therefore consider that *dispar* and *monacha* have to be regarded as belonging to the same genus, although they seem to represent different species groups within the genus. As explained in the generic synonymy, Walker's 1855 usage of *Lymantria* is upheld in accordance with the first reviser principle of the *International Code of Zoological Nomenclature*.

Species of *Lymantria* are of medium to large size for the family, similar in dimensions to species of *Dasychira* or larger. Females commonly have a wing expanse twice that of males and much heavier bodies. Females have fully developed wings, but those of some species, including *dispar*, may not fly. Sexual dimorphism in form and color is often extreme; it is well developed in *dispar* but even more so in such species as *mathura*, in which the hindwings of the male are yellow and of the female pink. Dimorphism is less developed in *monacha* and its near relatives (e.g., *concolor*), but still obvious.

Adult male with body rather slender (e.g., *dispar*) to almost as stout as that of a lasiocampid (e.g., *mathura*); no metallic dorsal tufts on metathorax or abdomen; antenna bipectinate with very long branches, each bearing one long terminal spinule and sometimes a second very short one; palpi heavily scaled, somewhat compressed, broad and rounded in profile, very similar to those of *Dasychira* or *Orgyia*; eye variable—large and protuberant, as wide or wider than front in most species (presumably nocturnal), as in *monacha*, or reduced to much narrower than front in predominantly diurnal species such as *dispar*; foretibia with full-length epiphysis; hindtibia with both pairs of spurs.

Venation of forewing without an accessory cell, basically similar to that of *Leucoma* except that R_2 does not arise separately from cell but branches from R_{3-5}, and, in both wings, M_2, M_3 and Cu_1 are not as widely separated.

Male genitalia with tegumen and uncus almost rigidly fused, and saccus often elongated, the whole forming a fusiform unit when viewed dorsoventrally; no gnathos; juxta a laterally elongated plate; valves of characteristic shape, usually a small basal lobe bearing an elongate, fingerlike costal process (e.g., in *dispar* and *monacha*). In some species the valve bears additional processes such as an accessory costal process and an elongated lobe arising from the saccular area, and also a pair of fingerlike processes on the tegumen between the uncus and bases of the valves (e.g., in *mathura*). Aedoeagus simple, rodlike, irregularly tapered distally; vesica globular or ovoid, simple, sometimes scobinate.

Adult female with wings longer and narrower than those of male, very large, even although seemingly not used for flight in some species. Body stout; metathorax and abdomen without metallic tufts; female antenna bipectinate with short branches hardly longer than thickness of shaft, each bearing one terminal spinule; palpi about as long but only half as wide as those of male, appearing somewhat hairy; eye smaller than that of male, but protuberant and as wide as front in some species (e.g., *monacha*), reduced and narrower than front in others (e.g., *dispar*); hindtibia with both pairs of spurs.

Female genitalia with a small, membranous, inconspicuous bursa copulatrix, no signum, usually a well-defined sterigma, and highly variable apophyses and ovipositor. The genus shows a strong tendency toward extreme elongation of the last three segments of the abdomen, including the anterior and posterior apophyses, forming a long ovipositor obviously adapted for some specialized egg-laying habit. Of the species examined, the elongated ovipositor is most extreme in *monacha*, but developed to a lesser extent in *concolor* and *mathura*. *Dispar* and *lunata* do not have this modification.

Most of the known larvae of *Lymantria* species are relatively simplified, with a full complement of low, rounded verrucae, all similarly developed, without dense dorsal hair tufts, and usually without hair pencils; the dorsolateral verrucae of the first thoracic segment are somewhat elevated, as though modified to bear hair pencils; the subdorsal tubercles bear stiff spines, the supraspiracular ones a mixture of spines and hair. The larvae of *dispar* and *monacha* are very similar; that of *fumida* has small anterior hair pencils, and the larva of *mathura* (subspecies *aurora* Butler) is peculiar in having one anterior and two posterior pairs of dorsolateral hair pencils. The life history of *dispar* is discussed under the species; others are not likely to differ greatly. The type-species, *monacha*, does differ from *dispar* in its host preferences, being a pest of coniferous trees in Europe. However, it feeds on various deciduous trees also. The tropical species may prove to be more host specific.

The only species of *Lymantria* established in the Western Hemisphere is *dispar*. Holland (1903: 309, pl. 38, figs. 14, 15) reported that he had been told that *L. monacha* was established in the suburbs of Brooklyn, New York, and even figured it in *The Moth Book*. Either the report was wrong or *monacha* did not persist, as there is no evidence of its presence now.

Lymantria dispar (L.) (Gypsy Moth*; Spongieuse, f., Fr.)

PL. 1, FIGS. 9–12. TEXT FIGS. 2 *a*, 20 (McD. 3965).

Phalaena Bombyx dispar Linnaeus, 1758, *Systema Naturae*, 10th edit., **1**: 501.
Type-locality: Not given. [Europe]

Bombyx dispar f. *disparina* Müller, 1802, *Fauna Lepidopterorum Silesiaca*, **3**: pl. 3, fig. 1.
Type-locality: Silesia, Poland.

Lymantria dispar var. *nigra* De Selys-Longchamps, 1857, *Ann. Soc. Ent. Belgique*, **1**: 52.
Type-locality: Belgium.

Liparis dispar japonica Motschulsky, 1860, *Études Entomologiques, rédigées par Victor Motschulsky*, **9**: 31. SUBSPECIES.
Type-locality: Japan.

Liparis dispar f. *burdigalensis* Mabille, 1876, *Bull. Soc. Ent. France*, (5) **6**: IX; see also Gaschet, 1876, *Ann. Soc. Ent. France*, (5) **6**: 521.
Type-locality: Bordeaux, France.

Liparis dispar var. *disparoides* Gaschet, 1876, *Ann. Soc. Ent. France*, (5) **6**: 521.
Type-locality: Bordeaux, France.

Porthetria umbrosa Butler, 1881, *Trans. Ent. Soc. London*, 1881: 10.
Type-locality: Tokei, Yokohama, and Hakodate, Japan.

Porthetria hadina Butler, 1881, *Trans. Ent. Soc. London*, 1881: 11.
Type-locality: Yokohama, Japan.

NOTE—*P. hadina* is based on the male type of *fumida* Butler, 1878, *Ann. Mag. Nat. Hist.*, (4) **20**: 402. The name *fumida* was restricted by Butler (1881) to the female type which thus in effect became the lectotype.

Ocneria dispar f. *erebus* Thierry-Mieg, 1886, *Le Naturaliste*, **8**: 237.
Type-locality: England.

Ocneria dispar ab. ♂ *semi-obscura* Thierry-Mieg, 1886, *Le Naturaliste*, **8**: 237.
Type-locality: England.

Lymantria dispar ab. *medio-fusca* Lambillion, 1898, *Rev. Ann. Soc. Ent. Namuroise*, 1898: p. 6.
Type-locality: Namur, Belgium.

Ocneria dispar f. *major* Fuchs, 1899, *Jahrbücher des Nassauischen Vereins für Naturkunde*, **52**: 130.
Type-locality: Germany.

Lymantria dispar ab. *fasciata* Lambillion, 1907, *Rev. Mensuelles Soc. Ent. Namuroise*, **7**: 51.
Type-locality: Liège, Belgium.

Lymantria dispar ab. *fasciata* Rebel, [1909], *in* Berge, *Schmetterlingsbuch*, 9th edition, p. 118.
Type-locality: Not given.

Lymantria dispar ab. *fraguarius* Ribbe, 1910, *Deutsche Ent. Zeits., Iris*, **23**: 221.
Type-locality: Andalusia, Spain.

Lymantria dispar ab. *insignata* Schultz, 1910, *Ent. Zeits.*, **24**: 35.
Type-locality: Vicinity of Berlin, Germany.

Lymantria dispar ab. *angulifera* Schultz, 1910, *Ent. Zeits.*, **24**: 35.
Type-locality: Germany.

Lymantria dispar ab. *unifascia* Schultz, 1910, *Ent. Zeits.*, **24**: 36.
Type-locality: Germany.

Lymantria dispar ab. *submarginalis* Schultz, 1910, *Ent. Zeits.*, **24**: 36.
Type-locality: Brandenburg, Germany.

Lymantria dispar f. *brunnea* Schulze, 1910, *Int. Ent. Zeits., Guben*, **4**: 26.
Type-locality: Not given [vicinity of Berlin?].

Lymantria dispar f. *wladiwostockensis* Strand, 1911, *in* Seitz, *Die Gross-Schmetterlinge der Erde*, **2**: 127.
Type-locality: Vladivostok, U.S.S.R.

Lymantria dispar ab. *destrigata* Klemensiewicz, 1912, *Spraw. Kom. Fizyogr. Kraków*, **46** (2): 6.
Type-locality: "Nowym Sączu."

Lymantria dispar f. *suffusa* Schulze, 1912, *Int. Ent. Zeits., Guben*, **6**: 263.
Type-locality: Vicinity of Berlin, Germany.

Lymantria dispar ab. *unicolor* Lambillion, 1913, *Rev. Mensuelles Soc. Ent. Namuroise*, Suppl. **28**: 441.
Type-locality: Belgium.

Lymantria dispar ab. *variegata* Lambillion, 1913, *Rev. Mensuelles Soc. Ent. Namuroise*, Suppl. **28**: 442; 1929, *Lambillionia*, **29** (10): pl. 1, fig. 4.
Type-locality: Destelbergen, Belgium.

Lymantria dispar f. *alba* Stauder, 1914, *Deutsche Ent. Zeits., Iris*, **28**: 16.
Type-locality: Trieste ("Österreichischen Litorale").

Lymantria dispar f. *atra* Heinrich, 1916, *Deutsche Ent. Zeits.*, 1916: 511.
Type-locality: Charlottenburg (near Berlin).

Liparis dispar ab. *lactea* Manon, 1926, *Revue de Zoologie Agricole et Appliquée*, **25**: 54.
Type-locality: Boutaut.

Liparis dispar ab. *dealbata* Manon, 1926, *Revue de Zoologie Agricole et Appliquée*, **25**: 55.
Type-locality: Boutaut.

Liparis dispar ab. *radiata* Manon, 1926, *Revue de Zoologie Agricole et Appliquée*, **25**: 55.
Type-locality: Boutaut.

Lymantria dispar asiatica Wnukowsky, 1926, *Rev. Russ. Ent.*, **20**: 79.
Type-locality: Southern and eastern Siberia.

Lymantria dispar asiatica ab. *obsoleta* Wnukowsky, 1926, *Rev. Russ. Ent.*, **20**: 79.
Type-locality: Not given [Siberia].

Lymantria dispar asiatica ab. *unicolor* Wnukowsky, 1926, *Rev. Russ. Ent.*, **20**: 80. HOMONYM of *unicolor* Lambillion, 1913.
Type-locality: Not given [Siberia].

Lymantria dispar asiatica ab. *ochracea* Wnukowsky, 1926, *Rev. Russ. Ent.*, **20**: 80.
Type-locality: Not given [Siberia].

Lymantria dispar albescens Matsumura, 1927, *Jour. Faculty Agric. Hokkaido Imperial University*, **19**: 25.
Type-locality: Ishigaki and Okinawa, Ryukyu Islands.

Lymantria [*dispar*] mut. *spectrum* Klatt, 1928, *Zoologischer Anzeiger*, **78**: 260.
Type-locality: Not given.

Lymantria dispar praeterea Kardakoff, 1928, *Ent. Mitteil.*, **17**: 416.
Type-locality: Ussuri [Maritime Territory, E. Siberia, U.S.S.R.].

Lymantria dispar praeterea ab. *examinata* Kardakoff, 1928, *Ent. Mitteil.*, **17**: 417.
Type-locality: Ussuri, U.S.S.R.

Lymantria dispar f. *fasciatella* Strand, 1934, *in* Bryk, *Lepidopterorum Catalogus*, **62**: 148.
NOTE—Proposed as a replacement name for *fasciata* Rebel, 1910, which is a junior homonym of *fasciata* Lambillion, 1907. It has the same type and type-locality as the Rebel name.

Lymantria dispar andalusiaca Reinig, 1938, *Elimination und Selektion*, p. 109.
Type-locality: Spain.

Lymantria dispar mediterranea Goldschmidt, 1940, *Material Basis of Evolution*, p. 59.
Type-locality: Southern Europe.

Lymantria dispar bocharae Goldschmidt, 1940, *Material Basis of Evolution*, p. 59.
Type-locality: Turkestan.

Lymantria dispar hokkaidoensis Goldschmidt, 1940, *Material Basis of Evolution*, p. 59.
Type-locality: Island of Hokkaido, Japan.

Lymantria dispar obscura Goldschmidt, 1940, *Material Basis of Evolution*, p. 60.

Type-locality: Lake Biwa and Gifu region, Honshu, Japan.

Lymantria dispar chosenensis Goldschmidt, 1940, *Material Basis of Evolution*, p. 60.
Type-locality: Korea.

Lymantria dispar nesiobia Bryk, 1942, *Deutsche Ent. Zeits., Iris*, **56**: 25.
Type-locality: Yeterefu, Kuriles.

Lymantria dispar mut. *rara* Klatt, 1944, *Zoologischer Anzeiger*, **144**: 175.
Type-locality: Not given.

Lymantria dispar koreiba Bryk, 1948, *Arkiv för Zoologi*, **41A**: 15.
Type-locality: Motojondo, Korea.

Lymantria dispar kolthoffi Bryk, 1948, *Arkiv för Zoologi*, **41A**: 16.
Type-locality: Kiangsu, Korea.

Lymantria dispar ab. *albofasciata* Schnaider, 1950, *Polskie Pismo Ent.*, **19**: 245, 253.
Type-locality: Not given.

Lymantria dispar ab. *obscurata* Schnaider, 1950, *Polskie Pismo Ent.*, **19**: 245, 253.
Type-locality: Not given.

Lymantria dispar ab. *fasciata* Schnaider, 1950, *Polskie Pismo Ent.*, **19**: 253. HOMONYM of *fasciata* Lambillion, 1907, and of Rebel, 1910.
Type-locality: Not given.

Lymantria dispar ab. *marmorea* Schnaider, 1950, *Polskie Pismo Ent.*, **19**: 253.
Type-locality: Not given.

Lymantria dispar ab. *grisea* Schnaider, 1950, *Polskie Pismo Ent.*, **19**: 293.
Type-locality: Not given.

Lymantria dispar ab. *subbrunnea* Schnaider, 1950, *Polskie Pismo Ent.*, **19**: 253.
Type-locality: Not given.

Lymantria dispar ab. *albicans* Schnaider, 1950, *Polskie Pismo Ent.*, **19**: 253.
Type-locality: Not given.

Lymantria dispar tsushimensis Inoue, 1956, *Tinea*, **3**: 141.
Type-locality: Kubara, Tsushima, Japan.

Lymantria dispar postalba Inoue, 1956, *Tinea*, **3**: 141.
Type-locality: Yakushima, Japan. [Inoue collection].

NOTE—Three additional names, *flava* Bandermann, 1924, *Ent. Zeits.*, **37**: 49, *eremita* Bandermann, 1924, *Int. Ent. Zeits.*, **18**: 30, and *bremenskyi* Knop, 1937, *Ent. Zeits.*, **51**: 262, were based on hybrids and have no standing in zoological nomenclature.

The gypsy moth is one of the most intensively studied and frequently described of all insects, as indicated by the many names proposed for its subspecies, forms and aberrations. These comprise what must be very nearly the longest list of synonyms for any species in the Lepidoptera. By listing all names for *dispar* in the synonymy I do not imply that none of these refer to valid subspecies; as distinct a form as *japonica*, for example, must be regarded as a good subspecies, if not a full species. However, all of the named variants are palearctic or oriental, not within the scope of the present work; indeed, none of the names were based on material of American origin. The form introduced into this continent is the nominate subspecies from Europe, *L. dispar dispar* (L.).

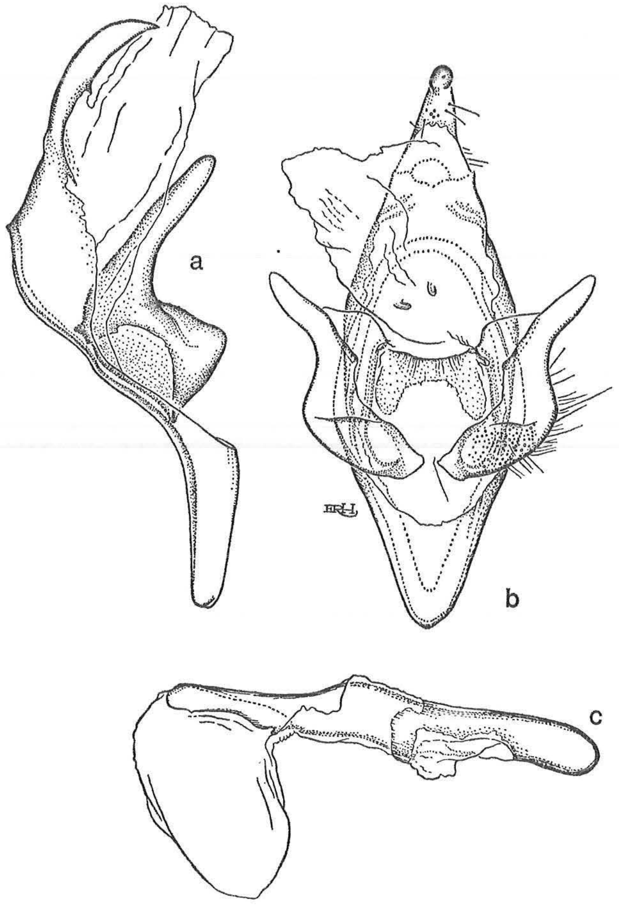

FIGURE 20: MALE GENITALIA OF *LYMANTRIA DISPAR*

a. Lateral view (New England).
b. Ventral view (no locality).
c. Aedoeagus of specimen shown in figure 20 *b*.

The gypsy moth was introduced into the United States about 1868 or 1869 by Leopold Trouvelot, a French artist, naturalist and mathematician who lived for a time at 27 Myrtle Street, Glenwood, Medford, Massachusetts, later returning to Paris. Trouvelot was greatly interested in rearing various species of moths to investigate their potential for silk production. He experimented with native species such as *Antheraea polyphemus* (Cramer) (Trouvelot, 1868) and imported from Europe a stock of *L. dispar* which he may have intended to use for hybridization experiments. During the course of his rearing work live material of *dispar* somehow escaped, and the species became established in the neighboring gardens, shade trees and woodland. Its escape seems to have been accidental, and Trouvelot, being aware of the dangerous character of the pest, and finding his efforts for its eradication futile, gave public notice of the fact that the moth had escaped from his custody (Forbush and Fernald, 1896: 3, 4). Within 10 or 12 years the moths became so abundant as to attract the attention of the residents of Medford, and by 1889, about 20 years after its introduction, the gypsy moth was unbelievably abundant throughout an area of about 359 square miles around Boston, stripping the trees completely.

The introduction and spread of the gypsy moth in Massachusetts was documented in detail by Forbush and Fernald (1896). They interviewed many of the residents of Medford and Malden who experienced the original outbreak, and the following are some samples of these early accounts:

> "In the fall of 1879 I moved to 27 Myrtle Street, where Mr. Trouvelot, who brought the gypsy moth to this country, formerly lived. In the following spring I found the shed in the rear of the house swarming with caterpillars. I knew that Mr. Trouvelot had been experimenting with silk-worms, but I did not know that the swarms of caterpillars in the shed came from the gypsy moth. . . . I fought the caterpillars of the gypsy moth for ten years before the State did anything. In their season I used to gather them literally by the quart before going to work in the morning [William Taylor]. [p. 8].
>
> "Mr. Trouvelot, who is said to have introduced the gypsy moth into this country, was a next-door neighbor of ours. The caterpillars troubled us for six or eight years before they attained to their greatest destructiveness. This was in 1889. They were all over the outside of the house, as well as the trees. All the foliage was eaten off our trees, the apples being attacked first and the pears next [Mrs. William Belcher]. [p. 8].
>
> "In 1889 the walks, trees and fences in my yard and the sides of the house were covered with caterpillars. I used to sweep them off with a broom and burn them with kerosene, and in half an hour they would be just as bad as ever. . . . The caterpillars did not leave a leaf. The trunks and branches were covered with their cocoons. The cocoons hung in bunches as big as a pint dipper. The stench in this place was very bad. (Mrs. S. J. Follansbee, 35 Myrtle Street). [p. 17].
>
> "I lived on Spring Street when the caterpillars were thickest there. The place simply teemed with them, and I used to fairly dread going down the street to the station. It was like running a gantlet. I used to turn up my coat collar and run down the middle of the street. One morning, in particular, I remember that I was completely covered with caterpillars inside my coat as well as out. The street trees were completely stripped down to the bark. . . . The worst place on Spring Street was at the houses of Messrs. Plunket and Harmon. The fronts of these houses were black with caterpillars, and the sidewalks were a sickening sight, covered as they were with the crushed bodies of the pest. (Sylvester Lacy). [p. 17].
>
> "About four to five P.M. they [the moths] flew about in thousands. Later in the season (1889) their eggs could be seen in clusters on the stone walls, fences, buildings and trees in great numbers, often nearly covering such objects. (James Bean). [p. 20]."

The adults of the gypsy moth should be easily recognized from the illustrations, plate 1, figures 9–12. The sexes are extremely dimorphic, the male being brown, and the female much larger and predominantly whitish. The male most closely resembles some of those in the other lymantriid genera, *Orgyia* and *Dasychira*, but may be distinguished by differences in the pattern of the forewing, especially the crescent-shaped discal spot, the single black dot in the cell between the antemedial line and discal spot, and the evenly dentate postmedial line. The female also has these markings but on a whitish background. The hindwing of the male is an obvious rust-brown shade, and the underside of both wings is a lighter brown. The male antenna is typically lymantriid, about as in the species shown (text figure 1 *c–e*), except that the end of each branch usually bears only one long spicule as in *Euproctis* and *Leucoma*, not two as in *Dasychira* and *Orgyia*. The female antenna is also bipectinate, but the branches and their subterminal spicules are much shorter.

The male genitalia are diagnostic; the species may always be identified by the shape of the valve (text figure 20), even if no other part of the moth is available. Sometimes it is useful to be able to make such determinations based only on decomposed fragments, as from the sticky pheromone traps used in surveys for this species.

The full-grown larvae are from 1½ to 2½ inches (31–63 mm) long, the larger ones being females. Male larvae molt five times and female larvae molt six times. The ground color of the body is yellowish brown, finely and densely flecked or mottled with black, most heavily in the dorsal area; a thin, light yellowish-brown, full-length, middorsal line is present. The conspicuous blue and red dorsal tubercles provide a good recognition character for this species. The five pairs of dorsal tubercles on the three thoracic segments and first two abdominal segments are blue, and those on abdominal segments three to eight are red. These are diagnostic. The dorsal eversible glands on abdominal segments six and seven are red. The two lateral rows of tubercles, above and below the spiracles, are usually brown, but the supraspiracular ones may be reddish. The dorsal tubercles bear short, delicate black spines, the supraspiracular ones a mixture of similar spines and longer black and yellowish hair, and the subspiracular ones somewhat shorter white or yellowish hair without spines. The subdorsal tubercles of the first thoracic segment are enlarged and bear a few more long hairs than do the others, but there are no real hair pencils or dense dorsal tufts as in *Orgyia* or *Dasychira*. The head has a reticulated pattern of black on a light-brown ground, with two irregular light bars dorsally and a pale, vertical midfrontal stripe. The abdominal legs have relatively well-developed lateral sclerotized plates. The larva is rather sparsely hairy compared to those of some of the tussock moths and more comparable in this regard to the larvae of *Leucoma salicis* and *Euproctis chrysorrhoea*. Superficially it resembles some of the tent caterpillars (Lasiocampidae, *Malacosoma* species), although the pattern and arrangement of colors is different.

The gypsy moth has one generation per year, and the adults occur from about mid-July until the end of August in New England; emergence may begin earlier farther south. The egg masses, each containing from 100 to 800 eggs, are deposited on the trunks or branches of trees, either fully exposed or in cavities or under loose bark, and sometimes on leaves, in debris on the ground, under stones, or on other surfaces such as stone walls. The eggs overwinter, and the young larvae hatch in May in New England, in April from eastern Pennsylvania southward. The larvae grow rapidly and reach maturity in little more than a month; the pupal stage lasts about ten days. Pupation commonly occurs on the trunks of trees, the pupa being enclosed in a flimsy cocoon made of only a few strands of silk.

Although the females have fully developed wings they do not fly, or at best are only barely capable of flight. Females of the large Japanese form, *L. dispar japonica* (or *L. japonica*?), differ in being able to fly well. Males of *dispar* fly very actively in late afternoon but appear to be somewhat nocturnal also; many have been collected at light. Their rust-brown coloring is probably an adaptation related to diurnal flight, as in the males of *Orgyia antiqua*.

Food plants of the gypsy moth include most of the common trees and shrubs, although in the first instar they appear to show a preference for species of oak, birch, alder, poplar, willow, sumac, basswood, larch, apple, hawthorn, shadbush, mountain ash, rose, box-elder, hazelnut and witch hazel. Later instars feed with less discrimination, readily accepting beech, chestnut, and conifers such as species of pine, spruce and hemlock. They tend to avoid species of elm, hickory, cherry, maple, and sassafras, black gum (*Nyssa sylvatica* Marsh.), blue beech (*Carpinus caroliniana* Walt.), and hop hornbeam (*Ostryia virginiana* (Mill.) K. Koch), except when food becomes scarce. Less favored trees may be severely defoliated if growing in mixed stands with more favored species. Some trees and shrubs they usually avoid entirely; these include ash, azalea, balsam fir, black walnut, dogwood, bald cypress, grape, greenbrier, hackberry, holly, honeysuckle, black locust, honey locust, mulberry, persimmon, sycamore, tulip tree and *Viburnum* species. For more detailed information on host preferences, consult Burgess and Baker, 1938.

From 1912 until the 1950's or early 1960's the gypsy moth quarantine programs of the U.S.

Department of Agriculture and various state agencies were in large part successful in retarding the spread of this species within and beyond the northeastern region. Isolated infestations were found in western New York in 1912, Ohio in 1914, New Jersey in 1914 and 1920, and western Pennsylvania in 1920, but these were eradicated. By 1922 it was widespread in all of the New England states and had spread into eastern New York; in 1932 it was discovered to be well established in eastern Pennsylvania. It subsequently reinvaded New Jersey and became established in central New York, Michigan and Maryland. The great upsurge in highway travel throughout North America in the 30-year period following the end of World War Two, and especially the widespread use of recreational vehicles for camping, appears to have greatly accelerated the spread of the gypsy moth. Egg masses and pupae are readily transported by such vehicles, and the insects may then hatch or emerge at new sites suitable for breeding.

New populations have recently become established in Cecil and Harford Counties, Maryland, southern Virginia, central North Carolina, Ohio and Lower Michigan. In the three years from 1972 to 1974, male moths were collected for the first time in South Carolina, Georgia, Florida, Kentucky, Indiana, Illinois, Missouri, California and Washington. A male was taken at Timberline Lodge, Mount Hood, Oregon, on 31 August 1968 (LACM), and males were collected in California in both 1973 and 1974, the most recent being from Yosemite National Park, Mariposa County, 28 August 1974 (*Lepidopterists' Society News*, 2/3: 2. 1975). In Canada, the gypsy moth is currently breeding in the counties of Glengarry and Stormont, being especially common near Kingston, and in southern Quebec between the St. Lawrence River and the United States border. Although known to breed only as far northeast as Machias and Dennysville, Maine, males were nevertheless taken in traps in several places in southern New Brunswick and in Yarmouth County, Nova Scotia, in the period 1971–73 (Forbes, Underwood and Van Sickle, 1974: 23). Burgess (1938: 36) reported it from St. Stephen, New Brunswick, but the recent records are the first from Nova Scotia.

Although long recognized as a pest in the Old World, outbreaks there have tended to be much less severe than in North America. Most native species have had time to evolve relatively stable populations, interacting with food supply, parasites, predators and diseases in a manner advantageous to long-term survival. Immigrants in a new region, deprived of such controls, may increase almost exponentially until the food supply gives out; that was the pattern of the original gypsy moth infestation in Massachusetts for the first 20 or 30 years. Since then, severe outbreaks in the Northeast have tended to run their course more quickly, probably in part because of biological control efforts and in part because of the changing composition of the forest under stress of gypsy moth depredations.

Several dipterous and hymenopterous parasites from Europe and Japan were successfully established in the United States, and a polyhedral virus "wilt" disease, believed to be of European origin, now takes a heavy toll of larvae in some areas, especially in dense populations. Major suppression projects currently involve the application of methylcarbamate, an organic phosphate insecticide, and *Bacillus thuringiensis*, a bacterial disease. The synthetic gypsy moth sex attractant, "Disparlure", developed by the U.S. Department of Agriculture at the Beltsville Agricultural Research Center, has proved to be an extremely effective bait in survey traps, but its use as a control agent is still experimental. It has been said that biological control has not been as successful as might have been expected (Nichols, 1962: 21), but at least in New England, population collapses are common after two or three years of what appears to be a natural cycle. After defoliating 255,000 acres in the eastern United States in 1969 and 972,000 acres in 1970, the gypsy moth reached a peak in 1971 with the defoliation of 2,000,000 acres, of which 75 per cent was classed as heavily defoliated. Total defoliation had declined to 750,905 acres in 1974. The previous high was in 1953 when 1,500,000 acres were defoliated.

GENUS
Leucoma Hübner

Laria Schrank, 1802, *Fauna Boica*, **2**: 152. HOMONYM.
Type-species: *Phalaena salicis* Linnaeus, 1758. Designated by Kozhanchikov, 1950, *Fauna U.S.S.R.*, **12**, Orgyidae: 340.

NOTE—*Laria* Schrank is preoccupied by *Laria* Scopoli, 1763, in the Coleoptera.

Leucoma Hübner, 1822, *Systematisch-alphabetisches Verzeichniss*...: 14–16, 18, 19.

Type-species: *Phalaena salicis* Linnaeus, 1758. Designated by Westwood, 1840, *Introduction to the Modern Classification of Insects . . .*, **2**, *Synopsis*: 92.

Stilpnotia Westwood, *in* Humphreys and Westwood, 1841, *British Moths and their Transformations*, **1**: 90.
Type-species: *Phalaena salicis* Linnaeus, 1758. Monotypy.

Leucosia Rambur, 1866, *Cat. Syst. Lép. Andalousie*, [2]: 266. HOMONYM.
Type-species: *Phalaena salicis* Linnaeus, 1758. Monotypy.

NOTE—*Leucosia* Rambur is preoccupied by *Leucosia* Weber, 1795, in the Crustacea.

Nymphyxis Grote, 1895, *Mitth. Roemer-Mus., Hildesheim*, **1**: [4].
Type-species: *Phalaena salicis* Linnaeus, 1758. Monotypy.

The species of *Leucoma* are of average size for the family; the sexes are more nearly alike in form and color than those of *Lymantria* and most other genera, the male having almost as stout a body as the female and wings of similar size and shape. The females are never as large as the largest *Lymantria dispar*. In both sexes the body and wings are white, the latter often with a satinlike lustre. Although species of *Euproctis* may also be white, many of these, including *chrysorrhoea* and *similis*, differ in having brown abdomens. Females of *Leucoma* apparently fly about as well as males. The genitalia and the integument of thorax and abdomen are darkly pigmented in *salicis* (but perhaps not in all species), and the resulting blackish body surface is often apparent through the sparse, white, hairy vestiture. Some species described from the Old World tropics have dark markings, at least a blackish discal spot on the forewing, but I consider it uncertain whether all species that have been included are congeneric. About 40 species have been considered to belong to the genus *Leucoma*, few of which I have seen. It is exclusively an Old World group with the exception of the one species introduced into North America. The following description is based mainly on *salicis* and *candida* Staudinger.

Adult male with body relatively stout, about like that of an average notodontid rather than like males of *Orgyia* species or *Lymantria dispar*, which are geometriform; no metallic tufts on metathorax or abdomen; antennae bipectinate with long branches, each bearing one very long and mostly one very short terminal spinule; palpi small, cylindrical, not exceeding front, dark or yellowish, hairy, unlike the larger, compressed palpi of *Lymantria*, *Dasychira* and *Orgyia*; eye quite large, as wide or wider than front; foretibia with a stout, full-length epiphysis; hindtibia with end spurs only.

Venation of forewing (text figure 21 *a*) without an accessory cell; subcosta and radial veins more nearly parallel to one another than those of *Lymantria*; R_2 arising before end of cell as in *Dasychira* and *Orgyia*; venation of hindwing about like that of *Lymantria*.

Male genitalia (text figure 21 *b*, *c*) peculiar in having valves fused together ventrally so that they cannot be spread apart in the usual way; valves thus form with tegumen and uncus a large outer ring within which, immediately behind zone of fusion, lies a large, thin, platelike juxta attached at its anterior margin (not visible in figure); tegumen greatly dilated toward saccal end, where saccus is present as a medial process; uncus short, inflexible; gnathos lacking; despite bizarre form, valve retains prominent costal process characteristic of many Lymantriidae (e.g., *Lymantria*, *Dasychira*, *Orgyia*); aedoeagus extremely large and stout relative to other genital components.

Adult female resembling male but with slightly stouter body, short antennal branches equal to two to three times thickness of shaft, and longer palpi, which slightly exceed front; also, eye about equal to width of front; epiphysis slightly shorter than foretibia. Female abdomen without enlarged anal tufts (e.g., like those of *Euproctis* and some *Lymantria* species), but ovipositor lobes (papillae anales) and eighth segment enormously enlarged and exposed at end of abdomen.

Female genitalia not studied in detail (illustrated by Kozhanchikov, 1950, figs. 165, 166, 169). The enlarged eighth segment and papillae anales, mentioned above, would seem to be their most notable feature.

Leucoma has a relatively simple, sparsely hairy larva. Although the verrucae may be quite large and bear radiating tufts of stiff hairs, these cover the body almost uniformly; there are no dense tufts or hair pencils. Dorsal glands are present on abdominal segments six and seven. Larval body markings evidently vary greatly from species to species; *salicis* is conspicuously marked with whitish spots; *candida* is blackish, marked only with weak, incomplete, pale stripes.

Leucoma salicis (Linnaeus) (Satin Moth*; Papillon Satiné, m., Fr.)

PL. 1, FIGS. 1, 2. TEXT FIG. 21 (McD. 3966).

Phalaena Bombyx salicis Linnaeus, 1758, *Systema Naturae*, 10th edit., **1**: 502.
Type-locality: Not given [Europe].

Leucoma salicis var. *sohesti* Capronnier, 1878, *Comptes-Rendus des Séances Soc. Ent. Belgique*, **21**: CC.
Type-locality: Near Bruxelles, Belgium.

Leucoma salicis ab. *rubicunda* Strand, 1901, *Schrift. Nat. Ges. Danzig*, N.F., **10**: 285.
Type-locality: Southern Norway.

Stilpnotia salicis nigrociliata Fuchs, 1903, *Jahrb. Nassauischer Verein für Naturkunde*, **56**: 71.
Type-locality: Not given [Europe].

Stilpnotia doii Matsumura, 1927, *Jour. Faculty Agric. Hokkaido Imperial University*, **19**: 38.
Type-locality: Rishiri Island, Japan.

Stilpnotia salicis ab. n. *neumanni* Bandermann, 1929, *Ent. Anz.*, **9**: 340.
Type-locality: Austria.

Leucoma salicis ab. *radiosa* S. G. Smith, 1954, *Ent. Rec. & Jour. Var.*, **66**: 97, pl. 3, fig. 7.
Type-locality: Wallasey, England.

Leucoma salicis f. *infranigricosta* Lempke, 1959, *Tijdschr. Ent.*, **102**: 123.
Type-locality: Groningen, Netherlands.

The satin moth is an introduced species native to temperate Eurasia from western Europe to Japan; it became established in North America sometime before 1920 in two widely separated

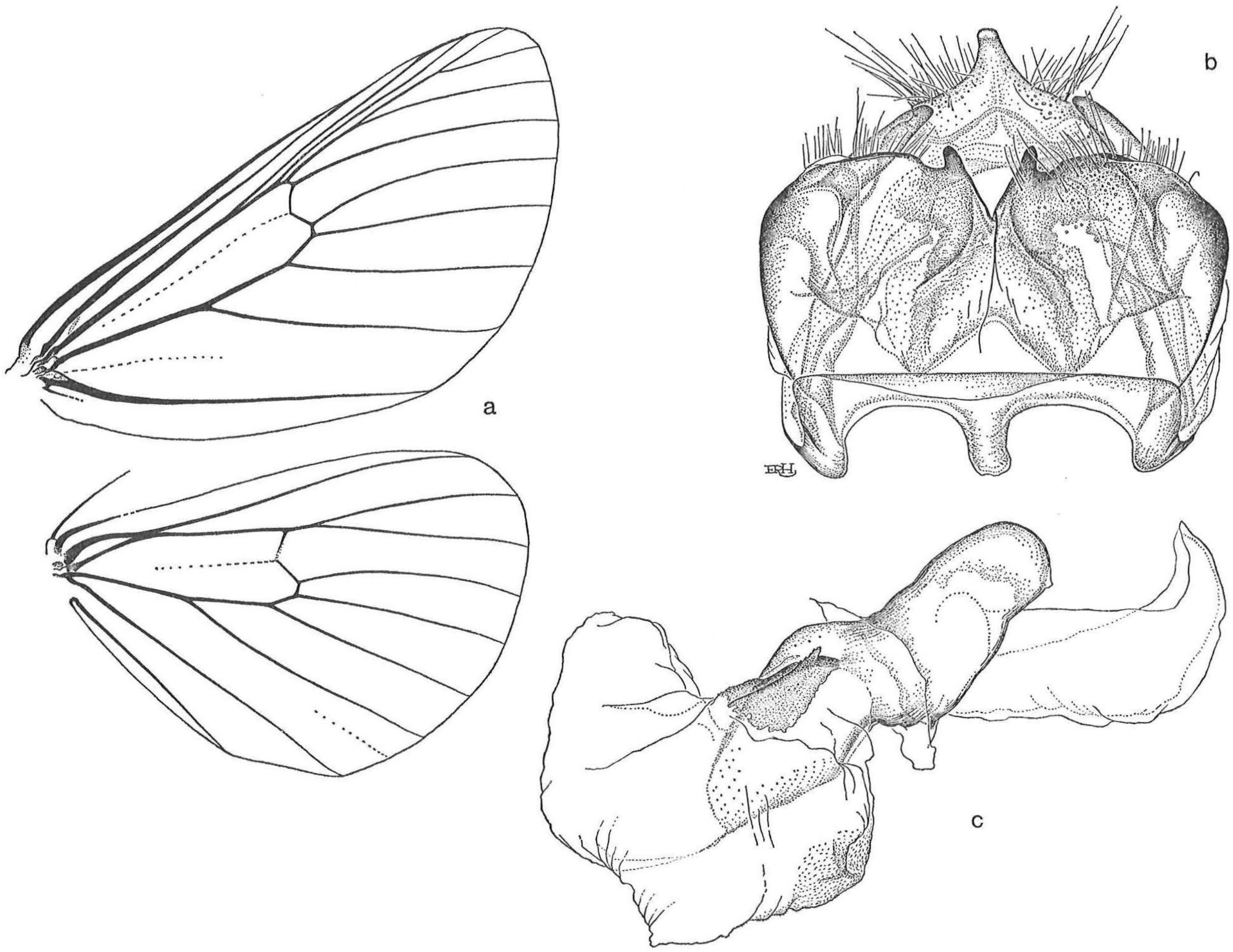

FIGURE 21: STRUCTURAL CHARACTERS OF *LEUCOMA SALICIS*

a. Wing venation, male (Quamichan Dist., Vancouver Island, B.C.).
b. Male genitalia (Halifax, N.S.). *c*. Aedoeagus of same specimen.

colonies, one in New England and the other in British Columbia. These populations have expanded greatly but still remain separate.

Salicis is the only moth of its size in our fauna that is entirely white, including the body, and with each leg marked by a series of annular black bands or at least transverse black bars (which may not always form complete rings). Some of the white species of Arctiidae may nearly fit this description but always have a patch of color somewhere on the body, spotted wings, or legs without black markings. The body integument of *salicis*, wherever the hairy vestiture has been worn thin or rubbed off, may be seen to be very dark, almost black. The antennae of both sexes are clearly of the lymantriid type, with usually one long and one very short spinule arising from the tip of each branch. The wings, especially the forewings, have a satinlike lustre which gave rise to the common name. Females especially may vary considerably in size, like those of the gypsy moth, but otherwise hardly any variation is apparent.

The full-grown larva is 45–50 mm long, bluish gray on the sides and black dorsally, with a conspicuous dorsal row of large cream-colored spots and a narrow subdorsal stripe of the same color broken into a series of segmental spots. The somewhat rounded dorsal spots lie astride the intersegmental membranes, and each tends to be bilaterally constricted near the middle at the intersegmental position. The verrucae (tubercles) are quite large, reddish brown, and bear relatively uniform tufts of brown to pale-yellowish hair; there are no dense tufts or hair pencils. The subdorsal verrucae are largest, the supraspiracular ones moderately large, and the sublateral ones smaller and double. The usual dorsal glands are present on abdominal segments six and seven. The head is black and sparsely clothed in rather long hairs. The very conspicuous whitish dorsal spots serve to distinguish this species from all other Lymantriidae in North America.

The larvae feed on species of poplar and willow and on this continent have usually shown a preference for ornamental or shade tree plantings of Lombardy poplar, *Populus nigra italica* DuRoi, white poplar, *P. alba* L., balm of Gilead or balsam poplar, *P. balsamifera* L., and Carolina poplar, *P. eugenei* Simon-Louis (believed to be a hybrid between Lombardy and balsam poplar) (Forbes, Underwood and Cuming, 1964: 27). The larvae will also feed on aspen and willow, perhaps in the absence of the preferred hosts, and were reported on the two aspens, *P. tremuloides* Michx. and *P. grandidentata* Michx., and on golden willow, *Salix vitellina* L., soon after the introduction of the species in New England (Burgess, 1927: 11). More recently there have been several reports of infestations of *salicis* in natural stands of trembling aspen in New Brunswick and central Newfoundland (Forest Insect and Disease Survey Reports, Canada Dept. Forestry, 1963–1970). In British Columbia it is reported to feed on all species of poplar, including black cottonwood, *P. trichocarpa* Torr. and Gray, with trembling aspen apparently the favored host in the Interior (Condrashoff, 1957: 27; Silver and Ross, 1964: 117). It is known to feed on various other poplars and willows in Europe.

The adults fly from early July to early August in Canada but may begin in June farther south. The eggs are laid on the bark of the host tree in usually elongate patches averaging about 15 mm in length, and they are covered with a white frothy secretion. They hatch in 12 to 19 days, and the young larvae feed from mid to late summer, going into diapause in the third instar. For purposes of hibernation the larvae spin individual webs in crevices or slight depressions in the bark of the trunks and branches, although under crowded conditions two or three larvae may occupy one web. The hibernation webs are only about 4 mm long, match the color of the bark, and are very inconspicuous. The larvae resume their feeding in the spring and, in the seventh instar, spin a loose cocoon through which the pupa is plainly visible. The cocoons may be formed between leaves on the tree, in crevices in the bark, in debris on the ground, or even on fences or on the sides of buildings. The adults emerge in about ten days. There has been much controversy over whether this species overwinters as an egg or young larva (Schnaider, 1959: 19). It would appear that in America and most of Europe hibernation occurs in the larval stage, but European reports of egg hibernation are numerous enough that it seems as though this may occur in some areas. *Salicis* has one generation in North America and most of Europe, although two generations are reported in southern Europe.

In the East *salicis* now occurs from Massachusetts to the Gulf of St. Lawrence region where it is found in all of the Atlantic Provinces, including the island of Newfoundland, on the Magdalen Islands, the Gaspé Peninsula, far up the St.

Lawrence River to the vicinity of Cornwall, Ontario, and thence southward into New York where there have been recent outbreaks near Herkimer and Utica in the Mohawk Valley. The western population occurs from Vancouver Island at least to the Okanagan Valley in the southern Interior of British Columbia, and southward through western Washington and Oregon to Modoc County, California.

The eastern and western introductions of this species were both discovered in 1920 (Burgess, 1921; Glendenning, 1929), and its subsequent spread is well documented. It was found to be well established between Boston, Massachusetts, and Hampton, New Hampshire, in 1920. By 1930 it had spread as far north as New Brunswick and Nova Scotia. It was reported from St. John's, Newfoundland, in 1934, Prince Edward Island in 1935, and the Magdalen Islands in 1937 (Reeks and Smith, 1956: 565). In the West, *salicis* was found defoliating poplars at New Westminster, British Columbia, in 1920 and at Vancouver in 1921. Its spread into the interior appeared to follow the Fraser River and the railway routes, by which it had reached Kamloops by 1950, Vernon by 1955, and Penticton by 1958 (Condrashoff, 1957: 26; Arrand, 1959: 40).

The adults of the satin moth are nocturnal, and females seem to fly about as well as males, unlike females of the gypsy moth. Both sexes are attracted to light in about equal numbers. I collected a female at about 5000 feet on Mount Washington, New Hampshire, 28 June 1953, at least 2000 feet above where the species would be expected to breed, and suppose this to be indicative of its flight and dispersal capabilities. A peculiar characteristic of the adults is that they are unusually difficult to kill in potassium cyanide killing jars.

GENUS
Euproctis Hübner

Euproctis Hübner, [1819], *Verzeichniss Bekannter Schmettlinge* [sic], (10): 159.
Type-species: *Phalaena chrysorrhoea* Linnaeus, 1758. Designated by Moore, [1883], *The Lepidoptera of Ceylon*, **2**: 89.

Nygmia Hübner, [1820], *Verzeichniss Bekannter Schmettlinge* [sic], (12): 193.
Type-species: *Phalaena icilia* Stoll, 1791. Designated by Kirby, 1892, *A Synonymic Catalogue of Lepidoptera Heterocera*, **1**: 448.

Porthesia Stephens, 1828, *Illustrations of British Entomology, Haustellata*, **2**: 65.
Type-species: *Phalaena chrysorrhoea* Linnaeus, 1758. Designated by Westwood, 1840, *Introduction to the Modern Classification of Insects . . .*, **2**, *Synopsis*: 92.

Artaxa Walker, 1855, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **4**: 794.
Type-species: *Artaxa guttata* Walker, 1855. Designated by Moore, [1883], *The Lepidoptera of Ceylon*, **2**: 84 (as *Bombyx digramma* Boisduval = *Artaxa guttata* Walker).

Lacida Walker, 1855, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **4**: 801.
Type-species: *Lacida antica* Walker, 1855. Designated by Swinhoe, 1923, *Ann. Mag. Nat. Hist.*, (9) **11**: 89.

Antipha Walker, 1855, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **4**: 806.
Type-species: *Antipha costalis* Walker, 1855. Designated by Kirby, 1892, *A Synonymic Catalogue of Lepidoptera Heterocera*, **1**: 456.

Dulichia Walker, 1855, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **4**: 809.
Type-species: *Dulichia fasciata* Walker, 1855. Monotypy.

Cispia Walker, 1855, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **4**: 857.
Type-species: *Cispia punctifascia* Walker, 1855. Designated by Moore, [1883], *The Lepidoptera of Ceylon*, **2**: 91.

Lopera Walker, 1855, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **4**: 919.
Type-species: *Lopera squamosa* Walker, 1855. Monotypy.

Arna Walker, 1855, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **4**: 1176.
Type-species: *Arna apicalis* Walker, 1855. Monotypy.

Urocoma Herrich-Schäffer, 1855, *Sammlung neuer oder wenig Bekannter Aussereuropäischer Schmetterlinge*, **1**: 82.

Type-species: *Urocoma limbalis* Herrich-Schäffer, 1855. Monotypy.

Somena Walker, 1856, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **7**: 1734.
Type-species: *Somena scintillans* Walker, 1856. Monotypy.

Utidava Walker, 1862, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **26**: 1689.
Type-species: *Utidava incomptaria* Walker, 1862. Monotypy.

Cozola Walker, 1865, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **32**: 390.
Type-species: *Cozola leucospila* Walker, 1865. Original designation.

Adlullia Walker, 1865, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **32**: 392.
Type-species: *Adlullia lunifera* Walker, 1865. Original designation.

Themaca Walker, 1865, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **32**: 394.
Type-species: *Themaca comparata* Walker, 1865. Monotypy.

Orvasca Walker, 1865, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **32**: 502.
Type-species: *Orvasca subnotata* Walker, 1865. Monotypy.

Bembina Walker, 1865, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **32**: 505.
Type-species: *Bembina apicalis* Walker, 1865. Monotypy.

Gogana Walker, 1866, *List of the Specimens of Lepidopterous Insects in the Collection of the British Museum*, **35**: 1920.
Type-species: *Gogana atrosquama* Walker, 1866. Monotypy.

Choerotricha Felder, 1874, *in* Felder, Felder and Rogenhofer, *Reise der Österreichischen Fregatte Novara um die Erde . . .* (*Zool.*), (2) **2**: Lepid., Atlas, pl. 98, fig. 14.
Type-species: *Choerotricha glandulosa* Felder, 1874. Designated by Collenette, 1935, *Stylops*, **4**: 244.

Cataphractes Felder, 1874, *in* Felder, Felder and Rogenhofer, *Reise der Österreichischen Fregatte Novara um die Erde . . .* (*Zool.*), (2) **2**: Lepid., Atlas, pl. 99, fig. 8.
Type-species: *Cataphractes holdingii* Felder, 1874. Monotypy.

Tearosoma Felder, 1874, *in* Felder, Felder and Rogenhofer, *Reise der Österreichischen Fregatte Novara um die Erde . . .* (*Zool.*), (2) **2**: Lepid., Atlas, pl. 100, fig. 6.
Type-species: *Tearosoma aspersum* Felder, 1874. Monotypy.

Chionophasma Butler, 1886, *Trans. Ent. Soc. London*, 1886: 384.
Type-species: *Chionophasma paradoxa* Butler, 1886. Monotypy.

Euproctis is an enormous Old World group of more than 600 species; of these, only *E. chrysorrhoea* (L.) has definitely become established in North America. Because of the size and diversity of the group, the generic definition given here cannot pretend to be all-inclusive; I have seen only about 20 per cent of the species. It is of necessity based on *chrysorrhoea*, *similis*, and their near relatives. If I were revising the whole genus, I think that I would treat it in the broad sense, including, as here, those species that used to be listed separately under *Nygmia* Hübner or *Porthesia* Stephens (the latter has the same type-species as *Euproctis*). Although I believe that the generic synonymy of 23 names is mainly correct, I cannot guarantee that it is entirely so.

Species of *Euproctis* range in size from very small (wing expanse 15 mm) to large (60 mm). Males of some of the small species are probably the smallest of all Lymantriidae, and females of the largest are nearly as large as those of *Lymantria*. Most, like *chrysorrhoea*, are more nearly midway between these extremes. The moths vary from quite slender to stout bodied, and sexual dimorphism in size, color and markings may be highly developed, especially in species of tropical Asia and the Indo-Australian region. A trend toward pale coloring and very simplified pattern, or no pattern, prevails throughout the group; the wings may be white, cream colored, straw yellow to deep yellow, grayish, or brown, with or without a pattern of spots (often only one or two spots); in some species the wings are bordered or banded with a different color but usually have no other pattern; a weak postmedial line or discal spot may be present on the forewing, but most species lack such markings. The two species treated here are pure white except for their brown- or yellowish-marked abdomens and faint dark spots on the male forewing of *similis*.

Adult male with body rather small but not as slender relative to wing area as that of *Lymantria* or *Orgyia*; no metallic tufts on thorax or abdomen; antennae bipectinate with long branches, each bearing one to three long terminal spinules; palpi slender, almost cylindrical, exceeding front by about half their length, third segment distinct, being more slender than second; eye large, protuberant, wider than front (in *E. similis* much wider than front); foretibia with epiphysis as long as tibia; hindtibia with both pairs of spurs.

Venation of forewing (text figure 22) without accessory cell; R_1 not arising from cell but branching from R_{3+4} far out, between points of origin of R_5 and R_4; bases of M_2 and Cu_1 nearly equidistant from M_3; hindwing with Sc and R barely touching, not fused; outer anterior corner of cell may be retracted $\frac{1}{3}$ of way toward base; M_3 and Cu_1 separate (text figure 22), stalked, or entirely united, appearing as one vein. Thus some species, such as *similis*, have one vein missing in the hindwing, and these have usually been placed in a different genus from species such as *chrysorrhoea*, which has a full complement of veins. However, I suspect that when all species are studied every intermediate stage will be found; *similis* and *chrysorrhoea* probably just happen to be species that show the opposite extremes of variation in this character. Examination of about 100 specimens of *chrysorrhoea* at the U.S. National Museum did indeed reveal that M_3 and Cu_1 may vary from separate to stalked for half their length in this species. In a smaller sample of *similis* I found no indication of a fork in $M_3 + Cu_1$.

Male genitalia (text figure 23) more conventional than those of *Leucoma*, although articulation of valve varies so that when spread out they may lie in an unusual position (text figure 23 *a*); saccus, juxta, and uncus well developed, the uncus rigidly downfolded; presence of true gnathos doubtful; aedoeagus variable but with rudiments of an upper and lower lip at distal end suggesting those of *Orgyia* species.

Adult female resembling male but larger, with stouter body, shorter antennal branches about equal in length to width of front; tip of abdomen appearing expanded because of presence of very large, dense, anal tuft surrounding tips of papillae anales. Female genitalia not studied.

Larvae gregarious and colorful, often dark with stripes or spots of red, orange or white. First, second and eighth abdominal segments may be somewhat swollen, giving larva a humped appearance, and first two or three abdominal segments may have low dorsal tufts; otherwise no special tufts or hair pencils; hair in general usually long but relatively sparse, allowing bright markings of integument to show clearly; usual two dorsal glands present.

Euproctis chrysorrhoea (Linnaeus) (Browntail Moth*; Cul brun, m., Fr.)

PL. 1, FIGS. 5–8. TEXT FIGS. 22, 23 *a* (McD. 3967).

Phalaena Bombyx chrysorrhoea Linnaeus, 1758, *Systema Naturae*, 10th edit., **1**: 502, No. 28.

Type-locality: Not given [Europe]. [Linnaean Society, London].

NOTE—Rothschild (1917: 355) presented a convincing case for the acceptance of *chrysorrhoea* as the name for the goldtail moth instead of for the browntail moth to which it had been applied previously, maintaining that Linnaeus' description and first cited reference fitted that species better than the browntail moth. He further contended that *Bombyx phaeorrhoea* Donovan, 1813, was the next oldest name available for the browntail moth, overlooking, however, *Bombyx auriflua* Esper, 1785, which, judging by Esper's colored figures, undoubtedly applies to this species. Rothschild's opinion prevailed for a time, being accepted by such authors as Barnes and Benjamin (1924: 213), Joannis (1928: 99), McDunnough (1938: 137), and Forbes (1948: 240), and *phaeorrhoea* has continued to be used for the browntail moth in North America to the present time. It did not gain such wide acceptance in Europe, where the names have generally been applied in the older sense.

Collenette (1947) reviewed the problem in detail, noting among other things that the only specimen in the Linnaean collection bearing an original label in Linnaeus' handwriting is an intact but unspread female of the browntail moth, and that most of the several references listed by Linnaeus, including the one cited first (Raj. ins. 156. n. 1: 15 [John Ray, *Historia Insectorum*, pp. xv, 400. London, 1710]), refer to this species or could refer to either species. I find Collenette's argument to be more in keeping both with the rules of priority and usage, and concur with him in returning to the earlier,

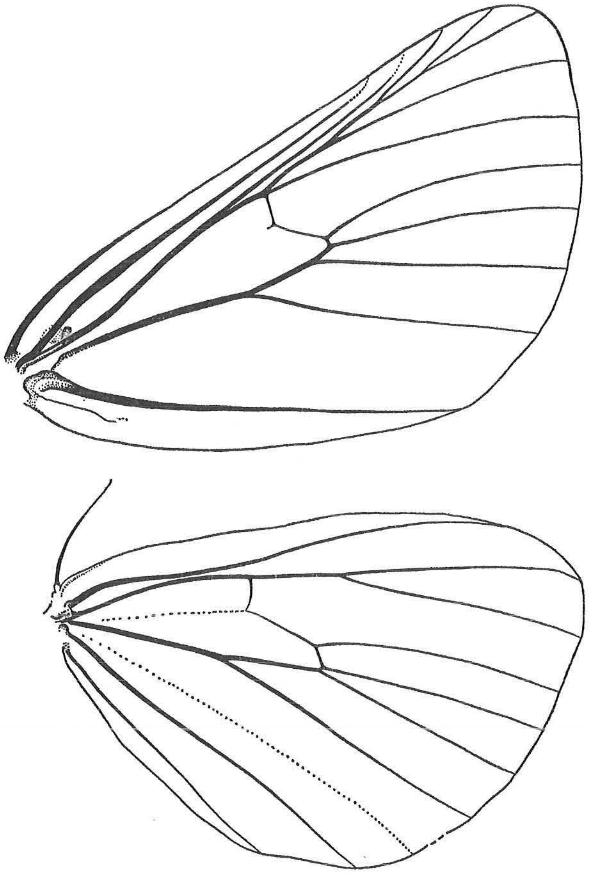

FIGURE 22: WING VENATION OF *EUPROCTIS CHRYSORRHOEA*
A specimen from Woburn, Mass.

more generally accepted names, *chrysorrhoea* for the browntail and *similis* Fuessly for the goldtail moth. The specimen of *chrysorrhoea* with Linnaeus' original label should probably be designated the lectotype; I do not do so here because I have not seen it.

Phalaena Bombyx auriflua Esper, 1785, *Die Schmetterlinge in Abbildungen nach der Natur*, **3**: 207, pl. 39, fig. 6. REVISED SYNONYMY.
Type-locality: Not given [Europe].

NOTE—*Phalaena Bombyx auriflua* [Denis and Schiffermüller], 1775, *Ankündung eines systematischen Werkes von den Schmetterlingen der Wienergegend*: 52, No. 4, is not accompanied by any description, reference, or clear indication, and hence is a *nomen nudum*. *Auriflua* Esper, 1785, is available, but it belongs in the synonymy of the browntail moth as listed here, not the goldtail moth with which it has usually been associated. Although *P. similis* Fuessly was listed by Esper as a synonym of *auriflua*, his fig. 6 unquestionably represents the browntail moth, especially inasmuch as his figs. 1 and 2 on the same plate show the goldtail moth, for which he used the name *chrysorrhoea*. *Bombyx auriflua* Fabricius, 1787, *Mantissa Insectorum*, **2**: 125, is the goldtail moth, but it is a homonym of *auriflua* Esper, 1785.

Bombyx phaeorrhoea Donovan, 1813, *The Natural History of British Insects*, **16**: pl. 555.
Type-locality: England.

Porthesia chrysorrhoea ab. *punctigera* Teich, 1889, *Korrespondenzblatt Naturforscher Verein Riga*, **41**: 87.
Type-locality: Riga, Latvia.

Euproctis chrysorrhoea ab. *nigrosignata* Bandermann, 1906, *Ent. Zeits., Guben*, **20**: 97, figs. e, f.
Type-locality: Not given [Halle, Germany?].

Euproctis chrysorrhoea f. *abdominata* Strand, 1910, *in* Seitz, *Die Gross-Schmetterlinge der Erde*, **2**: 135.
Type-locality: Bukowina [Near border of Rumania and eastern Ukraine. A province of the old Austrian-Hungarian Empire].

Euproctis chrysorrhoea ab. *punctella* Strand, 1910, *in* Seitz, *Die Gross-Schmetterlinge der Erde*, **2**: 135, pl. 21 e.
Type-locality: Not given.

Euproctis chrysorrhoea ab. *flavescens* Rebel, [1909], *in* Berge, *Schmetterlingsbuch*, p. 116.
Type-locality: Saxony, Germany.

Euproctis chrysorrhoea ab. *plumbociliata* Heinrich, 1916, *Deutsche Ent. Zeits.*, 1916: 510.
Type-locality: Berlin.

Euproctis chrysorrhoea f. *xanthorrhoea* Oberthür, 1916, *Études de Lépidoptérologie Comparées*, **12**: 282; ibid., **13**: 38, pl. CDXX, figs. 3586, 3587.
Type-locality: Algeria and Tunisia (specimens illustrated were from Aïn-Draham, Tunisia).

Euproctis chrysorrhoea ab. *fumosa* Chalmers-Hunt 1951, *Ent. Rec. & Jour. Var.*, **63**: 145.
Type-locality: St. Peter's, Isle of Thanet, Kent, England.

The browntail moth is an introduced species first discovered in North America at Somerville, Massachusetts, in 1897. It was locally well established when found and is believed to have been accidentally imported from Europe with nursery stock some years earlier. It went through a curious cycle of rapid expansion and decline within a period of less than 40 years and now is known to breed only in a few restricted coastal areas of New England.

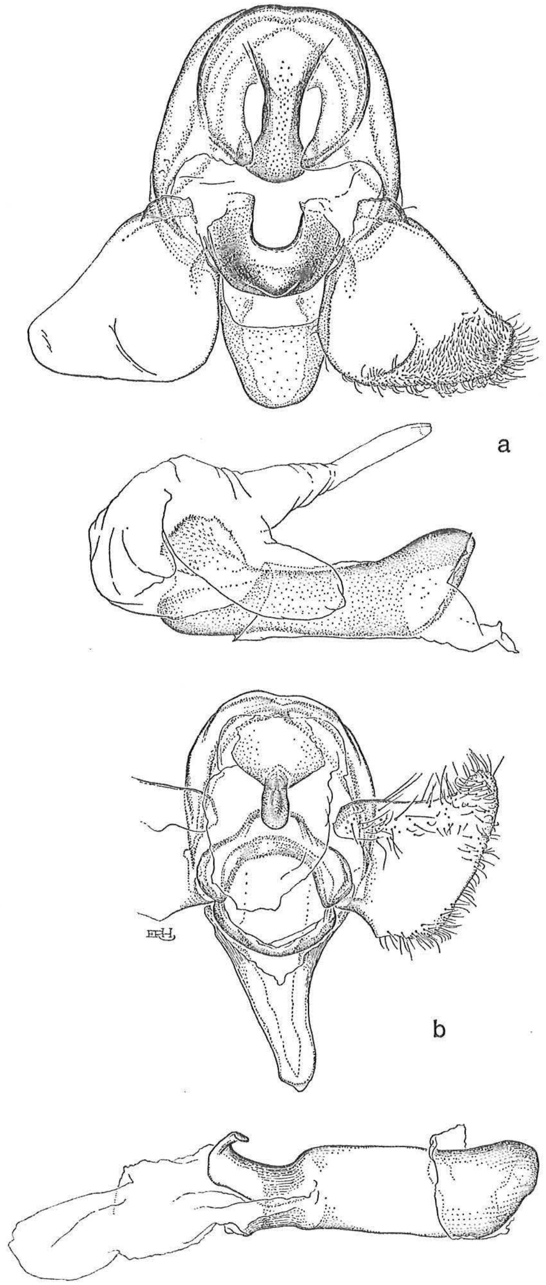

FIGURE 23: MALE GENITALIA OF *EUPROCTIS* SPECIES

a. Euproctis chrysorrhoea (Concord, N.H.).
b. Euproctis similis (Europe—no locality).

The adult moth is easily recognized, being the only species of this size with pure white wings and a brown abdomen; the color of the abdomen varies from orange to the more usual chestnut brown apically, and is a more grayish brown dorsally except for one or two white segments nearest the thorax. The dorsal abdominal coloring in females may be very pale, but they always have the tip of the abdomen expanded in a very distinctive way by enlarged, dense, brown apical tufts, the hairs of which become detached and fastened by a glutinous secretion to the egg masses when these are deposited. In Europe some examples of both sexes have small dark spots on the forewing, but I have not seen such specimens from America. Only the very similar goldtail moth, *E. similis* (plate 1, figures 3, 4), should it ever be rediscovered in North America, is likely to be confused with *chrysorrhoea*. In *similis* only the tip of the abdomen is colored, and it is yellow or orange. The male goldtail commonly has dark spots on the forewing, and the female abdomen is not as greatly expanded apically. The male genitalia differ greatly, as illustrated, and *similis* has lost vein M_2 of the hindwing.

The full-grown larva is about 35 mm long, dark brown, almost black, minutely dotted or striated with red, most strongly on the thoracic segments, and with the usual dorsal glands on abdominal segments six and seven also bright red. A broken, white, dorsolateral line runs the length of the abdomen; this is comprised of clumps of very short, downy, white hair. The body is clothed in yellowish-brown, barbed hairs arising from the usual verrucae in relatively sparse clumps; the dorsal verrucae of the first two or three abdominal segments are largest and bear slight rudiments of the dense dorsal tufting often better developed in other lymantriid genera, giving the larva a slightly humped appearance at this position. It has no hair pencils. The underside is blackish, transversely banded or striated with red or yellow. The head varies from light to dark brown.

The eggs are laid in a cluster of from 200 to 400 on the underside of a leaf and are covered with brown hairs from the abdomen of the female. The newly hatched larvae feed gregariously in late summer on the surface of the leaf, and after the first or second molt construct a shelter for hibernation. This is made by tying several terminal leaves together with a silk web and securing them to the twig. The larvae from one or more egg clusters may live and feed together and retire to a common shelter where they spend the winter. The larvae resume feeding as soon as the leaves develop in the spring; they reach maturity and pupate in late June. They spin cocoons between leaves, on the tree trunks, or wherever convenient, and about two weeks elapse before adult emergence (Burgess, 1938: 31). The flight period usually begins the first week of July and may last throughout July or even into August. The females seem to fly about as well as the males, and both sexes are attracted to light.

The favored foodplants of the browntail moth are usually the common rosaceous trees such as apple, pear, plum and cherry, both wild and cultivated, but the larvae are also known to feed on oak, willow, shadbush, bayberry, and many other kinds of trees and shrubs. Oak is commonly eaten by this species in Europe, and it inflicted severe damage upon oaks in New England for 20 or 30 years following its introduction; but there have been no significant reports of *chrysorrhoea* on oak in this region since the early 1930's. It never feeds on conifers and nearly always avoids certain other trees such as hickory and ash (Burgess, 1938: 32).

The history of the spread and decline of *E. chrysorrhoea* in North America is quite different from that of the gypsy moth or satin moth. After the initial discovery in Massachusetts in 1897, it spread rapidly and by 1905 had become extremely abundant in Rhode Island, southern New Hampshire, and southwestern Maine, and was first collected at Digby, Nova Scotia, in 1905. By 1915 it was causing severe damage to fruit and shade trees and to large areas of oak woodland from eastern Connecticut and Rhode Island northward well into Maine, through most of New Hampshire and eastern Vermont, and had become a major pest in the apple orchards of Nova Scotia and New Brunswick.

Beginning even before 1920, however, and continuing through the next two or three decades, the populations of the browntail moth steadily declined, and the distribution receded greatly until, today, the known breeding range is limited to some islands in Casco Bay, Maine, and beach areas of Cape Cod, Massachusetts. It appears to have become adapted almost exclusively to a seashore habitat where it feeds on such plants as *Prunus maritima* Marsh. on Cape Cod, *Myrica pensylvanica* Loisel and *Rosa virginiana* Mill. on some Casco Bay islands, as well as *Quercus*, *Prunus* and *Amelanchier* on other islands. Some populations are now being maintained on plants not considered or mentioned as preferred hosts at the time the species was at its peak of abundance early in this century (Schaefer, 1972: 44–45). It is interesting to note that the same kind of ecological restriction has occurred in Britain, where the browntail moth is now mainly confined to coastal regions of southwestern England, although on the European continent it is not exclusively coastal. Large periodic outbreaks of two or more years duration occur in Europe; there was an outbreak in Essex, England, in 1947–48, and there have since been others in Russia, Austria and Germany, northern Italy, and Yugoslavia.

The decline of the browntail moth in North America has generally been attributed to the large-scale collecting and burning of larval nests in fruit growing areas, spray programs, strict quarantine measures, and the introduction of European parasites, but surely only the last-mentioned strategy could have been of any permanent significance. The larvae breed successfully on so many kinds of uncultivated trees that the more direct control measures could have only local and temporary value, as in the case of the gypsy moth. The spectacular recession of the browntail moth probably has some ecological explanation that is not understood, but of course it may in part reflect the eventual success of parasites and diseases. Northward the distribution is limited climatically because the hibernating larvae are killed by temperatures below about −25° F. The potential southern limit of the species is unknown.

The browntail moth was thought to have been exterminated in Nova Scotia by the early 1930's, but in 1944 I collected males at light in two widely separated localities, the only examples that I ever saw there in more than 20 years of intensive collecting. These may have been individual immigrants from New England. On 6 July 1953 I found it coming commonly to light at Concord, New Hampshire, and three of these specimens are illustrated (plate 1, figures 5–7).

Euproctis similis (Fuessly) (Goldtail Moth; Cul doré, m., Fr.)

PL. 1, FIGS. 3, 4. TEXT FIG. 23 *b* (McD. 3968).

Phalaena similis Fuessly, 1775, *Verzeichniss der im Bekannten Schweizerischen Insekten ...*, p. 35, No. 662.
Type-locality: Switzerland.

Porthesia nyctea Grum-Grschimailo, 1891, *Hor. Soc. Ent. Ross.*, **25**: 464.
Type-locality: "In montibus ad Chuan-Che."

Porthesia similis var. *xanthocampa* Dyar, 1905, *Proc. United States Natl. Museum*, **28**: 948.
Type-locality: Japan.

Porthesia similis ab. *trimaculata* Strand, 1910, *in* Seitz, *Die Gross-Schmetterlinge der Erde*, **2**: 134.
Type-locality: Eastern Asia.

Porthesia similis ab. *quadrimaculata* Strand, 1910, *in* Seitz, *Die Gross-Schmetterlinge der Erde,* **2**: 134.
Type-locality: Eastern Asia.

Porthesia similis f. *coreacola* Matsumura, 1933, *Ins. Matsumurana,* **7**: 148, No. 12a.
Type-locality: Suigen, Korea.

Porthesia similis ab. *wilczynskia* Wize, 1934, *Polskie Pismo Ent.,* **13**: 108.
Type-locality: Vicinity of Gniezno, Poland.

Porthesia chrysorrhoea ab. *punctellata* Lempke, 1937, *Tijdschr. Ent.,* **80**: 284.
Type-locality: Amsterdam, Netherlands.

Porthesia similis subsp. *sjoquisti* Bryk, 1942, *Deutsche Ent. Zeits., Iris,* **56**: 26.
Type-locality: "Kurile Is."

Porthesia similis ssp. *varabilina* Bryk, 1948, *Ark. Zool.,* **41A**, No. 1: 17.
Type-locality: Korea—Gekatsungu, Myokosan or Shuotsu (source of holotype not specified).

Euproctis similis ab. *marginalis* Cockayne, 1951, *Entomologist,* **84**: 242, pl. 5, fig. 3.
Type-locality: Unknown.

Euproctis similis ab. *nigrostriata* Cockayne, 1951, *Entomologist,* **84**: 242, pl. 5, fig. 9.
Type-locality: Walthamstow, Essex, England.

Euproctis similis f. *immaculata* Lempke, 1959, *Tijdschr. Ent.,* **102**: 132.
Type-locality: Amsterdam, Netherlands.

Euproctis chrysorrhoea f. *fuscabdominata* Lempke, 1959, *Tijdschr. Ent.,* **102**: 133.
Type-locality: Wijk aan Zee, Netherlands.

Euproctis chrysorrhoea f. *nigricosta* Lempke, 1959, *Tijdschr. Ent.,* **102**: 134.
Type-locality: Zandvoort, Netherlands.

The goldtail moth is another Old World species native to Europe and the temperate regions of Asia east to Korea and Japan. It probably is not established in North America but has been reported several times. It may turn up again and is included here for that reason. I have seen specimens with three different North American locality labels, as follows: Budd Lake, New Jersey, 11 August 1934, Bud Fitzgerald (3 ♂♂ in CNC); Good's Greenhouse, London, Ontario, 15 May 1933 (1 ♂, 1 ♀ in CNC); Wellington, British Columbia, 4 May 1948, R. Guppy (1 ♂ in LACM). I illustrate the last example on plate 1, figure 3. These may represent isolated introductions that never became established or simply errors of labelling. The records for May would seem to be very much out of season.

The adults of *similis* and *chrysorrhoea* are similar except that the male *similis* usually has a faint grayish double or triple spot near the inner angle of the forewing, and the tip of the abdomen in both sexes is always bright orange or golden yellow, not deep brown. The abdominal coloring is confined to the posterior end only, the preceding four or more segments remaining predominantly whitish in both sexes. *Similis* has a more slender body than *chrysorrhoea,* and the tip of the female abdomen is not as much enlarged by exaggerated anal tufting. Also, in *similis,* vein M_2 of the hindwing is missing.

The life history of *similis* closely resembles that of *chrysorrhoea,* but the last instar larvae are readily distinguished by differences in coloring. They have conspicuous red markings consisting of a somewhat broken lateral stripe and a very distinct pair of orange-red addorsal lines that begin on the thorax, diverge abruptly on the first abdominal segment to encircle the dorsal verrucae, disappear on the second segment, and reappear as parallel addorsals on abdominal segments three to eight. These markings are variable, and in some specimens the addorsal lines are so exaggerated in width that they become confluent, forming one wide dorsal stripe. *Similis* is a rather general feeder on shade and forest trees and, like *chrysorrhoea,* is a well-known pest. In Europe the adults fly from late June through July.

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THE PLATES

Noctuoidea

LYMANTRIIDAE

PLATE 1

Noctuoidea

LYMANTRIIDAE

figs. 1–30

NATURAL SIZE 1:1

1. *Leucoma salicis* (L.), ♂. Debert, Colchester Co., N.S., 19 July 1961, D. C. Ferguson (USNM). (p. 97).
2. *Leucoma salicis* (L.), ♀. Yarmouth, Mass., July 1935 (USNM). (p. 97).
3. *Euproctis similis* (Fuessly), ♂. Wellington, B.C., 4 May 1948, R. Guppy (LACM). (p. 104).
4. *Euproctis similis* (Fuessly), ♀. Doboz (Békés), Hungary, 11 June 1927 (USNM). (p. 104).
5. *Euproctis chrysorrhoea* (L.), ♂. Concord, N.H., 6 July 1953, D. C. Ferguson (USNM). (p. 101).
6. *Euproctis chrysorrhoea* (L.), ♂. Concord, N.H., 6 July 1953, D. C. Ferguson (USNM). (p. 101).
7. *Euproctis chrysorrhoea* (L.), ♀. Concord, N.H., 6 July 1953, D. C. Ferguson (USNM). (p. 101).
8. *Euproctis chrysorrhoea* (L.), ♀. Manchester, N.H., 3 June 1938, *ex* larva, W. A. Osgood and J. C. Conklin (USNM). (p. 101).
9. *Lymantria dispar* (L.), ♂. Sandwich, Mass., July 1935 (USNM). (p. 90).
10. *Lymantria dispar* (L.), ♂. Waldeboro, Me., 8 Aug. 1970, C. V. Covell, Jr. (USNM). (p. 90).
11. *Lymantria dispar* (L.), ♀. Hamden, New Haven Co., Conn., reared from larva 24 July 1965, D. C. Ferguson (USNM). (p. 90).
12. *Lymantria dispar* (L.), ♀. Woburn, Mass., 21 July 1904, Ernest Shoemaker coll. (USNM). (p. 90).
13. *Acsala anomala* Benj., ♂. Head of Wheel Creek, 12 mi NW of Nome, Alas., 1000′, 29 May 1969, D. G. Roseneau (through K. W. Philip) (USNM). (p. 16).
14. *Acsala anomala* Benj., ♂. Head of Wheel Creek, 12 mi NW of Nome, Alas., 1000′, 29 May 1969, D. G. Roseneau (through K. W. Philip) (USNM). (p. 16).
15. *Gynaephora rossii* (Curtis), ♂. Mt. Jefferson, 5000′, N.H., *ex* pupa, 8 July 1952, D. J. Lennox and D. C. Ferguson (USNM). (p. 18).
16. *Gynaephora rossii* (Curtis), ♂. Labrador, Oberthür coll. (USNM). (p. 18).
17. *Gynaephora rossii* (Curtis), ♂. Rampart House, Y.T., 17 June 1951, J. E. H. Martin (CNC). (p. 18).
18. *Gynaephora rossii* (Curtis), ♂. Golovin, Alas., 10 July 1930 (USNM). (p. 18).
19. *Gynaephora rossii* (Curtis), ♂. Pt. Barrow, Alas., em. 27 June 1953, P. D. Hurd (USNM). (p. 18).
20. *Gynaephora rossii* (Curtis), ♂. Pt. Barrow, Alas., em. 19 June 1953, P. D. Hurd (USNM). (p. 18).
21. *Gynaephora rossii* (Curtis), ♀. Hopedale, Labr., Barnes coll. (USNM). (p. 18).
22. *Gynaephora rossii* (Curtis), ♀. Ft. McPherson, N.W.T., 5 July 1957, S. D. Hicks (CNC). (p. 18).
23. *Gynaephora rossii* (Curtis), ♀. Pt. Barrow, Alas., em. 24 June 1953, P. D. Hurd (USNM). (p. 18).
24. *Gynaephora rossii* (Curtis), ♀. Pt. Barrow, Alas., em. 21 June 1953, P. D. Hurd (USNM). (p. 18).
25. *Gynaephora groenlandica* (Wocke), ♂. Nedre Midsommer, Sö Greenland, 22 June 1966, Canadian Peary Land Expd. (CNC). (p. 20).
26. *Gynaephora groenlandica* (Wocke), ♂. Nedre Midsommer, Sö Greenland, 22 June 1966, Canadian Peary Land Expd. (CNC). (p. 20).
27. *Gynaephora groenlandica* (Wocke), ♀. Nedre Midsommer, Sö Greenland, 25 June 1966, Canadian Peary Land Expd. (CNC). (p. 20).
28. *Gynaephora groenlandica* (Wocke), ♂. Eureka, Ellesmere Island, N.W.T., em. 26 July 1953, P. F. Bruggemann (CNC). (p. 20).
29. *Gynaephora groenlandica* (Wocke), ♀. British Mts., Firth R., Y.T., 25 July 1956, E. F. Cashman (CNC). (p. 20).
30. *Gynaephora groenlandica* (Wocke), ♀. Eureka, Ellesmere Island, N.W.T., em. 26 June 1954, P. F. Bruggemann (CNC). (p. 20).

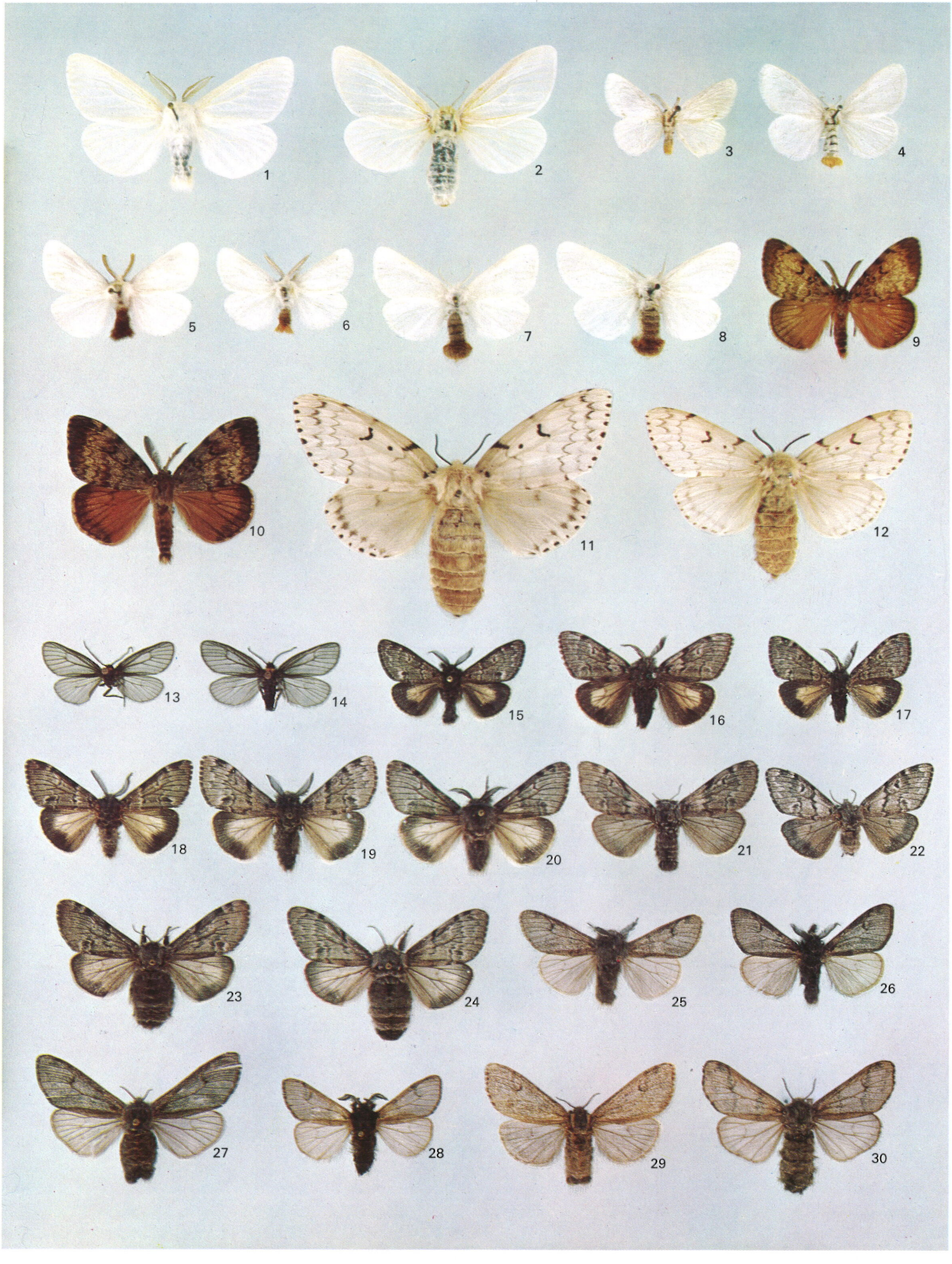
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PLATE 2

Noctuoidea

LYMANTRIIDAE

figs. 1–36

NATURAL SIZE 1:1

1. *Dasychira tephra* Hbn., ♂. McClellanville, S.C., 14 Aug. 1970, R. B. Dominick (WPC). (p. 25).
2. *Dasychira tephra* Hbn., ♂. McClellanville, S.C., 28 Aug. 1971, R. B. Dominick (WPC). (p. 25).
3. *Dasychira tephra* Hbn., ♂. McClellanville, S.C., 11 June 1968, R. B. Dominick (WPC). (p. 25).
4. *Dasychira tephra* Hbn., ♂. McClellanville, S.C., 27 May 1970, R. B. Dominick (WPC). (p. 25).
5. *Dasychira tephra* Hbn., ♂. McClellanville, S.C., 22 Nov. 1971, reared *ex ovo* on *Quercus nigra*, R. B. Dominick (WPC). (p. 25).
6. *Dasychira tephra* Hbn., ♂. Titusville, Fla., 31 March (CNC). (p. 25).
7. *Dasychira tephra* Hbn., ♂. Oneco, Manatee Co., Fla., 28 March 1957, J. G. Franclemont (JGF). (p. 25).
8. *Dasychira tephra* Hbn., ♂. Conroe, Montgomery Co., Tex., 22 April 1969, A. and M. E. Blanchard (AB). (p. 25).
9. *Dasychira tephra* Hbn., ♂. Conroe, Montgomery Co., Tex., 30 Sept. 1970, A. and M. E. Blanchard (AB). (p. 25).
10. *Dasychira tephra* Hbn., ♂. Conroe, Montgomery Co., Tex., 14 May 1967, A. and M. E. Blanchard (AB). (p. 25).
11. *Dasychira tephra* Hbn., ♀. McClellanville, S.C., 31 Aug. 1967, R. B. Dominick (WPC). (p. 25).
12. *Dasychira tephra* Hbn., ♀. McClellanville, S.C., 11 Aug. 1970, R. B. Dominick (WPC). (p. 25).
13. *Dasychira obliquata* (G. & R.), ♂. Six Mile Creek, Ithaca, N.Y., 6 Aug. 1947, J. G. Franclemont (JGF). (p. 48).
14. *Dasychira obliquata* (G. & R.), ♂. Richmond Gulf, Sardinia, N.Y., 2 Aug. 1946, J. G. Franclemont (JGF). (p. 48).
15. *Dasychira obliquata* (G. & R.), ♂. Lincoln, Penobscot Co., Me., 2 Aug. 1951, D. C. Ferguson (USNM). (p. 48).
16. *Dasychira obliquata* (G. & R.), ♂. Bear Mt., N.Y., reared *ex ovo*, 5 July 1933, F. Lemmer (USNM). (p. 48).
17. *Dasychira obliquata* (G. & R.), ♂. Cherry Hill Recreation Area, Rt. 107, 2000′, Oconee Co., S.C., 17 Aug. 1958, J. G. Franclemont (JGF). (p. 48).
18. *Dasychira obliquata* (G. & R.), ♂. Holotype of *Olene lemmeri* B. & Benj. Lakehurst, N.J., reared *ex ovo*, 2 Aug. 1926, Fred'k Lemmer (USNM). (p. 48).
19. *Dasychira obliquata* (G. & R.), ♂. Lakehurst, N.J. (Wrangle Brook Rd.), 28 Aug. 1956, J. G. Franclemont (JGF). (p. 48).
20. *Dasychira obliquata* (G. & R.), ♀. Holotype. Seekonk, R.I. (Labelled "E.S. No. 23080 Grote & Robinson Collection") (AMNH). (p. 48).
21. *Dasychira obliquata* (G. & R.), ♀. Six Mile Creek, Ithaca, N.Y., 10 Aug. 1956, J. G. Franclemont (JGF). (p. 48).
22. *Dasychira obliquata* (G. & R.), ♀. Wrangle Brook Road, Lakehurst, N.J., 21 Aug. 1955, J. G. Franclemont (JGF). (p. 48).
23. *Dasychira obliquata* (G. & R.), ♀. Wrangle Brook Road, Lakehurst, N.J., 31 Aug. 1956, J. G. Franclemont (JGF). (p. 48).
24. *Dasychira obliquata* (G. & R.), ♀. Highlands, 3865′, Macon Co., N.C., 3 July 1958, J. G. Franclemont (JGF). (p. 48).
25. *Dasychira obliquata* (G. & R.), ♀. Wrangle Brook Road, Lakehurst, N.J., 1 Sept. 1956, J. G. Franclemont (JGF). (p. 48).
26. *Dasychira obliquata* (G. & R.), ♀. Wrangle Brook Road, Lakehurst, N.J., 31 Aug. 1956, J. G. Franclemont (JGF). (p. 48).
27. *Dasychira obliquata* (G. & R.), ♀. Wrangle Brook Road, Lakehurst, N.J., 31 Aug. 1956, J. G. Franclemont (JGF). (p. 48).
28. *Dasychira cinnamomea* (G. & R.), ♂. Lectotype. Seekonk, R.I. (Labelled "No. 23086. Grote and Robinson Collection") (AMNH). (p. 45).
29. *Dasychira cinnamomea* (G. & R.), ♂. Washington, Litchfield Co., Conn., 24 July 1964, S. A. Hessel (USNM). (p. 45).
30. *Dasychira cinnamomea* (G. & R.), ♂. Putnam, Windham Co., Conn., reared *ex ovo*, Aug. 1965, A. B. Klots (CNC). (p. 45).
31. *Dasychira cinnamomea* (G. & R.), ♂. Lakehurst, N.J., July 1925, Fred'k. Lemmer (USNM). (p. 45).
32. *Dasychira cinnamomea* (G. & R.), ♂. Lakehurst, N.J., 1 Aug. 1910, Fred'k. Lemmer (USNM). (p. 45).
33. *Dasychira cinnamomea* (G. & R.), ♂. Wrangle Brook Road, Lakehurst, N.J., 25 Aug. 1956, J. G. Franclemont (JGF). (p. 45).
34. *Dasychira cinnamomea* (G. & R.), ♀. Wrangle Brook Road, Lakehurst, N.J., 31 Aug. 1956, J. G. Franclemont (JGF). (p. 45).
35. *Dasychira cinnamomea* (G. & R.), ♀. Wrangle Brook Road, Lakehurst, N.J., 21 Aug. 1955, J. G. Franclemont (JGF). (p. 45).
36. *Dasychira cinnamomea* (G. & R.), ♀. Holotype of *aridensis* Benjamin. Brown's Mills, N.J., 31 Aug. 1919, F. H. Benjamin (USNM). (p. 45).


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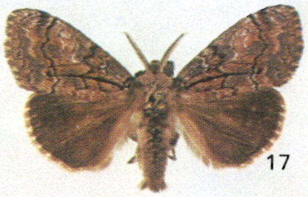
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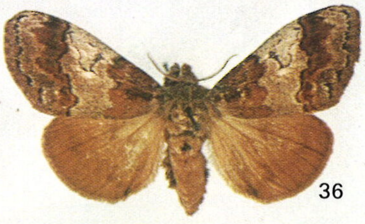
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PLATE 3

Noctuoidea

LYMANTRIIDAE

figs. 1–40

NATURAL SIZE 1:1

1. *Dasychira leucophaea* (J. E. Smith), ♂. Wedge Plantation, McClellanville, S.C., 30 Oct. 1968, reared *ex ovo* on *Quercus coccinea*, D. C. Ferguson (USNM). (p. 46).
2. *Dasychira leucophaea* (J. E. Smith), ♂. Wedge Plantation, McClellanville, S.C., 5 Nov. 1968, reared *ex ovo* on *Quercus coccinea*, D. C. Ferguson (USNM). (p. 46).
3. *Dasychira leucophaea* (J. E. Smith), ♂. Wedge Plantation, McClellanville, S.C., 5 Nov. 1968, reared *ex ovo* on *Quercus coccinea*, D. C. Ferguson (USNM). (p. 46).
4. *Dasychira leucophaea* (J. E. Smith), ♂. McClellanville, S.C., 25 May 1969, at light, R. B. Dominick (WPC). (p. 46).
5. *Dasychira leucophaea* (J. E. Smith), ♀. Wedge Plantation, McClellanville, S.C., 14 Aug. 1968, D. C. Ferguson (USNM). (p. 46).
6. *Dasychira leucophaea* (J. E. Smith), ♀. McClellanville, S.C., 12 May 1970, at light, R. B. Dominick (WPC). (p. 46).
7. *Dasychira leucophaea* (J. E. Smith), ♀. Wedge Plantation, McClellanville, S.C., 16 Nov. 1968, reared *ex ovo* on *Quercus coccinea*, D. C. Ferguson (USNM). (p. 46).
8. *Dasychira leucophaea* (J. E. Smith), ♀. Wedge Plantation, McClellanville, S.C., 20 Nov. 1968, reared *ex ovo* on *Quercus coccinea*, D. C. Ferguson (USNM). (p. 46).
9. *Dasychira leucophaea* (J. E. Smith), ♀. Lakehurst, N.J., 23 June, Otto Buchholz coll. (AMNH). (p. 46).
10. *Dasychira atrivenosa* (Palm), ♂. Lectotype. SW. Ark., coll. Chas. Palm (AMNH). (p. 43).
11. *Dasychira atrivenosa* (Palm), ♀. Paralectotype. SW. Ark., coll. Chas. Palm (AMNH). (p. 43).
12. *Dasychira atrivenosa* (Palm), ♂. Wedge Plantation, McClellanville, S.C., 12 Aug. 1968, D. C. Ferguson (WPC). (p. 43).
13. *Dasychira atrivenosa* (Palm), ♂. Wedge Plantation, McClellanville, S.C., reared 10 Oct. 1968 *ex ovo* on *Liquidambar styraciflua*, D. C. Ferguson (WPC). (p. 43).
14. *Dasychira atrivenosa* (Palm), ♀. Wedge Plantation, McClellanville, S.C., reared 14 Oct. 1968 *ex ovo* on *Liquidambar styraciflua*, D. C. Ferguson (WPC). (p. 43).
15. *Dasychira atrivenosa* (Palm), ♀. Town Bluff (Dam B), Tyler Co., Tex., 22 Sept. 1970, A. and M. E. Blanchard (AB). (p. 43).
16. *Dasychira basiflava* (Pack.), ♂. Fire Island, Long Island, N.Y., "VII-19" (USNM). (p. 34).
17. *Dasychira basiflava* (Pack.), ♂. Belmore, Long Island, N.Y., "VIII-10" (USNM). (p. 34).
18. *Dasychira basiflava* (Pack.), ♂. Orange Mts., N.J., 10 June 1931, Otto Buchholz, slide 117 D. C. Ferguson (USNM). (p. 34).
19. *Dasychira vagans vagans* (B. & McD.), ♂. L. Katherine, Oneida Co., Wis., 18 June 1941, H. M. Bower (AMNH). (p. 31).
20. *Dasychira basiflava* (Pack.), ♀. Greenwich, Fairfield Co., Conn., 17 July 1939, Starrett (YPM). (p. 34).
21. *Dasychira basiflava* (Pack.), ♀. Yaphank, Long Island, N.Y. (USNM). (p. 34).
22. *Dasychira basiflava* (Pack.), ♀. Lectotype of *Parorgyia clintoni*, G. & R. Seekonk, R.I., genitalia slide FHR 13,590 (AMNH). (p. 34).
23. *Dasychira basiflava* (Pack.), ♀. Beltsville, Md., 14 June 1970, D. C. Ferguson. Parent of males shown in figures 24, 25 (USNM). (p. 34).
24. *Dasychira basiflava* (Pack.), ♂. Beltsville, Md., reared 24 Aug. 1970 *ex ovo* on oak, D. C. Ferguson (USNM). (p. 34).
25. *Dasychira basiflava* (Pack.), ♂. Beltsville, Md., reared 24 Aug. 1970 *ex ovo* on oak, D. C. Ferguson (USNM). (p. 34).
26. *Dasychira basiflava* (Pack.), ♀. Short Hills, N.J., 15 June 1945, J. Mueller (AMNH). (p. 34).
27. *Dasychira basiflava* (Pack.), ♀. Highlands, 3865′, Macon Co., N.C., 1 July 1958, J. G. Franclemont (JGF). (p. 34).
28. *Dasychira matheri* Fgn., ♂. Allotype. Bovina, Warren Co., Miss., 19 July 1971, Bryant Mather (BM). (p. 36).
29. *Dasychira matheri* Fgn., ♂. Paratype. Bovina, Warren Co., Miss., 24 June 1971, Bryant Mather (BM). (p. 36).
30. *Dasychira meridionalis memorata* Fgn., ♂. Paratype. Wedge Plantation, McClellanville, S.C., 25 Sept. 1969, D. C. Ferguson (USNM). (p. 39).
31. *Dasychira meridionalis memorata* Fgn., ♂. Holotype. Wedge Plantation, McClellanville, S.C., reared 31 Oct. 1968 *ex ovo* on *Quercus coccinea*, D. C. Ferguson (USNM). (p. 39).
32. *Dasychira meridionalis memorata* Fgn., ♀. Allotype. Wedge Plantation, McClellanville, S.C., reared 4 Nov. 1968 *ex ovo* on *Quercus coccinea*, D. C. Ferguson (USNM). (p. 39).
33. *Dasychira meridionalis memorata* Fgn., ♀. Wedge Plantation, S. Santee R., Charleston Co., S.C., 18 Aug. 1968, D. C. Ferguson (WPC). (p. 39).
34. *Dasychira meridionalis memorata* Fgn., ♀. Wedge Plantation, S. Santee R., Charleston Co., S.C., 19 Aug. 1968, D. C. Ferguson (WPC). (p. 39).
35. *Dasychira meridionalis memorata* Fgn., ♀. Tennessee Colony, Anderson Co., Tex., 25 May 1966, A. and M. E. Blanchard (AB). (p. 39).
36. *Dasychira meridionalis memorata* Fgn., ♂. Town Bluff (Dam B), Tyler Co., Tex., 22 Sept. 1970, A. and M. E. Blanchard (AB). (p. 39).
37. *Dasychira meridionalis memorata* Fgn., ♂. Tennessee Colony, Anderson Co., Tex., 25 May 1966, A. and M. E. Blanchard (AB). (p. 39).
38. *Dasychira meridionalis kerrvillei* (B. & McD.), ♂. Lectotype. Kerrville, Tex., "V-12", H. Lacey (USNM). (p. 41).
39. *Dasychira meridionalis kerrvillei* (B. & McD.), ♂. Conroe, Montgomery Co., Tex., 13 May 1970, A. and M. E. Blanchard (AB). (p. 41).
40. *Dasychira meridionalis kerrvillei* (B. & McD.), ♂. Belton Reservoir, Bell Co., Tex., 6 May 1970, A. and M. E. Blanchard (AB). (p. 41).


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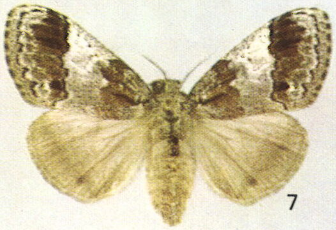
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PLATE 4

Noctuoidea

LYMANTRIIDAE

figs. 1–36

NATURAL SIZE 1:1

1. *Dasychira meridionalis kerrvillei* (B. & McD.), ♂. Conroe, Montgomery Co., Tex., 13 May 1970, A. and M. E. Blanchard (AB). (p. 41).
2. *Dasychira meridionalis kerrvillei* (B. & McD.), ♂. Conroe, Montgomery Co., Tex., 13 May 1970, A. and M. E. Blanchard (AB). (p. 41).
3. *Dasychira meridionalis memorata* Fgn., ♂. Churchill Bridge, Brazoria Co., Tex., 3 May 1968, A. and M. E. Blanchard (AB). (p. 39).
4. *Dasychira meridionalis kerrvillei* (B. & McD.), ♂. Bastrop State Park, Bastrop Co., Tex., 7 May 1970, A. and M. E. Blanchard (AB). (p. 41).
5. *Dasychira meridionalis kerrvillei* (B. & McD.), ♂. Belton Reservoir, Bell Co., Tex., 6 May 1970, A. and M. E. Blanchard (AB). (p. 41).
6. *Dasychira meridionalis kerrvillei* (B. & McD.), ♂. Belton Reservoir, Bell Co., Tex., 6 May 1970, A. and M. E. Blanchard (AB). (p. 41).
7. *Dasychira meridionalis pallorosa* Fgn., ♂. Holotype. Welder Wildlife Refuge, Sinton, San Patricio Co., Tex., 13 May 1963, A. and M. E. Blanchard (USNM). (p. 42).
8. *Dasychira meridionalis memorata* Fgn., ♀. Houston, Harris Co., Tex., 10 April 1963, A. and M. E. Blanchard (AB). (p. 39).
9. *Dasychira meridionalis kerrvillei* (B. & McD.), ♀. Bastrop State Park, Bastrop Co., Tex., 7 May 1970, A. and M. E. Blanchard (AB). (p. 41).
10. *Dasychira meridionalis meridionalis* (B. & McD.), ♂. Lectotype. Lakeland, Fla., 1–7 June (USNM). (p. 39).
11. *Dasychira meridionalis meridionalis* (B. & McD.), ♂. Oneco, Manatee Co., Fla., 27 March 1957, J. G. Franclemont (JGF). (p. 39).
12. *Dasychira meridionalis meridionalis* (B. & McD.), ♂. Oneco, Manatee Co., Fla., 26 March 1957, J. G. Franclemont (JGF). (p. 39).
13. *Dasychira meridionalis meridionalis* (B. & McD.), ♂. Titusville, Fla., "11–14" (CNC). (p. 39).
14. *Dasychira meridionalis meridionalis* (B. & McD.), ♀. Paralectotype. Lakeland, Fla., 1–7 June (USNM). (p. 39).
15. *Dasychira meridionalis meridionalis* (B. & McD.), ♀. Siesta Key, Sarasota Co., Fla., 5 April 1959, C. P. Kimball (CPK). (p. 39).
16. *Dasychira meridionalis memorata* Fgn., ♀. 2 mi SW Satsuma, Putnam Co., Fla., 20 June 1968, J. A. Concello (USNM). (p. 39).
17. *Dasychira meridionalis memorata* Fgn., ♀. Gainesville, Fla., 9 May 1968, R. E. Woodruff (USNM). (p. 39).
18. *Dasychira vagans vagans* (B. & McD.), ♂. Lectotype. St. Johns, Que., 1 July 1906, genitalia slide CH #5–4 Nov. 1930 (USNM). (p. 31).
19. *Dasychira vagans vagans* (B. & McD.), ♂. Norway Bay, Que., 8 July 1937, F. A. Urquhart (CNC). (p. 31).
20. *Dasychira vagans vagans* (B. & McD.), ♂. Aylmer, Que., 24 June 1919, J. McDunnough (CNC). (p. 31).
21. *Dasychira vagans vagans* (B. & McD.), ♂. Passadumkeag, Penobscot Co., Me., 5 July 1956, J. G. Franclemont (JGF). (p. 31).
22. *Dasychira vagans vagans* (B. & McD.), ♂. Passadumkeag, Penobscot Co., Me., 5 July 1956, J. G. Franclemont (JGF). (p. 31).
23. *Dasychira vagans vagans* (B. & McD.), ♂. Bat Cave, Henderson Co., N.C., 9 June 1969, C. V. Covell, Jr. (Covell coll.). (p. 31).
24. *Dasychira vagans vagans* (B. & McD.), ♂. L. Katherine, Oneida Co., Wis., 19 July 1943, H. M. Bower (CNC). (p. 31).
25. *Dasychira vagans vagans* (B. & McD.), ♀. Aylmer, Que., 24 June 1919, J. McDunnough (CNC). (p. 31).
26. *Dasychira vagans vagans* (B. & McD.), ♀. Constance Bay, Ont., 29 May 1941, T. N. Freeman (CNC). (p. 31).
27. *Dasychira vagans vagans* (B. & McD.), ♀. Big Indian Valley, Catskill Mts., N.Y., 21 June 1909, R. F. Pearsall (USNM). (p. 31).
28. *Dasychira vagans vagans* (B. & McD.), ♂. L. Kejimkujik, Queens Co., N.S., 13 July 1961, D. C. Ferguson (USNM). (p. 31).
29. *Dasychira vagans vagans* (B. & McD.), ♂. L. Kejimkujik, Queens Co., N.S., 2 July 1968, D. C. Ferguson (USNM). (p. 31).
30. *Dasychira vagans vagans* (B. & McD.), ♂. Petite Riviere, Lunenburg Co., N.S., 18 Aug. 1953, D. C. Ferguson (USNM). (p. 31).
31. *Dasychira vagans vagans* (B. & McD.), ♂. L. Kejimkujik, Queens Co., N.S., 14 July 1961, D. C. Ferguson (USNM). (p. 31).
32. *Dasychira vagans vagans* (B. & McD.), ♂. Doyles, Codroy Valley, Nfld., 30 July 1962, D. C. Ferguson (USNM). (p. 31).
33. *Dasychira vagans vagans* (B. & McD.), ♂. Doyles, Codroy Valley, Nfld., 2 Aug. 1962, D. C. Ferguson (USNM). (p. 31).
34. *Dasychira vagans vagans* (B. & McD.), ♂. Doyles, Codroy Valley, Nfld., 30 July 1962, D. C. Ferguson (USNM). (p. 31).
35. *Dasychira vagans vagans* (B. & McD.), ♀. L. Kejimkujik, Queens Co., N.S., 3 July 1957, D. C. Ferguson (USNM). (p. 31).
36. *Dasychira vagans vagans* (B. & McD.), ♀. S. Milford, Annapolis Co., N.S., 4 July 1934, J. McDunnough (CNC). (p. 31).


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PLATE 5

Noctuoidea

LYMANTRIIDAE

figs. 1–34

NATURAL SIZE 1:1

1. *Dasychira vagans grisea* (B. & McD.), ♂. Lectotype of *Olene vagans willingi* B. & McD. Humboldt, Sask., 13 July 1909 (USNM). (p. 32).
2. *Dasychira vagans grisea* (B. & McD.), ♂. Attons L., Cut Knife, Sask., 4 July 1940, A. R. Brooks (CNC). (p. 32).
3. *Dasychira vagans grisea* (B. & McD.), ♂. Joe Dollar Gulch, Hill City, Black Hills, S. Dak., 22 July 1964, D. C. Ferguson (YPM). (p. 32).
4. *Dasychira vagans grisea* (B. & McD.), ♂. Joe Dollar Gulch, Hill City, Black Hills, S. Dak., 29 July 1964, D. C. Ferguson (YPM). (p. 32).
5. *Dasychira vagans grisea* (B. & McD.), ♂. Big Timber Creek, 7 mi N of Big Timber, Sweetgrass Co., Mont., 10 July 1966, D. C. Ferguson (YPM). (p. 32).
6. *Dasychira vagans grisea* (B. & McD.), ♂. Big Timber Creek, 7 mi N of Big Timber, Sweetgrass Co., Mont., 10 July 1966, D. C. Ferguson (YPM). (p. 32).
7. *Dasychira vagans grisea* (B. & McD.), ♂. Lectotype. Eureka, Utah, 26 July 1911 (USNM). (p. 32).
8. *Dasychira vagans grisea* (B. & McD.), ♂. Dividend, Utah, "VII-4", Tom Spalding (USNM). (p. 32).
9. *Dasychira vagans grisea* (B. & McD.), ♀. Vernon, B.C., 11 July 1935, A. A. Dennys (CNC). (p. 32).
10. *Dasychira vagans grisea* (B. & McD.), ♀. Head of Pine Creek, Calgary, Alberta, 19 June 1910, "Bred *ex* full grown larva", F. H. Wolley Dod (CNC). (p. 32).
11. *Dasychira vagans grisea* (B. & McD.), ♀. Hill City, Pennington Co., S. Dak., 14 July 1964, D. C. Ferguson (USNM). (p. 32).
12. *Dasychira vagans grisea* (B. & McD.), ♀. Joe Dollar Gulch, Hill City, Black Hills, S. Dak., 21 July 1964, D. C. Ferguson (YPM). (p. 32).
13. *Dasychira vagans grisea* (B. & McD.), ♀. Snake Creek, Midway, Utah, 30 July 1971, D. C. Ferguson (USNM). (p. 32).
14. *Dasychira mescalera* Fgn., ♂. Paratype. Dalton Sprs. Camp, 5 mi W Monticello, San Juan Co., Utah, 8500′, 12 July 1963, F., P. and M. Rindge (AMNH). (p. 33).
15. *Dasychira mescalera* Fgn., ♂. Holotype. Guadalupe Mts., Tex., MacKittrick Canyon, 29 Sept. 1967, A. and M. E. Blanchard (USNM). (p. 33).
16. *Dasychira mescalera* Fgn., ♂. Paratype. Bear Canyon, 5400′, Guadalupe Mts., Tex., 3 Sept. 1969, A. and M. E. Blanchard (AB). (p. 33).
17. *Dasychira mescalera* Fgn., ♂. Paratype. Basin, Big Bend Natl. Park, Tex., 24 Sept. 1963, A. and M. E. Blanchard (AB). (p. 33).
18. *Dasychira mescalera* Fgn., ♂. Paratype. Green Gulch, Big Bend Natl. Park, Tex., 27 Aug. 1965, A. and M. E. Blanchard (AB). (p. 33).
19. *Dasychira mescalera* Fgn., ♀. Paratype. Basin, Big Bend Natl. Park, Tex., 4 Aug. 1964, A. and M. E. Blanchard (AB). (p. 33).
20. *Dasychira mescalera* Fgn., ♀. Paratype. Mackittrick Canyon, Guadalupe Mts., Tex., 29 Sept. 1967, A. and M. E. Blanchard (AB). (p. 33).
21. *Dasychira meridionalis kerrvillei* (B. & McD.), ♀. Paralectotype. Kerrville, Tex., June 1903 (USNM). (p. 41). The females shown in figures 21, 22 and 23 were included in this plate because I at first mistook them for specimens of *mescalera*.
22. *Dasychira meridionalis kerrvillei* (B. & McD.), ♀. Paralectotype. Kerrville, Tex., May 1909 (USNM). (p. 41).
23. *Dasychira meridionalis kerrvillei* (B. & McD.), ♀. Paralectotype. Kerrville, Tex., June 1900 (USNM). (p. 41).
24. *Dasychira dorsipennata* (B. & McD.), ♂. L. Kejimkujik, Queens Co., N.S., 13 July 1961, D. C. Ferguson (USNM). (p. 28).
25. *Dasychira dorsipennata* (B. & McD.), ♂. Smiley Brook, near Brooklyn, Hants Co., N.S., 18 July 1968, D. C. Ferguson (USNM). (p. 28).
26. *Dasychira dorsipennata* (B. & McD.), ♂. L. Kejimkujik, Queens Co., N.S., 13 July 1961, D. C. Ferguson (USNM). (p. 28).
27. *Dasychira dorsipennata* (B. & McD.), ♂. Annapolis Royal, N.S., reared 29 Sept. 1967 *ex ovo* on *Salix* sp., *Amelanchier* sp., etc., D. C. Ferguson (USNM). (p. 28).
28. *Dasychira dorsipennata* (B. & McD.), ♂. Lincoln, Me., reared 17–24 June 1934 on oak (USNM). (p. 28).
29. *Dasychira dorsipennata* (B. & McD.), ♂. Holotype. Chelsea, Ottawa Co., Que., 8–14 July (USNM). (p. 28).
30. *Dasychira dorsipennata* (B. & McD.), ♂. Poverty Hollow, Montgomery Co., Va., 9 July 1963, C. V. Covell, Jr. (Covell coll.). (p. 28).
31. *Dasychira dorsipennata* (B. & McD.), ♀. Smiley Brook, near Brooklyn, Hants Co., N.S., 20 July 1970, D. C. Ferguson (USNM). (p. 28).
32. *Dasychira dorsipennata* (B. & McD.), ♀. Annapolis Royal, N.S., reared 8 Oct. 1967 *ex ovo* on *Salix* sp., *Amelanchier* sp., etc., D. C. Ferguson (USNM). (p. 28).
33. *Dasychira dorsipennata* (B. & McD.), ♀. Aylmer, Que., 29 June 1920 [reared], J. McDunnough (CNC). (p. 28).
34. *Dasychira dorsipennata* (B. & McD.), ♀. Allotype. Chelsea, Ottawa Co., Que., 8–14 July (USNM). (p. 28).


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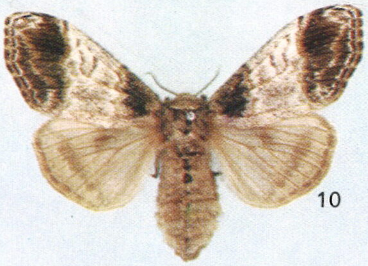
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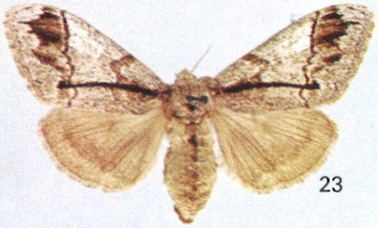
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PLATE 6

Noctuoidea

LYMANTRIIDAE

figs. 1–47

NATURAL SIZE 1:1

1. *Dasychira dominickaria* Fgn., ♂. Holotype. McClellanville, S.C., 30 May 1969, at light, R. B. Dominick (USNM). (p. 49).
2. *Dasychira dominickaria* Fgn., ♂. Paratype. McClellanville, S.C., 3 June 1970, R. B. Dominick (WPC). (p. 49).
3. *Dasychira dominickaria* Fgn., ♂. Paratype. McClellanville, S.C., 2 June 1970, R. B. Dominick (WPC). (p. 49).
4. *Dasychira dominickaria* Fgn., ♂. Paratype. Wedge Plantation, McClellanville, S.C., reared 29 Sept. 1971 *ex ovo* on bald cypress, D. C. Ferguson (USNM). (p. 49).
5. *Dasychira dominickaria* Fgn., ♂. Paratype. Wedge Plantation, McClellanville, S.C., reared 4 Dec. 1971 *ex ovo* on bald cypress, D. C. Ferguson (USNM). (p. 49).
6. *Dasychira dominickaria* Fgn., ♀. Paratype. Wedge Plantation, McClellanville, S.C., reared 13 Dec. 1971 *ex ovo* on bald cypress, D. C. Ferguson (USNM). (p. 49).
7. *Dasychira dominickaria* Fgn., ♀. Allotype. Wedge Plantation, McClellanville, S.C., reared 27 Nov. 1971 *ex ovo* on bald cypress, D. C. Ferguson (USNM). (p. 49).
8. *Dasychira dominickaria* Fgn., ♀. Paratype. McClellanville, S.C., 28 May 1970, R. B. Dominick (WPC). (p. 49).
9. *Dasychira dominickaria* Fgn., ♀. Paratype. Town Bluff (Dam B), Tyler Co., Tex., 22 Sept. 1970, A. and M. E. Blanchard (AB). (p. 49).
10. *Dasychira plagiata* (Wlk.), ♂. Doyles, Codroy Valley, Nfld., 6 Aug. 1962, D. C. Ferguson (USNM). (p. 51).
11. *Dasychira plagiata* (Wlk.), ♂. Doyles, Codroy Valley, Nfld., 31 July 1962, D. C. Ferguson (USNM). (p. 51).
12. *Dasychira plagiata* (Wlk.), ♂. Cascapedia Road, near Mt. Albert, Gaspé Peninsula, Que., 13 July 1950, D. C. Ferguson (USNM). (p. 51).
13. *Dasychira plagiata* (Wlk.), ♂. Smiley Brook, near Brooklyn, Hants Co., N.S., 18 July 1968, D. C. Ferguson (USNM). (p. 51).
14. *Dasychira plagiata* (Wlk.), ♂. Petite Riviere, Lunenburg Co., N.S., 16 July 1953, D. C. Ferguson (USNM). (p. 51).
15. *Dasychira plagiata* (Wlk.), ♂. Lincoln, Penobscot Co., Me., 7 July 1953, D. C. Ferguson (USNM). (p. 51).
16. *Dasychira plagiata* (Wlk.), ♂. Jefferson Notch, 3000′, N.H., 9 July 1952, D. C. Ferguson (USNM). (p. 51).
17. *Dasychira plagiata* (Wlk.), ♂. Lectotype of *Olene pini* Dyar. N. Saugus, Mass., genitalia slide USNM 52,602 (USNM). (p. 51).
18. *Dasychira plagiata* (Wlk.), ♂. Beckley Bog, near Norfolk, Litchfield Co., Conn., 21 June 1965, D. C. Ferguson (USNM). (p. 51).
19. *Dasychira plagiata* (Wlk.), ♂. Six Mile Creek, Ithaca, N.Y., 6 July 1954, J. G. Franclemont (JGF). (p. 51).
20. *Dasychira plagiata* (Wlk.), ♂. Richmond Gulf, Sardinia, N.Y., 7 Aug. 1946, J. G. Franclemont (JGF). (p. 51).
21. *Dasychira plagiata* (Wlk.), ♂. Richmond Gulf, Sardinia, N.Y., 30 July 1946, J. G. Franclemont (JGF). (p. 51).
22. *Dasychira plagiata* (Wlk.), ♂. Lectotype of *Olene interposita* Dyar. Tryon, N.C. (USNM). (p. 51).
23. *Dasychira plagiata* (Wlk.), ♂. Highlands, 3865′, Macon Co., N.C., 13 July 1958, J. G. Franclemont (JGF). (p. 51).
24. *Dasychira plagiata* (Wlk.), ♂. Richland Balsam Mt., 6000′, Jackson-Haywood Co. line, N.C., 30 June 1967, at light in forest of *Abies fraseri*, D. C. Ferguson (USNM). (p. 51).
25. *Dasychira plagiata* (Wlk.), ♀. Doyles, Codroy Valley, Nfld., 30 July 1962, D. C. Ferguson (USNM). (p. 51).
26. *Dasychira plagiata* (Wlk.), ♀. Petite Riviere, Lunenburg Co., N.S., 17 July 1953, D. C. Ferguson (USNM). (p. 51).
27. *Dasychira plagiata* (Wlk.), ♀. Petite Riviere, Lunenburg Co., N.S., 16 July 1953, D. C. Ferguson (USNM). (p. 51).
28. *Dasychira plagiata* (Wlk.), ♀. Concord, N.H., 6 July 1953, D. C. Ferguson (USNM). (p. 51).
29. *Dasychira plagiata* (Wlk.), ♀. Richmond Gulf, Sardinia, N.Y., 31 July 1946, J. G. Franclemont (JGF). (p. 51).
30. *Dasychira plagiata* (Wlk.), ♀. Lectotype of *Olene montana* Beutenmüller. Summit of Black Mts., N.C., 6500′ (AMNH). (p. 51).
31. *Dasychira plagiata* (Wlk.), ♀. Highlands, 3865′, Macon Co., N.C., 5 July 1958, J. G. Franclemont (JGF). (p. 51).
32. *Dasychira pinicola* (Dyar), dark form, ♂. Leslie Farm, Nelson Co., Ky., 23 June 1971, G. Florence (Covell coll.). (p. 53).
33. *Dasychira pinicola* (Dyar), dark form, ♂. Leslie Farm, Nelson Co., Ky., 23 June 1971, G. Florence (Covell coll.). (p. 53).
34. *Dasychira pinicola* (Dyar), ♂. Wrangle Brook Road, Lakehurst, N.J., 26 Aug. 1956, J. G. Franclemont (JGF). (p. 53).
35. *Dasychira pinicola* (Dyar), ♂. Wrangle Brook Road, Lakehurst, N.J., 8 June 1956, D. C. Ferguson (USNM). (p. 53).
36. *Dasychira pinicola* (Dyar), ♂. Wrangle Brook Road, Lakehurst, N.J., 18 June 1955, J. G. Franclemont (JGF). (p. 53).
37. *Dasychira pinicola* (Dyar), ♂. Wrangle Brook Road, Lakehurst, N.J., 14 June 1955, J. G. Franclemont (JGF). (p. 53).
38. *Dasychira pinicola* (Dyar), ♂. Wrangle Brook Road, Lakehurst, N.J., 3 June 1956, D. C. Ferguson (USNM). (p. 53).
39. *Dasychira pinicola* (Dyar), ♂. Wrangle Brook Road, Lakehurst, N.J., 7 June 1956, J. G. Franclemont (JGF). (p. 53).
40. *Dasychira pinicola* (Dyar), ♂. Wrangle Brook Road, Lakehurst. N.J., 5 June 1956, J. G. Franclemont (JGF). (p. 53).
41. *Dasychira pinicola* (Dyar), ♂. Wrangle Brook Road, Lakehurst, N.J., 7 June 1956, J. G. Franclemont (JGF). (p. 53).
42. *Dasychira pinicola* (Dyar), ♂. Wrangle Brook Road, Lakehurst, N.J., 3 June 1956, J. G. Franclemont (JGF). (p. 53).
43. *Dasychira pinicola* (Dyar), ♀. Wrangle Brook Road, Lakehurst, N.J., 20 Aug. 1955, J. G. Franclemont (JGF). (p. 53).
44. *Dasychira pinicola* (Dyar), ♀. Wrangle Brook Road, Lakehurst, N.J., reared 13 Aug. 1956 *ex ovo* on *Pinus banksiana* (in Nova Scotia), D. C. Ferguson (USNM). (p. 53).
45. *Dasychira pinicola* (Dyar), ♀. Wrangle Brook Road, Lakehurst, N.J., 8 June 1956, D. C. Ferguson (USNM). (p. 53).
46. *Dasychira pinicola* (Dyar), ♀. Wrangle Brook Road, Lakehurst, N.J., 8 June 1956, D. C. Ferguson (USNM). (p. 53).
47. *Dasychira pinicola* (Dyar), ♀. Wrangle Brook Road, Lakehurst, N.J., 28 Aug. 1956, J. G. Franclemont (JGF). (p. 53).


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PLATE 7

Noctuoidea

LYMANTRIIDAE

figs. 1–46

NATURAL SIZE 1:1

1. *Dasychira manto* (Stkr.), ♂. Southern Pines, N.C., reared on pine (USNM). (p. 57).
2. *Dasychira manto* (Stkr.), ♂. McClellanville, S.C., 12 April 1970, R. B. Dominick (WPC). (p. 57).
3. *Dasychira manto* (Stkr.), ♂. Wedge Plantation, S. Santee R., Charleston Co., S.C., 31 March 1967, D. C. Ferguson (USNM). (p. 57).
4. *Dasychira manto* (Stkr.), ♂. McClellanville, S.C., 19 Sept. 1968, R. B. Dominick (WPC). (p. 57).
5. *Dasychira manto* (Stkr.), ♂. McClellanville, S.C., 28 Sept. 1968, R. B. Dominick (WPC). (p. 57).
6. *Dasychira manto* (Stkr.), ♀. Southern Pines, N.C., 24–31 May, reared on pine (USNM). (p. 57).
7. *Dasychira manto* (Stkr.), ♀. Wedge Plantation, S. Santee R., Charleston Co., S.C., 29 March 1967, D. C. Ferguson (USNM). (p. 57).
8. *Dasychira manto* (Stkr.), ♀. Beltsville, Md., 14 June 1970, D. C. Ferguson (USNM). (p. 57).
9. *Dasychira manto* (Stkr.), ♀. Town Bluff (Dam B), Tyler Co., Tex., 21 Sept. 1970, A. and M. E. Blanchard (AB). (p. 57).
10. *Dasychira grisefacta grisefacta* (Dyar), ♂. Lectotype. Glenwood Sprs., Colo., 16–23 Aug., genitalia slide USNM 52,344 (USNM). (p. 55).
11. *Dasychira grisefacta grisefacta* (Dyar), ♂. Big Timber Canyon, *ca.* 6500′ (Half Moon Park), Crazy Mts., Mont., 25 July 1966, D. C. Ferguson (USNM). (p. 55).
12. *Dasychira grisefacta grisefacta* (Dyar), ♂. Big Timber Canyon, *ca.* 6500′ (Half Moon Park), Crazy Mts., Mont., 25 July 1966, D. C. Ferguson (USNM). (p. 55).
13. *Dasychira grisefacta grisefacta* (Dyar), ♂. Big Timber Canyon, *ca.* 6500′ (Half Moon Park), Crazy Mts., Mont., 25 July 1966, D. C. Ferguson (USNM). (p. 55).
14. *Dasychira grisefacta grisefacta* (Dyar), ♂. Holotype of *bonniwelli* (B. & Benj.). High Rolls, N. Mex., Aug., genitalia slide USNM 52,345 (USNM). (p. 55).
15. *Dasychira grisefacta grisefacta* (Dyar), ♀. Paralectotype. Glenwood Sprs., Colo., 24–30 July (USNM). (p. 55).
16. *Dasychira grisefacta grisefacta* (Dyar), ♀. Joe Dollar Gulch, near Hill City, Black Hills, S. Dak., 29 July 1964, D. C. Ferguson (USNM). (p. 55).
17. *Dasychira grisefacta grisefacta* (Dyar), ♀. Walnut Canyon, 6500′, 6⅓ mi EESE Flagstaff, Coconino Co., Ariz., 6 Aug. 1965, J. G. Franclemont. Reared from larva on *Pinus edulis* (JGF). (p. 55).
18. *Dasychira grisefacta ella* Bryk, ♂. "Type ♂." Duncans, Vancouver Island, B.C., "15-7-10", Hanham (USNM). (p. 56).
19. *Dasychira grisefacta ella* Bryk, ♂. Tenino, Thurston Co., Wash., 29 July 1949, E. C. Johnston (CNC). (p. 56).
20. *Dasychira grisefacta ella* Bryk, ♂. McDonald Fork, Oak Creek gate—el. 500′, 5 mi NW Corvallis, Benton Co., Wash., 26 July 1962, W. McFarland (LACM). (p. 56).
21. *Dasychira grisefacta ella* Bryk, ♀. "Type ♀." Duncans, Vancouver Island, B.C., Hanham (USNM). (p. 56).
22. *Orgyia leucostigma leucostigma* (J. E. Smith), ♂. Screven Co., Ga., 28 Sept., O. Buchholz coll., ♂ genitalia slide 11,241 (AMNH). (p. 82).
23. *Orgyia leucostigma leucostigma* (J. E. Smith), ♂. Wedge Plantation, McClellanville, S.C., 11 Aug. 1968, D. C. Ferguson (WPC). (p. 82).
24. *Orgyia leucostigma leucostigma* (J. E. Smith), ♂. Wedge Plantation, McClellanville, S.C., 15 Oct. 1971, D. C. Ferguson (USNM). (p. 82).
25. *Orgyia leucostigma leucostigma* (J. E. Smith), ♂. Wedge Plantation, McClellanville, S.C., 12 Dec. 1971, D. C. Ferguson (USNM). (p. 82).
26. *Orgyia leucostigma leucostigma* (J. E. Smith), ♂. McClellanville, S.C., 7 Aug. 1969, R. B. Dominick (WPC). (p. 82).
27. *Orgyia leucostigma leucostigma* (J. E. Smith), ♂. Oneco, Manatee Co., Fla., 19 March 1957, J. G. Franclemont (JGF). (p. 82).
28. *Orgyia leucostigma leucostigma* (J. E. Smith), ♂. Oneco, Manatee Co., Fla., 23 March 1957, J. G. Franclemont (JGF). (p. 82).
29. *Orgyia leucostigma leucostigma* (J. E. Smith), ♂. Oneco, Manatee Co., Fla., 20 March 1957, J. G. Franclemont (JGF). (p. 82).
30. *Orgyia leucostigma leucostigma* (J. E. Smith), ♂. Collier Seminole State Park, Collier Co., Fla., 11 April 1966, C. V. Covell, Jr. (USNM). (p. 82).
31. *Orgyia leucostigma leucostigma* (J. E. Smith), ♂. Tennessee Colony, Anderson Co., Tex., 25 May 1966, A. and M. E. Blanchard (AB). (p. 82).
32. *Orgyia leucostigma intermedia* Fitch, ♂. Holotype. New York (USNM). (p. 83).
33. *Orgyia leucostigma intermedia* Fitch, ♂. Holotype of *obliviosa* Hy. Edw. N.J., no. 7624 coll. Hy. Edwards (AMNH). (p. 83)
34. *Orgyia leucostigma intermedia* Fitch, ♂. Six Mile Creek, Ithaca, N.Y., 3 Aug. 1953, J. G. Franclemont (JGF). (p. 83).
35. *Orgyia leucostigma intermedia* Fitch, ♂. McLean Bogs Reserve, Tompkins Co., N.Y., 4 Aug. 1956, J. G. Franclemont (JGF). (p. 83).
36. *Orgyia leucostigma intermedia* Fitch, ♀. Brooklyn, New York, 25 Sept. 1914, coll. G. P. Engelhardt (USNM). (p. 83).
37. *Orgyia leucostigma intermedia* Fitch, ♂. Omaha, Nebr., 17 Sept. 1912, R. A. Leussler (AMNH). (p. 83).
38. *Orgyia leucostigma oslari* Barnes, ♂. Holotype. Poncha Sprs., Colo., 1–7 July, ♂ genitalia slide ELT 572 (USNM). (p. 85).
39. *Orgyia leucostigma oslari* Barnes, ♂. Colorado, coll. B. Neumögen (USNM). (p. 85).
40. *Orgyia leucostigma plagiata* (Wlk.), ♂. Aberration resembling *oslari.* Peggy's Cove, Halifax Co., N.S., 22 Sept. 1952, D. C. Ferguson (USNM). (p. 84).
41. *Orgyia leucostigma plagiata* (Wlk.), ♂. L. Kejimkujik, Queens Co., N.S., 22 Aug. 1957, D. C. Ferguson (USNM). (p. 84).
42. *Orgyia leucostigma plagiata* (Wlk.), ♂. Argyle, Yarmouth Co., N.S., reared 25 Aug. 1957 from larva on *Prunus serotina,* D. C. Ferguson (USNM). (p. 84).
43. *Orgyia leucostigma plagiata* (Wlk.), ♂. Middle R., Victoria Co., N.S., 18 Aug. 1970, Barry Wright (NSM). (p. 84).
44. *Orgyia leucostigma plagiata* (Wlk.), ♂. Debert, Colchester Co., N.S., 15 Sept. 1961, D. C. Ferguson (USNM). (p. 84).
45. *Orgyia leucostigma plagiata* (Wlk.), ♂. Peggy's Cove, Halifax Co., N.S., 18 Sept. 1952, D. C. Ferguson (USNM). (p. 84).
46. *Orgyia leucostigma intermedia* Fitch, ♂. Specimen resembling *plagiata.* Cartwright, Man., 8 Sept. 1912, ♂ genitalia slide ELT 2331 (USNM). (p. 83).


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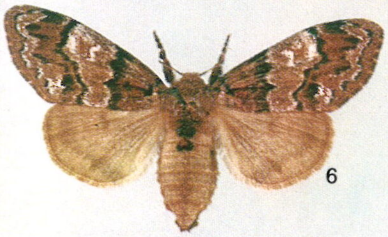
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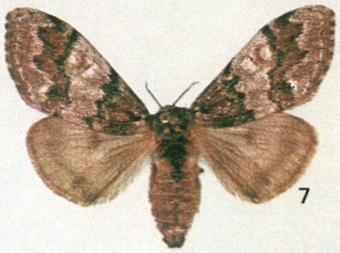
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PLATE 8

Noctuoidea

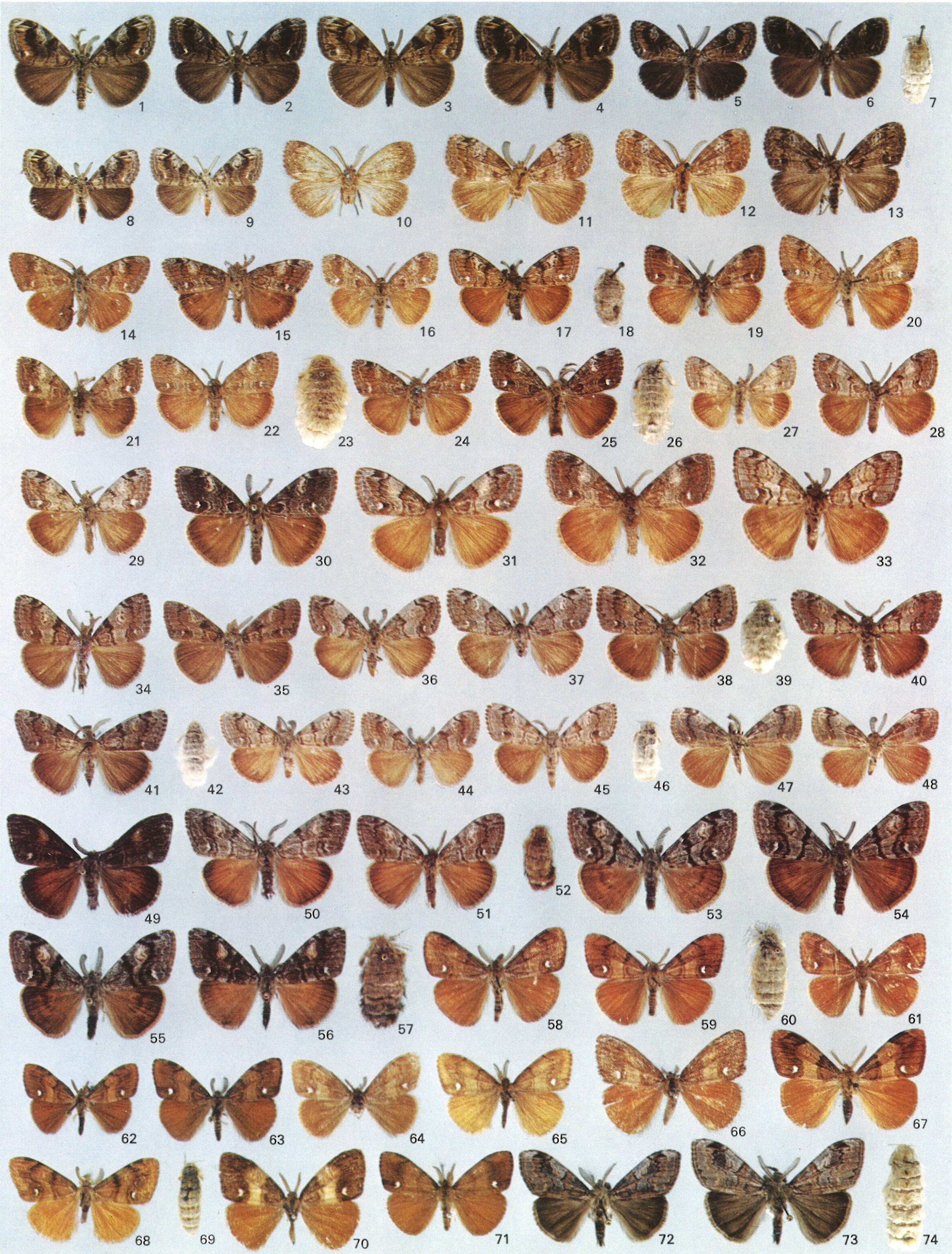
LYMANTRIIDAE

figs. 1–74

NATURAL SIZE 1:1

1. *Orgyia definita* Pack., ♂. McLean Bogs Reserve, Tompkins Co., N.Y., 22 Sept. 1950, J. G. Franclemont (JGF). (p. 77).
2. *Orgyia definita* Pack., ♂. Six Mile Creek, Ithaca, N.Y., 14 Sept. 1958, J. G. Franclemont (JGF). (p. 77).
3. *Orgyia definita* Pack., ♂. Highlands, 3865′, Macon Co., N.C., 7 Sept. 1958, J. G. Franclemont (JGF). (p. 77).
4. *Orgyia definita* Pack., ♂. Highlands, 3865′, Macon Co., N.C., 2 Sept. 1958, J. G. Franclemont (JGF). (p. 77).
5. *Orgyia definita* Pack., ♂. Wedge Plantation, McClellanville, S.C., 14 Oct. 1971, D. C. Ferguson (USNM). (p. 77).
6. *Orgyia definita* Pack., ♂. Wedge Plantation, McClellanville, S.C., 14 Oct. 1971, D. C. Ferguson (USNM). (p. 77).
7. *Orgyia definita* Pack., ♀. New Brighton, Pa., 10 Aug. 1907, Merrick Museum (USNM). (p. 77).
8. *Orgyia definita* Pack., ♂. Wrangle Brook Road, Lakehurst, N.J., 29 Aug. 1956, J. G. Franclemont (JGF). (p. 77).
9. *Orgyia definita* Pack., ♂. Wrangle Brook Road, Lakehurst, N.J., 19 July 1955, J. G. Franclemont (JGF). (p. 77).
10. *Orgyia detrita* Guér., ♂. Holotype. "Amérique septentrionale", Ex Musaeo Dr. Boisduval, Oberthür coll., genitalia slide USNM 52,038 (USNM). (p. 75).
11. *Orgyia detrita* Guér., ♂. Deep L., So. Fla., 16–23 April, *ex* larva, genitalia slide USNM 52,029 (USNM). (p. 75).
12. *Orgyia detrita* Guér., ♂. Fort Myers, Fla., 16–23 April (USNM). (p. 75).
13. *Orgyia detrita* Guér., ♂. McClellanville, S.C., 24 May 1970, R. B. Dominick (WPC). (p. 75).
14. *Orgyia vetusta* Bdv., ♂. Probable type. California, Oberthür coll. (USNM). (p. 65).
15. *Orgyia vetusta* Bdv., ♂. California, Oberthür coll. (USNM). (p. 65).
16. *Orgyia vetusta* Bdv., ♂. Lectotype of *gulosa* Hy. Edw. California, no. 7628 coll. Hy. Edwards (AMNH). (p. 65).
17. *Orgyia vetusta* Bdv., ♂. Berkeley, Calif., reared 22 May 1941 from larva on *Quercus agrifolia*, F. H. Rindge (AMNH). (p. 65).
18. *Orgyia vetusta* Bdv., ♀. Berkeley, Calif., reared 21 May 1941 from larva on *Quercus agrifolia*, F. H. Rindge (AMNH). (p. 65).

19. *Orgyia vetusta* Bdv., ♂. San Leandro, Alameda Co., Calif., 26 May 1957, T. W. Davies (USNM). (p. 65).
20. *Orgyia vetusta* Bdv., ♂. San Leandro, Alameda Co., Calif., 16 May 1957, T. W. Davies (USNM). (p. 65).
21. *Orgyia vetusta* Bdv., ♂. Laguna Beach, Calif., 20 June 1932, Don Meadows (USNM). (p. 65).
22. *Orgyia vetusta* Bdv., ♂. Santa Catalina Island, Calif., 11 May 1932, Don Meadows (USNM). (p. 65).
23. *Orgyia vetusta* Bdv., ♀. Santa Catalina Island, Calif., 7 May 1934, Don Meadows (USNM). (p. 65).
24. *Orgyia vetusta* Bdv., ♂. San Francisco Co., Calif., larva on *Lupinus*, July (USNM). (p. 65).
25. *Orgyia vetusta* Bdv., ♂. Casa Munras, Monterey area, Monterey Co., Calif., em. 27 May 1961, F. P. Sala (USNM). (p. 65).
26. *Orgyia vetusta* Bdv., ♀. Monterey, Calif., em. 27 May 1961, F. P. Sala (USNM). (p. 65).
27. *Orgyia vetusta* Bdv., ♂. Santa Monica, Calif., J. J. Rivers (USNM). (p. 65).
28. *Orgyia magna* Fgn., ♂. Loma Linda, San Bernardino Co., Calif., July (USNM). (p. 67).
29. *Orgyia magna* Fgn., ♂. Paratype. Rancho La Sierra, Arlington, Riverside Co., Calif., 5 June 1953, A. H. Rindge (AMNH). (p. 67).
30. *Orgyia magna* Fgn., ♂. Paratype. Rancho La Sierra, Arlington, Riverside Co., Calif., 13 April 1951, A. H. Rindge (AMNH). (p. 67).
31. *Orgyia magna* Fgn., ♂. Paratype. Box Spr., Riverside, Calif., 14 April 1934, John L. Sperry (AMNH). (p. 67).
32. *Orgyia magna* Fgn., ♂. Paratype. Riverside, Calif., 6 May 1940, H. Buckwalter (AMNH). (p. 67).
33. *Orgyia magna* Fgn., ♂. Holotype. Rancho La Sierra, Riverside Co., Calif., 18 May 1939, at light, F. H. Rindge (AMNH). (p. 67).
34. *Orgyia cana* Hy. Edw., ♂. Upland, Calif. (USNM). (p. 69).
35. *Orgyia cana* Hy. Edw., ♂. Wheeler Hot Sprs., Ventura Co., Calif., 20 July 1943, Don Meadows (USNM). (p. 69).
36. *Orgyia cana* Hy. Edw., ♂. Inyo Co., Calif., 15–30 July 1922, O. C. Poling (USNM). (p. 69).
37. *Orgyia cana* Hy. Edw., ♂. Jackson, Amador Co., Calif., 29 June 1957, genitalia slide USNM 52,021 (USNM). (p. 69).
38. *Orgyia cana* Hy. Edw., ♂. Anaheim, Calif., *ex* coll. Viola H. dos Passos (AMNH). (p. 69).
39. *Orgyia cana* Hy. Edw., ♀. Anaheim, Calif., *ex* coll. Viola H. dos Passos (AMNH). (p. 69).
40. *Orgyia cana* Hy. Edw., ♂. Riverside, Calif., 15 June 1940, H. Buckwalter (AMNH). (p. 69).
41. *Orgyia cana* Hy. Edw., ♂. Barclay Spr., Klamath Co., Oreg., 18 Aug. 1933, reared on wild cherry, Kenneth McLeod (USNM). (p. 69).
42. *Orgyia cana* Hy. Edw., ♀. Barclay Spr., Klamath Co., Oreg., 16 Aug. 1933, reared on wild cherry, Kenneth McLeod (USNM). (p. 69).
43. *Orgyia cana* Hy. Edw., ♂. Ormsby Co., Nev., 6 July, Baker, genitalia slide USNM 52,402 (USNM). (p. 69).
44. *Orgyia cana* Hy. Edw., ♂. Ogden, Utah, Bitterbrush Lab., reared 20 April 1959 (USNM). (p. 69).
45. *Orgyia cana* Hy. Edw., ♂. Ogden, Utah, Bitterbrush Lab., reared 20 April 1959 (USNM). (p. 69).
46. *Orgyia cana* Hy. Edw., ♀. Ogden, Utah, Bitterbrush Lab., reared 20 April 1959 (USNM). (p. 69).
47. *Orgyia leuschneri rindgei* Riotte, ♂. Gila Natl. Monument, 6000′, Catron Co., N. Mex., 4 July 1964, D. R. Davis (USNM). (p. 80).
48. *Orgyia leuschneri rindgei* Riotte, ♂. Gila Natl. Monument, 6000′, Catron Co., N. Mex., 4 July 1964, D. R. Davis (USNM). (p. 80).
49. *Orgyia pseudotsugata morosa* Fgn., ♂. Holotype. Thetis Island, Strait of Georgia, B.C., 9 Sept. 1966, Richard Guppy (USNM). (p. 73).
50. *Orgyia pseudotsugata pseudotsugata* (McD.), ♂. Upper Santa Ana R., San Bernardino Co., Calif., 20 Sept. 1947, John L. Sperry (USNM). (p. 73).
51. *Orgyia pseudotsugata pseudotsugata* (McD.), ♂. Summerdale, Mariposa Co., Calif., reared, H. E. Burke (USNM). (p. 73).
52. *Orgyia pseudotsugata pseudotsugata* (McD.), ♀. Summerdale, Mariposa Co., Calif., reared, H. E. Burke (USNM). (p. 73).
53. *Orgyia pseudotsugata benigna* Fgn., ♂. Paratype. Onion Saddle, 7600′, Chiricahua Mts., Cochise Co., Ariz., 8 Aug. 1966, J. G. Franclemont (JGF). (p. 74).
54. *Orgyia pseudotsugata benigna* Fgn., ♂. Holotype. Onion Saddle, 7600′, Chiricahua Mts., Cochise Co., Ariz., 22 Aug. 1966, J. G. Franclemont (JGF). (p. 74).
55. *Orgyia pseudotsugata benigna* Fgn., ♂. Paratype. Onion Saddle, 7600′, Chiricahua Mts., Cochise Co., Ariz., 22 Aug. 1966, J. G. Franclemont (JGF). (p. 74).
56. *Orgyia pseudotsugata benigna* Fgn., ♂. Paratype. W. Fork, 6500′, 16 mi SW Flagstaff, Coconino Co., Ariz., 17 Aug. 1954, J. G. Franclemont (JGF). (p. 74).
57. *Orgyia pseudotsugata benigna* Fgn., ♀. Allotype. Globe, Ariz., [reared from larva on] *Abies concolor*, "4-16-58" (USNM). (p. 74).
58. *Orgyia antiqua nova* Fitch, ♂. Manuel's, Avalon Peninsula, Nfld., reared 24 Aug. 1954 from larva on willow, D. C. Ferguson (USNM). (p. 63).
59. *Orgyia antiqua nova* Fitch, ♂. Green Bay, Lunenburg Co., N.S., reared 28 Sept. 1956 from larva on *Alnus rugosa*, D. C. Ferguson (USNM). (p. 63).
60. *Orgyia antiqua nova* Fitch, ♀. Green Bay, Lunenburg Co., N.S., reared 21 Sept. 1956 from larva on *Alnus rugosa*, D. C. Ferguson (USNM). (p. 63).
61. *Orgyia antiqua nova* Fitch, ♂. Holotype. Albany, N.Y., genitalia slide USNM 52,342 (USNM). (p. 63).
62. *Orgyia antiqua nova* Fitch, ♂. McLean Bogs Reserve, Tompkins Co., N.Y., 6 July 1953, J. G. Franclemont (JGF). (p. 63).
63. *Orgyia antiqua nova* Fitch, ♂. McLean Bogs Reserve, Tompkins Co., N.Y., 23 Sept. 1960, J. G. Franclemont (JGF). (p. 63).
64. *Orgyia antiqua argillacea* Fgn., ♂. Paratype. Alaska, U.S.N.M. Acc. 18,491, genitalia slide CH #6, 21 Sept. 1928 (USNM). (p. 65).
65. *Orgyia antiqua nova* Fitch, ♂. Ramparts, Alas., 1–7 Aug. (USNM). (p. 63).
66. *Orgyia antiqua badia* Hy. Edw., ♂. Holotype. Vancouver Island, B.C., no. 7619 coll. Henry Edwards (AMNH). (p. 63).
67. *Orgyia antiqua badia* Hy. Edw., ♂. Nahcotta, Wash., 30 Aug. 1954 (USNM). (p. 63).
68. *Orgyia antiqua badia* Hy. Edw., ♂. Corvallis, Oreg., 15 July 1959, [reared from larva on] spruce, Robert F. Koontz (USNM). (p. 63).
69. *Orgyia antiqua badia* Hy. Edw., ♀. Corvallis, Oreg., em. 6 Aug. 1943, [reared from larva on] "Bl. spruce", H. A. Scullen (USNM). (p. 63).
70. *Orgyia antiqua badia* Hy. Edw., ♂. Truckee, Calif., coll. Jacob Doll (USNM). (p. 63).
71. *Orgyia antiqua badia* Hy. Edw., ♂. Truckee, Calif., coll. Jacob Doll (USNM). (p. 63).
72. *Orgyia falcata* Schaus, ♂. Madera Canyon, 4880′, Santa Rita Mts., Santa Cruz Co., Ariz., 7 Oct. 1959, J. G. Franclemont (JGF). (p. 86).
73. *Orgyia falcata* Schaus, ♂. Madera Canyon, 4880′, Santa Rita Mts., Santa Cruz Co., Ariz., 14 Oct. 1959, J. G. Franclemont (JGF). (p. 86).
74. *Orgyia falcata* Schaus, ♀. Madera Canyon, 4880′, Santa Rita Mts., Santa Cruz Co., Ariz., reared 8 July 1965 from larva on *Quercus hypoleuca*, J. G. Franclemont (JGF). (p. 86).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NOTES

1. ABBREVIATIONS FOR COLLECTORS AND COLLECTIONS

AB	André Blanchard
ABK	Alexander B. Klots
AEB	A. E. Brower
AFB	Annette F. Braun
AMNH	American Museum of Natural History
ANSP	Academy of Natural Sciences, Philadelphia
BH	Bernard Heineman
BM	Bryant Mather
BMNH	British Museum (Natural History)
CAS	California Academy of Sciences, San Francisco
CM	Carnegie Museum
CNC	Canadian National Collection
CPK	C. P. Kimball
CU	Cornell University
DCF	D. C. Ferguson
FMNH	Field Museum of Natural History
GS	Gayle Strickland
HUMB	Museum Alexander Humboldt, Berlin University
INHS	Illinois Natural History Survey
JGF	J. G. Franclemont
JN	John Newman
JRH	J. R. Heitzman
KWP	K. W. Philip
LACM	Los Angeles County Museum of Natural History
LEM	Lyman Entomological Museum
MCZ	Museum of Comparative Zoology, Harvard University
MNSA	Museu Argentino de Ciencias Naturales "Bernardino Rivadavia", Buenos Aires
MOG	Murray O. Glenn
MSU	Michigan State University
NHMV	Naturhistorisches Museum, Vienna
NSM	Nova Scotia Museum
PMBC	Provincial Museum of British Columbia
RHL	Ronald H. Leuschner
ROK	R. O. Kendall
ROM	Royal Ontario Museum, University of Toronto
SAH	Sidney A. Hessel
UA	University of Alberta
UBC	University of British Columbia
UCB	University of California, Berkeley
UCD	University of California, Davis
UM	University of Michigan
UMO	University Museum, Oxford
USNM	United States National Museum
WEM	William E. Miller
WPC	Wedge Plantation Collection (R. B. Dominick)
YPM	Peabody Museum of Natural History, Yale University
ZSBS	Zoologische Sammlung des Bayerischen Staates, Munich

2. COMMON NAMES

The use of an asterisk* in the text denotes a name listed in *Common Names of Insects Approved by The Entomological Society of America* (1970).

French-language common names have been taken from Auclair, J. L., *et al.*, 1964, *French Names of Insects of Canada*, 3rd edition, published for the Quebec Society for the Protection of Plants by Department of Agriculture and Colonization, Quebec. The abbreviation "m." after a name indicates that it is masculine, "f." that it is feminine.

3. CITATIONS OF AUTHORITIES

Authors' names without parentheses indicate that the specific name is associated with the genus in which it was described.

Authors' names in parentheses indicate that the specific name has been transferred from the genus in which it was described to another genus.

4. WING LENGTHS

Wing length is the measurement in millimeters from the base to the apex of the forewing.

5. LOCATION OF TYPE-SPECIMEN

The current location of the type-specimen is given by the appropriate abbreviation in square brackets immediately following the type-locality.

INDEX TO ANIMAL NAMES

Principal entries are given in bold face
Plate references are given as (8:49)

Generic names cited only in combination with specific names, whether in synonymy or text, are not given in the index. Look for such entries under the specific name. For example, *Gynaephora groenlandica* will be found under *groenlandica*, but not under *Gynaephora.*

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