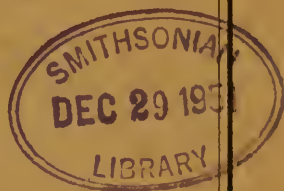


SMITHSONIAN MISCELLANEOUS COLLECTIONS
VOLUME 116, NUMBER 7
(End of Volume)

THE BUTTERFLIES OF VIRGINIA

(WITH 31 PLATES)

BY
AUSTIN H. CLARK
AND
LEILA F. CLARK
Smithsonian Institution



(PUBLICATION 4050)

CITY OF WASHINGTON
PUBLISHED BY THE SMITHSONIAN INSTITUTION
DECEMBER 20, 1951



DEC 20 1951



BUTTERFLIES OF VIRGINIA

(From photograph by Frederick M. Bayer. For explanation, see page 195.)

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PREFACE

SINCE 1933 we have devoted practically all our leisure time to an intensive study of the butterflies of Virginia. We have regularly spent our annual leave in the State, stopping at various places from which each day we drove out into the surrounding country. In addition to prolonged visits of 2 weeks or more to various towns and cities, we spent many week ends in particularly interesting localities. We have visited all the 100 counties in the State at least twice, most of them many times, and our personal records are from more than 800 localities. We have paid special attention to the Coastal Plain, particularly the great swamps in Nansemond, Norfolk, and Princess Anne Counties, and to the western mountains.

Virginia is so large and so diversified that it would have been impossible for us, without assistance, to have made more than a superficial and unsatisfactory study of the local butterflies. We have been so fortunate as to have had invaluable assistance from many friends within the State, some of whom have sent us hundreds of records and many specimens from their home territory.

Prof. Carroll M. Williams, of Harvard, provided us with records from Richmond and localities farther east, extending over several years. Dr. Carroll E. Wood, Jr., and Dr. Carl W. Gottschalk collected records and specimens for us at Salem and in Roanoke County for more than 7 years. Frank W. Trainer sent us detailed records and many specimens, covering a period of several years, from Farmville, and later from Charlottesville. Warren P. Stoutamire sent us his records from Gala, and Lloyd G. Carr sent us records and specimens from Mountain Lake.

But this is by no means all the assistance we have had. Prof. Ellison A. Smyth, Jr., was so very kind as to send us his records for more than 50 years' collecting, chiefly from Blacksburg and Poverty Hollow, Montgomery County, and also from Salem. These were supplemented by records from Poverty Hollow sent us by Herman J. Erb. Dr. Frank Morton Jones most generously sent us his records from eastern Virginia, especially Accomack, Northampton, Princess Anne, and Nansemond Counties. Jackson H., John, and Alexander Boyd have sent us many interesting records from Woodberry Forest and the Dismal Swamp region. John M. Burns has given us numerous records from Mountain Lake.

Otto Buchholz has been so good as to send us detailed records of all the species he collected over a period of several years in eastern Virginia, several of which were not found by anyone else. Dr. Warren Herbert Wagner, Jr., made many trips to different parts of Virginia to get records for us, and we owe most of the information regarding the distribution of *Poanes aaroni* to him. He and Dr. George W. Rawson paid special attention to the Second Swamp near New Bohemia and also to the North Landing River swamp, providing us with many records from those interesting areas.

On our visits to various localities in Virginia we have from time to time been accompanied by friends who have assisted us in gathering specimens and records. Mr. and Mrs. Ernest L. Bell have been with us in eastern Virginia, and also in Frederick County. Prof. and Mrs. Charles T. Brues and Dr. Alice Brues joined the Bells and ourselves on a visit to the Dismal Swamp region. Dr. and Mrs. William M. Mann accompanied us on a 2 weeks' trip to southern and southwestern Virginia, and also on other trips to the Dismal Swamp and the Northern Neck. Jackson H., John, and Alexander Boyd joined us in a visit to the Dismal Swamp, and Dr. and Mrs. Harald A. Rehder have also been with us in the same area. Mr. and Mrs. William D. Field and later Mr. and Mrs. R. Tucker Abbott accompanied us on expeditions to Middle Mountain in western Highland County.

Others who have been with us on collecting trips are Dr. and Mrs. Adam G. Böving, Dr. and Mrs. Grover C. Pitts, Dr. Carl W. Gottschalk, Dr. Laurence Ilsley Hewes, Dr. William T. M. Forbes, Dr. Walter S. Hough, Mr. and Mrs. John F. Gates Clarke, Mr. and Mrs. David Hall, Lt. Col. and Mrs. Edvald L. Rasmussen, Dr. and Mrs. George S. Myers, Dr. and Mrs. Matthew W. Stirling, Dr. Herbert Friedmann, Mr. and Mrs. John E. Graf, Prof. John W. Bailey, John B. Lewis, Mr. and Mrs. Gerrit S. Miller, Dr. and Mrs. William F. Foshag, Mr. and Mrs. Stephen J. McDonough, Dr. Richard P. Dow, Miss Grace Sandhouse, Dr. Ashley B. Gurney, Dr. Norman B. Tindale of Adelaide, South Australia, Mr. and Mrs. Herbert G. Deignan, Dr. Ellis LeG. Traughton of Sydney, New South Wales, Dr. Austin Roberts and Dr. E. Percy Phillips of South Africa, Dr. H. Boschma and Dr. L. P. Holthuis of Leiden, The Netherlands, Prof. and Mrs. Torsten Gislén of Lund, Sweden, Mrs. G. S. Pobst of Tazewell, and Vilhelm Lauritzen and V. Lauritsen of Copenhagen, Denmark.

During the course of our work in Virginia we have been the recipients of generous hospitality in many places. Among our hosts and hostesses we are especially indebted to Miss Lilian E. Smith of Mount

Solon; Miss Willie T. Weathers of Aylett; Miss Florence Walker of Bayford; Dr. and Mrs. William T. Sanger, Dr. and Mrs. Wortley F. Rudd, and Dr. and Mrs. Sidney S. Negus of Richmond; Lt. Col. and Mrs. Edvald L. Rasmussen and Mr. and Mrs. Richard H. Rule of Fairfax; Mr. and Mrs. John A. Blakemore of Abingdon; Dr. and Mrs. George W. Jeffers of Farmville; Mr. and Mrs. Gus Welsh of Apple Orchard Mountain; Theodor Mussaeus of Limeton; John B. Lewis of Amelia Court House; and L. Parker Hill of Suffolk.

While this memoir was in press we received many additional records from Petersburg sent us by Bryant Mather of Jackson, Miss.; from the Dismal Swamp region sent us by Kilian Roeber of Jackson, Tenn.; and from Boyd's Tavern, which we owe to the kindness of Miss Leila A. Henry of Arlington, Va. Also, we enjoyed the hospitality of Mr. and Mrs. Douglas D. Withers of Mount Solon, and accompanied Mr. and Mrs. William J. Faymonville, Jr., of Louisville, Ky., on a visit to Reddish Knob.

William D. Field, associate curator of insects, United States National Museum, has been so good as to read over the entire manuscript for us, and we are greatly obliged to him for his critical comments.

Cyril F. dos Passos most kindly checked all the scientific names, bringing them into conformity with current usage.

We realize that this report represents only an introduction to the study of the butterflies of Virginia. A vast amount of work still remains to be done before they can be considered as adequately known. Many areas in the western mountains and on the Coastal Plain have not been explored, and far more information is necessary for the accurate determination of the seasons in different parts of the State.

We hope later to publish our detailed records, and also our notes on the habits and other attributes of the various species.

For the illustrations we are indebted to the late Gurney I. Hightower and to Floyd B. Kestner, Smithsonian Institution photographers. All the specimens shown are in the United States National Museum.



CONTENTS

	Page
Preface	iii
Introduction	I
Distribution of butterflies in Virginia.....	2
The map	8
Keys to the butterflies of Virginia.....	9
1. Key to the families and subfamilies of butterflies represented in Virginia	10
2. Key to the species of Lethiinae.....	11
3. Key to the species of Satyrinae.....	11
4. Key to the species of Apaturidae, Nymphalidae, Argynnidæ, and Danaidæ	12
5. Key to the species of Riodinidæ	15
6. Key to the species of Lycaenidæ	15
7. Key to the species of Pieridæ	18
8. Key to the species of Papilionidæ	20
9. Key to the species of Pyrginæ	21
10. Key to the males of the species of Hesperiidæ.....	24
Annotated list of butterflies of Virginia.....	30
Family Satyridæ	30
Family Apaturidæ	39
Family Nymphalidæ	40
Family Argynnidæ	49
Family Danaidæ	65
Family Libytheidæ	68
Family Riodinidæ	69
Family Lycaenidæ	70
Family Pieridæ	86
Family Papilionidæ	118
Family Hesperiidæ	147
Erroneous records	186
Bibliography	187
Plates	197
Index	229

THE BUTTERFLIES OF VIRGINIA

BY AUSTIN H. CLARK

AND

LEILA F. CLARK

Smithsonian Institution

(WITH 31 PLATES)

INTRODUCTION

THE number of species and subspecies of butterflies for which we have definite records for Virginia is 154. Two of these, *Pieris virginiensis* and *Phoebis philea*, are accidental visitors. Several others, as *Agraulis vanillae*, *Strymon ontario*, *Ascia phileta*, and *Urbanus proteus*, are irregularly recurrent visitors. Several butterflies of regular occurrence in the State are summer visitors only, dying out completely during winter. This is certainly true of *Phoebis sennae* and *Calpodetes ethlius* and probably of four or five more. *Vanessa cardui* is usually present and occasionally common, though in some years absent.

Two of the most abundant butterflies in the State are introductions. *Pieris rapae*, an immigrant from Europe, first appeared in 1870-71, and *Colias chrysotheme eurytheme*, an intruder from the west and south, was first noted by Dr. Frank Morton Jones in 1923. If *Augiades sylvanus* really occurs at Richmond, it represents a second introduction from Europe.

On the other hand, *Pieris virginiensis* undoubtedly occurred in the State before the deforestation of the western mountains. *Atrytone arogos* has not been found for nearly 50 years, but this small species is easily overlooked. *Speyeria diana* and *Glaucopsyche lygdamus* now appear to be restricted to only a portion of their former range. It is probable that those species like *Speyeria diana*, *Atrytone conspicua*, and *Poanes hobomok* that occur in the western mountains and in the Dismal Swamp region formerly ranged widely over the State.

Boloria selene marilandica and *Poanes massasoit hughii* occur just across the Potomac River in Maryland, and both probably will be discovered in Virginia when the counties along the south bank of the Potomac have been more thoroughly explored. Indeed, we suspect

that the record for *Boloria selene* from Bayford is based upon *B. s. marilandica*; we have not seen the specimen.

Three species that occur in nearby West Virginia and one in Kentucky will probably be found in Virginia, while a fifth, which occurs in Pennsylvania and North Carolina, we have been unable to find in Virginia. This last may have been extirpated by deforestation.

The number of butterflies known from North Carolina, a State more than one-third again as large as Virginia, is 147; but in North Carolina the localities where collecting has been done are relatively few, especially in the eastern and presumably richer half. The number known from New York, which is about one-fourth again as large as Virginia, is 132. Being farther north, New York would be expected to have fewer species than Virginia; but there are some obvious gaps in the New York list, and the State has not been covered nearly so intensively as Virginia. From England, with an area slightly greater than that of New York but less than that of North Carolina, according to Dr. E. B. Ford, there are 68 butterflies recorded, several of which are rare casuals. Nine of these 68 occur in Virginia—*Nymphalis antiopa*, *Vanessa atalanta*, *V. cardui*, *Boloria selene*, *Danaus plexippus*, *D. p. megalippe*, *Lycaena phlaeas*, *Cyaniris argiolus*, and *Pieris rapae*. But *Nymphalis antiopa*, *Boloria selene*, *Lycaena phlaeas*, and *Cyaniris argiolus* occur in slightly different forms.

There are recognized in North America north of Mexico 700 species, the number of species and subspecies together being 1,110.

DISTRIBUTION OF BUTTERFLIES IN VIRGINIA

The distribution of the butterflies of any highly diversified region such as Virginia is dependent upon a number of different factors, the most important of which are the distribution of the food plant or plants and the conditions of humidity and temperature, especially the daily and seasonal oscillations, under which these plants are available for food, or under which the pupal stage must be passed.

Although the caterpillars of most butterflies will feed on several or many different kinds of related or unrelated plants, the majority show decided preferences, and these preferences may be uniform throughout their range or may differ in various regions. In some cases our native butterflies show marked preference for introduced over native plants. Many species are confined to a single kind of plant with perhaps a few of its close relatives. A few are confined to a single or a few plants in their early stages, later becoming general feeders. Several feed on plants that are widely different botanically, but similar in their chemical composition.

Since most of the plants that serve as food for butterflies in Virginia are generally distributed over the State, the food factor is of relatively slight significance in determining the distribution of the local species. A few, however, are limited in their distribution by the localization of their food plants, or by the plants with which they are invariably associated and which for this reason are assumed to be their food plants. Such plants are the mistletoe (*Phoradendron flavescens*), the large passionflower (*Passiflora incarnata*), the red bay (*Persea borbonia*), the canes (*Arundinaria gigantea* and *A. tecta*), the Carolina vetch (*Vicia caroliniana*), and certain marsh sedges and grasses, particularly those confined to salt or brackish marshes (species of *Scirpus* and *Carex*, *Spartina alterniflora* var. *glabra*, and *Zizania palustris*).

Many species, the food plants of which are generally distributed over the State, are confined to regions in which, during their active or inactive early stages, the humidity is subject to the least variation. Most of these occur only in the mountains, particularly the higher and wetter mountains of the southwest. At the lower altitudes in the mountains they are found, if at all, only in permanently damp valleys near streams, though on or near the mountain tops they become distributed generally over the frequently cloud-enshrouded open pastures. A few, however, live in the coastal swamps or wet pine barrens, as here near the ground where the caterpillars feed it is always damp, though much warmer than it is in the mountains. A few species occur both in the cool, damp mountain valleys and in the coastal swamps but are absent from the intervening area.

An interesting illustration of the independent distribution of related species all feeding on the same generally distributed food plants is afforded by the several local fritillaries belonging to the genera *Speyeria* and *Boloria*. All the species of *Speyeria* and *Boloria* living in Virginia feed on violets, which are abundant everywhere from the higher mountain tops to the eastern swamps. *Speyeria cybele* occurs at all points within the State and is almost everywhere common. *Speyeria diana* lives both in the mountains in damp, wooded ravines and valleys near cold streams and on the Coastal Plain near cold springs or oozes in the woods and swamps, but not on the Piedmont. *Speyeria idalia* is found in wet, open, grassy meadows on the higher western Piedmont, in the broader mountain valleys, and in the high mountain pastures. *Speyeria aphrodite* occurs throughout the wooded mountain valleys and on mountain pastures. *Boloria toddi* frequents mountain bogs and the higher pastures. *Boloria selene* lives in wet open meadows at more or less high altitudes, always in association with the much more generally distributed *B. toddi*.

In considering the present distribution of the butterflies of Virginia it is important to bear in mind that it is by no means a natural one, for local conditions have been greatly altered since the coming of the Europeans. The lowlands have long been under intensive agricultural development, and the endemic flora has been greatly restricted in area and profoundly modified both by the changed conditions and by the introduction of many European and other weeds. The mountains have been almost wholly deforested, the original forests being now replaced by second growth more or less extensively invaded by foreign weeds from the lowlands or from the north. Swamps, bogs, and marshes have been partly or completely drained, damp mountain valleys have become dry valleys, and in general there is greater uniformity over the State than was the case in the past.

This present relative uniformity in conditions is reflected in the distribution of the butterflies. About 100 species, or two-thirds of the butterflies known from Virginia, are found in all sections of the State, from the western mountains to the coast. These are all hardy and adaptable species, able to maintain themselves, and often to increase, under changed conditions.

These are almost the only butterflies that occur on the Piedmont except locally in the north, and over the cultivated areas on the Coastal Plain. To the west they become somewhat less numerous, but they occur in all the valleys and cleared areas, some of them also in the woods. This faunal complex, in origin a secondary association of vigorous, hardy, aggressive types chiefly of local origin but with immigrant elements from the south and west and from Europe, is distantly suggestive of the floral associations characteristic of abandoned fields in the same area.

Superposed upon this originally secondary but now primary faunal complex of recent origin are certain fairly distinct faunal divisions corresponding to the well-known life zones. In Virginia these life zones are indicated by only a small minority of the species, which for the most part are rather strictly localized.

Canadian Zone.—In Virginia the Canadian Zone, so far as the butterflies are concerned, is represented only by a few isolated areas in the west and southwest above about 4,000 feet in Augusta, Highland, Giles, Montgomery, Grayson, and Washington Counties.

The characteristic butterfly of the Canadian Zone in Virginia is *Polygona faunus smythi*, which is everywhere common; *Speyeria atlantis* is common in the Canadian Zone on Middle Mountain in Highland County, where *Colyas interior* also occurs. These may occur elsewhere in the Canadian Zone, but little collecting has been done there

at the time they are on the wing, and both are easily overlooked because of their resemblance to the common *Speyeria aphrodite* and *Colias philodice*. Three additional Canadian Zone species occur in West Virginia within sight of the Virginia border, and probably originally these were found in Virginia.

Transition Zone.—In Virginia the Transition Zone includes the entire western portion of the State from the eastern base of the Blue Ridge westward, except for the Shenandoah Valley from Augusta County northward and a small area in Lee County. In the north its lower limit is at about 1,500 feet, in the south at about 2,000 feet. In the north the eastern border of this zone becomes somewhat indefinite, characteristic Transition Zone species occurring locally or casually eastward, especially in the Potomac Valley, to northeastern Fairfax County. The characteristic Transition Zone butterflies in Virginia are: *Enodia portlandia anthedon*, *Euphydryas phaëton*, *Phyciodes batesii*, *Boloria toddi*, *B. selene myrina*, *Speyeria aphrodite*, *Polygonia progne*, *Calephelis borealis*, *Glaucopsyche lygdamus*, *Incisalia irus*, *I. augustinus*, *I. polios*, *Erora laeta*, *Pieris virginiensis*, *Pyrgus centaureae*, *Erynnis persius*, *E. lucilius*, *Hesperia sassacus*, *Atrytone conspicua* (also in the Dismal Swamp), *Atrytone bimacula*, *Poanes hobomok* (also in the Dismal Swamp), and *Polites mystic*. The most convenient index species of the Transition Zone in Virginia are *Speyeria aphrodite* and *Polygonia progne*, both of which are common and generally distributed. The other species confined to this zone are nearly all of local occurrence. It should be noted that species confined to localities within the Transition Zone in Virginia are not necessarily confined to this zone elsewhere. None of the species characteristic of the Transition Zone in Virginia occur throughout the zone beyond the limits of the State, and very few are found even throughout the Alleghanian or eastern portion. Notwithstanding these irregularities, the Transition Zone as it is found in Virginia is a distinct and fairly well marked zoogeographic province. Of the species characteristic of the Transition Zone in Virginia slightly more than 80 percent are, like the species of the Canadian Zone, single-brooded, half flying in spring only, the other half for a more or less extended period in summer.

Upper Austral Zone.—The area herein regarded as representing the Upper Austral Zone is bounded on the west by the Blue Ridge; on the north it is represented by a long, narrow tongue running down the Shenandoah Valley southwestward to Augusta County, and by irregular interdigitations with the Transition Zone in Loudoun, Prince William, and Fairfax Counties; in the southwest an Upper Austral

tongue enters Lee County from Tennessee; on the western side of Chesapeake Bay the eastern boundary of the Upper Austral may be considered as a more or less indefinite line from the head of Mobjack Bay to south-central Greensville County, bending westward to include a considerable portion of Prince George County. Along this line the Upper and Lower Austral are inextricably interdigitated. The river bottoms and extensive swamps as far as the Second Swamp on the Blackwater River are Lower Austral, inhabited by more or fewer of the Lower Austral species. But the higher ground between the river bottoms lacks these Lower Austral species and may therefore be considered as representing irregular fingers of the Upper Austral. As far as the butterflies are concerned, the Eastern Shore (Accomack and Northampton Counties) is Upper Austral.

In Virginia the area corresponding to the Upper Austral elsewhere is in reality nothing more than a featureless faunal no-man's land. It has been wholly deforested, and the greater part has long been under intensive cultivation. Such patches of woodland as are found are various second-growth associations.

There are no butterflies that are confined to the Upper Austral Zone in Virginia, all the species found within that zone being either of very general distribution or else occurring also in the Lower Austral Zone, more rarely also in the Transition Zone. The Upper Austral Zone can therefore be defined only in negative terms as a region between the Transition and Lower Austral Zones from which the species characteristic of these two zones are absent.

The sporadic occurrence in widely separated localities within the Upper Austral Zones of such primarily Transition Zone species as *Strymon edwardsii*, *Hesperia metea*, *H. leonardus*, *Atrytonopsis hianna*, and *Amblyscirtes hegon*, and until recently the general occurrence of *Colias philodice*, suggest that originally most of this area belonged to the Transition Zone and that the clearing-off of the forests and other plant cover, and consequent exposure of the land surface to the drying effect of the hot sun in summer, have rendered the region unsuitable for the original Transition Zone species, and at the same time have led to the extensive immigration of hardy Lower Austral types.

Indeed, we have seen this very process taking place within the past 20 years. With the invasion from the south and west of *Colias eurytheme* the original population of *C. philodice* has now almost completely disappeared by replacement and apparently also through extensive hybridization, though the two subspecies still remain distinct for the most part in the Transition Zone. Over this area, too,

the yellow swallowtail (*Papilio glaucus*) is so excessively variable that typical examples of the northern forms may be found early in spring, and typical examples of the southern form in summer, with all possible intermediates. This suggests that originally the region was inhabited by the northern form, but the clearing of the land was accompanied by infiltration of the southern form with resultant hybridization, so that now the entire Upper Austral is inhabited by a hybrid population, although the northern 1-brooded forms still persist in the mountains and the southern 2-brooded form is dominant in the Lower Austral.

The occurrence throughout the so-called Upper Austral in Virginia of hybrids between the two species of *Colias*, and of presumed hybrids between northern and southern forms of *Papilio glaucus*, emphasizes the fact that in Virginia this zone is a secondary faunal complex resulting from the clearing of the land over an area originally divided among three life zones, the Transition and the Upper and Lower Austral. These unnatural conditions characteristic of the Upper Austral in Virginia occur generally from southern New Jersey southward along the Piedmont to North Carolina.

Lower Austral Zone.—The Lower Austral Zone is represented at the present time in Virginia by more or less restricted and sometimes isolated areas—river bottoms, extensive swamps, marshes, and pine barrens—which are surrounded by a greater area of intensively cultivated higher country supporting the easterly extension of the generalized and featureless Upper Austral fauna. These Lower Austral localities are confined to an area that includes the outer Coastal Plain as far as Cape Henry, and the western shore of Chesapeake Bay as far as Mobjack Bay. Its western limit may be approximately indicated by an irregular line from the head of Mobjack Bay southwestward to south-central Greensville County, in its central portion bending westward to include the Second Swamp on the Blackwater River near New Bohemia. This area as outlined may be defined as an area for the most part Upper Austral within which, though not beyond its borders, Lower Austral species occur in suitable localities. There is no really definite boundary between the Upper and Lower Austral such as those between the Upper Austral and Transition or between the Transition and the Canadian. It is possible that the western side of the southern tip of the Eastern Shore peninsula should be included in the Lower Austral, for Dr. Frank Morton Jones has found here a colony of *Papilio palamedes*. Farther north in the Dahl Swamp in Accomack County we found *Atrytone alabamæ* common; this is presumably a Lower Austral

species, although it ranges north to the vicinity of Lakewood, N. J.

The characteristic Lower Austral species in Virginia are: *Euptychia areolatus areolatus*, *E. gemma*, *E. sosybius*, *Lethe portlandia portlandia*, *L. creola*, *Agraulis vanillae*, *Calephelis virginiensis*, *Atlides halesus*, *Papilio palamedes*, *Atrytone dukesi*, *A. dion*, *A. palatka*, *Poanes yehl*, *Amblyscirtes textor*, *A. carolina*, and *A. alternata*. The index species, common and of general distribution throughout the zone, are *Papilio palamedes*, *Lethe portlandia portlandia*, *L. creola*, *Poanes yehl*, *Amblyscirtes textor*, and *A. carolina*. The other species characteristic of this zone are mostly of local occurrence. Although they are primarily characteristic of this zone, *Euptychia areolatus septentrionalis*, *E. gemma*, *E. sosybius*, and *Lerodea eufala* occur sparingly beyond its borders.

In Virginia it is possible to distinguish three divisions of the Lower Austral. Along the coast just behind the sand dunes there are extensive sedge marshes with scattered willow and other shrubs. Here *Minois pegala pegala* and *Limenitis archippus floridensis* are the characteristic butterflies. Farther west in the great gum (*Nyssa aquatica*) swamps along the North Landing River occur *Atrytone dukesi*, *A. palatka*, and, on the west side of the Dismal Swamp, *Euptychia areolatus areolatus* and *Amblyscirtes alternata*. These two subdivisions of the Lower Austral as a whole are characterized by southern species that are restricted to the extreme southeastern part of Virginia.

Not properly included within any of the faunal regions are the two salt-marsh butterflies, *Panoquina panoquin* and *Poanes aaroni*, which occur in all suitable localities along the coast, and also *Poanes viator*, found abundantly in all brackish marshes with an abundance of wildrice.

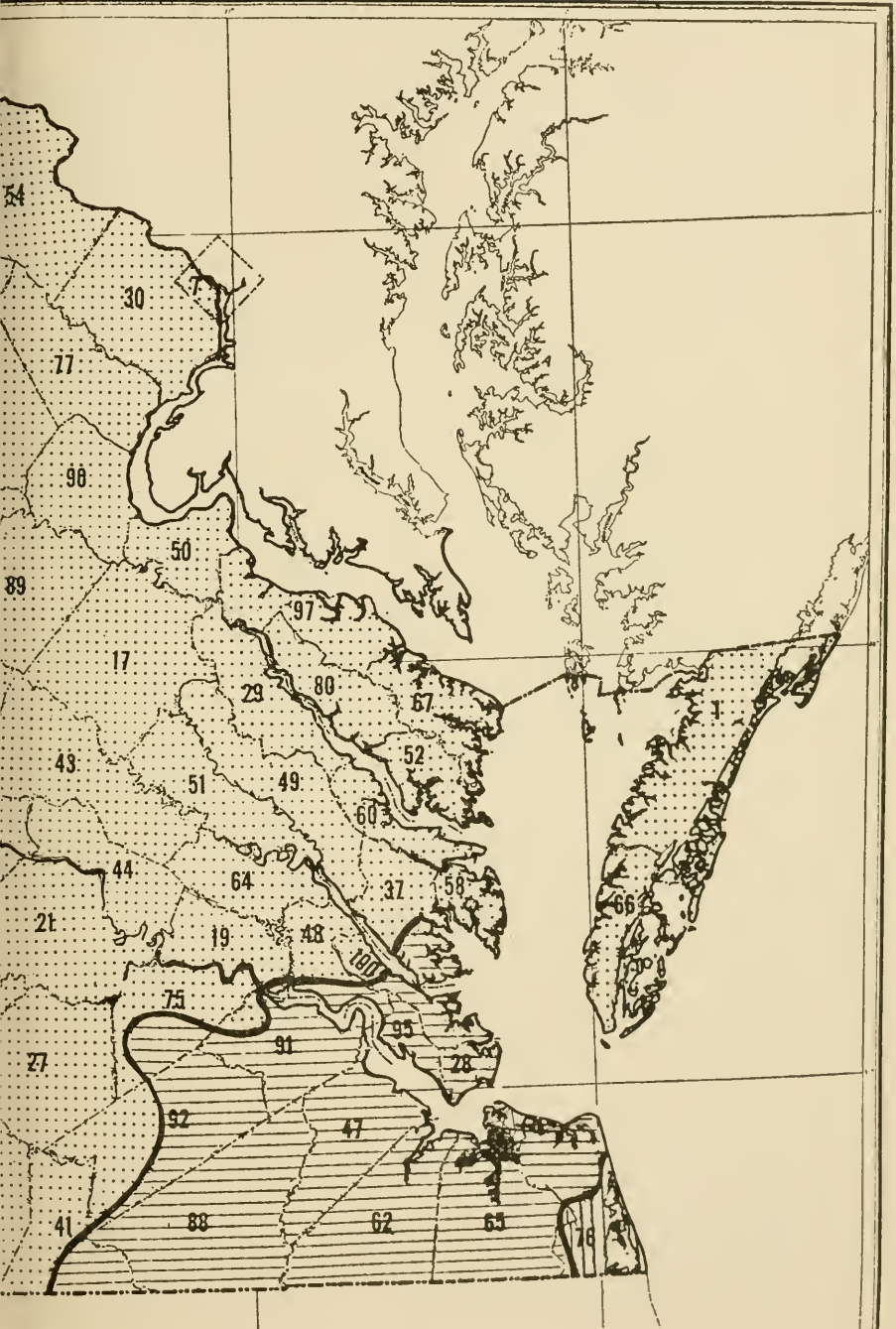
THE MAP






The accompanying map (fig. 1) of the faunal zones of Virginia has been prepared wholly from our personal records. The Canadian Zone begins at an altitude of about 4,000 feet in Highland County, and at an altitude of about 4,500 feet near the southern border of the State.

The lower border of the Transition Zone is at an altitude of about 1,500 feet in the northern portion of Virginia, rising to about 2,000 feet in the south; its lower border is higher on the eastern face of the mountains than on the western.

The Lower Austral is wholly on the Coastal Plain.

VIRGINIA



- Canadian 
- Upper Austral 
- Lower Austral 
- Coastal Section 
- Transition 

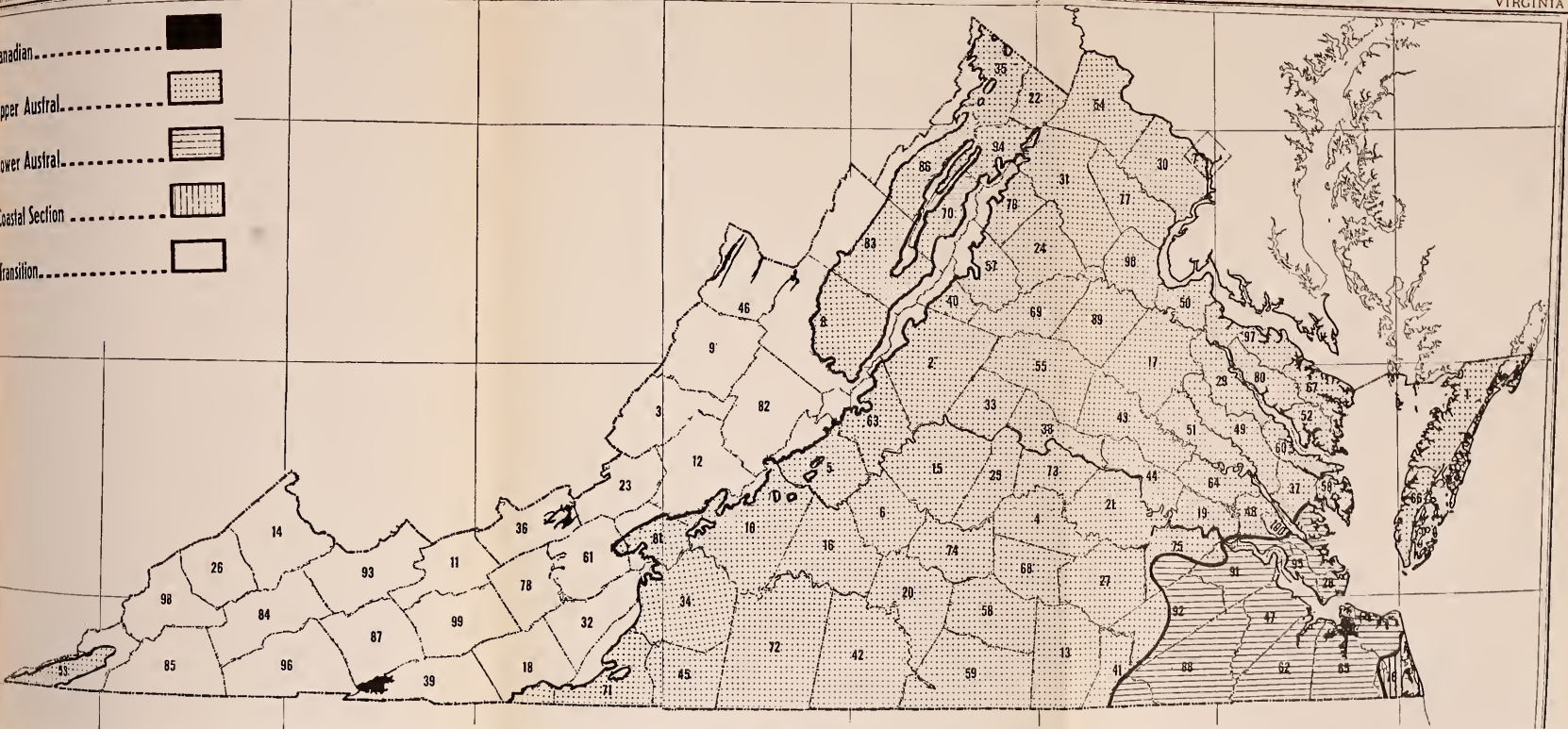


FIG. 1.—Faunal zones of Virginia.

1870
1871
1872
1873
1874

The counties are numbered and may be identified by reference to the following list.

THE COUNTIES OF VIRGINIA

- | | | |
|---------------------|---------------------|---------------------|
| 1. Accomack. | 34. Franklin. | 68. Nottoway. |
| 2. Albemarle. | 35. Frederick. | 69. Orange. |
| 3. Alleghany. | 36. Giles. | 70. Page. |
| 4. Amelia. | 37. Gloucester. | 71. Patrick. |
| 5. Amherst. | 38. Goochland. | 72. Pittsylvania. |
| 6. Appomattox. | 39. Grayson. | 73. Powhatan. |
| 7. Arlington. | 40. Greene. | 74. Prince Edward. |
| 8. Augusta. | 41. Greensville. | 75. Prince George. |
| 9. Bath. | 42. Halifax. | 76. Princess Anne. |
| 10. Bedford. | 43. Hanover. | 77. Prince William. |
| 11. Bland. | 44. Henrico. | 78. Pulaski. |
| 12. Botetourt. | 45. Henry. | 79. Rappahannock. |
| 13. Brunswick. | 46. Highland. | 80. Richmond. |
| 14. Buchanan. | 47. Isle of Wight. | 81. Roanoke. |
| 15. Buckingham. | 48. James City. | 82. Rockbridge. |
| 16. Campbell. | 49. King and Queen. | 83. Rockingham. |
| 17. Caroline. | 50. King George. | 84. Russell. |
| 18. Carroll. | 51. King William. | 85. Scott. |
| 19. Charles City. | 52. Lancaster. | 86. Shenandoah. |
| 20. Charlotte. | 53. Lee. | 87. Smyth. |
| 21. Chesterfield. | 54. Loudoun. | 88. Southampton. |
| 22. Clarke. | 55. Louisa. | 89. Spotsylvania. |
| 23. Craig. | 56. Lunenburg. | 90. Stafford. |
| 24. Culpeper. | 57. Madison. | 91. Surry. |
| 25. Cumberland. | 58. Mathews. | 92. Sussex. |
| 26. Dickenson. | 59. Mecklenburg. | 93. Tazewell. |
| 27. Dinwiddie. | 60. Middlesex. | 94. Warren. |
| 28. Elizabeth City. | 61. Montgomery. | 95. Warwick. |
| 29. Essex. | 62. Nansemond. | 96. Washington. |
| 30. Fairfax. | 63. Nelson. | 97. Westmoreland. |
| 31. Fauquier. | 64. New Kent. | 98. Wise. |
| 32. Floyd. | 65. Norfolk. | 99. Wythe. |
| 33. Fluvanna. | 66. Northampton. | 100. York. |
| | 67. Northumberland. | |

KEYS TO THE BUTTERFLIES OF VIRGINIA

The following keys to the butterflies found in Virginia are intended for use primarily by those who are not specialists in the Rhopalocera. They are therefore based for the most part on the color and color pattern, by which most of the local butterflies are readily distinguished. In the family HesperIIDae it has not been practicable to include the females in the keys. These may be identi-

fied in the field through association with the males. Although often differing more or less widely on the upper surface, most females may be identified by a comparison of the under side of the hind wings with that of the males. But the identification of many of the smaller species of Hesperiidæ is by no means easy and whenever possible should be checked by comparison with authentic specimens or by someone familiar with the group.

I. KEY TO THE FAMILIES AND SUBFAMILIES OF BUTTERFLIES REPRESENTED
IN VIRGINIA

- 1a. Head of moderate width or narrow, the front less than twice as broad as high; antennae separated by about the width of their bases or less; no eyelashes..... 2
- 1b. Head very broad, the front twice as broad as high; antennae separated by 2 to 4 times the width of their bases; a strong but slender tuft of lashes in front of the eyes (Hesperiidæ)..... 12
- 2a. Fore legs in the males or in both sexes imperfect, the foot without normal terminal claws..... 3
- 2b. Fore legs perfect and used in walking by both sexes..... 11
- 3a. Head large, nearly or quite as broad as the thorax; bases of the antennae not notching the eyes; fore legs in the males, and usually also in the females, greatly reduced and brushlike, not used in walking 4
- 3b. Head small and narrow, narrower than the thorax; bases of the antennae notching the eyes; size small..... 8
- 4a. Palpi not elongated; fore legs of females as well as males defective... 5
- 4b. Palpi greatly elongated, more than half as long as the antennae; fore legs of males greatly reduced and brushlike, of females perfect.... LIBYTHEIDÆ
- 5a. Antennae clothed with scales; body not spotted with white..... 6
- 5b. Antennae without scales; body spotted with white; size large..... DANAIIDÆ (key 4)
- 6a. One or more of the veins of fore wings enlarged or swollen (Satyridæ) 7
- 6b. None of the veins in the fore wings enlarged or swollen..... APATURIDÆ, NYMPHALIDÆ, and ARGYNNIDÆ (key 4)
- 7a. Costal vein of the fore wings enlarged and stout, gradually tapering distally LETHIINÆ (key 2)
- 7b. All the veins of the fore wings abruptly swollen at the base..... SATYRINÆ (key 3)
- 8a. Fore legs of males greatly reduced and brushlike, of females perfect; no white ring about the eyes; antennae not ringed with white; wings held horizontally when at rest..... RIODINIDÆ (key 5)
- 8b. Fore legs of males with defective terminal claw only; a conspicuous white ring about the eyes; antennae ringed with white; wings held vertically when at rest (Lycaenidæ)..... 9
- 9a. Antennae short, less than half the length of the fore wings, the segments not much longer than broad..... SPALGINÆ (key 6)

- 9b. Antennae at least half as long as the fore wings, the segments twice as long as broad or longer..... 10
- 10a. Hind wings rounded at the anal angle, or at least without a conspicuous lobe, tailless or with a single tail.....LYCAENINAE (key 6)
- 10b. Hind wings with a conspicuous lobe at the anal angle, or with two tails.....THECLINAE (key 6)
- 11a. Fore legs with the tibia (outermost long joint or segment) bearing a leaflike structure, the epiphysis, on the inner side; hind wings with conspicuous tails; wings chiefly dark brown or black, if yellow or white, then with transverse dark stripes.....PAPILIONIDAE (key 8)
- 11b. No epiphysis on the tibia of the fore legs; hind wings without tails; wings white, yellow, or orange, with or without a dark border, but never with transverse stripes.....PIERIDAE (key 7)
- 12a. Distal recurved portion of the antennal club as long as, or nearly as long as, the proximal part, the club being bent in its proximal part; abdomen shorter than the hind wings; males often with a recurved fold on the costa of the fore wings containing androconia.....PYRGINAE (key 9)
- 12b. Distal recurved portion of the antennal club much shorter than the proximal part or absent, the club being bent beyond its thickest part; abdomen as long as, or longer than, the hind wings; males usually with an elongate black velvety patch on the fore wings containing androconia.....HESPERIINAE (key 10)

2. KEY TO THE SPECIES OF LETHIINAE

- 1a. Hind wings with a slight angle at vein 4..... 2
- 1b. Hind wings with the border evenly rounded (pl. 1, *i, j*).....
.....*Lethe eurydice* (p. 31)
- 2a. Under side of fore wings with the postmedian line produced in a single sharp point on vein 4; sexes essentially alike (pl. 1, *e-h*).....
.....*Lethe portlandia* (p. 30)
- 2b. Under side of fore wings with the postmedian line produced outward opposite the cell, with an angle on vein 4 and another on vein 6, and a more or less straight line between them; males with the fore wings more pointed than those of the females and with broad patches of androconia in the inner portions of the interspaces on the fore wings, running out to a point along the veins (pl. 1, *a-d*).....
.....*Lethe creola* (p. 30)

3. KEY TO THE SPECIES OF SATYRINAE

- 1a. Fore wings with a broad yellow band in the outer half including two large eye spots (rarely one) (pls. 2, *f-i*; 8, *e*)....*Minois pegala* (p. 32)
- 1b. No yellow band on the fore wings..... 2
- 2a. Upper surface with two conspicuous eye spots near the apex and lower angles of the fore wings, and two similar eye spots near the upper and anal angles of the hind wings, or a single eye spot near the anal angle (pl. 3, *e, f*).....*Euptychia cymela* (p. 38)
- 2b. Upper surface without eye spots, plain brownish or grayish..... 3
- 3a. Under surface with conspicuous eye spots..... 4

- 3*b*. Under surface without eye spots; upper surface of hind wings with three black marginal spots; hind wings below with marginal silver markings (pl. 3, *g, h*).....*Euptychia gemma* (p. 36)
- 4*a*. Under surface of fore wings with a conspicuous circular eye spot near the apex, followed by several less conspicuous ones; under surface of hind wings with a submarginal row of 5 circular eye spots of which the one near the outer angle and the second from the anal angle are black-centered and conspicuous (pl. 3, *i*).....
.....*Euptychia sosybius* (p. 38)
- 4*b*. Under surface of hind wings with a row of large oval or elongate eye spots, the three central the largest, the whole series surrounded by an irregularly oval reddish ring (pl. 3, *a-d*).....
.....*Euptychia areolatus* (p. 36)

4. KEY TO THE SPECIES OF APATURIDAE, NYMPHALIDAE, ARGYNNIDAE,
AND DANAIIDAE

- 1*a*. Under side of hind wings with numerous conspicuous silver spots... 2
- 1*b*. Under side of hind wings without numerous conspicuous silver spots.. 6
- 2*a*. Fore wings much less than twice as long as broad..... 3
- 2*b*. Fore wings very long, more than twice as long as broad; dull reddish with black markings; cell of fore wings with three black spots with white centers (pl. 7, *e, f*).....*Agraulis vanillae* (p. 64)
- 3*a*. Fore wings more than 30 mm. long..... 4
- 3*b*. Fore wings less than 25 mm. long; wings above dull orange with a black border and fine black markings (pl. 9, *a-c*)..*Boloria selene* (p. 62)
- 4*a*. Fore wings above reddish orange with delicate black markings; hind wings above blue-black with two rows of spots, both white (females) or the outer orange and the inner white (males) (pl. 7, *i, j*).....
.....*Speyeria idalia* (p. 54)
- 4*b*. Both fore and hind wings above similar, brownish golden with dark brown markings 5
- 5*a*. Under side of hind wings with the light-yellow submarginal band broad, occupying the entire space between the two outer rows of silver spots, and at least twice as broad as the silver spots on either side (pls. 2, *c*; 7, *g, h*).....*Speyeria cybele* (p. 58)
- 5*b*. Under side of hind wings with the light-yellow submarginal band narrow, not so broad as the largest silver spots on its inner side.... 26
- 6*a*. Both hind and fore wings strongly angulated; under side of wings vermiculated light and dark, barklike in appearance, without any definite color pattern..... 7
- 6*b*. Hind wings not angulated; under side of wings not vermiculated and barklike; under side of fore wings, and often of hind wings, with the same color pattern as the upper side..... 11
- 7*a*. Above dark maroon with a broad yellow border followed by a row of small metallic blue spots; large, fore wings about 40 mm. long (pl. 2, *b*).....*Nymphalis antiopa* (p. 42)
- 7*b*. Upper surface of wings reddish, the fore wings bordered with dark brown, the hind wings more or less extensively dark brown, the light areas on both wings with large dark-brown spots..... 8

- 8a. Larger, the fore wings 30-35 mm. long; basal quarter of costal border of fore wings beneath conspicuously mottled with pale yellow and brown; wings narrowly edged with pale violet; center of under surface of hind wings with a silver semicolon (pl. 16, fig. f).....
Polygonia interrogationis (p. 40)
- 8b. Smaller, the fore wings about 25-27 mm. long; no mottling on costal border of the fore wings beneath; silver mark in center of under side of hind wings entire..... 9
- 9a. Silver boomerang-shaped mark in center of hind wings beneath abruptly broadened at each end..... 10
- 9b. Silver boomerang-shaped mark in center of hind wings beneath pointed at each end (pl. 5, c, d).....*Polygonia progné* (p. 41)
- 10a. Under side of wings not very dark; fore wings with the border below the subapical angle, and the hind wings, with the border on either side of the tail, but slightly irregular at the veins; tails of hind wings triangular with converging sides; no submarginal chevrons on under side of wings (pl. 5, e, f).....*Polygonia comma* (p. 40)
- 10b. Under side of wings very dark, mostly blackish; borders of wings very jagged, with a process at each vein; tails of hind wings twice as long as broad, with parallel sides; a row of dark green submarginal chevron-shaped marks on the under side; dark spots above large (pl. 5, a, b).....*Polygonia faunus* (p. 41)
- 11a. Above dark brown or blackish; fore wings with a bright red or orange band from the inner third of the costal border to the lower angle, and several subapical white spots; hind wings broadly bordered with bright red or red-orange; fore wings angulated, 25-30 mm. long (pl. 8, f).....*Vanessa atalanta* (p. 43)
- 11b. No bright red or orange above..... 12
- 12a. Hind wings above with two large and conspicuous eye spots; fore wings with a large and conspicuous eye spot in a broad whitish band; fore wings angulated, 25-30 mm. long (pls. 4, h-j; 5, g, h).....
Junonia evarete (p. 45)
- 12b. Hind wings above without two large and conspicuous eye spots..... 13
- 13a. Wings above uniform dull orange to brownish orange or dull mahogany with black veins and a broad black border including small white spots..... 14
- 13b. Wings above not dark orange with black veins and a black border including small white spots..... 15
- 14a. Larger, the fore wings about 50 mm. long; black border of wings with a double row of small white spots; no black line across hind wings; thorax spotted with white (pl. 10, a-b).....*Danaus plexippus* (p. 65)
- 14b. Smaller, the fore wings 35-43 mm. long; black border of wings with a single row of white spots; hind wings crossed by a narrow black line parallel to the margin in the outer third (pl. 6, d-f).....
Limnitis archippus (p. 52)
- 15a. Under side of hind wings uniform brownish yellow or steel blue, lighter in the outer third, the two sections separated by a thin silver line; a row of thin silver submarginal dashes; sometimes a silver spot in the cell and another at the inner third of the costal border; above, inner two-thirds of wings black, outer third orange (males), or steel

- blue with light-blue and whitish spots in the outer third (females); fore wings 43-55 mm. long (pl. 7, *a-d*).....*Speyeria diana* (p. 55)
- 15b. Under side of hind wings not uniformly colored—variegated, or with several spots in the cell, or with a row of submarginal spots or dots; no silver 16
- 16a. Wings above blackish, becoming metallic bluish or greenish on outer third of hind wings; under side with a few large spots in the cell, and hind wings with a submarginal row of orange spots; rarely with a white band across the fore wings, or across both wings; fore wings 35-45 mm. long (pls. 2, *a*; 6, *c, g, h*).....*Limenitis arthemis* (p. 49)
- 16b. Wings not uniform blackish unmarked except in outer portion; no metallic green or blue..... 17
- 17a. Black with an interrupted brick-red border and numerous whitish spots in the outer third of the wings; below with the whitish spots continued inward to base of wings; fore wings 25-30 mm. long (pl. 3, *l*).....*Euphydryas phaeton* (p. 47)
- 17b. Ground color of wings above not black—yellow, orange, reddish, grayish, or brown; no brick-red border or uniformly distributed small whitish spots 18
- 18a. Wings above grayish, reddish, or orange brown, the fore wings with dark lines and numerous light spots, the hind wings with a submarginal row of blackish spots, which may be concealed by the dark ground color 19
- 18b. Wings above with the ground color light, yellow, orange or reddish, with dark lines and other markings..... 20
- 19a. Grayish brown; fore wings with a rounded black spot in the outer portion of the interspace between the two lowest veins; fore wings 25-30 mm. long (pl. 4, *c*).....*Asterocampa celtis* (p. 39)
- 19b. Reddish or orange brown; no rounded black spot on fore wings; hind wings may be uniformly dark; fore wings 20-32 mm. long (pl. 4, *a, b*).....*Asterocampa clyton* (p. 39)
- 20a. Under side of hind wings with conspicuous submarginal eye spots, the inner portion grayish with an intricate reticulated pattern..... 21
- 20b. No eye spots on under side of hind wings..... 22
- 21a. Under side of hind wings with two large and conspicuous eye spots (pl. 4, *f, g*).....*Vanessa virginiensis* (p. 44)
- 21b. Under side of hind wings with a series of five or six submarginal eye spots; fore wings 30-35 mm. long (pl. 4, *d, e*).....*Vanessa cardui* (p. 44)
- 22a. Under side of hind wings variegated purplish; wings above with an intricate pattern of black lines and a row of small submarginal black spots; fore wings with an obtuse angle below the apex, about 25 mm. long (pl. 9, *d, e*).....*Boloria toddi* (p. 61)
- 22b. Under side of hind wings yellowish or whitish, usually variegated with brown 23
- 23a. Size medium, the fore wings usually 30-35 mm. long; brownish yellow, above with a submarginal row of rounded black spots, each in a large pale spot, on both wings; bordering this interiorly is a line of large dark-bordered pale spots; cell of fore wings with a large pale dark-bordered spot at the end and a smaller one near the middle (pl. 6, *a, b*).....*Euptoicta claudia* (p. 63)

- 23*b*. Smaller, the fore wings not over 25 mm. long; no submarginal rounded black spots on fore wings..... 24
- 24*a*. Under side of hind wings clear bright yellow, almost unmarked; above very dark, the blackish markings exceeding the yellow in area, at least on the fore wings; fore wings 17-18 mm. long (pl. 11, *f-i*).....
.....*Phyciodes batesii* (p. 49)
- 24*b*. Under side of hind wings with more or less extensive dark-brown lines or other markings; a marginal pearly crescent between veins 3 and 4; on the upper surface the yellowish ground color exceeds in area the dark markings..... 25
- 25*a*. Submarginal spots on hind wings above uniform, all solid black, fore wings 15-20 mm. long (pl. 11, *j-m*).....*Phyciodes tharos* (p. 48)
- 25*b*. Submarginal spot on hind wings between veins 3 and 4 in the form of a ring and larger than the others; fore wings 18-25 mm. long (pl. 9, *f, g*).....*Melitaea nycteis* (p. 47)
- 26*a*. Border of wings marked with a narrow black submarginal line, the veins from this to the margin more or less broadly black; fore wings 35-43 mm. long (pl. 8, *a, b*).....*Speyeria aphrodite* (p. 59)
- 26*b*. Border of fore wings solid black, of hind wings mostly black; smaller, fore wings 30-33 mm. long (pl. 8, *c, d*).....*Speyeria atlantis* (p. 61)

5. KEY TO THE SPECIES OF RIODINIDAE

- 1*a*. Fringes of fore wings uniform brown, at most with an indefinite light spot at the apex; ground color above uniform brownish red; small, the fore wings 9-12 mm. long (pl. 12, *j*)...*Calephelis virginiensis* (p. 69)
- 1*b*. Fringes of fore wings with three conspicuous white spots, one at the apex, one in the middle, and one at the lower angle; ground color above dark purplish brown with a broad vaguely defined darker band across the middle of each wing; larger, the fore wings 15-16 mm. long (pl. 12, *i*).....*Calephelis borealis* (p. 69)

6. KEY TO THE SPECIES OF LYCAENIDAE

- 1*a*. Fore wings bright coppery red with a brown border and a few black spots; hind wings above dark grayish brown with a red submarginal band; fore wings about 15 mm. long (pl. 15, *l-n*).....
.....*Lycaena phlaeas* (p. 71)
- 1*b*. Fore wings not bright coppery red..... 2
- 2*a*. Wings beneath blackish brown, the hind wings with a group of large metallic green or coppery spots near the anal angle, the fore wings sometimes (males) with a metallic green streak; above brilliant metallic blue-green with a broad brown border; hind wings with two tails; fore wings about 20 mm. long (pl. 12, *c, d*)...*Atlides halesus* (p. 77)
- 2*b*. Under side of wings not blackish brown with conspicuous metallic spots; smaller 3
- 3*a*. Under side of wings dark slaty or brownish with a submarginal row of large circular black spots conspicuously ringed with white; above light silky blue (pls. 14, *g*; 15, *a-c*).....*Glaucopsyche lygdamus* (p. 72)
- 3*b*. Under side of wings without a submarginal row of large circular black spots ringed with white..... 4

- 4a. Under side of hind wings plain light blue-gray or brown with black dots 5
- 4b. Under side of hind wings brown or gray or green ornamented with fine lines, never with dots..... 7
- 5a. Under side of hind wings gray-brown or brown with a submarginal row of large orange-red spots; above plain gray-brown or brown (pl. 13, *g, h*).....*Strymon titus* (p. 79)
- 5b. Under side of hind wings light blue-gray without submarginal orange-red spots 6
- 6a. Hind wings rounded, without tails; above clear blue or (summer females) blue with the costal and outer borders of the fore wings broadly brown (pl. 14, *a-f, h*).....*Cyaniris argiolus* (p. 73)
- 6b. Hind wings with a hairlike tail at the base of which is an orange spot; above blue or brown, if brown usually with some blue near the body (pl. 14, *i, j*).....*Everes comyntas* (p. 75)
- 7a. Hind wings with two thin hairlike tails..... 8
- 7b. Hind wings without tails..... 15
- 8a. Above brilliant metallic blue with a brown border (pl. 12, *e, f*).....
.....*Eupsyche m-album* (p. 78)
- 8b. Above brown, sometimes tinged with dull blue..... 9
- 9a. Under side of fore and hind wings with a broad bright-red stripe outwardly bordered with white just beyond the middle; more or less dull blue on the inner portion of the wings above (pl. 12, *h*)...
.....*Strymon cecrops* (p. 78)
- 9b. No red band on wings below..... 10
- 10a. Under side of hind wings mostly bright green, with two very irregular conspicuous white lines; a conspicuous white streak on the outer border of the fore wings parallel to the margin; above golden brown with a dark-brown border (pl. 12, *g*).....*Mitoura gryneus* (p. 84)
- 10b. Under side of hind wings brown or gray; an orange spot between the bases of the tails..... 11
- 11a. Under side of wings gray with a fine line of white, interiorly bordered with black and brownish red in the outer third, and a large orange spot above the interval between the tails; above gray with an orange crescent at the base of the tails (pl. 11, *n, o*)...*Strymon melinus* (p. 81)
- 11b. Wings brown or blackish brown, beneath with a conspicuous blue patch between the orange spot and the anal angle..... 12
- 12a. Under side of wings with four evenly spaced irregular fine white lines in the outer two-thirds and a complete row of small submarginal orange or maroon spots (pl. 13, *e*).....*Strymon liparops* (p. 81)
- 12b. Under side of wings with a narrow submarginal white line or series of dashes, and a single or double continuous or interrupted white line in the outer third..... 13
- 13a. A broad dark bar narrowly bordered with white at the end of the cell of each wing on the under side..... 14
- 13b. Under side with no markings in the cell; the two white lines in the outer third of the lower surface of the wings continuous and conspicuous; fore wings above usually with a dull-orange patch, or at least some dull-orange scales (pl. 13, *f*).....*Strymon ontario* (p. 79)
- 14a. Inner white line continuous or nearly so, forming the outer border

- of a dark band; sometimes a finer white line along the inner border of this band (pl. 13, *c*).....*Strymon falacer* (p. 80)
- 14*b*. Inner white line double, equally strong on each side of the dark band, and interrupted, forming a series of disconnected white-ringed spots, especially on the hind wings (pl. 13, *d*).....*Strymon edwardsii* (p. 80)
- 15*a*. Hind wings without a lobe at the anal angle..... 16
- 15*b*. Hind wings with a rounded lobe at the anal angle..... 17
- 16*a*. Under side light grayish green with an irregular bright-red band in the outer third; wings above brown, the hind wings more or less extensively blue in the posterior portion; antennae half as long as fore wings, with elongated segments (pl. 12, *a, b*).....*Erora lacta* (p. 85)
- 16*b*. Under side of hind wings coarsely checkered brownish yellow; above black with a large irregular fulvous patch in the center of the fore wings and a large fulvous patch in the outer portion of the hind wings, these patches sometimes occupying most of the wings; antennae less than half as long as fore wings, with short segments (pl. 15, *e, k*).....*Fenisecca tarquinius* (p. 70)
- 17*a*. Under side of hind wings with the inner half similar to the outer, both crossed by irregular or jagged very dark lines, the central one narrowly bordered with white outwardly, giving an irregularly checkered effect; border of hind wings conspicuously scalloped; ground color of under side with a purplish cast (pls. 13, *b*; 30, *h, i*).....
.....*Incisalia niphon* (p. 82)
- 17*b*. Under side of hind wings with the inner half uniformly colored and darker than the outer half, from which it is separated by a very irregular line 18
- 18*a*. Hind wings with an even and unscalloped border, beneath plain brown, lighter in the outer half (pl. 16, *e*).....*Incisalia augustinus* (p. 83)
- 18*b*. Hind wings with a scalloped border, beneath with an overwash of whitish scales in the lower two-thirds of the outer half..... 19
- 19*a*. Under side of fore wings with a narrow light-gray line along the outer border (pl. 13, *a*).....*Incisalia polios* (p. 83)
- 19*b*. No narrow light-gray line along the outer border of the fore wings below 20
- 20*a*. Hind wings beneath only slightly darker in the outer half; outer half of lower two-thirds thickly flecked with whitish scales; more or less evident white scaling in a broad band along the inner margin; band across middle of fore wings below scalloped and very irregular; male with a conspicuous stigma on the fore wings (pl. 16, *c*).....
.....*Incisalia irus* (p. 84)
- 20*b*. Hind wings beneath with the inner half very dark brown, contrasting strongly with the much lighter outer half, uniform in color or with a large indefinite area of olive or lighter-brown scales near the anterior border; hoary scaling confined to a broad definite or indefinite band in the hinder two-thirds of the wing which seldom extends beyond the row of spots or crescents in the light outer portion; band across under side of fore wings in middle of outer half not scalloped, parallel to the outer border, usually with the lower half abruptly nearer the outer border than the upper; male without a stigma (pl. 16, *d*).....*Incisalia henrici* (p. 84)

7. KEY TO THE SPECIES OF PIERIDAE

- 1a. Ground color above white..... 2
- 1b. Ground color above not white..... 9
- 2a. Small, the fore wings 15-20 mm. long; hind wings below marbled or reticulated with green or grayish green..... 3
- 2b. Larger, the fore wings more than 20 mm. long..... 4
- 3a. Fore wings with the outer part of the costal margin curved downward to a sharply pointed apex; a small black spot at the end of the cell; hind wings below mottled gray-green and white; males with the apex of the fore wings broadly orange (pl. 9, *i, j*)..... *Anthocharis genutia* (p. 86)
- 3b. Fore wings of normal shape, the apex rounded; apical portion of fore wings broadly dusky; a black bar across the end of the cell; hind wings below coarsely reticulated with apple-green and basally tinged with pink (pl. 16, *a, b*)..... *Euchloë olympia* (p. 87)
- 4a. A black spot or bar at the end of the cell of the fore wings..... 5
- 4b. No black spot or bar at the end of the cell of the fore wings..... 6
- 5a. A broad rectangular black bar across the end of the cell of the fore wings; a large black spot on the lower margin of the fore wings in the outer third; fore wings otherwise plain or nearly so, or with a border about 5 mm. wide of broadly black veins and white interspaces; no orange or yellow spot in center of hind wings above; hind wings below pure white, or more or less marked with yellowish, or (in spring) white with broad dark-gray veins (pl. 18, *c-h*)..... *Pieris protodice* (p. 92)
- 5b. A small black spot at the end of the cell of the fore wings; no black spot near the lower margin; border of fore wings broadly black with included white spots; hind wings above with a conspicuous orange or yellow spot in the center; hind wings below uniform whitish or yellowish, usually more or less speckled with dark scales and with a central circular pearly spot ringed with brown, and a smaller supplementary spot behind it (pls. 10, *e*; 17, *e, f*)..... white females of *Colias eurytheme* or *philodice* (pp. 93, 97)
- 6a. Fore wings with the apex black, a rounded black spot halfway between the lower end of the cell and the outer border and another below it between veins 1 and 2, the latter sometimes absent; hind wings with a small black spot on the outer third of the costal border (pl. 18, *a*)..... *Pieris rapae* (p. 88)
- 6b. Fore wings without conspicuous rounded black spots..... 7
- 7a. Fore wings with black triangles at the outer ends of the veins, longest at the apex and disappearing after vein 2 (males), or with the apex broadly blackish, the black decreasing in width but persisting to the lower angle, and the costal margin blackish, giving off a narrow black line following the anterior border of the cell and curving about its outer end; hind wings plain white (males) or with black triangles at the ends of the veins (females); fore wings about 30 mm. long (pl. 8, *g-j*)..... *Ascia phileta* (p. 93)
- 7b. Above plain white, unmarked; fore wings 20-25 mm. long..... 8

- 8a. Apex of fore wings faintly grayish; under side of hind wings plain white or faintly yellowish, usually with scattered dark scales (pl. 18, a).....*Pieris rapae* (early spring) (p. 88)
- 8b. Under side of hind wings white, the veins broadly bordered with light grayish; no dusky scaling at apex of fore wings above (pl. 18, b).....*Pieris virginicensis* (p. 90)
- 9a. Ground color above dark gray (pl. 8, g, h).....
.....Dark females of *Ascia phileta* (p. 93)
- 9b. Ground color above yellow or orange..... 10
- 10a. Fore wings without a broad black or brown border; large, the fore wings 35-40 mm. long..... 11
- 10b. Fore wings with a broad black or dark-brown border; smaller, the fore wings seldom so much as 30 mm. long..... 12
- 11a. Bright clear yellow, unmarked (pl. 10, c).....*Phoebis seniae* (p. 112)
- 11b. Bright yellow; fore wings with a large orange patch at the end of the cell, hind wings broadly bordered with orange (pl. 10, d).....
.....*Phoebis philea* (p. 112)
- 12a. Hind wings below with a central circular pearly spot ringed with brown or red, above with an orange or yellow spot at the end of the cell; fore wings with a black spot at the end of the cell..... 13
- 12b. No central circular pearly spot in center of hind wings below, or orange or yellow spot at the end of the cell of the hind wings above..... 14
- 13a. Fore wings with the apex sharply pointed and a very broad black border with a sharp angle extending inward toward the middle of the cell and a truncated angle extending inward between veins 1 and 2; a large black patch including most of the cell, reaching the costal border anteriorly and extending inward and downward to the base of the wings; yellow (pl. 2, d).....*Zerene caesonia* (p. 112)
- 13b. Fore wings with the apex rounded, the black border, broad or narrow, with an even inner edge, plain or including yellow spots; yellow or orange (females sometimes white)..... 17
- 14a. Lower border of fore wings with a broad dark-brown band..... 15
- 14b. No dark markings except for the dark border and a small spot at the end of the cell of the fore wings..... 16
- 15a. Dark band on lower portion of fore wings broadest outwardly, tapering to a point at the wing base; a narrow dark border on inner two-thirds of the costal border of the hind wings; apex of fore wings broadly blackish, the blackish portion bordered by a straight line running from about the middle of the costal border to the end of vein 3; under side yellow; small, the fore wings 12-15 mm. long (pl. 16, g, h).....*Nathalis iole* (p. 115)
- 15b. Dark band on lower portion of fore wings sharply defined with nearly parallel borders and a rounded outer end, separated from the lower border of the wing by a narrow brownish-orange line; no dark line on costal border of hind wings; inner border of black apical portion of fore wings a curved line running from the middle of the costal border to the lower angle; under surface of hind wings silky white; larger, the fore wings about 17 mm. long (pl. 16, i, j).....
.....*Eurema jucunda* (p. 117)

- 16a. Larger, the fore wings 23-25 mm. long; blackish border on fore wings narrowest in the middle, on hind wings with an angle extending inward toward the cell; bright orange (males rarely bright yellow) (pl. 2, e).....*Eurema nicippe* (p. 115)
- 16b. Smaller, the fore wings 16-20 mm. long; black border of fore wings with the inner edge an even curve from just beyond the middle of the costal border to the lower angle; black border of hind wings narrow, tapering to a point at the anal angle; bright yellow, the females sometimes whitish, rarely pure white (pl. 9, h).....*Eurema lisa* (p. 116)
- 17a. Under side of fore wings with a row of submarginal black dots approximately under the inner margin of the black border on the upper side; spot at the end of the cell of the fore wings conspicuous, more than half as high as the width of the cell; pearly spot in center of under side of hind wings ringed with red-brown and with a small supplementary spot on its anterior border; fringes dull, more or less pinkish; color yellow or orange (pls. 10, e; 17, a, b, e, f).....*Colias eurytheme* or *philodice* (pp. 93, 97)
- 17b. No submarginal black dots on under side of fore wings; spot at the end of the cell of the fore wings small and obsolescent, not half so high as the width of the cell; pearly circular spot in center of under side of fore wings ringed with red and without a supplementary spot; fringes bright rosy red; color light yellow (pl. 17, c, d, g, h).....*Colias interior* (p. 111)

8. KEY TO THE SPECIES OF PAPILIONIDAE

- 1a. White or greenish white with broad dark-brown bands and a scarlet spot at the anal angle; tails long and slender, half as long as the hind wings or longer, with straight and slowly converging sides (pl. 19, g, h).....*Graphium marcellus* (p. 145)
- 1b. Color not white and dark brown; tails shorter, much less than half as long as the hind wings..... 2
- 2a. Under surface of the wings chiefly yellow..... 3
- 2b. Under surface of the wings black or blackish brown..... 4
- 3a. Upper surface of wings yellow with a broad black border including yellow submarginal lunules or broad dashes; fore wings with four black bands extending downward from the costal margin, only the innermost reaching the lower margin; hind wings with a long narrow tapering black stripe and the inner margin narrowly black (pls. 19, f; 20, a-h; 21, a-h).....*Papilio glaucus* (p. 124)
- 3b. Upper surface of wings brown; fore wings with a broad band of yellow from the apex to the inner third of the lower border, and a curved row of large submarginal spots; hind wings with a row of large yellow spots in the outer third and a broad transverse yellow band across the basal portion; a large yellow spot on the tails (pl. 19, e).....*Papilio cressphontes* (p. 120)
- 4a. Under surface of the wings with a single submarginal row of orange or yellow or orange and yellow spots..... 5

- 4b. Under surface of the wings with two rows of conspicuous orange or orange and yellow spots parallel with the margin..... 6
- 5a. Outer half of hind wings below metallic steel-blue with a curved submarginal row of large rounded spots set in black, each with a small silver patch on the upper side; wings above brown or blackish becoming metallic steel-blue or green on the hind wings; hind wings and sometimes (females) the lower half of the fore wings with a submarginal row of small light spots (pl. 19, *a-d*).....
.....*Battus philenor* (p. 118)
- 5b. Outer third of hind wings below darker than the proximal two-thirds from which it is marked off by a narrow black line bordered outwardly by a narrow interrupted metallic-blue line; submarginal spots consisting of stout orange and yellow crescents near the margin; hind wings above with scattered blue scales which become much more dense beyond a conspicuous narrow black line along the outer third; a conspicuous orange spot at the outer angle (pls. 19, *f*; 21, *c-g*).....dark females of *Papilio glaucus* (p. 124)
- 6a. Upper surface of wings with two rows of yellow spots, the large spots of the inner row usually coalesced into a yellow band on the hind wings 7
- 6b. Upper surface of the wings with a single submarginal row of greenish spots; hind wings above crossed in the middle by a broad vaguely defined band of grayish green (males) or with diffuse metallic-blue scaling (females); a conspicuous orange spot on outer third of costal border of hind wings (pl. 22, *a, b*).....*Papilio troilus* (p. 122)
- 7a. Inner row of large yellow spots on the fore wings in a straight line parallel to the smaller spots of the submarginal row; yellow band on hind wings crossed by black veins or (females) represented by a row of spots; orange spot at the anal angle with a conspicuous black center; no yellow line on inner portion of hind wings below (pl. 22, *c-h*).....*Papilio polyxenes* (p. 144)
- 7b. Inner row of large yellow spots on the fore wings in an irregular line, the three uppermost and the lowest displaced outwardly, the second lowest displaced inwardly; yellow band on hind wings continuous, not crossed by black veins; inner portion of under side of hind wings with a narrow yellow line from the inner portion of the costal border to just above the spot at the anal angle (pl. 22, *c, d*).....*Papilio palamedes* (p. 121)

9. KEY TO THE SPECIES OF PYRGINAE

- 1a. Hind wings with the anal angle produced into a long tail more than half as long as the wing; fore wings with a row of angular yellowish spots from the middle of the costal border to the lower angle, and a few smaller spots toward the apex; fore wings 20-23 mm. long (pl. 23, *d*).....*Urbanus proteus* (p. 148)
- 1b. Hind wings without tails..... 2
- 2a. Ground color brown or blackish; no conspicuous white spots on the hind wings 3
- 2b. Wings above gray, both fore and hind wings with conspicuous white markings 19

- 3a. Fore wings with a conspicuous broad yellow or brownish-yellow band or row of large angular spots running from the middle of the costal border to the lower angle; size large, the fore wings more than 22 mm. long; dark brown, the hind wings above unmarked..... 4
- 3b. Fore wings without a conspicuous broad yellow or brownish-yellow band or row of large spots; smaller, the fore wings not over 20 mm. long 6
- 4a. Band on fore wings of irregular width, brownish yellow; hind wings below with a conspicuous white patch..... 5
- 4b. Band on fore wings with almost parallel sides, 3-4 mm. broad, lustrous golden; hind wings below dark brown with a few scattered light spots near the outer border; fore wings about 25 mm. long (pl. 23, *b, c*).....*Rhabdoides cellus* (p. 149)
- 5a. Hinds wings below with a large irregular central patch of bright silvery; fore wings 25-30 mm. long (pl. 23, *a*)..*Proteides clarus* (p. 147)
- 5b. Hind wings below with the outer third chalky white; smaller, the fore wings 22-25 mm. long (pl. 23, *e*).....*Achalarus lyciades* (p. 148)
- 6a. Fore wings above uniform brown or blackish, the fore wings with usually small white spots..... 7
- 6b. Fore wings above with numerous grayish scales or mottled blackish or brownish and lighter..... 11
- 7a. Fore wings 18-22 mm. long, with a few to many angular white spots.. 8
- 7b. Smaller, the fore wings less than 15 mm. long..... 10
- 8a. Fore wings crossed by a conspicuous narrow interrupted line of largely contiguous white angular spots running from the middle of the costal border to the lower angle (pls. 23, *g, h*; 25, *e*).....*Thorybes bathyllus* (p. 149)
- 8b. Fore wings with the white spots small and widely separated..... 9
- 9a. Spots on the fore wings irregularly arranged, but present from the costal border to the lower angle; under side of hind wings without numerous whitish scales (pl. 25, *a, b*).....*Thorybes pylades* (p. 150)
- 9b. Spots on the fore wings in a straight line from the middle of the costal border to the lower angle; outer portion of hind wings more or less dusted with whitish scales (pl. 25, *c, d*).....*Thorybes confusus* (p. 150)
- 10a. Wings of normal shape, uniform silky blackish, the fore wings with more or less numerous minute circular white spots (pl. 26 *r*).....*Pholisora catullus* (p. 153)
- 10b. Hind wings with a coarsely crenulate border; wings clouded darker and lighter; fore wings with two minute white spots near the apex and another just below the middle (pl. 15, *i, j*).....*Pholisora hayhurstii* (p. 153)
- 11a. Fore wings with no subapical glassy spots..... 12
- 11b. Fore wings with subapical glassy spots..... 13
- 12a. Smaller, the fore wings rarely more than 17 mm. long; a distinct hoary patch between the upper halves of the two bands crossing the upper surface of the fore wings; males with a pencil of hair on the hind tibiae; costal fold of males with flagellate tapering scales (pl. 24, *g, h*).....*Erynnis icelus* (p. 154)

- 12b. Larger, the fore wings rarely less than 17 mm. long; no distinct hoary patch between the upper halves of the two bands crossing the upper surface of the fore wings; males without a long pencil of hair on the hind tibiae; costal fold of males with twisted ribbonlike scales (pl. 24, i).....*Erynnis brizo* (p. 155)
- 13a. Larger, the fore wings seldom less than 17 mm. long; costal fold of males with no rodlike androconia, the androconia being at least twice as stout apically as basally..... 14
- 13b. Smaller, the fore wings rarely more than 17 mm. long; costal fold of males with many rodlike subequal androconia, sometimes two-pronged, apically not twice as stout as basally..... 16
- 14a. Upper surface of fore wings flecked with whitish scales throughout so as to be quite different in general tint from the hind wings; hind wings below with numerous light spots in the outer third and usually with one or two small circular light spots near the outer third of the costal border (pls. 24, o, p; 25, f).....*Erynnis juvenalis* (p. 157)
- 14b. Upper surface of fore wings flecked with whitish scales only in small patches or not at all; hind wings below with the spots in the outer third obsolete or absent, and no small circular spots near the costal border 15
- 15a. Glassy spots on the fore wings conspicuous; under side of hind wings with faintly marked light spots toward the margin (pl. 25, j, k)...
.....*Erynnis horatius* (p. 158)
- 15b. Glassy spots on the fore wings small and inconspicuous; under side of hind wings almost or quite plain blackish (pl. 25, g, h).....
.....*Erynnis zarucco* (p. 158)
- 16a. Dark spots on upper surface of wings well defined and in sharp contrast to the ground color, giving a checkered appearance; costal fold of males with many "apple-seed" androconia (pl. 24, n).....
.....*Erynnis martialis* (p. 156)
- 16b. Dark spots on upper surface of wings poorly defined and not sharply contrasted with the ground color; costal fold of males without "apple-seed" androconia 17
- 17a. Inner portion of wings with numerous long light grayish hairs; spring only (pl. 24, j, l).....*Erynnis persius* (p. 155)
- 17b. Few or no light hairs on inner portion of wings; spring and summer.. 18
- 18a. Markings of fore and hind wings fairly well defined (pl. 24, k).....
.....*Erynnis lucilius* (p. 155)
- 18b. Darker, the markings on fore and hind wings obscured and poorly defined (pl. 24, m).....*Erynnis baptisiae* (p. 156)
- 19a. Fore wings with a broad white band formed of a series of spots usually at least twice as broad as high and frequently much broader, separated only by the dark veins, beyond which is a submarginal row of white spots; fore wings about 15 mm. long (pl. 24, b, c, e, f).
.....*Pyrgus communis* (p. 152)
- 19b. Fore wings with an irregular series of discontinuous spots which are not broader than long in the outer third, and no submarginal spots; hind wings with a row of submarginal spots and a pair of elongate spots beyond the end of the cell; fore wings 13-14 mm. long (pl. 24, a, d).....*Pyrgus centaureae* (p. 151)

10. KEY TO THE MALES OF THE SPECIES OF HESPERIINAE

- 1a. Under side of hind wings plain yellow, unmarked..... 2
- 1b. Under side of hind wings not plain yellow, unmarked..... 5
- 2a. Small, the fore wings 12-14 mm. long..... 3
- 2b. Larger, the fore wings 15-18 mm. long..... 4
- 3a. Fore wings about 12 mm. long; fore wings above infuscated yellow with a broad brown outer border; hind wings above clear yellow with a brown border; fore wings below black with the costal and outer margin reddish-fulvous (pl. 3, *k*)..... *Ancyloxypha numitor* (p. 159)
- 3b. Fore wings 13-14 mm. long; both wings above clear yellow with a brown border 1.5-2 mm. broad; fore wings below pale yellow, the lower border clouded with brown (pl. 11, *a, b*)... *Atrytone arogos* (p. 172)
- 4a. Fore wings above clear yellow with an even brown outer border 1.5 mm. broad, a dark streak along the inner half of the lower border of the cell, and a narrow black line running from the outer third of the costal border parallel to the outer margin to the lower part of the outer end of the cell; no stigma; hind wings with a very narrow brown border; fore wings below with the lower and inner half of the base black (pl. 27, *c-c*)..... *Atrytone logan* (p. 173)
- 4b. Fore wings about 18 mm. long, bright yellow with a broad brown even outer border 4 mm. wide and a narrow black stigma; hind wings darker and duller yellow with a very broad brown costal and outer border (pl. 29, *g-i*)..... *Atrytone palatka* (p. 173)
- 5a. Under side of hind wings yellow with black or brown spots or blotches; no dark border..... 6
- 5b. Under side of hind wings not yellow with dark spots or blotches..... 9
- 6a. Under side of hind wings evenly dotted with small black or brown spots..... 7
- 6b. Under side of hind wings with small and large spots of red-brown irregularly distributed; fore wings 13-14 mm. long..... 8
- 7a. Hind wings below spotted with black; fore wings 14 mm. long; above bright yellow with a series of contiguous marginal triangles extending inward, a large black stigma, and a curved black line from the stigma to the apex; hind wings with a narrow brown border widening at the anal angle (pl. 28, *c*)..... *Hylephila phyleus* (p. 161)
- 7b. Hind wings below with dark brown spots; fore wings 12 mm. long; wings above dark brown, the fore wings with about 6 small yellow spots (pls. 28, *p*; 30, *a-c*)..... *Amblyscirtes carolina* (p. 180)
- 8a. Wings above golden yellow with a brown border having an angular inner edge; no stigma; hind wings below with a large brown spot at the base sending off a branch to the inner third of the costal margin, a narrow irregular interrupted brown border, and usually a few small spots about the middle of the inner half (pl. 27, *a, b*)...
..... *Poanes zabulon* (p. 169)
- 8b. Above yellow, marked as in *H. phyleus* (7a); hind wings below with two large brown spots near the outer margin, one near the inner margin, and one or two small spots above the latter (pls. 27, *f*; 28, *i*)..... *Polites vibex* (p. 167)
- 9a. Upper side of wings plain dark brown or black, unmarked..... 10
- 9b. Upper side of wings not plain brown unmarked..... 13

- 10a. Larger, the fore wings 17 mm. long; hind wings below with two long light streaks diverging from the base to the outer margin (pl. 29, *a-d*).....*Atrytone dukesi* (p. 175)
- 10b. Smaller, the fore wings not more than 14 mm. long; no streaks on the under surface of the hind wings..... 11
- 11a. Fore wings about 14 mm. long..... 12
- 11b. Fore wings about 12 mm. long; wings unmarked above and below (pl. 11, *c, d*).....*Lerodea l'herminieri* (p. 181)
- 12a. Hind wings below plain brown, unmarked (pls. 11, *e*; 26, *e*).....
.....*Atrytone ruricola* (p. 177)
- 12b. Hind wings below with a chevron-shaped row of contiguous bright-yellow spots in the outer third and a yellow line running from the base of the wing through the angle of the chevron (pl. 26, *c, d*).....*Poanes massasoit* (p. 172)
- 13a. Under side of hind wings without spots or sharply contrasting markings, plain, with one or two long ill-defined light streaks, with whitish veins, or with light veins and a sharply defined light streak.. 14
- 13b. Under side of hind wings with spots or sharply contrasting markings.. 21
- 14a. Under side of hind wings with one or two long ill-defined light streaks running from the base to the margin..... 15
- 14b. Under side of hind wings without ill-defined light streaks running from the base to the margin..... 17
- 15a. Both wings above bright yellow with a uniform brown border about 2 mm. wide; fore wings without a stigma, 13-17 mm. long; hind wings below with a single median light streak (pl. 28, *m-o, r*).....
.....*Poanes aaroni* (p. 170)
- 15b. Wings above dark brown, the stigma bordered outwardly by a conspicuous yellow band; a narrower yellow band just within the costal border from about the middle of the cell to beyond the end of the stigma; hind wings with a broad yellow line from about the middle of the cell to near the outer margin; hind wings below with two diverging ill-defined light streaks from the base to the outer border 16
- 16a. Yellow band bordering the stigma outwardly about 2 mm. wide, nearly as wide as the brown border between it and the margin, and broadly united with the yellow stripe near the costal border; hind wings above with the yellow band about 5 mm. long; fore wings 16-17 mm. long (pl. 29, *e*).....*Atrytone dion* (p. 173)
- 16b. Slightly smaller and darker; yellow band bordering the stigma outwardly about 1 mm. wide, much narrower than the brown border between it and the margin, not connected with the yellow sub-costal line; yellow band on hind wings about 2-3 mm. long, or more or less obsolete (pl. 29, *f*).....*Atrytone alabamæ* (p. 174)
- 17a. Hind wings below plain brown..... 18
- 17b. Hind wings below not plain brown..... 19
- 18a. Larger, the fore wings 17-18 mm. long; fore wings above with a conspicuous white spot concave outwardly below the end of the cell, a small one beyond its upper end, one below the large one near the lower border, and one or two small ones near the apex (pl. 26, *p*).....*Panoquina ocola* (p. 186)

- 18b. Smaller, the fore wings 13-14 mm. long; above more grayish, the fore wings with two small white spots below the end of the cell and three very small ones in a row near the apex (pl. 24, q).....
.....*Lerodea eufala* (p. 182)
- 19a. Hind wings below grayish olive with white or yellowish veins..... 20
- 19b. Hind wings below with an ill-defined dark long-triangular patch extending inward from the outer third of the costal margin to beyond the middle; fore wings above with a few small white spots in the subapical region (pl. 27, o, r).....*Lerema accius* (p. 178)
- 20a. Hind wings below with a broad white streak from the outer part of the cell to the margin; above grayish brown, the fore wings with numerous whitish spots in the outer half, the hind wings with a whitish streak from the outer part of the cell to the margin (pl. 26, l).....
.....*Panoquina panoquin* (p. 185)
- 20b. Hinds wings below with white veins but no broad white streak; fore wings below with the lower half of the basal portion as far as the middle black, the upper portion of the black area bordered with two white spots, the lower the larger; fore wings above with the stigma bordered outwardly with dull reddish (pl. 27, j, k).....
.....*Atrytone bimacula* (p. 176)
- 21a. Hind wings with a transverse row of three conspicuous spots both above and below; fore wings with about 6 or 7 white spots, a large one at the end of the cell, one about half as large about the middle of the lower border, the others smaller and subapical; wings above brown, lighter toward the body; large, the fore wings about 25 mm. long (pl. 23, f).....*Calpodex ethlius* (p. 183)
- 21b. Hind wings without a row of three conspicuous white spots on both surfaces 22
- 22a. Under side of hind wings black, the inner two-thirds with an intricate white reticulation; fore wings with an angled line of small white spots on the outer third; above black with an angled row of white spots on the outer third of the fore wings; small, the fore wings 13-15 mm. long (pl. 3, j).....*Amblyscirtes textor* (p. 180)
- 22b. Under side of hind wings not black with a reticulate white pattern... 23
- 23a. Fore wings above with the stigma in two well-separated parts; above brown, the fore wings with an elongate yellow spot extending outward from the anterior portion of the stigma and a smaller spot near the apex; hind wings below yellow, or purplish brown, with a short row of obscure light spots in the outer third (pl. 26, m-o).....
.....*Wallengrenia otho* (p. 167)
- 23b. Fore wings above with the stigma continuous or absent..... 24
- 24a. No yellow, above or below; markings confined to isolated spots, never in bands or streaks..... 25
- 24b. Fore wings above marked with yellow, broadly yellow or with a yellow band or row of large spots bordering the stigma on its outer side 28
- 25a. Larger, the fore wings 15-17 mm. long; above brown with a few white spots in the outer third of the fore wings; hind wings below brown becoming hoary gray in the outer half; a small but conspicuous white circular spot near the base, and usually another about half-

- way to the outer angle; spring only (pl. 26, q).....
*Atrytonopsis hianna* (p. 177)
- 25b. Smaller, the fore wings 10-14 mm. long; above blackish with small white spots in the outer third of the fore wings..... 26
- 26a. Hind wings below pale gray with a semicircular band of white spots, a small spot at the end of the cell, and another at about the middle of the costal margin; spring (pls. 25, i; 27, l).....
*Amblyscirtes hegon* (p. 179)
- 26b. Hind wings below blackish; spring and summer..... 27
- 27a. No spot in the middle of the costal border of the fore wings, and hind wings immaculate; fore wings with 2 or 3 (rarely more) minute white spots in the outer fourth of the costal margin; hind wings below blackish, slightly mottled, clouded with pale-bluish scales, especially in the outer third (pl. 27, n, q)....*Amblyscirtes vialis* (p. 179)
- 27b. A small white spot near the costal border of the fore wings at about the middle; three minute white spots near the apex, and an irregular row of small white spots in the outer third parallel to the margin; hind wings with a small white spot above the end of the cell, and often additional spots (pl. 25, l, n)....*Amblyscirtes alternata* (p. 179)
- 28a. Hind wings above plain brown, unmarked..... 29
- 28b. Hind wings marked with yellow above..... 31
- 29a. Hind wings below olive-gray with a curved row of obscure spots in the outer portion; fore wings above dull golden as far as the minute subapical spots and the stigma; an elongate spot at the anterior end of the stigma and commonly other spots along its outer side.. 30
- 29b. Hind wings below dark purplish brown with a curved row of paler spots; fore wings above with three minute subapical spots and a row of whitish-yellow spots along the outer side of the stigma, the upper the longest and the lowest somewhat isolated, forming an interrupted band about one-third as broad as the distance from the stigma to the margin; fore wings 14 mm. long (pl. 28, d)...*Polites verna* (p. 164)
- 30a. Fore wings 12-13 mm. long; stigma broad, short, and sinuous (pl. 28, f).....
*Polites themistocles* (p. 165)
- 30b. Fore wings usually 14-15 mm. long; stigma longer and narrower, almost a straight line (pls. 15, d; 28, e)....*Polites manataaqua* (p. 164)
- 31a. Hind wings below with a narrow irregular white band or row of white spots forming a right angle, with the apex at about the middle of the outer border, and a short white oblique line in the middle of the wing; above dull, with a broad dingy-yellow band bordering the stigma outwardly, an obscure angular line of dull-yellow spots on the hind wings, and some minute dull-whitish spots in the apex of the fore wings; fore wings 13 mm. long; spring (pl. 28, a, b)....
*Hesperia metca* (p. 160)
- 31b. Hind wings not marked with white below; yellow above bright, in sharp contrast to the brown..... 32
- 32a. Fore wings yellow with a broad brown outer border and a very large black oval stigma; hind wings brown broadly streaked with yellow; under side of hind wings yellow with a few large obscure darker spots; fore wings 14 mm. long (pl. 26, f-i).....
*Atalopedes campestris* (p. 163)

- 32*b*. Stigma narrowly linear or absent..... 33
- 33*a*. Under side of hind wings with a series of small clearly defined submarginal spots and one in the cell..... 34
- 33*b*. Under side of hind wings without small clearly defined spots; no small spot in the cell..... 36
- 34*a*. Hind wings below with an angular row of five to seven clearly defined and conspicuous spots..... 35
- 34*b*. Hind wings below pale cinnamon with four circular yellowish spots in the outer portion and another in the cell toward the base; wings above yellow with brown borders, on the fore wings anteriorly extending inward to the end of the cell; stigma and streaks in the cell brown, the stigma sometimes with a yellow center; three minute yellow spots in the broad brown apical portion (very variable in the extent of the yellow markings above) (pls. 28, *q*; 30, *d, f, g*).....
.....*Poanes yehl* (p. 171)
- 35*a*. Hind wings below bright cinnamon with an angular row of seven clearly defined submarginal light spots and another in the cell; fore wings above orange-yellow with a broad brown border, the apical portion extending inward to nearly the middle of the costal margin, and more or less dusky as far as the stigma; hind wings with the central portion orange-yellow, which may be restricted to a band in the middle of the outer third (pl. 26, *a, b*)...*Hesperia leonardus* (p. 160)
- 35*b*. Hind wings below dark brown (or yellow) with an angular row of usually five well-separated whitish circular spots, another in the cell, and another above it near the costal border; fore wings above brown, the stigma broadly bordered outwardly with yellow, and some yellow subapical spots; hind wings above with the angular line of small spots below repeated (pl. 27, *i*).....*Hesperia attalus* (p. 161)
- 36*a*. Hind wings above uniform yellow or orange-yellow with a broad sharply defined border, or with the central portion occupied by a very large yellow spot..... 37
- 36*b*. Hind wings above not uniform yellow with a sharply defined brown border 39
- 37*a*. Fore wings above golden yellow with a brown outer border 3 mm. wide including two small elongate yellow spots beyond the end of the cell; no stigma; under side of hind wings yellow with a broad brown border, essentially as above; fore wings 16-17 mm. long (pl. 28, *j-l*).....*Poanes hobomok* (p. 169)
- 37*b*. Fore wings above mostly brown, or with a conspicuous black stigma.. 38
- 38*a*. Larger, the fore wings about 20 mm. long; hind wings below dark gray with a broad more or less obscure light band from the base to the outer margin and some light spots near its outer end; fore wings above brown with a row of orange-yellow spots in the outer third increasing in size downward, a large spot in the cell, and some small spots near the apex (pl. 29, *j*).....*Poanes viator* (p. 168)
- 38*b*. Smaller, the fore wings 13 mm. long; hind wings below dull yellow, the central portion with a large blotchy lighter patch; fore wings above yellow with a brown outer border 2-3 mm. wide and a long narrow black stigma (pl. 27, *m, p*).....*Hesperia sassacus* (p. 161)

- 39a. Hind wings below brown with a small group of elongate indistinct light spots beyond the cell; upper surface of hind wings with similar but better-defined yellow spots; fore wings above yellow with a broad brown border 3 mm. broad, a dusky costal border, and a large black stigma surrounded by yellow at its upper end; fore wings about 15 mm. long (pl. 27, *g, h*) *Atrytone conspicua* (p. 176)
- 39b. Hind wings below with large sharply contrasting light areas. 40
- 40a. Hind wings below brown with a broad and irregular submarginal crescent of strongly contrasting bright yellow or orange-yellow, a large spot in the cell, and another at the base of the wing, the markings often confluent; fore wings above as far as the stigma, and a few spots beyond, yellow; hind wings above with a group of 4 or 5 elongate yellow spots alternating large and small in the outer portion; fore wings 12-13 mm. long (pl. 28, *g, h*) . . . *Polites peckius* (p. 165)
- 40b. Hind wings below with a broad band of straw yellow on the outer half and a patch of darker yellow on the inner portion; outer portion of fore wings below with a broad triangular patch of straw yellow, the inner portion darker yellow; fore wings above yellow with a brown outer border 2-3 mm. wide and a black stigma joined to the apical portion of the border by two diverging lines; hind wings above with the central portion yellow, sharply defined outwardly but inwardly becoming dusky; fore wings 14 mm. long (pl. 26, *j, k*) *Polites mystic* (p. 166)

ANNOTATED LIST OF BUTTERFLIES OF VIRGINIA

Family SATYRIDAE

Subfamily LETHIINAE

Genus LETHE Hübner

LETHE CREOLA (Skinner)

Plate 1, a, b, c, d

Range.—From southern Princess Anne County westward and northwestward to Greensville, Dinwiddie, and Prince George Counties; our records are from Dinwiddie, Greensville, Isle of Wight, Nansemond, Prince George, and Princess Anne Counties.

Occurrence.—Found in wet woods with an abundant undergrowth of *Arundinaria tecta*; very local; common in certain localities along the western border of the Dismal Swamp and near Petersburg and New Bohemia, elsewhere not numerous. This species usually, but not always, occurs with *L. portlandia portlandia*. It is easily overlooked as it is crepuscular, seldom flying during the day but becoming very active just before dark. It is readily secured by beating it out of the cane in which it rests during the daylight hours.

Seasons.—Two broods. This species first appears in the second week in June, flying until early in July. The second brood is on the wing shortly after the middle of August and flies until the end of the second week in September.

LETHE PORTLANDIA (Fabricius)

There are two subspecies in Virginia.

LETHE PORTLANDIA PORTLANDIA (Fabricius)

Plate 1, e, f

Diagnostic features.—Row of ocelli on under side of fore wings curved; second and third ocelli on under side of hind wings with elongate pupils, the fourth usually without a pupil; under side of fore wings with the row of eye spots edged with white interiorly and more or less completely exteriorly; a white band runs from the costal margin to the region of the second ocellus, and beyond this a narrower white band runs from the costal margin to the upper part of the first ocellus; discocellular vein closing the cell of the hind wings angled.

Range.—This subspecies is found on the southeastern Coastal Plain from the sea westward to Prince George, Dinwiddie, and Greenville Counties. Our records are from Dinwiddie, Greenville, Isle of Wight, Nansemond, Norfolk, Prince George, Princess Anne, Surry, and Southampton Counties.

Occurrence.—Found in damp and wet woods and along streams and roadside ditches wherever cane (*Arundinaria gigantea*) is abundant; generally distributed and locally common—in wet seasons abundant—from the coast to the western border of the Dismal Swamp, becoming more local and less numerous farther west. Though flying by day, especially on cloudy days, this species is most active in early morning and at dusk.

Seasons.—Three broods. This butterfly is on the wing almost continuously from the end of May until the end of September or early October, becoming progressively more numerous as the season advances, and often abundant in September. The first brood appears at the very end of May and flies until nearly the middle of July. The second brood is on the wing shortly after the end of the third week in July, and the third brood appears late in August; freshly emerged individuals are found up to the end of September.

LETHE PORTLANDIA ANTHEDON A. H. Clark

Plate 1, *g, h*

Diagnostic features.—Row of ocelli on under side of fore wings straight; all the ocelli on the under side of the hind wings with similar circular pupils; no clear white on wings beneath; discocellular vein closing the cell of the hind wings evenly curved.

Range.—Found in the Blue Ridge and in the Alleghanies, chiefly at high altitudes. Our records are from Bedford, Botetourt, Giles, and Madison Counties.

Occurrence.—This subspecies inhabits damp wooded ravines and steep damp wooded mountain sides with a growth of bottle-brush grass (*Hystrix patula*). It is very local and not numerous, the widely scattered colonies occupying limited areas and including few individuals. It is active during the day, though more or less crepuscular.

Season.—One brood. Our records are all from early July to early August.

LETHE EURYDICE (Johansson)

The subspecies represented in Virginia is—

LETHE EURYDICE APPALACHIA R. L. Chermock

Plate 1, *i, j*

Range.—Found locally throughout the State, though chiefly in the north and west. Our records are from Augusta, Fairfax, Frederick, Giles, Grayson, Greenville, Henrico, Montgomery, New Kent, Prince Edward, Prince George, Rockbridge, Stafford, Tazewell, and Wythe Counties.

Occurrence.—In the mountains and on the Piedmont this butterfly is found in permanently wet sedgy areas, almost invariably with alders, in and near woods; it is very local and seldom common. On the Coastal Plain it lives in wet woods and swamps with abundant *Arundinaria*, always with *Lethe portlandia portlandia*; here it is very local and, so far as we have seen, decidedly rare.

Seasons.—Probably one brood, with a few individuals emerging late in the season possibly representing a partial second brood. Our earliest date is June 17, and most of our records are in July. In August the numbers decrease, but we have found it as late as September 19. At Mountain Lake, in Giles County, the earliest record is July 4, and here the species is more common in the last half of August than it appears to be elsewhere.

Subfamily SATYRINAE

Genus MINOIS Hübner

MINOIS PEGALA (Fabricius)

There are four intergrading subspecies in Virginia.

MINOIS PEGALA MARITIMA (W. H. Edwards)

Plate 8, *e*

Diagnostic features.—Fore wings of the females 28-30 mm. long, of the males 23-27 mm.; three anterior eye spots under side of hind wing circular; color dark, the females usually as dark as the males.

Range.—From the vicinity of the District of Columbia locally southward on the Coastal Plain to Dinwiddie, Sussex, Southampton, Nansemond, and Norfolk Counties, where it is typically developed and distinctive, though intergrading to some extent with *alope*; also from Fauquier County westward at the higher altitudes in the mountains, and southwestward to the southern border of the State, here intergrading extensively with *alope* and seldom so typically developed as on the Coastal Plain.

Variation.—This small dark form is most typically developed in

the pine barrens of the inner Coastal Plain. Here the individuals are very dark and are quite the same as others from similar situations in New Jersey. As in New Jersey, males with the lower eye spot on the fore wings greatly reduced or wholly absent are fairly common; such males (pl. 8, *c*) also occur in the District of Columbia and in eastern Massachusetts.

In the mountains this subspecies is somewhat less typical than it is on the Coastal Plain, with the yellow band on the fore wings usually somewhat lighter. In this area it grades insensibly into *alope*, so that it is impossible to draw any definite line between them. In many places specimens may equally well be referred to *maritima* or *alope*, and over large areas on the Piedmont the first individuals to emerge are small and dark and resemble *maritima*, while those emerging later are larger and lighter and would unhesitatingly be referred to *alope*.

In a meadow just south of Monterey, Highland County, the individuals are very variable in size, in the size of the eye spots on the fore wings, and in the color of the yellow band on the fore wings which in fresh specimens varies from reddish to almost pure white, though white-banded individuals are rare. Many of the smaller individuals in this meadow would be unhesitatingly identified as *maritima*, others are equally typical *alope*. Such diversity in any one locality is unusual, though we have found cases in wet pastures in West Virginia.

In Frederick County, and in the northern mountains, the males occasionally have the yellow band on the fore wings somewhat narrowed and constricted in the middle, the central portion of both the outer and inner borders being concave. Some of these are referable to *maritima*, others to *alope*.

In a small male from Short Mountain taken by Dr. Warren H. Wagner, Jr., on August 3, 1940, the band on the fore wings is much darkened, being about halfway between the normal clear yellow and the general ground color of the wings. A similar male with the fore wings 24 mm. long was taken by Dr. Wagner at Panorama on July 19, 1936. These two individuals, both of which were flying with many typical *maritima*, approach the northern subspecies *nephele*, and resemble some specimens determined as *nephele* from Beaver County, Pa.

Occurrence.—On the Coastal Plain *maritima* is found in open and more or less grassy pine woods, especially along their borders; it is very local, though common wherever it occurs. In the mountains it lives along the borders of spruce woods, about the edges of mountain bogs and the brushy borders of mountain pastures, and also in open

bogs and wet pastures; here it is rather generally distributed and common wherever it is found.

Season.—One brood. This subspecies appears usually shortly after the first of July, sometimes as early as the last week in June, becomes common the second week in July, and flies in gradually diminishing numbers until early in September. The males emerge a week or more before the first females, and disappear usually by the middle of August when the females are still common.

MINOIS PEGALA ALOPE (Fabricius)

Plate 2, f, g

Diagnostic features.—Fore wings of females 31-34 mm. long, of males 27-30 mm.; three anterior eye spots on under side of hind wings circular; color usually somewhat lighter than in *maritima*, with the females commonly lighter and more grayish than the males.

Range.—Throughout the State, except in the sedge marshes south of Virginia Beach and in the highest mountain regions. In the mountains it usually occurs with *maritima*, into which it intergrades through an unbroken series of intermediates. On the Coastal Plain it often, though not always, occurs with *maritima*. West of the coastal marshes, north of Virginia Beach, and on the outer coast of the Eastern Shore it occurs with *pegala*, though the latter is the dominant form; a short distance inland from the sea *alope* becomes dominant, and intergrades between *pegala* and *alope* are common. On the Eastern Shore *alope* occurs alone in the Dahl Swamp and probably in the interior generally.

The range of this subspecies has the appearance of being largely unnatural. Of the three subspecies of *pegala* this is the only one that is thoroughly at home on cultivated land. It is probable that the extensive overlapping by this subspecies of the territory in which *maritima* and *pegala* occur has been due, in part at least, to the clearing of the land which has resulted in the infiltration by the most adaptable subspecies, *alope*, of the territory normally occupied by the two others.

Occurrence.—Found along the borders of woodlands, about groups of bushes in open fields, and along streams through pastures; it also occurs in open deciduous woods with an abundance of coarse grass, and in patches of pines, especially scrub pines, avoiding thick woods and open grasslands. Rather local, but in suitable localities usually common, though seldom abundant.

Season.—One brood. This subspecies first appears between the end of the third week in June and the first of July, the females coming

out about a week later than the first males, and reaches the peak of its abundance in the last half of July and the first half of August. Later in August the numbers decline, the males disappearing in the last half of the month and the females flying until late in September.

MINOIS PEGALA CAROLINA R. W. Chermock

Diagnostic features.—Resembling *M. p. alope*, but with the band on the fore wings cream white.

Range.—The white-banded individuals from a wet meadow just south of Monterey, Highland County, mentioned on page 33 probably should be referred to this recently described form. The senior author has also found it, flying with *M. p. alope*, in Greenbrier County, West Virginia.

MINOIS PEGALA PEGALA (Fabricius)

Plate 2, *h, i*

Diagnostic features.—Fore wings of females 35-41 mm. long, of males 29-32 mm.; three anterior eye spots on under side of hind wings, or at least the two lower, oval. Throughout most of the range in the south the lower eye spot on the fore wings is lacking in both sexes; in North Carolina most of the females have this eye spot more or less developed, in northern North Carolina and Virginia all the females have two eye spots, and the males begin to acquire the lower eye spot, north of Virginia Beach both sexes having both eye spots equally developed.

Range.—Coastal region of eastern Virginia from the North Carolina to the Maryland borders. In the sedge marshes from Knotts Island to Virginia Beach this is the only subspecies present. Just west of the sedge marshes and along the coast north of Virginia Beach *pegala* is the dominant form, though *alope* also occurs. Farther inland it reaches the western border of the Dismal Swamp, where *alope* is the dominant form, as it is away from the coast on the Eastern Shore. Where the ranges of *pegala* and *alope* overlap there is complete intergradation between them.

Variation.—In the sedge marshes south of Virginia Beach, where *pegala* occurs alone, the females always have both eye spots on the fore wings fully developed; in the males the lower eye spot may be present, more or less reduced, or absent. North of Virginia Beach the size decreases slightly, and the males usually have both eye spots on the fore wings fully developed. In the sand-dune area between Virginia Beach and Cape Henry very pale more or less grayish individuals

occur which appear to agree perfectly with certain specimens of the form *texana*.

Occurrence.—In the sedge marshes south of Virginia Beach this butterfly lives largely in the open, though always in the more or less immediate vicinity of the scattered bushes in which it takes refuge when alarmed. Farther north it keeps close to the seacoast, being replaced by *alope* a short distance inland. Here *alope* also is found along the coast, but in lesser numbers.

Season.—One brood. The males first appear in the last week in June, becoming common early in July, when the first females appear. Both sexes are common through July and the first half of August, the males preponderating in July and the females becoming relatively more numerous in August. The males disappear toward the end of August but the females persist until the end of September.

Genus **EUPTYCHIA** Hübner

EUPTYCHIA GEMMA (Hübner)

Plate 3, *g, h*

Range.—From Princess Anne to Hanover and southern Cumberland Counties and southward; also southern Scott County. We have records from Hanover, Henrico, Isle of Wight, Lunenburg, Nansemond, Norfolk, Prince Edward, Prince George, Princess Anne, and Scott Counties.

Occurrence.—Found on the Coastal Plain in wet pine woods; local and usually infrequent, though sometimes common. On higher land it occurs along streams and in damp valleys and ravines.

Seasons.—Three broods. Our records indicate that this species first appears shortly after the end of the third week in April and flies until about the second week in May. The second brood appears about the middle of June and flies into early July. The third brood, in which the individuals are more numerous than in the two preceding, appears early in August, becomes common after the middle of the month, and remains on the wing until early October.

EUPTYCHIA AREOLATUS (J. E. Smith)

Two subspecies occur in Virginia.

EUPTYCHIA AREOLATUS AREOLATUS (J. E. Smith)

Plate 3, *b, d*

Diagnostic features.—Dark mouse gray, lighter below; eye spots on under side of hind wings elongated, usually at least twice as long as broad, often much longer.

Range.—Known only from two localities on the western border of the Dismal Swamp and from Holland, all in Nansemond County. We found it common about 8 miles south of Suffolk, and our friend Otto Buchholtz took it at another locality on the edge of the Dismal Swamp, and also at Holland.

Variation.—At the locality about 8 miles south of Suffolk *areolatus* occurred with *septentrionalis*. Most of the individuals were intergrades between the two, but some were typical *areolatus* agreeing with specimens from South Carolina and Georgia, while others were equally typical *septentrionalis* agreeing with specimens from New Jersey.

Occurrence.—Found in grassy open areas in pine woods and along the grassy borders of pine woods, especially along roads and railway tracks.

Seasons.—Two broods. Mr. Buchholtz found it on May 15, and we took it on May 30. Mr. Buchholtz also took it on August 8 and 20.

EUPTYCHIA AREOLATUS SEPTENTRIONALIS Davis

Plate 3, a, c

Diagnostic features.—Dark warm brown; eye spots on under side of hind wings short and broad, from scarcely longer than broad to about twice as long as broad.

Range.—Southeastern Virginia from Lunenburg, Nottoway, and Dinwiddie Counties eastward to Nansemond County. Our records are from Dinwiddie, Greensville, Lunenburg, Nansemond, Nottoway, and Southampton Counties.

Variation.—Specimens from Virginia are usually slightly larger than others from Lakehurst, N. J., with the eye spots on the under side of the hind wings usually slightly longer, but many Virginia specimens agree perfectly with others from New Jersey. As already noted, in the locality about 8 miles south of Suffolk this intergrades with the typical southern subspecies.

Occurrence.—This subspecies occurs in the same situations as *E. a. areolatus*.

Seasons.—Two broods. We have found it in the last half of April and on May 30; Mr. Buchholtz took it on May 9. It also flies from August 8 (Buchholtz) into September.

EUPTYCHIA SOSYBIUS (Fabricius)

Plate 3, i

Range.—Southeastern Virginia westward and northward to Mecklenburg, Prince Edward, Henrico, Caroline, King William, New Kent, Gloucester, and Mathews Counties; also southwestern Virginia eastward and northeastward to Buchanan, Russell, Montgomery, and Roanoke Counties. We have records from Buchanan, Caroline, Gloucester, Greensville, Henrico, Isle of Wight, King William, Lee, Mathews, Mecklenburg, Montgomery, Nansemond, New Kent, Norfolk, Nottoway, Prince Edward, Prince George, Princess Anne, Roanoke, Russell, Scott, Southampton, Surry, and Sussex Counties.

Occurrence.—On the Coastal Plain this species is found everywhere in pine and mixed woods, least commonly in the very wet areas preferred by *E. gemma*. It is common to abundant in all suitable localities from Princess Anne to Prince George and Greensville Counties, becoming more local and less numerous farther north and west. In the southwestern mountains it lives in wooded river bottoms and in the lower portions of damp valleys; here it is local and not very common.

Seasons.—Three broods. This species appears shortly after the end of the third week in April and becomes numerous in the last half of May, the numbers falling off in the first half of June. The second brood appears at about the end of the third week in June, reaches its maximum in the last half of July, and falls off in numbers in the first half of August. The third brood, of which in most localities the individuals are most numerous, appears in the last half of August and flies until the first week in October. Dr. Carroll M. Williams writes us that he has found this species around Richmond only in spring. Later in the season it disappears and is replaced by *E. cymela*, which then becomes common. Farther east on the Coastal Plain *E. sosybius* is the dominant species throughout the summer.

EUPTYCHIA CYMELA (Cramer)

Plate 3, e, f

Range.—Throughout the State.

Variation.—Specimens from the Coastal Plain east of the Dismal Swamp usually have larger eye spots than those from farther west.

Occurrence.—Found everywhere in open deciduous woods; generally distributed and usually fairly common locally, and in some years common generally.

Season.—One brood. This species usually first appears, in very

small numbers, about the middle of May, very rarely as early as the last week in April, and in the last week in May suddenly becomes common. Increasing in numbers through June, it reaches a maximum late in June and in the first half of July on the Coastal Plain, in the last half of July in the mountains. It usually disappears in the first half of August, though stray individuals are sometimes found as late as the end of the third week in August.

Family APATURIDAE

Subfamily APATURINAE

Genus ASTEROCAMPA Röber

ASTEROCAMPA CELTIS (Boisduval and LeConte)

Plate 4, c

Range.—Northern and western parts of the State southward to Essex, Henrico, Nelson, and Amherst Counties, and in the mountains southwestward to the southern border. Our records are from Amherst, Arlington, Augusta, Botetourt, Essex, Fairfax, Fauquier, Frederick, Henrico, Loudoun, Madison, Nelson, Page, Roanoke, Rockbridge, Shenandoah, Warren, Washington, Westmoreland, and Wise Counties.

Occurrence.—Found in woodland glades, about the edges of woods, and in groves including hackberry trees; very local and irregular in its appearance, but usually common when and where it occurs; more generally distributed and more numerous in dry than in wet summers.

Seasons.—Two broods. The hackberry butterfly first appears in the last week in May, becomes common in the last half of June, and flies until about the middle of July. It reappears in the last half of July and flies until the end of the season in September or early October. It is most numerous in the last half of the summer.

ASTEROCAMPA CLYTON (Boisduval and LeConte)

Plate 4, a, b

Range.—Northern and western part of the State southward to Northampton, Lancaster, and Henrico Counties, and in the mountains southwestward to the southern border. Our records are from Botetourt, Giles, Henrico, Lancaster, Montgomery, Northampton, Page, Shenandoah, Warren, and Wythe Counties.

Occurrence.—Found along woodland roads and streams, in glades in the woods, and along tree-lined roadsides, always in the vicinity of hackberry trees; very locally distributed and erratic in its occurrence,

but usually rather common when and where it is found. This species is frequently associated with the more generally distributed and more numerous *A. celtis*, though by preference rather more of a woodland species.

Seasons.—Two broods. This species appears to have the same seasons as *A. celtis*, but it is not in evidence until about the middle of June. The second brood is on the wing toward the end of July and flies until about the middle of September.

Family NYMPHALIDAE

Subfamily NYMPHALINAE

Genus POLYGONIA Hübner

POLYGONIA INTERROGATIONIS (Fabricius)

Plate 16, f

Range.—Throughout the State.

Occurrence.—Found in open deciduous woods, in brushy regions, about willows in damp meadows and along roadsides, and sometimes in damp open fields; generally distributed, everywhere frequent and locally common.

Seasons.—Three broods. This species, popularly called the question mark, emerges from hibernation in the last half of March and flies through May and early June. In the latter part of May, sometimes as early as the end of the third week, a fresh brood appears, and the insect is on the wing continuously until the end of the season in October or November. In July a second brood appears, and toward the end of August a third brood, the individuals of which live through the winter.

Note.—The dark summer form (*umbrosa*) occasionally hibernates, and the light winter form (*fabricii*) is sometimes found in summer.

POLYGONIA COMMA (Harris)

Plate 5, e, f

Range.—Throughout the State. We have records from Albemarle, Alleghany, Amelia, Arlington, Augusta, Bedford, Clarke, Fairfax, Fauquier, Giles, Grayson, Hanover, Henrico, Madison, Montgomery, Nansemond, New Kent, Northampton, Page, Prince Edward, Prince George, Prince William, Princess Anne, Pulaski, Roanoke, Shenandoah, Smyth, and Warren Counties.

Occurrence.—Found in open deciduous woods, especially in glades and along the roads; local and usually not very common; most gener-

ally distributed and most numerous in the mountains, especially at the higher altitudes, becoming very local on the outer Coastal Plain.

Seasons.—Three broods. The comma, sometimes called the hop merchant, appears in the first warm days of spring, in the lower areas usually in the last half of March, in the mountains usually in April. Indeed, it is occasionally noticed on warm days throughout the winter flying along sheltered woodland roads. These early individuals, which have overwintered, fly until about the middle of May, sometimes until the end of the month. In the last week in May the first brood appears, flying through June and until about the middle of July. After the third week in July individuals of the second brood appear. In late August, September, and October the third brood is on the wing, flying until the end of the season in October. It is possible that in the northern part of the mountain region the third brood is only partial. This species usually passes the winter in the adult stage. A perfectly fresh individual taken by John Boyd at Woodberry Forest on April 23, and others noticed by us in Augusta County on May 12, suggest that the winter may sometimes be passed in the pupa.

POLYGONIA PROGNE (Cramer)

Plate 5, *c, d*

Range.—Confined to the Transition Zone in the western part of the State, ranging eastward to Warren, Page, Madison, Bedford, and Grayson Counties, casually farther eastward. Our records are from Albemarle, Bath, Bedford, Bland, Giles, Grayson, Highland, Madison, Montgomery, Page, Rockbridge, Rockingham, Shenandoah, Smyth, Tazewell, Warren, and Washington Counties.

Occurrence.—Found in and near open deciduous woods, especially along woodland roads and in brushy areas; generally distributed throughout its range, frequent and locally often rather common.

Season.—Two broods. This species, the gray comma, appears early in May, rarely as early as the middle of April, and flies through May and into June. The first brood is on the wing by the end of the first week in July, and the butterfly becomes common in the last half of the month, flying until about the middle of August. The second brood appears toward the middle of August and flies until the end of the season in September, when the individuals go into hibernation.

POLYGONIA FAUNUS (W. H. Edwards)

The subspecies found in Virginia is—

POLYGONIA FAUNUS SMYTHI A. H. Clark

Frontispiece, figs. 3, 6; plate 5, *a, b*

Range.—Confined to the Canadian Zone in the higher mountains in the western part of the State in Highland, Augusta, Giles, Montgomery, Washington, Smyth, and Grayson Counties.

Occurrence.—Found chiefly in the spruce or "lashhorn" forests, especially in clearings, along forest roads, and along the borders of the forests; in some places occurring in deciduous woods that have replaced the original spruce forest; locally distributed, but common wherever it is found, least numerous in deciduous woods.

Season.—One brood. Smyth's anglewing first appears at about the end of the first week in July, becomes common in the last half of the month, and continues to emerge until at least the middle of August, the individuals going into hibernation at the end of the season. Our only spring record is Augusta County, May 12, 1947 (Dr. G. C. Pitts).

Genus NYMPHALIS Kluk

NYMPHALIS ANTIOPA (Linné)

Plate 2, *b*

Range.—Throughout the State. Our records are from Albemarle, Amelia, Augusta, Bedford, Buckingham, Chesterfield, Clarke, Culpeper, Fairfax, Fauquier, Frederick, Giles, Grayson, Hanover, Henrico, Highland, Isle of Wight, Madison, Mecklenburg, Montgomery, Nansemond, New Kent, Northampton, Page, Prince Edward, Prince William, Princess Anne, Roanoke, Rockingham, Shenandoah, Smyth, Warren, Washington, and Westmoreland Counties.

Occurrence.—Found in open deciduous woods and groves, and about willows, poplars, and elms in open country; generally distributed, more numerous in the higher Piedmont and in the mountains than elsewhere, though nowhere very common.

Seasons.—Two or three broods. The mourning cloak, the hardest of all the butterflies occurring in Virginia and the one active at the lowest temperatures, may be seen flying about in sheltered places in the woods at any time during the winter if there happens to be a succession of warm sunny days. It is always the first butterfly to appear in spring, flying in some numbers on the first warm days, usually in the first half, or shortly after the middle, of March and becoming common in April. In May the numbers decrease, but a new brood appears at the end of the month or early in June, and a second brood appears in August, flying into September. Fresh individuals appear

ing in late September and October presumably represent a partial third brood. We have no definite proof, but we believe that on the Coastal Plain there are three full or nearly full broods, in the mountains two broods and a partial third.

Genus *VANESSA* Fabricius
VANESSA ATALANTA (Linné)

Plate 8, *f*

Range.—Throughout the State.

Variation.—Throughout its wide range this butterfly is singularly uniform, without definite local races. In Virginia it varies between two extremes. At one extreme the individuals are dark golden-brown above with the orange band across the fore wings broad; the size is rather small, the fore wings being 27-30 mm. long. At the other extreme the individuals are larger, with the fore wings up to 35 mm. long, and black with the band across the fore wings more reddish and narrow, often interrupted, and commonly including a small white circular spot; the under side is very dark.

In Virginia most individuals are intermediate between these two extremes—very dark brown above with the band of the fore wings of moderate width. They agree with typical *atalanta* of Europe. In the spring many of the individuals tend to approach the small light extreme, and large dark individuals do not occur.

In the summer the individuals average somewhat larger and darker than in spring, and in boggy areas on the Piedmont and on the Coastal Plain there occur large and very dark individuals which are less active than those usually seen and which range northward locally along the coast to Long Island. Southward they become progressively more numerous and more generally distributed, and finally predominate. In Virginia this is a "wet" form, confined to boggy areas, although farther south it represents the species almost or quite to the exclusion of the other forms.

Occurrence.—Found in open fields, especially boggy fields with buttonbush, and in open deciduous woods; generally distributed and usually rather common, occasionally locally or generally abundant. It is sometimes noticed in numbers in patches of pine woods along the seacoast, where it seeks shelter from the wind.

Seasons.—Three broods. The red admiral first appears at the end of March or early in April, both worn and fresh individuals flying together. The first fresh individuals to appear are small males which are followed in about a week by larger and darker males and females.

The first brood reaches its maximum in the last half of May and almost or quite disappears in the first week in June. About the middle of June individuals of the second brood appear, these reaching a maximum in the last half of July, after which the numbers fall off. After about the middle of August the third brood is on the wing, reaching a maximum in the first half of September and flying into October or even as late as the last week of November.

The red admiral hibernates both as an adult and in the pupal stage. It would appear that in the coastal regions hibernation is mainly in the pupa, in the colder and drier regions chiefly in the adult stage.

VANESSA CARDUI (Linné)

Plate 4, *d, e*

Range.—Throughout the State.

Occurrence.—Found in open country everywhere, and when abundant also in open woods; very erratic in occurrence, usually infrequent to frequent, occasionally everywhere abundant, and in some years apparently entirely absent; more regularly present and more numerous on the Coastal Plain and in the southern half of the western mountains than elsewhere.

Seasons.—Three broods. Our records are insufficient to enable us to make any definite statement regarding the broods of this species in Virginia further than to say that these appear to agree with the broods of the two related species *Vanessa atalanta* and *V. virginiensis*. No individual of the overwintering brood has ever been found in Virginia, although we have found a few on the District of Columbia side of the Potomac. The painted lady therefore is almost or quite killed out each winter, the summer individuals being the young either of a few that have overwintered in protected situations and escaped observation or of wandering females that have entered the State from outside. The second brood appears at the very end of May and slowly increases in numbers, reaching a maximum in the last half of July. In the last half of August brilliant fresh individuals indicate the appearance of the third brood, which is on the wing until the end of the season, usually in early, sometimes in late, October.

VANESSA VIRGINIENSIS (Drury)

Plates 4, *f, g*; 30, *j, k* (aberration)

Range.—Throughout the State.

Occurrence.—Found in open country everywhere, generally common, most numerous on the Coastal Plain. This species, in contrast

to *Vanessa atalanta* and *V. cardui*, varies but little in numbers from year to year.

Seasons.—Three broods. This species, the American painted lady, appears on the Coastal Plain toward the end of March or early in April, in the interior somewhat later, both worn and fresh individuals flying together. About the first of June, later in the higher country, the first individuals of the second brood are on the wing and the butterfly increases in numbers, reaching a maximum in the last half of July and the first half of August. About the middle of August while the individuals of the second brood are still numerous the first individuals of the third brood appear, and the insect flies until the end of the season, usually early in October. Fresh individuals sometimes noted in November and even as late as the middle of December are probably premature emergences of the next spring brood.

This species hibernates both as an adult and in the pupa, near the coast chiefly in the pupa, elsewhere largely or mainly as an adult.

Genus *JUNONIA* Hübner

JUNONIA EVARETE (Cramer)

The subspecies occurring in Virginia is—

JUNONIA EVARETE COENIA (Hübner)

Plates 4, *h, i, j*; 5, *g, h*

Range.—Throughout the State.

Variation.—In Virginia this butterfly has two seasonal forms, a spring-and-autumn form and a summer form, and in addition a very distinctive form confined to localized wet areas.

In the spring-and-autumn form (pl. 4, *h*), which may also be found in dry areas during the summer, the fore wings measure about 27 mm. long in the females and about 24 mm. in the males. The ground color above is brown. On the under side the ground color of the hind wings and of the apex of the fore wings is light gray, usually slightly tinged with buff, and there are two conspicuous oval black spots narrowly ringed with buff about as broad as, or narrower than, an interspace, not far from the outer border of the hind wings. In this form the wings are dry and brittle, and nearly all the individuals captured are nicked or more extensively damaged.

The summer form (pl. 4, *i, j*) is very similar but averages slightly larger and somewhat darker. It is characterized especially by having on the under side of the hind wings a more or less developed irregular pinkish or reddish band with indefinite edges crossing the wings from

the outer third of the anterior border to near the anal angle, passing just in front of the two black spots. This is by far the commonest and most widely spread form in summer.

In the form confined to localized wet areas (pl. 5, *g, h*) the fore wings are about 30 mm. long in the females and about 28 mm. long in the males. On the upper surface the ground color is dark and the brown of the fore wings and of the outer half of the hind wings sometimes shows dark green metallic reflections. On the under side the apical portion of the fore wings and the whole of the hind wings are dull pinkish red, often quite uniform, but usually darkest in a long irregular narrow triangle bordered by irregular crenulate lines running from a base near the outer angle of the hind wings to an apex near the anal angle. This triangle often includes two small oval blue spots narrowly ringed with lighter, or some trace of such spots. Occasionally the under side of the hind wings is uniform bronze instead of red. This form has curiously soft wings and always feels as if it had recently emerged from the pupa. Though the wings may be rubbed, they are rarely broken or torn. With this form there are always to be found more or fewer of the usual summer form that drift into its restricted areas from the surrounding country, and in some places all intergrades between this and the summer form may be found.

Occurrence.—Found in open country, especially in dry and more or less barren areas and along roadsides, but also in wet fields, when abundant penetrating into open woods, especially on the Coastal Plain.

Seasons.—Three broods. The buckeye appears at the end of May and is on the wing continuously in increasing numbers until the end of the season, toward the middle of November or later. The second brood appears after the middle of July when many individuals of the first brood are still on the wing and flies until at least the end of August. The third brood appears late in August and flies until the end of the season. The butterflies of this brood may be seen on warm days throughout the first half of the winter, but they have never been found in spring in Virginia.

Our records indicate that this butterfly is merely a summer visitor to Virginia, dying out completely in the winter, for we have no record of any overwintered individual. Our earliest records are all for the last days of May and represent the earlier individuals of the first brood. These records are all from the outer Coastal Plain—Princess Anne, Norfolk, Nansemond, and Accomack Counties. During June the butterfly becomes distributed all over the Coastal Plain and the adjacent Piedmont, and also in the Shenandoah Valley as far north-east as Warren and Fauquier Counties. By mid-July it has spread

over the entire State, and in August it is found everywhere, most abundantly on the Coastal Plain, though it is common or even abundant on the Piedmont, and frequent even in the higher mountain valleys. It varies more or less in abundance from year to year, occasionally being scarce on the Coastal Plain and almost completely absent elsewhere.

Although we know of no instance of this butterfly's surviving the winter in Virginia, we have seen ragged overwintered individuals in March, April, and early May in Washington, D. C.

Subfamily MELITAEINAE

Genus EUPHYDRYAS Scudder

EUPHYDRYAS PHAËTON (Drury)

Plates 3, *l*; 30, *e* (aberration)

Range.—From Fairfax County westward and in the mountains southwestward to the southern border of the State. Our records are from Alleghany, Amherst, Arlington, Bedford, Botetourt, Giles, Madison, Montgomery, Page, Roanoke, and Rockbridge Counties.

Occurrence.—Found, always in association with balmony, or turtlehead (*Chelone glabra*), in bogs in or near woods and in wet meadows with bushes or trees, more rarely in damp ravines near mountain streams; very local, but often abundant in the restricted areas in which it occurs.

Season.—One brood. The balmony, or turtlehead, butterfly is on the wing from early in June until about the end of the third week in July; at Mountain Lake, Giles County, where for most species the seasons are later than elsewhere in the State, it has even been taken in August. For a large colony that formerly inhabited a meadow at Cabin John, Md., just across the Potomac River from Fairfax County, the dates were from May 30 to July 11, and presumably the individuals of the colony that formerly was found at the southern end of the Highway Bridge, on the site of the old Washington Airport, had the same flight period. At Forks of Cacapon in Hampshire County, W. Va., a short distance west of the Frederick County line, we have taken this species as early as May 29.

Genus MELITAEA Fabricius

MELITAEA NYCTEIS (Doubleday and Hewitson)

Plate 9, *f*, *g*

Range.—Found in the mountainous western portion of the State, ranging eastward to Warren, Fauquier, Page, Madison, Augusta,

Rockbridge, Bedford, Prince Edward, and Lunenburg Counties. Our records are from Alleghany, Amherst, Augusta, Bedford, Buchanan, Fairfax, Fauquier, Giles, Highland, Lunenburg, Madison, Montgomery, Page, Prince Edward, Pulaski, Roanoke, Rockingham, Russell, Scott, Shenandoah, Smyth, Warren, Washington, Wise, and Wythe Counties. We have not found it in Frederick County, though it is common in Hampshire County, W. Va., a few miles farther west. It has recently been taken in some numbers by T. B. Blivens at Cabin John, Md., just across the Potomac River from Fairfax County, and by Dr. Laurence I. Hewes in Fairfax County.

Occurrence.—Found in open woods with brushy undergrowth in hilly or mountainous country, especially along the brushy borders of roads through woods and in brushy clearings; generally distributed and rather common in the southwest, elsewhere local and not numerous.

Seasons.—Two broods. This species first appears early in May and flies until about the middle of June. It reappears in the last week in June, becomes most numerous in the last half of July and the first half of August, and flies until the first week in September. The early records, which were kindly given us by Dr. Warren H. Wagner, Jr., and others, are from Hampshire County, W. Va., not far from the Frederick County line, where this species is common, and from Cabin John, Md.

MELITAEA ISMERIA Boisduval and LeConte

Frontispiece, fig. 9

This species was recorded from Virginia by Boisduval and LeConte in 1833 and by Strecker in 1878, possibly quoting Boisduval and LeConte. It was again recorded from Virginia by Hall in 1930 (Bull. Hill Mus., vol. 2, Supplement, p. 34), but this may refer to West Virginia.

Genus **PHYCIODES** Hübner

PHYCIODES THAROS (Drury)

Plate 11, *j, k, l, m*

Range.—Throughout the State.

Occurrence.—Found everywhere in open country, in scrubby land, and in the more open woods—in fact, everywhere but in the thickest woods; common throughout, though most numerous in weedy fields with asters and along weedy roadsides. This species and *Everes comyntas* are the most generally distributed and the most numerous butterflies in Virginia.

Seasons.—Three broods. The pearl crescent usually first appears shortly after the middle of April (rarely early in April or even late in March), becoming common by the end of the month and flying continuously until the end of the season, usually the first or second week in October, though sometimes as late as almost the middle of November. It is least common in the first half of June, in the interval between the first two broods, but from the middle of June onward it is abundant and fresh individuals are always obtainable, though they become relatively scarce in the first half of August. The second brood appears shortly before the middle of June (along the coast as early as the end of the first week). The third brood appears in the latter half of August, when worn individuals of the second brood still are numerous, and flies until the end of the season.

PHYCIODES BATESII (Reakirt)

Plate II, *f, g, h, i*

Range.—Definitely known only from Bedford, Frederick, and Giles Counties. In Bedford County a pair was taken by Dr. Carroll E. Wood, Jr., in Sunset Field, Apple Orchard Mountain, on June 1, 1938; these are now in the United States National Museum. In Giles County one was taken on Beanfield Mountain, Pembroke Road, July 1, 1940, and another at Mountain Lake on the same day, both by Lloyd G. Carr. Bates's pearl crescent was described in 1865 from specimens from Winchester, Va., and Gloucester, N. J. Samuel H. Scudder recorded it from Virginia without definite locality in 1872.

Occurrence.—Found along the borders of woods, in glades in woods, and on bushy hillsides. It is probably more common than these few records would indicate, as its close resemblance to *P. tharos* would cause it to be overlooked. But throughout its range it is very local and seldom common where it occurs.

Season.—One brood. The dates are June 1 and July 1. Dr. W. T. M. Forbes has pointed out that in any given locality this species flies between the first two broods of *P. tharos*.

Family ARGYNNIDAE

Subfamily LIMENITINAE

Genus LIMENITIS Fabricius

LIMENITIS ARTHEMIS (Drury)

The subspecies found in Virginia is—

LIMENITIS ARTHEMIS ASTYANAX (Fabricius)

Plates 2, a; 6, c, g, h

Range.—Throughout the State.

Variation.—*Limenitis arthemis* is divisible into three subspecies, which when typically developed are quite distinctive. The northern subspecies, *rubrofasciata* Barnes and McDunnough, most nearly approaches the Old World species and probably should be regarded as the parent stock in America. The other two subspecies are *astyanax* Fabricius in the Southeast and *arizonensis* W. H. Edwards in the Southwest. Over a broad area extending from Nova Scotia southward through New England and New York to Pennsylvania and westward to Minnesota *rubrofasciata* passes over into the southeastern *astyanax* through a great number of intermediate forms, of which nearly 20 may be recognized and others also occur. Many of these forms have received names. Whether these forms represent simply transitional types between the stable *rubrofasciata* and the equally stable *astyanax*, or whether they are hybrids, is debatable. A few of these forms reappear in areas so far south that there can be no question of hybridization. White-banded individuals of *astyanax* in southwestern Virginia (pls. 2, a; 6, g), for instance, are undoubtedly of local origin. They cannot be directly related to white-banded individuals living farther north from which they are separated by a broad area in which no white-banded individuals occur.

A parallel case occurring in Australia has been studied in detail by Dr. G. A. Waterhouse. The satyrid *Tisiphone abeona* Donovan is divisible into seven subspecies or local races. One of these, *T. a. joanna* Butler, apparently confined to the watershed of the Hastings River, is so variable that no two specimens are alike. Some specimens from Port Macquarie are somewhat similar to the subspecies *morrissi* Waterhouse; others are similar to the quite different subspecies *aurelia* Waterhouse. Twenty-two varieties of *joanna* are figured by Waterhouse. He found great variation in butterflies raised from eggs all laid by the same female, the variation being equally great in both sexes.

Twenty miles north of Port Macquarie the subspecies *morrissi* occurs, and about 25 miles south the subspecies *aurelia*. The subspecies *joanna*, therefore, is parallel to the intermediate forms of *Limenitis arthemis* connecting *rubrofasciata* on the north with *astyanax* on the south, though the latter cover a much greater extent of territory.

Dr. Waterhouse has successfully paired the subspecies *abeona* with

the subspecies *morrisei* and *rawnsleyi* Miskin and carried the progeny through two and three generations. This would suggest that *joanna* is a natural hybrid between *morrisei* and *aurelia*, and by inference that the intergrades between *Limenitis arthemis rubrofasciata* and *L. a. astyanax* may be also fertile hybrids between these two forms.

It is most unfortunate that Drury's type specimen of *arthemis* was a specimen almost exactly halfway between *rubrofasciata* and *astyanax*. The name *arthemis* cannot logically be used for any of the subspecies; though applicable to the species as a whole it is based upon a single individual in the midst of a long series of unstable intergrades. Exact duplicates of Drury's type specimen are rare, though approximate duplicates are not uncommon, flying with various other types of intergrades.

A large female agreeing closely with others from the Adirondacks of New York and with Drury's figure of *arthemis* was taken at Charlottesville, Albemarle County, by Frank W. Trainer on October 5, 1941. It is very worn and appears to have come from a considerable distance, possibly from West Virginia or the mountains of Pennsylvania. Thanks to the generosity of Mr. Trainer this specimen is now in the United States National Museum.

A fresh and perfect female referable to the form *albofasciata* Newcomb (pl. 2, a) was taken by Col. Wirt Robinson, U. S. Army, in Nelson County on July 23, 1919. In the extent of the white band and the blue on the hind wings it agrees minutely with specimens from Sharon and Deerfield, Mass., from Long Island, the type locality of *albofasciata*, and with Newcomb's figure. It is, however, brighter and more metallic than northern specimens, and the under side is darker. Except for the broad white bands it agrees with specimens of *astyanax* from the same region. This appears to be simply an individual from the local *astyanax* stock in which, for some reason, the broad white bands have reappeared.

A small male from Nelson County (pl. 6, g), also taken by Colonel Robinson, is essentially a small example of *astyanax* with a narrow white band on the fore wings. It is intermediate between the forms *albofasciata* and *proserpina* W. H. Edwards. Both this and the preceding specimen are now in the United States National Museum.

Occasional individuals from Mountain Lake, Giles County, show more or less strongly developed indications of a white band on the under side of the fore wings, much more rarely on the upper side. Except for this they agree completely with specimens of *astyanax* from the same region. These resemble *proserpina*, but are probably of local origin, unconnected with *proserpina* from farther north.

Similar individuals occur rarely in Augusta County, and probably elsewhere in the mountains.

Occurrence.—Found in open deciduous woods, especially along the roads, about groves of trees in open country, in orchards, and occasionally about willows in boggy fields; generally distributed, usually infrequent to frequent, locally rather common. It is rather more numerous and more generally distributed in the western mountains than on the Piedmont or on the Coastal Plain.

Seasons.—Three broods. In Virginia the black admiral first appears in May, usually about the second week, rarely as early as the sixth, and slowly increases to a maximum at the end of May and the first week in June. The numbers then decrease and the insect becomes rare toward the end of June. Early in July it reappears, reaching a maximum in the last half of the month and the first half of August. In the last half of August it again becomes scarce, but it reappears again at the end of the month and reaches a third maximum in the first week in September. After the middle of September the numbers decrease, but it is sometimes found until nearly the middle of October.

LIMENITIS ARCHIPPUS (Cramer)

Two intergrading subspecies of the viceroy occur in Virginia.

LIMENITIS ARCHIPPUS ARCHIPPUS (Cramer)

Plate 6, *f*

Diagnostic features.—Color above light, pale dull orange, sometimes darker and more brownish on the fore wings; under side of wings with no trace of bands in the cell.

Range.—Throughout the State; but in the region east of the Dismal Swamp interdigitating and intergrading with *L. a. floridensis*, which finally becomes dominant near the coast south of Virginia Beach.

Variation.—This subspecies is fairly uniform throughout its wide range, and most of the specimens from Virginia agree perfectly with others from farther north (New York) or west (Illinois). In the northern and western portions of the State very pale females are sometimes found that resemble the lightest from the Middle West (pl. 6, *f*), though in the same areas occasional males will be nearly as dark as examples of *floridensis*. On the outer Piedmont and on the Coastal Plain the average color becomes darker, and dark males are more frequent. In the Dismal Swamp region the butterfly is more or less intermediate between *archippus* and *floridensis*. Here, so far as we have seen, there are no very light individuals such as occur in the

north and west, but individuals darker than the average, sometimes much darker, are frequent. Normally colored individuals resembling the average of those from New York or the Middle West occur eastward to the coast, though only as local colonies or individuals in a population composed chiefly of the dark *floridensis*.

It is possible that the draining of the eastern part of the Dismal Swamp and the Green Sea by the digging of the Dismal Swamp canal, and the draining of the northern portion east of Suffolk, has resulted in the intrusion of *archippus* into territory normally inhabited by *floridensis*, for under the original conditions in this area there was a broad belt of territory of a nature unsuited to either subspecies.

Occurrence.—Found about willows, especially along streams and the borders of ponds in low open country and in the broader and more open valleys, occasionally on hillsides about poplars and along roadsides; rather local, though usually frequent to common where it occurs. This is more of a lowland and open-country butterfly than *L. arthemis astyanax* and is usually more numerous in the areas in which it is found.

Seasons.—Three broods. The viceroy first appears about the middle of May and is on the wing continuously until the end of the season, the first or second week in October. As a result of the varied growth stages in which the caterpillars spend the winter the emergence period of the first brood is unusually long and the broods are broadly overlapping, so that the fluctuations in numbers during the season are relatively slight. The butterfly is most abundant between the middle of July and the middle of August. Fresh individuals representing the second brood appear early in July when worn individuals of the first brood are still numerous. Late in August the third brood puts in its appearance, flying until the end of the season.

LIMENITIS ARCHIPPUS FLORIDENSIS Strecker

Plate 6, *d, e*

Diagnostic features.—Color above darker, orange-brown to chestnut or dark mahogany, usually darker on the fore wings; under side of wings usually with the cell bands characteristic of *L. arthemis astyanax* faintly indicated in pale blue.

Variation.—The dark individuals forming the great majority of those occurring east of the Dismal Swamp appear to be inseparable from the subspecies *floridensis*, though in the region just east of the Dismal Swamp there are some colonies composed of individuals of average coloration. On the other hand, many are darker than some

specimens from Florida, and Dr. Warren H. Wagner, Jr., took a specimen at Wallaceton on July 5, 1941, that was almost as dark as *L. a. eros*. Just west and north of the Dismal Swamp very dark individuals, especially males, are rather frequent, and they occur, with rapidly diminishing frequency, westward throughout the State, though rarely in the western and northern portion.

In the revised edition of "The Butterfly Book" (1931), Dr. W. J. Holland figures (pl. 73, figs. 1, 2) the type specimen of W. H. Edwards's *eros* under the name *floridensis*. In *floridensis* the hind wings above are usually slightly lighter than the fore wings; the under surface of the hind wings is usually considerably lighter than in *eros*, and there are no white spots along the inner side of the black band. The subspecies *floridensis* more nearly resembles his figure of *L. a. archippus* (pl. 7, fig. 4), but it is darker, especially on the fore wings. In southern Florida there is complete intergradation between *floridensis* and *eros*, just as in Virginia there is complete intergradation between *floridensis* and *archippus*. Strecker followed his original description of *floridensis* with a description of what he called "ab. b. male Nig." This form, considered as an aberration by Strecker, was later described as *eros* by W. H. Edwards.

Occurrence.—Found about willows in the marshes and along the roadsides; rather local, but usually common where it occurs, especially in the sedge marshes near the coast. This form is more generally distributed and, near the sea, usually more common than *L. a. archippus* farther west.

Seasons.—Three broods. Our records are too few to give a very definite picture of the broods, but there is no evidence that these differ from the broods of *L. a. archippus*.

Subfamily ARGYNNINAE

Genus SPEYERIA Scudder

SPEYERIA IDALIA (Drury)

Plate 7, i, j

Range.—Throughout northern and western Virginia south and east to Fairfax, Prince William, Stafford, Spotsylvania, Orange, Albemarle, Nelson, Rockbridge, Alleghany, Roanoke, Floyd, and Patrick Counties. We have records from Albemarle, Alleghany, Augusta, Buchanan, Fairfax, Fauquier, Frederick, Grayson, Greene, Highland, Loudoun, Madison, Montgomery, Nelson, Orange, Patrick, Prince William, Pulaski, Rappahannock, Roanoke, Russell, Shenandoah, Smyth, Spotsylvania, Stafford, Tazewell, Warren, Washington, and Wythe Counties.

Variation.—In the northern Piedmont region the regal fritillary reaches a large size, the males having the fore wings 39-42 mm. long, the fore wings of the females being 46-50 mm. In the higher mountain regions the size is appreciably less, especially in the females. Mountain males have the fore wings 37-41 mm. long, the fore wings in mountain females being 42-46 mm. The males taken at high altitudes are less richly colored than the larger lowland males, and in both sexes the black markings on the fore wings tend to be slightly heavier, and the dark color near the inner border of the hind wings below more extensive.

Occurrence.—Found in pastures with boggy or marshy areas, in damp open grasslands, in extensive grassy bogs, and at high altitudes in dry pastures; generally distributed in the northern part of the State as far south as Spotsylvania, Orange, and Albemarle Counties, farther south found only in the mountains and more localized; usually frequent to common in the areas in which it occurs.

Season.—One brood. The males of this species appear about the middle of June, rarely as early as the end of May, and are followed about 2 weeks later by the females. The males continue to emerge until about the middle of July, and the females until after the middle of August. Both sexes fly until the end of the season in September, but after about the first of August the males are all worn and shabby, and their numbers decrease rapidly. By the end of August males have become rare, though females still are common.

SPEYERIA DIANA (Cramer)

Plate 7, *a, b, c, d*

Range.—From Chesterfield to James City County and southeastward to the Dismal Swamp; from Highland County southwestward in the mountains, eastward to Rockbridge, Bedford, Roanoke, Montgomery, Floyd, and Patrick Counties. Our records are from Alleghany, Bath, Bedford, Bland, Botetourt, Buchanan, Charles City, Chesterfield, Dickenson, Floyd, Giles, Grayson, Highland, Isle of Wight, James City, Montgomery, Nansemond, Northampton, Patrick, Prince George, Pulaski, Roanoke, Rockbridge, Smyth, Surry, Tazewell, Washington, Wise, and Wythe Counties.

The present range of this fritillary, covering only the outer Coastal Plain and the mountains, is quite abnormal; furthermore, it is decidedly rare except in a very few widely scattered localities. We have only a single record for no less than 14 counties. These facts suggest that it has been largely extirpated from a much more extensive for-

mer range by the clearing of the land and that its disappearance from most of the State is only a matter of time. The records for Northampton and Chesterfield Counties are old; it has not been seen in either county for at least 20 years.

Variation.—The males have the fore wings usually between 43 and 47 mm. in length. The largest males we have seen were from southern Illinois, with the fore wings 52 mm. long. The first males to appear are smaller than those that emerge later, and the males from Highland County and from the higher altitudes in the mountains farther south are always small, resembling the earliest males from other regions.

On the Coastal Plain the males occasionally have on the under side of the hind wings at the end of the cell a conspicuous silver spot bordered inwardly and outwardly by black lines, corresponding to the silver spot in the same position in *S. cybele* though smaller, seldom reaching more than halfway across the cell, and the silver markings on the outer portion of the hind wings may be enlarged. Occasionally on the upper surface of the fore wings there are broad light dashes in the black ground color beyond the cell in the interspaces between veins 3 and 4, 4 and 5, 5 and 6, corresponding to the light dashes on the under side though with indefinite borders. So far as we have seen, these features are confined to males from the Virginia Coastal Plain. The majority of the males from the Coastal Plain, however, do not differ in any way from others from the mountains.

In perfectly fresh males, at least in those from the Coastal Plain, the black on the fore wings is overlaid with a beautiful blue reflection recalling that in certain species of *Euploea*, though not so intense. This soon disappears.

Dr. Henry Skinner has pointed out that the males differ materially in the number and size of the black spots on the upper surface of the hind wings. We have seen males, both from the Coastal Plain and the mountains, with the light border of the hind wings almost immaculate. There is some variation in the size of the black spots on the fore wings, and veins 2, 3, and 4 may be narrowly or rather broadly infuscated. The contrast between the dark basal and light outer portions of the under surface of the hind wings is sometimes accentuated. These variations seem to bear no relation to locality.

The females have the fore wings 50 to 55 mm. long. Dr. Skinner said that females from eastern Tennessee, western North Carolina, and southern Illinois are larger than those found in Virginia; but the females from the lower altitudes in southwestern Virginia appear to be quite as large as any from farther south. Dr. Skinner pointed out

that the females vary a great deal in the degree of silver beneath and also in the band of large bluish or greenish spots on the hind wings above. In some specimens these spots are large, and in others they are confined to a small area around the black spots. The number and size of the cream-colored or white spots on the upper surface of the fore wings is also quite variable.

A female from Spring Grove, Surry County, captured on September 4, 1940, has the fore wings with blue and the hind wings with blue-green reflections. The band on the hind wings is blue, broader and more continuous than in any others we have seen from elsewhere, crossed by very narrow dark lines, and separated from the submarginal dashes, which have white centers, by a relatively narrow black line. Another female taken at the same time and place is similar, but the hind wings have blue reflections like the fore wings, and the band is blue-green.

Prof. Ellison A. Smyth, Jr., writes that he is inclined to believe that perfect freshly emerged females always have the under side of the hind wings and of the apex of the fore wings dark blue-black and that as the insect ages this speedily assumes a rusty-brown color, even before the upper surface shows any wear or dimness. All the fresh specimens in his collection, as well as his recollection and notes of other captures, indicate the correctness of this conclusion. Some slightly worn females show in direct light the brown color, but held at a slight angle, and particularly in artificial light, the blue-black can still be seen. He has one female, nearly fresh, in which the outer third of the under side of the hind wings, which usually retains the blue-black, is also rusty brown with blue-black angular dashes running to the outer margin. He has specimens that are green on the upper surface instead of blue, and also specimens showing various shades of blue. The blue area on the upper surface of the hind wings varies from an almost complete band to isolated blue angular dashes. Professor Smyth's specimens were from Montgomery County.

Occurrence.—Found on the Coastal Plain and outer edge of the Piedmont in and near old pine woods with running streams or extensive cold seepages. In the mountains it occurs chiefly at moderate or high, though not the highest, altitudes in deep, damp, well-wooded valleys or ravines, or on damp, wooded mountain sides, always more or less near cold streams, and always where the undergrowth, especially rhododendrons or alders, is thick. It is very local, and as a rule rare to infrequent where found. In a number of localities we have found it but once, although we have visited them several or many times. We have searched carefully for it in many likely-looking

localities in the southwestern counties without finding any trace of it.

We have found this species most numerous in Surry County, from Surry to Cabin Point, especially about Spring Grove. We first noticed it in this region on June 15, 1938, when we captured four males along the main highway (Route 10) in about 20 minutes and saw others. On July 5 we found two males and a female in the same place, and Mrs. Barnes, who lives nearby, told us that sometimes there would be as many as 25 at one time about her butterflybush. Dr. Warren H. Wagner, Jr., who visited this locality on June 25, 1940, reported seeing about 12 males and a female in a couple of hours. Otto Buchholtz and J. W. Obenderfer, Jr., have also taken specimens here. It is fairly common in Poverty Hollow, Montgomery County, where Professor Smyth obtained his specimens, in certain valleys near Hot Springs, Bath County, and near Mountain Lake, Giles County.

Season.—One brood. The males of this species first appear shortly before the middle of June (June 10) and soon become common. The females appear in the third week in June (June 25) and increase slowly in numbers until August, when they are at their height, though all the males are more or less worn. Both sexes fly until early September, the males becoming very scarce toward the end of the season.

SPEYERIA CYBELE (Fabricius)

Plates 2, *c*; 7, *g*, *h*

Range.—Throughout the State.

Variation.—The ground color of the females may be more or less dark yellowish or buffy. The inner portion of the wings is often heavily infuscated. The black markings, particularly those of the fore wings, may be enlarged and confluent, especially on the under side. Quite commonly the second and third black bars across the cell of the fore wings are merged into a large black spot, and the spot in the expanded portion of the outer black bar is solid black. The spots of ground color enclosed by the marginal chevrons on the fore wings may be whitened from the apex downward, this whitening usually affecting only the uppermost three or four spots, rarely more. The color of the under side of the hind wings varies from a uniform rather light yellow-brown to uniform cinnamon, chocolate, or purplish brown, the last two being very rare. It is usually yellow-brown more or less extensively washed with cinnamon or light chocolate.

In males from the lowlands of Virginia the fore wings are usually 38-40 mm. long, those of the females 47-50 mm. long, though smaller individuals occur. In the mountains the size is somewhat less.

Occurrence.—Found in open woods, especially in rolling, hilly, or mountainous country, and in open fields and bogs more or less near woods; generally distributed and in most places frequent to common; infrequent on the outer Coastal Plain and on the Eastern Shore (Accomack and Northampton Counties).

Season.—One brood. The males of the cybele first appear about the middle of May and soon become common. The females appear about the first of June and slowly increase in numbers. After about the middle of August all the males are worn and ragged, but fresh females continue to appear throughout August and even in early September when the males have become very scarce. We do not understand Dr. W. J. Holland's statement that this species "seems to be single-brooded in the north and double-brooded in Virginia, the Carolinas, and regions westward in the same latitude." Although fresh females appear throughout the summer, we know of no records of fresh males after about the first of August.

SPEYERIA APHRODITE (Fabricius)

Plate 8, *a, b*

Range.—Confined to the Transition Zone in the western mountains, occurring eastward to Frederick, Warren, Rappahannock, Madison, Rockingham, Albemarle, Nelson, Rockbridge, Bedford, Floyd, and Patrick Counties; occasional at Cabin John, Md., across the Potomac River from Fairfax County. We have records from Albemarle, Alleghany, Amherst, Augusta, Bath, Bedford, Bland, Buchanan, Carroll, Dickenson, Fauquier, Floyd, Frederick, Giles, Grayson, Highland, Lee, Madison, Montgomery, Nelson, Page, Patrick, Pulaski, Rappahannock, Roanoke, Rockbridge, Rockingham, Russell, Scott, Shenandoah, Smyth, Tazewell, Warren, Washington, Wise, and Wythe Counties.

Variation.—In specimens from Virginia and the Carolinas the light spots in the outer half of the anterior portion of the under side of the fore wings are duller and more brownish than in those from farther north, and the pink flush at the base is usually less pronounced, these southern individuals showing an approach to the form *alcestis*.

In Virginia this species reaches a large size, the fore wings in the males being about 37 mm. long and in the females 38-44 mm. The earliest individuals and those of the high mountain "balds" or open grassy areas are somewhat smaller than those appearing in summer in more favorable localities.

The earliest individuals to appear early in summer are bright and clear, and in both sexes the ground color of the under side of the hind wings is uniform light yellowish brown. Very soon females are noted in which the under side of the hind wings is more or less extensively and heavily shaded or blotched with deeper cinnamon-brown in the interspaces between the silver spots. Later these females are supplemented by others in which the ground color of the under side of the hind wings is uniform deep cinnamon-brown, this color usually more or less completely obliterating the submarginal yellow band, which is always prominent in the lighter females. In summer and autumn all three types of females, with all possible intergrades, occur, those of the intermediate type being the most numerous and those of the dark type common. The female forms of this species are parallel to those of *S. cybele*, but the extreme dark form, very rare in *cybele*, is common.

Like *S. cybele* this fritillary is subject to frequent and occasionally extensive aberrations. The black spots on both surfaces may become enlarged, elongating within the interspaces, and more or less extensively coalesced, while the ground color is heavily obscured with dark scales above and below. We have seen more or less extreme females of this type from Syria, from Long Mountain on Route 60, and from White Sulphur Springs, W. Va. In the males this infuscation takes a somewhat different form, the individuals becoming above velvety brownish black with a more or less heavily infuscated fulvous margin about 5 mm. wide which on the fore wings is crossed by long, broad triangles at the veins and on the hind wings includes a partially double row of black bars in the interspaces, and just within these, more or less fused with the dark interior portion of the wings, a row of black spots. On the under side the wings are almost entirely blackish, the hind wings showing the usual silver spots only on the inner third (ab. *bakeri*). We have not seen this aberration from Virginia, but we have seen four somewhat diverse examples from Waynesburg, Ohio.

Among the minor variations the following five are more or less frequently noted. The submarginal spots on the fore wings may be greatly enlarged. The area between the second and third bars across the cell of the fore wings may be entirely black, a variation more common in *S. cybele* and also occurring in *Euptoieta claudia*. In the females the broad dark band between veins 2 and 3 of the fore wings may be continued inward to the cell, forming a conspicuous black trapezoid. In the males the black dashes forming the irregular post-median line on the fore wings may all be extended outward to a

straight line parallel to the outer border of the wings (*ab. hughii*). In the males also the submarginal chevrons may be extended inward, becoming completely coalesced with the row of submarginal spots, with which they form an elongated spot with a deeply concave outer end.

Occurrence.—Found in bogs, glades, open woods, and fields, especially boggy fields, in mountainous country, and also in high mountain pastures; generally distributed and common to abundant wherever found, especially at the higher altitudes.

Season.—One brood. The males are on the wing in small numbers early in June, occasionally at the end of May, the females appearing toward the end of June, both sexes becoming common early in July. Both sexes remain on the wing until early in October, though after the end of August the proportion of the now worn and ragged males rapidly diminishes. Fresh females, however, may be found until the end of the season.

SPEYERIA ATLANTIS (W. H. Edwards)

Plate 8, *c, d*

Range.—Known only from Highland County. On June 19, 1948, when in company with Mr. and Mrs. William D. Field, we found this species frequent in a meadow on the crest of Middle Mountain near the mission school and obtained several specimens. Flying with it were *Boloria toddi ammiralis* and *B. selene myrina*.

Several years ago our friend the late John Boyd told us that he had seen an individual in Bath County but failed to catch it.

Occurrence.—Found in high mountain bogs and damp pastures.

Genus **BOLORIA** Moore

BOLORIA TODDI (Holland)

The subspecies occurring in Virginia is—

BOLORIA TODDI AMMIRALIS (Hemming)

Plate 9, *d, e*

Range.—Confined to the Transition Zone in the western part of the State, occurring eastward to the higher altitudes in Page, Madison, Rockingham, Augusta, Nelson, Bath, Montgomery, Floyd, and Patrick Counties. Our records are from Augusta, Bath, Carroll, Floyd, Giles, Grayson, Highland, Madison, Montgomery, Nelson, Page, Patrick, Pulaski, Rappahannock, Roanoke, Rockingham, Smyth, Tazewell, Washington, and Wythe Counties.

Variation.—Individuals of the first brood are often rather small and light-colored with a washed-out appearance below and with the dark markings above restricted and more or less disconnected. Summer individuals as a rule are very uniform. Occasional specimens have the dark markings above reduced in size and disconnected, while in others they are enlarged and confluent; but these aberrations are as a rule rare. In certain localities, however, as in a wet pasture near Independence, Grayson County, many, or even most, individuals in summer have the dark markings above enlarged and confluent, in extreme cases the inner half of the wings being almost wholly black.

Occurrence.—Found in high, dry mountain pastures, in wet or boggy pastures at somewhat lower altitudes, and in mountain bogs; locally distributed, though common where it occurs.

Seasons.—Three broods. This fritillary first appears in the last half of May, flying nearly through June. It reappears shortly after the first of July, and the third brood is on the wing in the last half of August, broadly overlapping the second brood and flying until early September.

BOLORIA SELENE (Schifferrmüller)

One subspecies is known definitely from Virginia, and another occurs in Maryland just across the Potomac River and should be found in suitable localities on the Virginia side.

BOLORIA SELENE MYRINA (Cramer)

Plate 9, *a*

Diagnostic features.—Small, the fore wings 22-23 mm. long; color above dull yellowish orange, the black markings narrow and delicate.

Range.—Known only from Highland, Bath, Nelson, and Giles Counties.

Variation.—Specimens from Virginia do not differ appreciably from others from farther north, although the average size is slightly larger, the fore wings being 22-23 mm. long, and the color averages slightly more reddish than in individuals from Massachusetts. Occasional summer individuals have the dark markings above enlarged and confluent, like corresponding individuals from the north.

Occurrence.—Found in wet pastures or in extensive grassy mountain bogs; very local, but frequent to common wherever it occurs; most generally distributed in Highland County and the northwestern part of Giles County. Wherever this subspecies occurs *B. toddi ammiralis* is also found, but the latter is much more generally distributed

and lives under more diverse conditions. But *B. toddi ammiralis* does not occur with the following subspecies.

Seasons.—Three broods. This little fritillary first appears in the first week in May (records from Hampshire County, W. Va.) and flies until the middle of June. The second brood is on the wing after the middle of July and flies until the second half of August. Presumably there is in Virginia, as elsewhere, a third brood in the last half of August and September, although we have no records for that period.

BOLORIA SELENE MARILANDICA (A. H. Clark)

Frontispiece, figs. 1, 2; plate 9, *b, c*

Diagnostic features.—Larger than *B. s. myrina*, the fore wings about 25 mm. long; color above more reddish with the black markings broad and heavy and more or less confluent.

Range.—?Northampton County. An old record from Northampton County (Bayford) may refer to this subspecies.

This butterfly was formerly rather common in a bog at Beltsville, Md., near the railway station, but it has not been found there since 1929. In 1941 it was rediscovered by Dr. Warren H. Wagner, Jr., in a bog near Largo, Md., but has now disappeared from that locality also. No locality where it occurs is known at present.

Occurrence.—Found in open, wet, grassy bogs.

Season.—One brood. In contrast to the 3-brooded *B. s. myrina*, this subspecies flies only from the very end of June until near the end of July.

Genus EUPTOIETA Doubleday

EUPTOIETA CLAUDIA (Cramer)

Plate 6, *a, b*

Range.—Throughout the State.

Variation.—The earliest individuals appearing in spring in Virginia are always very small with the fore wings 22-25 mm. long, and are easily mistaken for a species of *Boloria*. Later individuals have the fore wings 28-35 mm. long, the females being larger than the males.

There is more or less variation in the intensity and clearness of the dark markings, especially in the females. In some of these the ground color of the inner half of the wings is more or less heavily infuscated and the dark markings broadened and blurred. Rarely the light spot near the costal margin in the basal third of the fore wings may be

black, or the three light spots in the three lowest interspaces just beyond the irregular median line on the fore wings may be black.

Occurrence.—Found chiefly in dry open fields and along roads through fields; in late summer usually generally common and locally abundant on the outer Coastal Plain, frequent to common on the Piedmont, and infrequent on the higher mountain pastures. This butterfly varies considerably in abundance in different years. It was especially numerous in 1935 and 1936, but we did not meet with it at all in 1939, our only record for that year being a single individual noted by Dr. Carl W. Gottschalk at Salem, Roanoke County, on September 7.

Our records indicate that this butterfly in Virginia overwinters locally in small numbers, at least in certain years, for we have records of the dwarf spring form in April and May from Henrico, Albemarle, and Warren Counties, and from Hampshire County, W. Va. For June we have records only from Princess Anne, Accomack, Henrico, Fauquier, Albemarle, and Roanoke Counties, most of them from the Coastal Plain. By the end of July the butterfly has become generally distributed, and by the end of the season it is usually one of the common butterflies in most parts of the State, and is abundant on the Coastal Plain wherever the common passionflower or maypop (*Passiflora incarnata*) thrives in the corn and cotton fields and along the roadsides. Our spring records are to be regarded merely as showing the very spotty nature of the occurrence of this species in spring, not as giving a true picture of the localities in which it may be expected to occur, as these localities vary more or less from year to year.

Seasons.—Three broods. The variegated fritillary appears on the Coastal Plain early in April, or even toward the end of March, somewhat later inland, and flies into June. Toward the end of June fresh individuals of the second brood begin to appear, and the insect becomes more and more common as the second brood develops. About the middle of August the first individuals of the third brood appear, and the butterfly soon extends to every section of the State. At the end of September and in October fresh individuals may represent a partial fourth brood. This species is on the wing until some time in October or even November, occasionally into early December.

Subfamily HELICONIINÆ

Genus AGRAULIS Boisduval and LeConte

AGRAULIS VANILLÆ (Linné)

The subspecies occurring in Virginia is—

AGRAULIS VANILLAE NIGRIOR MichenerPlate 7, *e, f*

Range.—Known to us only from Princess Anne and Norfolk Counties on the outer Coastal Plain.

Occurrence.—Found in open country generally, especially in waste land and along roadsides where maypops (*Passiflora incarnata*) are abundant; an irregular summer visitor from farther south, usually rare or wholly absent, occasionally locally frequent. The senior author found it rather common about Norfolk in 1929, and Dr. George W. Rawson tells us that he has seen it common there.

Season.—Our only records are Norfolk, August 3, 1929, and Princess Anne County, August 19, 1936 (Warren H. Wagner, Jr.).

Family DANAIIDAE

Subfamily DANAINAE

Genus DANAUS Kluk

DANAUS PLEXIPPUS (Linné)

Two subspecies occur in Virginia.

DANAUS PLEXIPPUS PLEXIPPUS (Linné)Plate 10, *a*

Diagnostic features.—Preapical spots on fore wings light dull orange; apical portion of fore wings, beyond the preapical spots, more or less extensively dull orange; two complete rows of small white spots in the black border of the hind wings.

Range.—Throughout the State.

Variation.—We have noticed no appreciable variation in this butterfly in Virginia. An individual with the ground color mouse gray instead of dull orange (ab. *fumosus*) was captured at Farmville in October 1941 by Miss Marie Bricker, who very kindly presented it to the United States National Museum.

Occurrence.—Generally distributed in open country, preferring damp or wet pastures with an abundance of flowers, unkept and weedy fields, particularly along streams and about ponds, and weedy roadsides; it is also quite at home in the extensive cattail marshes along the southeastern coast and occasional in the more open pine woods of the Coastal Plain, though avoiding thick woods and woods with undergrowth. This butterfly is most abundant in the higher areas in the north and west, especially in the mountains, less common on the Piedmont, and least numerous on the Coastal Plain, though

usually common in the great marshes along the southeastern coast. Its numbers show considerable fluctuation from year to year.

Migratory flights in Virginia.—While driving from Washington to Alexandria along the main boulevard on September 22, 1934, we saw between 200 and 300 monarchs in the adjoining fields or crossing the road, flying singly or more rarely in twos or threes, occasionally in larger groups, from 6 to 15 or 20 feet above the ground. All were flying directly west. The light wind, as determined from weather vanes in Alexandria, was east or slightly north of east. Continuing from Alexandria to Accotink, the same phenomenon was noticed; between 200 and 300 were seen, all flying west. On September 25, 1934, on the road from Accotink to Alexandria, between 5 and 5:30 o'clock in the afternoon, a few butterflies were noticed, flying west as before.

Dr. Carroll M. Williams writes us that in the autumn of 1936 he noticed a southerly movement of this species at Richmond. "The steady, yet completely scattered, migration in a general southerly direction was quite apparent. No hint of mass migration was visible, however."

At Bear Trap Farm near Mount Solon, Augusta County, in September 1944, we noticed that all the individuals seen were flying southwest, parallel to Narrowback Mountain. They were usually 4 to 6 feet above ground, but one was at a height of about 50 feet. Only once were two in sight at the same time, a male and a female feeding on the same group of flowers a few inches apart. This was evidently a scattered migration like that described by Dr. Williams.

Dr. Williams quotes from a letter from Mrs. Walton, of Clifton Forge, Alleghany County, as follows: "During the first of October 1935, a great mass of monarch butterflies passed through the valley coming from the northeast and following the valley river (the James) and railroad. They were about 30 yards in width and 6 feet in depth. They were flying just high enough to miss the house tops and so on down until you could touch them. They were flying at a moderate speed, and some of them would pause a second to rest; and when night came they would all rest just where darkness caught them. They were so thick in places that they seemed like a cloud passing. Some of them would dart in and out between the houses. In their flight they followed the mountain valley."

This unusual flight was the subject of much discussion locally at the time.

Dr. Frank Morton Jones, of Wilmington, Del., writes us that at Virginia Beach, Princess Anne County, from April 18 to 30, 1906, throughout most days from one to three or four of these butterflies

were usually in sight flying toward the north or northeast, some obviously seeking the larval food plant. There were many dead ones along the shore, washed up by the waves.

This note is particularly interesting and significant in view of the fact that later in the season, in summer and autumn, this is not a common insect about Virginia Beach. It also suggests an explanation of the occurrence of the tropical form (*megalippe*) in southeastern Virginia. Individuals of this form, which so far as is known is normally nonmigratory, may join the flocks of *plexippus* in the far south where both occur and be, so to speak, swept north with it.

On April 28, 1931, Prof. and Mrs. Torsten Gislén of Lund, Sweden, reported a single individual flying westward along the Virginia shore of the Potomac River rather high in the air, and on May 9, 1931, when on the Maryland side of Great Falls, in company with Miss Dorothea M. A. Bate of the British Museum and Drs. Doris M. Cochran and Herbert Friedmann of the United States National Museum, the senior author saw one flying slowly up the river before the wind about 20 feet above the cliffs, just as it flies in the same region in autumn.

Seasons.—Four to six broods. The monarch first appears shortly after the middle of April, on the Piedmont and in the west late in April or early in May, the dull and worn individuals seen at this time having come from hibernation. So far as is known, all the individuals on the wing at this time are females. Toward the end of May fresh individuals of both sexes appear, and the butterfly is continually on the wing in increasing numbers until toward the end of October. There are four to six broods during the summer, but fresh individuals are to be found at all times as each female deposits her eggs over an unusually long period. In the last half of the summer if the season be dry fresh individuals will be seen in numbers after a heavy rain, a phenomenon from which this butterfly's popular name "storm fritillary" is derived. This species does not survive the winter in Virginia, coming in each year from the south.

DANAUS PLEXIPPUS MEGALIPPE (Hübner)

Plate 10, b

Diagnostic features.—Preapical spots on fore wings white; apical portion of fore wings, beyond the preapical spots, heavily infuscated; small white spots in the black border of the hind wings obsolete or wholly absent in the central portion.

In the revised edition of Dr. W. J. Holland's "The Butterfly Book" (1931), the figure of *Danais plexippus* (pl. 7, fig. 1) is not *plexippus*

but *megalippe*. The specimen from which this figure was made came from South America, probably from Surinam.

Range.—Our records are from Essex, Norfolk, Princess Anne, Shenandoah, and Surry Counties, and Alexandria.

Occurrence.—An uncommon casual visitor to Virginia from tropical America, found chiefly on the outer Coastal Plain.

Seasons.—Our dates are June 15, July 4, 5, 6, 23, and September 2.

Note.—In addition to those taken in Virginia, we have examined specimens of this form from St. Tammany Parish, La., near New Orleans (Percy Viosca, Jr.), Key West (Lucien Harris, Jr.), the northern end of Currituck Sound, N. C. (captured by us), and Long Island, N. Y.; also, one from Decatur, Ill. Except for the one from Decatur, Ill., and the one from Shenandoah County, Va., all these specimens are from the vicinity of seaports (Norfolk, New Orleans, Key West, and New York) at which steamers are constantly arriving from tropical American ports. We are inclined to believe that these individuals were brought to this country on these steamers and that, though a rather frequent visitor, this form is not properly an element of our fauna.

This form, as well as typical *D. p. plexippus*, has been captured in England. Of *Danaus plexippus* 157 individuals have been reported as seen in England, of which 62 were captured. Dr. E. B. Ford writes that of these only 22 have been determined as to subspecies, and 1 of these, caught in Cornwall in 1885, is said to be of the Central American type. On August 30, 1941, he was so fortunate as to capture a fine example at Kynance Cove, Cornwall, of which he published a colored figure. His figure also appears to represent the Central American form and is most closely matched by one from Costa Rica in the National Museum collection.

It has been suggested that our Virginia specimens are in reality aberrations of *D. p. plexippus*; but if that were the case they should be found in the west, where the species is much commoner than it is on the Coastal Plain, and not almost exclusively in the general vicinity of Norfolk.

Family LIBYTHEIDAE

Genus LIBYTHEANA Michener

LIBYTHEANA BACHMANII (Kirtland)

Plate 23, *i*

Range.—Throughout the State. Our records are from Accomack, Albemarle, Amelia, Arlington, Augusta, Botetourt, Culpeper, Fair-

fax, Fauquier, Frederick, Giles, Goochland, Henrico, Isle of Wight, Lee, Madison, Montgomery, Nansemond, Northampton, Page, Prince Edward, Prince William, Princess Anne, Rappahannock, Roanoke, Rockbridge, Rockingham, Shenandoah, Surry, Sussex, Warren, and Westmoreland Counties.

Occurrence.—Found in open fields near woods, in brushy fields, along tree-lined roadsides, and about hackberry trees; very local and very erratic in its occurrence, though usually frequent to abundant when and where found.

Seasons.—Three or possibly four broods. The beaked butterfly first appears, coming out of hibernation, in the first half of April and flies into early May. The first brood is on the wing in the last half of June, the second in the last half of July and especially in early August, and the third in late August and September. It is probable that some of the September butterflies represent a fourth brood. According to W. H. Edwards the period from the laying of the eggs to the emergence of the butterfly is from 15 to 17 days.

Family RIODINIDAE

Genus *CALEPHELIS* Grote and Robinson

CALEPHELIS VIRGINIENSIS (Guérin)

Plate 12, *j*

Range.—Known only from Virginia Beach and Lake Tecomseh in Princess Anne County, and from Brinkley and the western border of the Dismal Swamp in Nansemond County.

Occurrence.—Found along the grassy and weedy borders of pine woods; very local, but common where it occurs. It has a curious way of making itself conspicuous by resting in the center of the mass of white flowers of the common yarrow or milfoil (*Achillea millefolium*), with the wings extended horizontally.

Seasons.—Three broods. The first brood flies late in April and in May, the second in July, and the third from early in September to early in October.

CALEPHELIS BOREALIS (Grote and Robinson)

Plate 12, *i*

Range.—Known only from Hot Springs in Bath County, Gala and Tinker Mountain in Botetourt County, Blacksburg, Palmers Hill, and Poverty Hollow in Montgomery County, and Fort Lewis Mountain in Roanoke County.

Occurrence.—Found in open woods, about the borders of woods, and in clearings in damp valleys in limestone regions; very local, but common where it occurs.

We have never been so fortunate as to meet with this butterfly, the northern metalmark, ourselves. Regarding its occurrence in Montgomery County Herman J. Erb wrote us: "It was the early part of July. I went alone on top of Palmer's Hill, about 2,500 feet above sea level, and found a gully running toward the Roanoke River. There is a small brook in the center of the gully almost dry in the summer. . . . Farther down I came to a little open spot in the woods and saw a few small butterflies. They were easy to catch, but new to me. I showed them to Professor Smyth, and he told me they were *C. borealis*. He told me that he was 12 years in Blacksburg, and all he ever got was one. Since then I got my *C. borealis* from the same locality every time I went to Virginia. They are on the wing from about the 25th of June until the latter part of July. Three years ago last summer (i.e., in 1933) . . . I discovered a new locality for *C. borealis*. I crossed Brush Mountain about 10 miles west of Blacksburg and over 3,000 feet above sea level, and went up Poverty Hollow. It was tough going, but I was amply paid. I struck a paradise all along the path. In the little open spots I took about forty *C. borealis*. All together I took about 100 *C. borealis* in 1933."

Although we have never found this species in Frederick County, Dr. Warren H. Wagner, Jr., found it common in nearby West Virginia, at Ice Mountain in Hampshire County and at Caudy Castle in Morgan County.

Season.—One brood. This species is on the wing from the middle of June to the first week in August. It is most numerous during the first 3 weeks of July.

Family LYCAENIDAE

Subfamily SPALGINAE

Genus FENISECA Grote

FENISECA TARQUINIUS (Fabricius)

Plate 15, *c, k*

Range.—Northern and western portions of the State eastward to Fairfax, Henrico, Prince Edward, and Halifax Counties. Our records are from Albemarle, Amherst, Augusta, Fairfax, Giles, Grayson, Halifax, Henrico, Montgomery, Prince Edward, Roanoke, Rockbridge, and Smyth Counties. It is probably more generally distributed than these records would indicate.

Variation.—Although this species varies between unusually wide extremes, the fore wings being in normal individuals 11–20 mm. long, our series from Virginia is very uniform in size, the fore wings being usually 15–17 mm. long, and also in color. We have found that bred individuals of this species are so very variable as to give quite a false idea of this butterfly as it exists in nature in the same region.

Seasons.—One to eight broods, usually four or five. The alder butterfly appears shortly after, or sometimes before, the middle of April and is on the wing continually until early October. The caterpillar develops very rapidly, molting only three times, but the pupal stage is of very variable length, usually from 8 to 11 days, though sometimes as long as 11 months in pupae from the same lot. The butterflies seen at the end of the season are probably for the most part of the fourth or fifth brood, but a few may represent only a second brood and others a sixth, seventh, or even eighth brood.

Subfamily LYCAENINAE

Genus LYCAENA Fabricius

LYCAENA PHLAEAS (Linné)

The subspecies occurring in Virginia is—

LYCAENA PHLAEAS AMERICANA (Harris)

Plate 15, *l, m, n*

Range.—Throughout the State.

Variation.—Early-spring individuals are lighter and less reddish on the upper surface of the fore wings than individuals of the summer brood, and the spots of the outer row, together with the inner cell spot, are smaller, sometimes much smaller. The dark border is also narrower. On the under side the hind wings are darker and the submarginal scarlet line is often more or less obscured. The hind wings are rounded, or with a broadly obtuse angle at the end of vein 2; in the summer form the angle at the end of vein 2 is more prominent and may even be produced into a short tooth.

This species is subject to considerable variation. Occasionally the red above and below is replaced by straw yellow (ab. *fulliolus*). A fine example of this aberration was taken by the senior author at Rocky Run, Fairfax County, on May 2, 1937.

Occurrence.—Found in dry fields and waste lands wherever the sheep sorrel (*Rumex acetosella*) grows; common in the northern portion of the State and southwestward on the higher elevations

in the mountains, and also among the sand dunes south of Virginia Beach; elsewhere local and seldom common.

Seasons.—Three broods. The little copper usually first appears shortly after the middle of April, rarely in the first half of the month, and flies through May and into early June. The second brood appears in the first half of June and flies until just after the middle of August. The third brood is on the wing in the last week in August and flies until the end of the season early in October.

Note.—The large copper, *Lycaena thoë* (pl. 15, *f, g, h*), has been taken in the District of Columbia and in adjacent Maryland and probably will be found in Virginia.

Genus GLAUCOPSYCHE Scudder

GLAUCOPSYCHE LYGDAMUS (Doubleday)

Plate 15, *a, b*

The subspecies represented in Virginia is—

GLAUCOPSYCHE LYGDAMUS NITTANYENSIS F. H. Chermock

Frontispiece, figs. 4, 5; plates 14, *g*; 15, *c*

Range.—Confined to the mountains in the western part of the State. Our records are from Augusta, Bath, Botetourt, Buchanan, Frederick, Highland, Montgomery, Page, Roanoke, Rockbridge, and Warren Counties. Our few records from Frederick County were possibly strays from Hampshire County, W. Va., where this butterfly is common. The records from Highland and Augusta Counties are from the west and east sides of Shenandoah Mountain, the boundary line between these two counties. Most of our records are from Roanoke and Montgomery Counties. This form is probably of local occurrence throughout the mountain area.

Occurrence.—Found in hilly or mountainous country in damp, wooded valleys and in rich woods always in association with the food plant, the Carolina vetch (*Vicia caroliniana*), rarely straying into open fields or visiting gardens; very local, but frequent to common wherever it occurs.

Season.—One brood. Our dates are from March 30 to May 19; it is most numerous in the last half of April.

Note.—In October 1948 (Proc. Ent. Soc. Washington, vol. 50, No. 7, pp. 176-178) the senior author described this subspecies under the name of *Glaucopsyche lygdamus boydi*, listing all the localities

known to him in Pennsylvania, West Virginia, Virginia, North Carolina, and Arkansas, with the dates of capture. The type locality was given as Ice Mountain, Hampshire County, W. Va. Cyril F. dos Passos called his attention to F. H. Chermock's *G. l. nittanyensis*, the description of which, from State College, Pa., had appeared a short time before. Dr. Ralph L. Chermock was so very kind as to send him a series of five specimens of *nittanyensis*, including two paratypes. These left no doubt that *boydi* is a synonym of *nittanyensis*. William D. Field agrees with this conclusion.

Genus **CYANIRIS** Dalman

CYANIRIS ARGIOLUS (Linné)

The subspecies occurring in Virginia is—

CYANIRIS ARGIOLUS PSEUDARGIOLUS (Boisduval and LeConte)

Plate 14, *a, b, c, d, e, f, h*

Range.—Throughout the State.

Variation.—The early-spring form of this species in Virginia is *pseudargiolus* (= *violacea*). This form is variable, especially in the mountains. The upper surface may be either clear blue or somewhat tinged with violet. The under surface varies from grayish white to brownish gray, and the markings vary from light to rather heavy. Occasionally individuals are taken (for instance in Frederick County, April 24, 1938) in which the marginal spots and accompanying chevrons are more or less completely fused into a broad brown marginal border. Such examples are properly referable to *marginata*.

We have taken the form *lucia* only in western Frederick County in Virginia, but we have a specimen from Cabin John, Md., just across the Potomac River from Fairfax County, taken on April 19, 1926. Strecker's record of *lucia* from Virginia may refer either to Virginia or to West Virginia.

The brown male (*nigra*) we have found only in western Frederick County, where it is not common. We took one brown female (*intermedia*) in Frederick County west of Cross Junction on the West Virginia line on April 24, 1938. Strecker described this form from Virginia, which may have referred to West Virginia.

Toward the end of the emergence period of the first brood, from about May 1 until nearly the middle of June according to the locality and year—usually in the last half of May—the form *neglecta* makes its appearance. In these early individuals of the form *neglecta* the males are somewhat paler than those occurring later in the summer and have a slight violet tinge; the hind wings are indistinctly marked,

with the light areas usually reduced and heavily dusted with blue scales. The females are dull and the light areas on both wings, which are not sharply defined, are rather heavily dusted with blue or light brownish scales. This form, in which the fore wings are usually 14–15 mm. long, resemble summer individuals from the vicinity of Boston, Mass. It appears to occur all over the State, but in the mountains from Page and Highland Counties southwestward it is largely replaced by a larger form (*neglecta-major*) with the fore wings 15–18 mm. long in which the colors, especially in the females, are clearer and better defined above, and the under surface is whitish with the spots and other markings greatly reduced. We have not seen this form except in the mountains.

In contrast to the individuals of the spring brood, those of the summer broods are everywhere similar and show little variation. They represent typical *neglecta*. The fore wings are 12–15 (usually about 14) mm. long. The males are clear blue, with the hind wings white crossed by blue veins and somewhat dusted with blue scales, and with a blue border; occasionally there is a large vague and ill-defined triangular patch of whitish heavily dusted with blue scales on the lower portion of the fore wings. The females are white with the fore wings metallic blue in the basal portion, with the costal and outer borders broadly brown and a brown streak at the end of cell; the hind wings have the anterior border and a row of small marginal spots brown.

In the autumn occasional individuals of the spring form *pseudargiolus* are to be found (Nansemond escarpment, September 2, 1935), in association with much more numerous examples of *neglecta*.

Dr. Carl W. Gottschalk has a specimen of the summer form *neglecta* in which the left side is female and the right side is male. It was captured at Salem, Roanoke County.

Occurrence.—Found in rich woods, especially along the roads and along their borders, in moist brushy fields, brushy bogs, and swamps; everywhere frequent, and in some localities, particularly in the mountains, common or even abundant, especially in spring.

Seasons.—One complete brood, followed by two incomplete broods. The common blue appears in the last half of March or early in April and soon becomes common, flying through May and into June. At about the middle of June, or somewhat earlier, a new brood appears which is on the wing until about the middle of August. Toward the end of August a third brood appears which flies until the end of the season, usually about the end of the first week in September.

This butterfly is most abundant in late April and May when large

numbers are frequently seen about dogwood, wild-cherry, and other flowering trees in favorable localities. At this season it is confined to woods and swamps, where it is rather local, except for stray individuals. The individuals of the second brood are more generally distributed than are those of the first, occurring in brushy fields as well as in the woods, but they are never so numerous in any one locality. The second brood is not complete, many of the pupae formed by caterpillars originating from eggs laid by females of the first brood lasting over until the following spring, especially in the drier areas. The third brood is composed of only a small number of individuals.

Genus **EVERES** Hübner

EVERES COMYNTAS (Godart)

Plate 14, *i, j*

Range.—Throughout the State.

Variation.—This butterfly varies considerably in size, the fore wings of apparently normal individuals ranging all the way from 5 to 14 mm. There are two fairly well-marked size groups, one with the fore wings less than 10 mm. long, the other with the fore wings 10–14 mm., long. The average length of the fore wings in both sexes is about 12.2 mm. Large individuals are most numerous in the mountains. Dwarfs of both sexes with the fore wings 5–6 mm. long are especially common in spring. The average size is greater in the mountains than in the lower areas, as in the case of the common blue (*Cyaniris argiolus pseudargiolus*). It is also greater farther north, in the vicinity of Boston, Mass., than it is in Virginia.

William D. Field has noted that in Kansas the females in the summer broods are brown or blackish brown above with two marginal black spots capped inwardly with orange in the lower portion of the hind wings between veins 2 and 3 and 3 and 4. The under side is grayish white, with a marginal series of dark points and a submarginal series of dark bars along the outer margin of the wings. The marginal points in the two interspaces beyond the tail are black with a suffused border of metallic green and silver, and with orange crescents on the inner side; sometimes there is a little orange above the marginal spot in the next interspace. There is a submarginal series of black spots crossing both wings, a bent bar at the end of the cell in both wings, and three black spots across the base of the hind wings, all these spots being ringed with white.

The males, according to Mr. Field, are similar to the females on the under surface but usually have only two orange crescents on

the hind wings. On the upper surface they are violet-blue with a dark-brown border usually about 1 mm. broad. There is a very faint series of dark points in the marginal border of the hind wings, that between veins 2 and 3 being larger and darker than the others and often bordered or capped interiorly with orange; sometimes the point in the interspace between veins 3 and 4 is also enlarged and bordered interiorly with orange. Mr. Field points out that on the under side the males usually differ slightly from the females by having a little less of the marginal orange on the hind wings, there being usually two of these orange spots in the males and three in the females.

According to Mr. Field the spring brood differs quite consistently from the summer broods in a number of features. The females are slightly darker above, often almost black, and are usually more or less extensively suffused with blue, this suffusion varying from a few blue scales at the base of the wings to an almost complete suffusion over both pairs of wings, except for the apex of the fore wings. Most commonly in Virginia the fore wings are heavily dusted with blue scales in a rounded triangle extending from the base to the outer end of the cell and thence to the lower angle, and the hind wings are thickly dusted with blue scales in their inner half. There is a complete series of black dots along the outer margin of the hind wings, those in the two interspaces beyond the tail being capped with small orange crescents, the others encircled with blue, and there is a submarginal series of brownish-black bars. On the under side the ground color is lighter than in the summer form with the maculation much less distinct, especially in regard to the marginal and submarginal markings. There are two instead of three orange crescents in the posterior region of the hind wings.

The males above are violet-blue with a very narrow brownish marginal border, which is much less than 1 mm. in width. On the hind wings the marginal black spots are more distinct than in the summer form, those in the two interspaces beyond the tail being capped with small but distinct orange crescents. On the under side they are paler than the males of the summer form, with less distinct markings.

In Virginia the spring and summer broods differ as described by Mr. Field for Kansas. Summer individuals at hand from New England (the vicinity of Boston) resemble most closely spring individuals from Virginia, though they are to a certain extent intermediate. The under side is slightly duller and less uniform than in summer individuals from Virginia, with the markings more distinct. The New England males are bluer than the Virginia summer males

with a narrower dark border, and the females show no blue dusting on the upper surface.

Occasional individuals from all parts of Virginia entirely lack the tails on the hind wings, there being merely a small sharp point at the end of vein 2, and rarely this point is so reduced as scarcely to be noticeable. Individuals without tails occur in both sexes, but appear to be more frequent in the females.

The black spots of the submarginal row on the under side of the hind wings are sometimes enlarged and produced inward in a long sharp point; rarely they reach the spots of the inner row, forming long black dashes in the interspaces.

Occurrence.—Common to abundant everywhere along weedy roadsides, in open fields, more especially the drier fields, and in open woods; the most uniformly distributed, locally as well as throughout the summer, and the most numerous butterfly in the State.

Seasons.—Four broods. The tailed blue appears about the first of April, somewhat earlier on the outer Coastal Plain and somewhat later in the mountains, soon becomes common, and is on the wing continuously until the end of the season in the first or second week in October. The first brood flies from early April until toward the end of May, the second begins to appear about the end of the third week in May, the third appears early in July, and the fourth flies from about the third week in August until the end of the season. It is possible that at the end of the season some of the fresh individuals may represent a fifth brood, at least on the outer Coastal Plain.

Subfamily THECLINAE

Genus ATLIDES Hübner

ATLIDES HALESUS (Cramer)

Frontispiece, fig. 10; plate 12, *c, d*

Range.—Regularly present only in the southeastern part of the State, in Princess Anne, Norfolk, and Nansemond Counties; casual or accidental in Montgomery County.

Occurrence.—Found wherever the mistletoe (*Phoradendron flavescens*) grows abundantly; regularly present, though not very common, in the Dismal Swamp and about its borders; more or less casual elsewhere. This butterfly as a rule keeps high in the trees about the mistletoe and is therefore easily overlooked. It is most frequently seen on white flowers in fields more or less near the swamp.

Seasons.—Three broods. The mistletoe hairstreak first appears at

the end of March or early in April; the second brood is on the wing in July; and the third brood flies from the latter part of August until the end of the season late in October.

Genus **EUPSYCHE** Scudder

EUPSYCHE M-ALBUM (Boisduval and LeConte)

Plate 12, *e, f*

Range.—Found in the southern part of the State north to Accomack, Fairfax, Madison, Albemarle, and Augusta Counties. Our records are from Accomack, Albemarle, Augusta, Botetourt, Fairfax, Floyd, Madison, Montgomery, Nansemond, Prince Edward, Prince George, and Roanoke Counties. Our Accomack County record is based upon one specimen we captured on Tangier Island.

Occurrence.—Found in moist fields near woods and along the edges of woods; apparently a permanent resident of the State as a whole, but of irregular occurrence in any one locality; usually local and uncommon, though from time to time locally frequent.

Seasons.—Three broods. The azure hairstreak appears in the latter half of April and flies until early June. The second brood is on the wing the last week in June and flies through July and into August. The third brood appears toward the end of August and flies until the end of the season early in October.

Genus **STRYMON** Hübner

STRYMON CECROPS (Fabricius)

Frontispiece, fig. 7; plate 12, *h*

Range.—Southern portion of the State north to northern Accomack, Westmoreland, Fairfax, Albemarle, Augusta, and Highland Counties. Before 1946 it was not known in the eastern part of the State north of Westmoreland and Caroline Counties. In 1946 it was taken just south of Alexandria, and in 1947 it was fairly common in northern Fairfax County and appeared in the District of Columbia.

Variation.—An interesting form of this butterfly in which the red on the under side is replaced by light yellow (ab. *gottschalki*) has been taken several times in Roanoke and Rockbridge Counties.

Occurrence.—Found chiefly in damp open woods with abundant undergrowth, and in the mountains along the borders of woods and in brushy pastures; rather local, but frequent to abundant wherever it occurs. This butterfly varies more or less in numbers locally from year to year, from time to time becoming very common in restricted areas.

Seasons.—Three broods. The red-banded hairstreak usually appears in the latter half of April, on the Coastal Plain sometimes as early as the first of the month, and flies through May into early June. The second brood is on the wing shortly after the middle of July, and the insect continues to fly until the end of the season. The third brood appears toward the end of August.

STRYMON TITUS (Fabricius)

Two subspecies are found in Virginia.

STRYMON TITUS TITUS (Fabricius)

Plate 13, *g*

Diagnostic features.—Black spots on under side of hind wings ringed with pale brownish, the rings being inconspicuous against the ground color.

Range.—Known only from Highland County—Strait Creek, July 25, 1939; Monterey, July 26, 1939; Buckeye, July 27, 1939.

Occurrence.—Found in open fields near woods and in extensive clearings in woods; rare.

Season.—One brood. The three specimens known from Virginia are all worn. The butterfly probably flies from early July to early August.

STRYMON TITUS MOPSUS (Hübner)

Plate 13, *h*

Diagnostic features.—Black spots on under side of hind wings conspicuously ringed with clear pure white.

Range.—Apparently confined to the Piedmont and the Shenandoah valley. Our records are from Arlington, Fairfax, Fauquier, Henrico, Montgomery, Prince Edward, and Warren Counties. In North Carolina it has been reported only from Raleigh and Tryon.

Occurrence.—Found along the brushy borders of woods and in open fields often at a considerable distance from woods or brush; very local, and in most places infrequent. Except at Farmville, where this butterfly appears to be fairly common, all the records represent only one or two individuals.

Season.—One brood. This butterfly is on the wing from about the middle of June to about the middle of July. It is most numerous in the last week in June and the first week in July.

STRYMON ONTARIO (W. H. Edwards)

The subspecies found in Virginia is—

STRYMON ONTARIO ONTARIO (W. H. Edwards)

Plate 13, *f*

Range.—Known only from Botetourt County, Gala, June 29, 1942 (Warren P. Stoutamire); Fairfax County, Difficult Run, June 29, 1920 (Ernest Shoemaker); and Nansemond County, Dismal Swamp, May 25, 1945 (Otto Buchholtz). We have examined the specimen captured by Mr. Stoutamire and one of the two taken by Ernest Shoemaker, which is in the American Museum of Natural History in New York.

Occurrence.—Apparently an infrequent casual.

Season.—One brood. Virginia records are May 25 and June 29. A specimen from White Oaks, Md., was taken by Dr. Warren H. Wagner, Jr., on June 17, 1942. In Ohio a specimen was taken in Washington Township, Jackson County, by Edward S. Thomas on June 11, 1933, and another was taken by Joe Enke at Columbus on June 18, 1933.

STRYMON EDWARDSII (Saunders)

Plate 13, *d*

Range.—Probably throughout the State. The records are: Richmond County, Warsaw, June 27, 1937; Prince Edward County, Farmville, June 15, 29, July 20, 1941 (Frank W. Trainer); Augusta County, Sherando, July 5, 1937; and Roanoke County, McAfee Knob, July 6, 1946 (Carroll E. Wood, Jr.). There is a single record for North Carolina, Tryon, in July.

Occurrence.—In and near open deciduous woods with oaks; rare.

Season.—One brood. The dates in Virginia run from the middle of June to the end of July.

STRYMON FALACER (Godart)

Plate 13, *c*

Range.—Probably throughout the State. Our records are from Augusta, Botetourt, Giles, Montgomery, Prince Edward, Rappahannock, Roanoke, Shenandoah, Smyth, Surry, and Warren Counties.

Occurrence.—Found in and near deciduous woods with oaks; not common. The senior author once found it in some numbers in Rappahannock County just east of Panorama.

Season.—One brood. Our dates in Virginia are from June 7 (Gala, Botetourt County) to August 3 (Hungry Mother, Smyth County).

STRYMON LIPAROPS (Boisduval and LeConte)Plate 13, *e*

Range.—Probably throughout the State. The records are: Montgomery County, Palmer Hill, June 15, 1896, and Blacksburg, June 24, 1902 (Ellison A. Smyth, Jr.); Roanoke County, Fort Lewis Mountain, July 3, 1937 (Carroll E. Wood, Jr.), July 15, 18, 1949 (Carl W. Gottschalk); Tazewell County, Burke's Garden, August 8, 1940; Prince Edward County, Farmville, June 30, 1940 (Frank W. Trainer); Nansemond County, Dismal Swamp, June 5, 1944, May 14, 1945 (Otto Buchholtz). There is a single record for North Carolina, at Southern Pines (John Boyd). All the specimens are the form *strigosa*.

Occurrence.—Found in and near open deciduous woods with oaks; rare.

Season.—One brood. The dates of capture in Virginia run from May 14 (Dismal Swamp) to August 8 (Burke's Garden).

STRYMON MELINUS (Hübner)

Two subspecies occur in Virginia.

STRYMON MELINUS MELINUS (Hübner)Plate 11, *n*

Diagnostic features.—Under side of wings pale gray; anterior orange spot on under side of hind wings large, extending anteriorly to vein 4 or 5 and inward so as to interrupt the postmedian line, and usually fused with the posterior spot.

Range.—Eastern Princess Anne County, south of Virginia Beach. There is no sharp line of demarcation between this subspecies and the following. Specimens from Princess Anne County south of Virginia Beach agree with average *S. m. melinus* from Florida. Farther north and west, in northern and western Princess Anne, Norfolk, Nansemond, Isle of Wight, and Surry Counties, the individuals are mostly intermediate between *melinus* and *humuli*, though many are more or less typical *humuli*.

Occurrence.—Found in weedy open fields with more or less abundant *Lespedeza*.

Seasons.—Apparently four broods, agreeing with those of the following subspecies.

STRYMON MELINUS HUMULI (Harris)

Plate 11, *a*

Diagnostic features.—Under side of wings darker; anterior orange spot on under side of hind wings smaller, scarcely or not at all extending beyond vein 3, not reaching the postmedian line, and usually separated from the posterior spot.

Range.—Throughout the State, except in eastern Princess Anne County south of Virginia Beach where it is replaced by the preceding subspecies, with which it intergrades.

Occurrence.—Found in open country, especially in weedy unkept fields and along roadsides with *Lespedeza*; generally distributed and everywhere uniformly frequent, though seldom very numerous; most common on the Coastal Plain, least common in the mountains. We have found it most numerous on Tangier Island, playing about the border of the groundsel (*Baccharis halimifolia*) scrub near the southern end of the island. On Tangier Island it is one of the commoner butterflies, occurring in the fields and salt marshes wherever there are flowers. This is the most widely distributed and the commonest hairstreak in Virginia.

Seasons.—Four broods. The gray hairstreak first appears early in April, or even late in March, later in the higher regions, and from then on is found in increasing numbers until the end of the season in late September or early October. There appear to be four broods, the first appearing late in March or early in April, the second at the end of May, the third shortly before the middle of July, and the fourth in the last half of August.

Genus *INCISALIA* Scudder*INCISALIA NIPHON* (Hübner)

The subspecies found in Virginia is—

INCISALIA NIPHON NIPHON (Hübner)Plate 13, *b*

Range.—Throughout the State. Our records are from Albemarle, Arlington, Fairfax, Frederick, Henrico, Prince Edward, Prince William, Princess Anne, Roanoke, and Westmoreland Counties.

Occurrence.—Found in and near open pine woods, patches of scrub pine, and deciduous woods with an abundance of pine; very local and not common; most numerous in Fairfax and western Frederick Counties.

Season.—One brood. This species appears in the second week in April and flies until the end of June. It is most numerous in the last half of April and the first half of May.

Note.—There is a possibility that the northern *Incisalia niphon clarki* T. N. Freeman (pl. 30, *h, i*) may occur in the Canadian Zone in the higher mountain regions. We have seen no specimens from these areas.

INCISALIA AUGUSTINUS (Westwood)

The subspecies found in Virginia is—

INCISALIA AUGUSTINUS CROESIOIDES Scudder

Plate 16, *c*

Range.—From Fairfax County westward to Frederick and Page Counties and southwestward in the mountains to Bedford and Montgomery Counties. Our records are from Albemarle, Augusta, Bedford, Botetourt, Clarke, Fairfax, Frederick, Madison, Montgomery, Page, Rappahannock, and Roanoke Counties.

Variation.—Females from Roanoke County frequently show a line of rusty or brick red across the end of the cell of the fore wings, the red sometimes being extended for a greater or less distance along the veins. A specimen from Roanoke County, April 15, 1938, another unusually large one with the fore wings 15 mm. long from Castleman's Ferry, Clarke County, April 20, 1941, and two from Rocky Run, Fairfax County, have the fringes entirely white.

Occurrence.—Found about blueberry, huckleberry, or laurel (*Kalmia latifolia*) bushes in open woods and along the borders of woods in hilly or mountainous country; locally distributed, but common to abundant wherever found.

Season.—One brood. This butterfly first appears in the third week in March, or as late as early April, and flies until the second week in May, or in the higher altitudes until about the last of the month. It is most numerous in the last half of April.

INCISALIA POLIOS Cook and Watson

Plate 13, *a*

Range.—The only Virginia specimen was taken at Orphanage Falls, at the foot of Fort Lewis Mountain, Roanoke County, on April 5, 1938, by Carroll E. Wood, Jr. It is a fresh specimen and quite typical, resembling others from New Jersey. Mr. Wood pre-

sented it to the United States National Museum where Frank Watson examined it and confirmed the identification.

Occurrence.—This individual was found in association with large numbers of *I. augustinus*.

Season.—One brood. In New Jersey, and presumably also in Virginia, this butterfly appears with *I. augustinus*, and from a week to 10 days earlier than either *I. henrici* or *I. irus*. In Virginia it probably flies from the latter part of March to early May.

INCISALIA IRUS (Godart)

Plate 16, *c*

Range.—From Fairfax County to Frederick County, and southwestward in the mountains to Roanoke County. Our records are from Arlington, Fairfax, Frederick, Madison, Page, Rappahannock, and Roanoke Counties.

Occurrence.—Found about the borders of woods and along roads through open woods; very local and not common.

Season.—One brood. This species first appears in the last week in March and flies until about the middle of May, and in the higher altitudes as late as the first week in June.

INCISALIA HENRICI (Grote and Robinson)

Plate 16, *d*

Range.—From Westmoreland and Fairfax to Frederick Counties and southwestward in the mountains to Montgomery and Giles Counties. Our records are from Albemarle, Clarke, Fairfax, Frederick, Giles, Montgomery, Orange, Roanoke, and Westmoreland Counties.

Occurrence.—Found in open woods, along the borders of woods, and in brushy areas, usually in association with the redbud (*Cercis canadensis*); very local, but often common where it occurs. Except for *I. augustinus* this is the commonest species of *Incisalia* in Virginia.

Season.—One brood. This species appears in the last week in March and flies until the second week in May; it is most numerous in the last half of April.

Genus MITOURA Scudder

MITOURA GRYNEUS (Hübner)

Plate 12, *g*

Range.—Probably throughout the State. We have records from Accomack, Albemarle, Amelia, Arlington, Augusta, Fairfax, Giles,

Henrico, Madison, Montgomery, Nansemond, Nelson, Northampton, Orange, Prince Edward, Prince George, Prince William, Roanoke, Rockbridge, Stafford, Surry, Warren, and Westmoreland Counties.

Occurrence.—Found in the vicinity of red cedars (*Juniperus virginianus*), never straying very far from them; very local, and erratic in its appearance, likely to appear suddenly in a locality where it was previously unknown, persist for one or a few seasons, then as suddenly disappear; usually common when and where it is found.

Seasons.—Two broods, but the second brood is incomplete, as more or fewer of the pupae formed by the young of the first brood do not give forth the adults until the following spring. The green hairstreak appears usually about the middle of April, rarely as early as the first week in April, and flies until the middle of June. The second brood appears early in July, or even toward the end of June, and flies until about the middle of August. This butterfly is most numerous in the last half of April and the first half of May and common, though less numerous, in the last half of July.

Genus **ERORA** Scudder

ERORA LAETA (W. H. Edwards)

Frontispiece, fig. 8; plate 12, *a, b*

Range.—The only Virginia specimen was captured at the Mountain Lake Biological Station, Giles County, on June 23, 1938, by Prof. Lorus J. Milne. It is a fresh specimen, very recently emerged. Professor Milne very kindly presented it to the United States National Museum.

Occurrence.—Mr. Scudder wrote: "As to the haunts of this insect, all (unless the New Jersey specimen, and perhaps the London, be exceptions) seem to have been taken in mountainous regions. Mr. Saunders took his specimen in a wood; Mr. Edwards one of his at the bottom of a freshly dug post hole near a hop vine. Mine was taken on a road into a mountain ravine, just before it entered the woods from partially cleared ground."

Seasons.—Probably three broods in Virginia, one in the last half of April and May, another in the last half of June and July, and a third in August and September.

Family PIERIDAE

Subfamily PIERINAE

Genus ANTHOCHARIS Boisduval, Rambur, and Graslin

ANTHOCHARIS GENUTIA (Fabricius)

Plate 9, *i, j*

Range.—Throughout the State.

Variation.—The earliest individuals to appear in spring are small, both sexes having the fore wings about 16 mm. long. The wings are somewhat narrowed, and the outer border of the fore wings makes an obtuse angle with the lower border so that the pointed apex is rather prominent. Gradually the individuals become larger, the fore wings finally reaching 20 mm. or even more in length, and the wings become more ample, the hind wings somewhat more broadly rounded and the fore wings longer in the basal half so that the outer border makes approximately a right angle with the lower border and the pointed apex becomes less conspicuous. In size and in wing shape the earliest individuals agree with others from farther north, and the latest agree essentially with the subspecies *flavida* from the coast of Georgia; but we have seen no specimens from Virginia in which the orange patch is extended inward as in *flavida*. Occasional females have the outer portion of the fore wings lemon yellow, the yellow covering the area that is orange in the males. More rarely in the females this area is heavily infuscated.

Occurrence.—Found chiefly in low, open deciduous woods with large rough-barked trees near streams or swamps; in the mountains it prefers the damp ravines and valley bottoms, though occurring sparingly in the higher levels; locally distributed and usually infrequent, though in some places common, regularly or in certain years.

Season.—One brood; locally in the mountains from Page County southwestward an incomplete second brood immediately follows the first, and occasional individuals representing this second brood appear along the Potomac in Fairfax County.

On the outer Coastal Plain the orangetip appears soon after the middle of March, on the Piedmont about the end of March, and in the mountains shortly after the middle of April. The time of its first appearance is, however, subject to considerable variation in different years. In any one locality it is on the wing for from 4 to 5 weeks at the most, sometimes for only 2 or 3. For about the first week only males are found, and in the last week practically all the individuals seen are females. The length of the flight period varies

considerably from year to year. It disappears on the outer Coastal Plain early in April, but in the mountains and in the northern part of the State it flies until the second week in May or even later, by which time, according to Dr. Ellison A. Smyth, Jr., well-grown larvae can be found on the food plant. In the mountains in Page and Montgomery Counties and probably elsewhere, and rarely in northern Fairfax County, a small partial second brood appears shortly after the end of the third week in May and flies until about the second week in June. At Blacksburg, Montgomery County, Dr. Smyth found the second brood on the wing as early as May 26; he noted that this brood flies for only about a week and is not so numerous as the first brood.

Dr. W. J. Holland ("The Butterfly Book," revised edition, 1931, p. 287) wrote: "The first brood appears in early spring. It is double-brooded in the western portions of North Carolina, where I have taken it in the spring, and quite abundantly late in the autumn." We do not understand this statement. In his revision of the list of butterflies of North Carolina (in C. S. Brimley, "The Insects of North Carolina," 1938, p. 257) the senior author was able to include definite records only from Raleigh, Chapel Hill, and Roanoke Rapids, all in the north-central part of the State, in March and April.

Genus EUCHLOË Hübner

EUCHLOË OLYMPIA (W. H. Edwards)

Plate 16, *a, b*

Range.—Known only from northern and western Frederick County.

Variation.—In Virginia and in adjacent West Virginia the early individuals of this species are always typical *olympia*, but as the season progresses the amount of gray on the apex of the fore wings decreases and the body becomes less shaggy. If during the period of emergence the weather becomes hot and dry, this tendency is carried to an extreme and the form *rosa* appears, quite like specimens from Texas except for the black spot at the end of the cell of the fore wings, which is slightly smaller. The form *rosa* flies with worn individuals of typical *olympia* and a more or less complete series of intergrades. In Virginia and West Virginia it is possible to capture on the same day typical *olympia* and typical *rosa*, though most individuals will be intermediate between the two forms.

In fresh individuals of this species the markings on the under side of the hind wings are a beautiful apple green, and the anterior por-

tion of the hind wings below is strongly suffused with a delicate pink that gradually pales toward the outer edge; the costal border of the fore wings may be pink, above as well as below. The extent and intensity of this pink color are variable, but it appears to be as well developed in *olympia* as in *rosa*. After death the pink gradually fades away and the delicate apple green changes to a rather disagreeable dingy yellow-green, so that preserved specimens give but little idea of the exquisite coloring of this "apple-blossom" butterfly in life.

Occurrence.—Found in open woods, especially in the higher portions, and along the rocky exposed crests of high ridges; common along the crest of the ridge forming the western border of Frederick County, infrequent or casual farther eastward. It is common to abundant in the higher regions of adjacent Hampshire County, W. Va.

Season.—One brood. Our records indicate that this species first appears about the middle of April and flies until about the middle of May.

Genus *PIERIS* Schrank

PIERIS RAPAE (Linné)

Plate 18, *a*

Range.—Throughout the State.

Variation.—The earliest individuals seen in spring are rather small, with the fore wings about 23 mm. long. The outer border of the fore wings is more or less strongly convex. At the apex of the fore wings there is a small, often more or less indefinite, light-gray patch which in the female does not quite reach the outer edge of the costal border. The under side of the hind wings is more or less heavily speckled with dark-gray scales, especially in the inner half, most densely in a large but indefinite patch in the inner half of the wing just below a more or less conspicuous light stripe running from the base of the wing to just above the middle of the outer border. The males are often unmarked above and below, but usually there is a single dark spot, more distinct and darker below, on the fore wings just beyond the end of the cell and about halfway between the costal and the lower border (pl. 18, *a*), and a similar spot on the anterior border of the hind wings about two-thirds of the distance from the base to the outer angle. In the females the spot on the fore wings is always present and below it in the interspace between veins 1 and 2, just above the spot on the anterior border of the hind wings, there is a more or less developed broad dash of dusky scales. In the males the wing bases, and in the females the basal third of the wings, are

more or less heavily infuscated. The early spring form in its fullest development with the males wholly immaculate and the females with only a small subcentral spot on the fore wings does not occur every year, and we have never found it on the Coastal Plain.

As the season advances the individuals increase somewhat in size and pass into the late spring or intermediate form, which in turn passes into the summer form. Although it is easily possible to get a complete series of intergrades between the earliest spring form and the summer form, the early-spring form, the late-spring or intermediate form, and the summer form are to a certain extent distinctive. The first two grade imperceptibly into each other, but intergrades between the late-spring and summer forms are rather less numerous.

In summer individuals the fore wings are usually 25–27 mm. long, the outer border of the fore wings is more nearly straight, the dark markings are extended and intensified, and the infuscation of the under side of the hind wings more or less completely disappears. Summer males have the dark apical patch on the fore wings considerably larger than spring males, and also darker, especially the inner portion, where the scales may be quite black. There is commonly a slender tooth of black running inward along vein 5. The spot on the fore wing is larger and darker, especially on the inner side, and there is a gray spot below it near the inner border. The spot on the anterior border of the hind wings is large and dark. The inner portion of the wings is much less heavily infuscated, and the lower surface of the hind wings is less extensively stippled with dark scales—indeed in some examples these may be very few. Occasional summer individuals occur in which the dark apical patch is reduced, the spot on the fore wings is small, and the faint spot below it and that on the anterior border of the hind wings are merely vestigial; but these have the other features characteristic of the summer form.

In the summer females the dark apical area of the fore wings is more extensive than it is in spring individuals, and much darker. It either extends so as to include the end of vein 5, reaching the outer margin halfway between veins 5 and 4, in which case vein 3 may be dusky at the tip, or it terminates in the interspace between veins 5 and 6, in which case a narrow dark triangle extends inward for some distance along vein 4; this triangle may be quite isolated, or it may be united basally with the patch above. The two spots on the fore wings and the spot on the hind wings are much larger and darker than in the spring form. There is commonly a narrow dusky line extending inward from beneath the middle of the lower spot

along the inner border, and rarely the two spots on the fore wings are connected by a crescent of dark scales thickest in the middle with the convexity outward. The females are frequently more or less yellowish, rarely a rather bright pale yellow.

Occurrence.—Everywhere common in low open country and abundant about farms where cabbages are grown, becoming less numerous, though universally present, in the mountains; though everywhere present at all seasons, its numbers are to a considerable extent proportionate to the available supply of its favorite food plant, cabbage.

Introduction and establishment in Virginia.—B. W. Jones, writing to Samuel H. Scudder from Spottsville, said that "it was a general complaint (in Surry County) as early as 1870-71 among farmers that they could raise no good cabbage on account of it. In 1872-73 it infested the gardens about Petersburg in untold numbers." This was the first notice of the species in the State. It reached Washington, D. C., in 1872. By 1874 it had covered the northeastern half of Virginia, and in the year following it was found throughout the State.

Seasons.—Three to eight broods, usually four to six. The European cabbage white appears early in the third week in March and, if the weather be warm, soon becomes common. It continues on the wing until about the middle of October. Over most of Virginia there appear to be four to six broods a year, but in the cooler mountain regions there are probably only three, and in neglected cabbage fields under proper conditions of temperature and moisture there may be as many as seven or even eight. In this species the life span of the individual is subject to great variation. On food plants other than cabbage and in cool temperatures the caterpillars develop rather slowly, but when feeding on cabbage the generations may succeed each other with extraordinary rapidity. The cabbage white hibernates in the pupa. Some of the pupae of each brood do not give forth the adults until the spring following, so that spring individuals may be the young of any of the broods of the preceding summer, though most of them are the young of the fourth, fifth, or sixth broods. Occasional pupae remain dormant over two winters.

PIERIS VIRGINIENSIS W. H. Edwards

Plate 18, b

Range.—One record, Frederick County northwest of Cross Junction on the Bloomery Road (Route 698) about 200 feet east of the West Virginia line, April 24, 1938.

Variation.—This species varies considerably in the intensity of the bordering of the veins on the under side of the hind wings. This bordering is pale in all the individuals from Virginia and adjacent West Virginia that we have seen, some having the under side of the hind wings almost immaculate white.

Occurrence.—Confined to rich deciduous woods and extremely local, occurring in limited numbers at usually widely separated localities. The reduction in the numbers of *Pieris virginiensis* and its present occurrence only in widely separated localities are undoubtedly the result of deforestation, which has greatly reduced the areas in which it is possible for it to maintain itself. The case of *Pieris virginiensis* is similar to that of *Speyeria diana*.

We agree with Dr. Alexander B. Klots that the habitat of this species is so very different from that of *P. rapae* that there can be no question of any direct competition between them. *Pieris rapae* is an open-country butterfly and avoids the woods. The early-spring form in Virginia frequents the edges of woods but does not enter them, flying off over the fields when frightened. *Pieris virginiensis* keeps strictly to the woods. We have found both species on the same groups of flowers by the roadside at different times, but this is unusual.

The individual we captured in Virginia had evidently been carried over the border from some nearby locality in West Virginia by the strong west wind that was blowing at the time. Curiosity in regard to its true home led us to investigate the matter in 1939. On May 8, following the Bloomery Road (Virginia 698, becoming West Virginia 45) into West Virginia, we passed the Bloomery Post Office and soon entered a valley with a wooded hillside on the right just beyond a wooden bridge over a small stream. Here *Pieris virginiensis* was not infrequent, flying in indolent fashion among the trees, and several were captured both by us and by Mr. and Mrs. Ernest L. Bell who accompanied us. We noted what we assumed were individuals of this species in a number of similar localities along the road from Forks of Cacapon through Largent to Great Cacapon. Though nowhere numerous, this species seems to be generally distributed throughout this region. We noted it in the same area on May 12, 1941.

Season.—One brood. This species appears shortly after the middle of April and flies until about the middle of May.

PIERIS PROTODICE Boisduval and LeConte

Plate 18, *c, d, e, f, g, h*

Range.—Throughout the State.

Variation.—Early in spring this butterfly appears in a small form (*vernalis*) which is dull chalky white above with the hind wings on the under side heavily marked with dark along the veins, these dark markings below being similar in kind and in degree in the two sexes (pl. 18, *c, d*). This early spring form varies in size and in the extent and intensity of its markings in different regions, and also in the same region in different years. The fore wings are commonly 21–23 mm. long.

The early-spring form is soon replaced by a larger intermediate form in which the markings on the under side of the hind wings are paler in the females and very faint in the males.

In the summer form the fore wings are usually 23–27 mm. long, the females being larger than the males. The males have the under side of the hind wings pure white and unmarked (pl. 18, *e, f*), while in the females they are marked with dirty yellowish (pl. 18, *g, h*).

In autumn individuals occasionally are found that resemble the summer individuals in size and in the markings of the upper surface, except that the markings of the females are clearer and blacker than in most summer females. On the under side of the hind wings the veins are broadly dark, greenish or grayish yellow, as in the early-spring form. This autumnal form is seldom common and does not appear every year. It is interesting in approaching very closely the western subspecies *occidentalis*, which occurs in the northern Rocky Mountain region and in Alaska. In fact the only obvious difference between *occidentalis* and the eastern autumnal form of typical eastern *protodice* seems to be that the dark spot in the outer third of the interspace between veins 1 and 2 of the fore wings is uniformly larger in the autumnal, as in the other, forms of typical *protodice*.

Occurrence.—Found in open fields, early in spring chiefly near the borders of woods, later generally distributed; very erratic in its occurrence, usually local and rather infrequent or even rare, though in some years common to abundant locally or, more rarely, throughout. The early-spring form sometimes appears in considerable numbers in restricted areas where, later in the season, no individuals of the summer form are found. This species is the most unpredictable in its occurrence of all the endemic butterflies in Virginia.

Seasons.—Three broods and a partial fourth. The checkered white appears with the first warm weather of spring, usually in the last

half of April, often early in April, occasionally in March, and flies until about the middle of May. In the last week in May the second brood appears and is on the wing until about the middle of July, when the third brood appears, flying through August and into September. In the last half of September, a partial fourth brood appears, augmenting the numbers of the third brood, which is still flying.

Genus *ASCIA* Scopoli

ASCIA PHILETA (Fabricius)

The subspecies represented in Virginia is—

ASCIA PHILETA PHILETA (Fabricius)

Plate 8, *g, h, i, j*

Range.—One record, Chincoteague Island, Accomack County, July 28, 1928 (Dr. Frank Morton Jones).

Occurrence.—An irregular or casual visitor from farther south. Dr. Jones captured three individuals, one of which was a female of the dark smoky form, on the flowers of a privet hedge. Boisduval and LeConte recorded this species from "Virginia" but said that it was rare.

Note.—William P. Comstock has recorded, under the name *A. monuste*, a specimen of this species from Virginia. As this specimen was in the collection of Henry Edwards it may have come from West Virginia.

Genus *COLIAS* Fabricius

COLIAS PHILODICE Godart

Plate 17, *a, b, e*

Diagnostic features.—Ground color above clear light yellow with no trace of orange.

Range.—Throughout the State.

Variation.—The individuals on the wing early in spring are small, with the fore wings 24–25 mm. long. In the females the dark border of the hind wings is narrow with a slightly scalloped inner edge, which shows a slight tendency to continue inward along the veins. It may terminate just after vein 5, or it may be continued somewhat farther. In a white female taken near Washington in April it is rather broad and is continued as a haze of dark scales almost to the anal angle. The dark border on the fore wings is narrow, the portion below vein 4 being about as wide as the cell with the included spots

separated from the yellow of the wing only by a fine hazy line, or confluent with it. In two white females this border is somewhat broader and the apical portion is extended inward for about two-thirds of the distance from the apex to the black spot at the end of the cell, while the included spots are much reduced in size. Yellow females are occasionally similar. The black spot at the end of the cell may have a more or less conspicuous yellow center. The early-spring males have the borders of the wings narrow and more or less brownish. In both sexes the under side of the hind wings and apical portion of the fore wings is more or less strongly infuscated, tinged with olive-green, or with grayish in the white females. In these early individuals the hind wings are broadly and evenly rounded and the fore wings are rather short with the outer border always more or less convex and the apex well rounded. The later-spring individuals are somewhat larger and resemble more or less closely those of the brood following.

In the second and following broods the males vary but little. The fore wings are usually 24-32 (averaging 26.1) mm. long. Most of the variation is in the shape of the hind wings and concerns the development of a rounded angle at the end of vein 7, which may be wholly wanting, and the relative development of the anal angle, which occasionally is so very broad as to be almost absent. The dark borders are broad and black. In the southwestern portion of the State very large males with the fore wings 30-32 mm. long are occasionally found. These have the hind wings roundedly subangulate at the end of vein 3 as well as at the end of vein 7. Similar males occur in the valleys of West Virginia. The senior author took one on August 3, 1927, at Silver Spring, Md., but we have not noted this variety in northern or eastern Virginia.

The females are more variable than the males. The average size is slightly greater, but the maximum size is less. In the summer broods the fore wings are 24-31 (averaging 27.8) mm. long. Although as a rule the hind wings of the females are broader and more evenly rounded than those of the males, they occasionally have the same form with a well-developed rounded angle at the end of vein 7 and a well-developed rounded anal angle. The angle between the lower and outer border of the fore wings is ordinarily obtuse, somewhat less so than in the males, more rarely nearly a right angle. Rarely females have the hind wings broadly and evenly rounded and the fore wings rather strongly convex on the outer margin. The black border on the fore wings is usually heavy, the black extending inward for two-thirds of the distance from the apex of the wings to

the black cell spot. The spots within this border are very variable in size. Occasionally they are wholly absent, the margin of the wing both in the yellow and in the white form being solid black. Sometimes the black border is narrow and of uniform width, not broadening toward the apex, so that it extends less than half the distance from the apex to the black discal spot. The dark border on the hind wings is very variable, though usually broad and rather heavy. Its upper portion may enclose a rather large rounded yellow (or white) spot and sometimes it may more or less completely enclose another below it. Usually the first of these is more or less definitely indicated. Beneath these spots the dark scaling usually runs up the veins in a short tooth; more rarely the inner border of the dark margin is smooth. Occasionally the margin is reduced to a series of curved triangles with their broad bases, which are separated from one another by narrow yellow (or white) lines, situated on the margin of the wing and their attenuated apices running inward along the veins. In extreme cases the bases of the triangles may be very narrow and widely separated and the black may run for a long distance inward along the veins, especially the two uppermost, as a black line. When the black on the fore wings is much reduced there may be simply a light dusting of dark scales on the ends of the four anterior veins. In some individuals, both yellow and white, the base of the fore wings as far as a line at right angles to the lower border passing through the origin of vein 2 is very heavily dusted with deep-olive (in the yellow individuals) or dark-gray (in the white) scales, and similar scales are also abundant on the abdominal half of the hind wings, especially toward the base.

In both sexes there is much variation in the color of the spot at the end of the cell on the upper surface of the hind wings. It is commonly straw yellow, sometimes so pale as scarcely to be distinguished against the ground color of the wings, but it may be more or less bright orange, or even reddish orange, nearly as bright as in *eurytheme*. There is also much variation in the black spot at the end of the cell in the fore wings. This is usually about twice as long as broad in the males, and from one-half to one-third again as long as broad in the females. In both sexes it often bears a prominent tooth in the middle of the apical side. In the males it is sometimes reduced to a narrow black line, and in the females rather frequently and in the males occasionally it has a conspicuous yellow (or white) center.

White females are frequently flushed with sulphur yellow on the hind wings from the abdominal border as far as the cell and vein 2,

where the yellow ends abruptly, and also, less strongly, in the corresponding areas on the fore wings. In some cases the yellow is bright and very conspicuous. In all such individuals that we have seen the hind wings are shaped like those of *Zerene caesonia*, with a reduced dark border, and the fore wings have the outer margin at right angles to the lower.

In Virginia white females are relatively as common early in spring as later in the season, appearing with the earliest yellow females of the spring brood. In spring, however, they occur in only one type, a white replica of the corresponding yellow females.

In addition to the common white female there is also a dark female which is deep, almost chrome, yellow on the fore wings with a pronounced dull-orange flush on the hind wings. This dark female is not very common. We have it from Massachusetts as well as from Virginia.

Occurrence.—Found in open country generally, especially in clover fields; formerly abundant throughout, now common in the higher mountain pastures and frequent in the southwest, elsewhere infrequent or even rare, having been almost completely replaced by the western and southern subspecies *eurytheme*. Until about 20 years ago this was the most characteristic and most noticeable butterfly of fields and pastures, especially in the Piedmont and mountain regions. Though less common, it was still numerous in the peanut- and cotton-growing areas in the Southeast. Apparently a somewhat hardier butterfly than *eurytheme* and better adapted for life in rugged regions, it is still predominant in the higher mountain pastures and still frequent in the valleys among the southwestern mountains.

Seasons.—Three broods, with a partial fourth. The yellow clover butterfly appears usually about the middle of April, sometimes as early as the end of March, and flies almost continuously until the end of the season in October, usually disappearing in the first half of the month, though sometimes persisting until the end, or even into November. It is least common, and locally absent, about the end of May. In the first or second week in June, or somewhat earlier, the second brood begins to put in its appearance, and in about a week the butterfly is common. About the second week in August the third brood is on the wing. Fresh individuals appearing in October probably represent a partial fourth as well as a delayed third brood.

COLIAS EURYTHEME Boisduval

Plates 10, *c*; 17, *f*

Diagnostic features.—Ground color orange varying to yellow with a mere trace of orange on the hinder portion or lower side of the fore wings.

Range.—Throughout the State.

Variation.—This butterfly is exceedingly variable, much more so than *C. philodice*. Before considering this subspecies as it occurs in Virginia it is of interest to present a composite picture of it based upon a long series taken by Dr. Warren H. Wagner, Jr., in the District of Columbia, which presumably could be duplicated south of the Potomac.

The fore wings in the males vary from 18 to 32 mm. in length, in the females from 18 to 33 mm. Dwarfs are most common early in spring, though they occur at all seasons. Giants are found only in the last half of the summer, in low and more or less damp meadows.

The shape of the fore wings is very varied. They may be short and broad with the outer edge at right angles to the lower edge and the outer edge rather strongly convex, or longer with the angle between the outer and lower borders obtuse, the outer border straight, and the apex pointed. In early spring or winter individuals they may be markedly elongated and narrow. The extreme type of short wing and the extreme type of long wing occur most frequently in very small individuals, and are rare in individuals above medium size. The pointed wing with the straight outer border is characteristic of all very large individuals, but also occurs typically developed among the smallest. The lower border of the fore wings is straight in the females, in the males either straight or bowed outward, forming a very broadly rounded obtuse angle approximately in the center. There is little difference between males and females in the shape of the fore wings, though in the females they are never so pointed as in the more extreme males, and the lower border is always straight.

The hind wings vary from evenly rounded with scarcely any trace of an anal angle to subangulate with a sharply rounded anal angle, almost a right angle, and another sharply rounded angle at the end of vein 6. The wings are usually broad, the maximum width in the females and in many males being 88 percent of the length. In the larger males with strongly angulated wings the width is 80 percent of the length. In long-winged early-spring or winter individuals the maximum width is only 70 percent of the length.

The color varies from light clear citron yellow, sometimes more

or less greenish above, with a faint orange flush on the inner portion of the under side of the fore wings (? hybrids with *philodice*), to a uniform brilliant orange usually with the costal margin bright yellow, the males with a more or less intense violet iridescence, the females with the spots included in the dark border yellow. But the costal margin in both sexes and the included spots in the dark border of the females may be orange like the rest of the wings. Rarely the males are uniformly chrome yellow or light dull orange (? hybrids). In the transition from the form wholly yellow above to the deep-orange form, the orange first appears as a faint flush on the fore wings between the lower border and vein 1. From this the orange spreads anteriorly to the cell. Individuals are common that have the fore wings suffused with orange in a roughly triangular patch extending from the wing base outward to a line from the end of the cell to the lower end of the dark margin, the upper and outer sides of this orange triangle gradually shading into the yellow of the rest of the wing. More rarely this orange patch has sharply defined borders, or the veins anterior to the orange patch are broadly bordered with orange, the borders being broadest at the base and tapering outwardly. Next, the orange suffusion appears on the hind wings, but here it becomes evident uniformly over the entire wing, except beyond vein 7 and below vein 1, these areas always remaining yellow. As the orange spreads over the wings it usually deepens in color, though this is not always true. Uniform pale-orange, chrome-yellow, or dull-orange individuals occur, flying with the much more numerous bright-orange ones.

The dark border of the wings in the males is very variable, ranging from vestigial to very dark and broad, 7 mm. wide at the narrowest point in a specimen with the fore wings 30 mm. long. In a long-winged spring male with the fore wings 22 mm. long taken on April 12, 1938, the border of the fore wings below vein 4 is represented merely by a fine diffuse dusting of dark scales forming a series of narrow crescents with the convexity inward, one in each interspace. Anterior to vein 4 the dark dusting in the interspaces extends farther and farther inward so that the whole apex is dusted with dark scales; the infuscated area is crossed by broadly yellow veins, and there is a marginal more or less semicircular spot at the outer end of each interspace. On the hind wings there is a dusting of dark scales at the ends of the interspaces between veins 4 and 5, 5 and 6, 6 and 7, that between veins 4 and 5 being very slight, that between veins 5 and 6 the most extensive, with that between veins 6 and 7 smaller. The margin of the wing beyond these small patches of dark scales is

narrowly yellow. The reduction of the dark border in the males to a rather faint and very narrow submarginal dusting of dark scales is rare; usually the border is continuous and dark, and the dark scales extend outward to the base of the fringe. On the fore wings the dark border varies in width in its lower half from scarcely more than one-third of an interspace to more than twice the width of an interspace. Most commonly it is approximately the width of an interspace, often slightly more or slightly less. When the border of the fore wings is narrow its inner edge frequently is deeply indented by long narrow angles running inward along the veins, and the veins may cross it as narrow yellow lines. Most commonly, however, only the veins at the apex are yellow, and these do not quite reach the outer edge. When the dark border is broad the inner edge may be more or less deeply scalloped, the black of the border extending outward as long narrow angles along the veins. In most cases the inner edge of the dark border is simply irregular. In the males the dark border of the hind wings is developed proportionately to that of the fore wings. It may reach downward to vein 1, but usually ends at about vein 2. When the border is narrow it may not pass vein 3, and in extreme cases it is developed only between veins 6 and 4.

In the females the inner edge of the dark border of the fore wings is abruptly bent inward in the interspace between veins 3 and 4. Rarely it is broadly curved inward in the anterior half. The inner edge of the border is usually very irregular, though occasionally smooth. The spots in the dark border vary greatly in size, being largest in the small light-orange individuals. They are usually of different sizes, that in the interspace between veins 3 and 4 being much smaller than the others, or absent. Rarely they are large and subequal, and more or less confluent, forming a partially interrupted broad yellow band separated from the orange or yellow on the inner portion of the wing by a narrow dark band of uniform width broadly and evenly curved in its anterior half. Not infrequently the spots are entirely absent, the black border then closely resembling that of the male. In spring individuals the dark border is narrower than it is in summer individuals, and below vein 4 the inner portion may be narrow, vestigial, or even entirely absent, the dark border of the female then resembling approximately that of the male except for the inclusion of a curved row of four spots in the apical portion.

On the hind wings in the females the dark border may be narrow, resembling that of the male though with the inner edge vaguely defined. Sometimes it is as broad as it is on the fore wings with the inner edge parallel to the edge of the wings and completely enclosing

a row of subequal yellow spots, largest anteriorly, one in each interspace, much as in the females of *C. eogene* from Kashmir. Usually it is broad anteriorly where it completely encloses from one to three spots, the inner border then becoming obsolescent or represented by a slight dusting of dark scales in the interspaces. Occasionally the border is represented merely by long narrow dark triangles with their bases outward that extend inward along the veins. Rarely it is wholly absent, there being merely a few dark scales at the outer ends of the anterior veins.

The spot at the end of the cell of the fore wings is usually well developed, black, and conspicuous, sometimes with an orange, yellow, or white center. Rarely it is much enlarged, taking the form of a black circular ring surrounding a white center. It may be reduced to a narrow line, or it may even be vestigial, represented simply by a few dusky scales. Not infrequently it is produced into a more or less extended angle on the side toward the apex. It may be bright orange instead of black. In pale-orange early-spring individuals it is commonly more or less broadly bordered with orange or mixed with orange scales, sometimes entirely orange.

The spot at the end of the cell of the hind wings varies from pale straw yellow to orange-red. In light-orange early-spring individuals it is sometimes very large, its greatest diameter, parallel with the cell, being as great as the maximum width of the cell. Usually its diameter is somewhat less than the width of the interspace between veins 4 and 5. Rarely it is very small, only about one-third the width of this interspace. There is usually a small supplementary spot on its outer side just across vein 5, but this may be absent, especially if the spot be small.

The wing bases above are usually marked with blackish scales. In the males these may be very dark, and the blackish patch is sometimes extended as a sooty infuscation along the lower border of the fore wings halfway to the outer margin, and also on the hind wings in the interspace between veins 1 and 2 and the lower half of the cell downward almost to the anal angle. In the females the infuscation is less dense than in the males, but more extensive. On the fore wings it may be confined to the costal border, though it commonly affects about the basal third of the fore wings and the area below the cell on the hind wings, becoming diffuse toward the outer edge. Occasionally the entire hind wing is infuscated except for a light marginal band or row of more or less indistinct spots.

In the females the veins of the fore wings for their whole length and the veins in the outer half of the hind wings may be narrowly

blackish. Rarely in the males all the veins are marked by narrow black lines. We have not seen an example of this last from Virginia, but Mr. Wagner has one from Nebraska.

The under side of the hind wings may be clear yellow, yellowish white, dull white, or grayish blue. They are usually more or less heavily dusted with dark scales, when the dusting is heavy becoming dusky olive-yellow and in extreme cases in winter dull green with a broad indefinite lighter border.

On the under side of the fore wings the antemarginal spots are usually well developed, with the three lowest the largest. In the forms with very narrow dark borders above they may be as much as four times as far from the edge of the wings as the inner edge of the dark border. In the forms with broad dark borders they may be somewhat nearer the edge of the wings than the inner edge of the dark border. Usually they are approximately under the inner edge of the dark border. In *philodice* they are slightly farther from the edge of the wings, beyond the inner edge of the black border. This line of spots is usually straight and parallel with the outer edge of the wings, but it may be somewhat curved inward. It is more frequently curved inward in *philodice*. In males in which the dark border is narrow, the outer edge of the wing markedly convex, and the spot at the end of the cell of the hind wings small and that at the end of the cell of the fore wings vestigial, the spots are greatly reduced and not infrequently are wholly absent.

The fringes of the wings vary from light dull olive with or without a pink edging to entirely bright pink. They are usually more or less dull rosy or pinkish.

In Virginia *Colias eurytheme* occurs in a considerable number of more or less distinctive though intergrading forms. The relative frequency of these forms and their seasonal distribution have undergone marked changes since the establishment of this butterfly as a common species and at present differ more or less widely in different areas. The greatest variability appears to occur in the southwestern part of the State where in the lowlands a long series of variations may be taken at any time during the summer. It is in this region that *C. philodice* is most numerous at the lower altitudes, and also is most variable. Farther north and east where, except in the higher mountain pastures, *eurytheme* predominates almost or quite to the exclusion of *philodice*, both are less variable. Here the great majority of the individuals taken at any one time conform to a single type, and variants are uncommon, although they do occur.

Several of the forms of *eurytheme* occurring in Virginia have received names, but these are deceptive in that they imply a certain fixity that does not exist. The forms are in reality fluid in varying degrees and for the most part indefinite, varying in size and intergrading completely with others.

Each of the forms commonly recognized—*eurytheme* (= *ariadne*), *keewaydin*, and *amphidusa*—is subject to parallel variation in Virginia. Each may be very pale with scarcely a trace of orange, females of each may be white, and the characteristic color and wing shape of winter individuals is superposed upon each of these forms equally. The chief forms of *C. eurytheme* occurring in Virginia may be described as follows.

A small pale form has the fore wings 20-23 mm. long. It is yellow with a flush of orange on the inner portion of the lower part of the fore wings, and sometimes also on the hind wings; the dark borders of the wings are narrow and more or less brownish. This form occurs alone in early spring, when the bases of the wings above and the under side of the hind wings are more or less heavily infuscated. Individuals of this spring type (*eurytheme*) are on the wing at Farmville, according to Frank W. Trainer, until late in May, broadly overlapping individuals of the orange form (*amphidusa*), which are on the wing from May 5. We have found *eurytheme* on the wing from the end of March to May 19, at which time individuals of the larger orange form (*amphidusa*) were common. But the small pale form also occurs locally throughout the summer in the drier regions, flying with the much more numerous individuals of the orange form. Summer individuals of the small pale form, which are usually somewhat rare, differ from those flying in spring in lacking the infuscation at the base of the wings above and on the under side of the hind wings. Toward autumn in dry seasons the numbers of the small pale form increase and as the weather becomes cool the under side of the hind wings becomes increasingly infuscated so that the individuals tend to approach the spring form. Spring specimens have been called *eurytheme* (*ariadne*), but these grade imperceptibly into others taken in summer and autumn that differ more or less widely, especially in the degree of infuscation. In habits the individuals of the small pale form resemble *C. philodice* rather than the larger forms of *eurytheme*. The flight of the males is lower and less swift than that of the males of the larger forms, and in a narrower zigzag, made up of shorter lines. It is noticeable that the males prefer the company of the males of *philodice*, and associate with them on muddy spots. On the mud they

are quite indistinguishable, but when the group takes wing the slight flush of orange is at once evident. In summer males of this form are most easily obtained by searching for them among the companies of the males of *C. philodice* resting on mud.

The large pale form resembles the preceding in color, except that the dark borders of the wings are broader and blacker and the size is larger, the fore wings being usually 25-27 mm. in length, and rarely as much as 30 mm. It occurs only in summer, and we have found it only in the extreme southwestern counties, though it may occur elsewhere. It is possibly a hybrid between *C. eurytheme* and *C. philodice*.

In an intermediate form the size is large, with the fore wings 25-27 mm. long as a rule, though occasional individuals may have the fore wings up to 32 mm. long. The color is yellow faintly and uniformly flushed with orange except along the costal border of the fore wings. It resembles the following forms, but is paler. We have it only from southwestern Virginia. It may be a hybrid.

The early-summer form is the same size as the preceding, which it resembles except for its darker color. It is the predominant form in early summer. It occurs throughout the summer, but in most regions it gradually becomes more or less extensively diluted with the following form, though always remaining abundant. Before 1931 spring individuals in Virginia were all of this form, differing from summer individuals only in being smaller and with the bases of the wings above and the under side of the hind wings more or less infuscated. They were somewhat deeper orange than the usual run of summer individuals though by no means so dark as, and with less black than, the dark-orange summer form.

The dark-orange form should probably be regarded as an extreme development of the preceding, with which it intergrades completely and abundantly. It resembles the preceding, but is deeper orange with broader and blacker dark margins. The males, in contrast to those of the preceding forms, always show a violet iridescence which is often strong. The large females occasionally have the spots within the dark border of the fore wings nearly or even quite as deep orange as the ground color of the wing instead of the usual yellow. White females of this form are often flushed with salmon-pink on the lower inner portion of the fore wings and with yellow on the hind wings. Though the fore wings usually measure 25-27 mm. in length, individuals of both sexes with the fore wings 30-32 mm. long are not infrequent in low moist areas. As in the case with large individuals in other forms,

there is usually a rounded angle on the hind wings at the end of vein 3. This form, which flies in summer with the preceding, reaches its most intense coloration after the first of August when many of the males are very richly colored with violet reflections and broad and very black borders. Richly colored individuals increase in number until the end of the warm weather. The relative proportion of this and the preceding form vary from year to year. In 1930 no richly colored individuals were found in the vicinity of Washington, the darkest being intermediate between this form and the form preceding. This is the form to which the name *amphidusa* was applied by Dr. Boisduval.

A curiously colored chrome-yellow form is probably a variant of the preceding forms. It is rare and should possibly be regarded as an aberration.

The females of all the forms are more or less frequently white, these white females being apparently least common in the small pale form and most numerous in the dark-orange form. The white females of the latter in the last half of the summer are frequently flushed with salmon-pink below the cell of the fore wings, fading to white near the black border, and with greenish yellow on the hind wings; in some individuals the basal third of the costal border of the fore wings, the hairs on the anterior portion of the dorsal surface of the thorax and on the head, and on the central part of the thorax below, and the legs are bright pink.

The winter forms of *C. eurytheme* are worthy of special mention. During autumn, if the weather remains warm enough to permit this butterfly to persist in the adult stage, the individuals become paler and paler, and finally after the middle of November all the individuals are very pale. The males are washed with light orange on the hind wings and on the lower portion of the fore wings, on which it passes gradually into yellow on the anterior half or two-thirds. A few of these males are of the small pale type with only a very faint trace of orange on the hind wings and a scarcely stronger flush on the lower half of the fore wings, and narrow more or less brownish borders; the lower edge of the fore wings is straight, and the hind wings are evenly rounded. Although they are as pale, or nearly as pale, as the small spring form, most of the males have the dark border of the wings broad and black, while the lower border of the fore wings is distinctly convex and the hind wings are subangulate at the end of vein 3 as in summer individuals. Though most of the males are of medium size or rather small, a few are as large as average large summer males. In all the males the base of the fore wings and the

inner third of the hind wings are more heavily and extensively infuscated than in individuals taken at other seasons, and on the hind wings the infuscation, becoming less and less intense, runs almost or quite to the outer border in the vicinity of the anal angle.

The females are as pale as the males. Though the fore wings are bright and clear, the hind wings are dull yellowish green becoming abruptly lighter near the dark border, sometimes with a very faint overwash of orange. The dark border of the fore wings is narrower than in the summer individuals, and the dark border of the hind wings is much narrowed, reaching inward only to the line represented by the outer ends of the more or less completely included light spots in the summer form, and also much shortened, ending about two-thirds of the distance from the outer to the anal angle. The fore wings are less pointed and the hind wings are distinctly narrower and longer than in the summer females.

On the under side the males are infuscated on the outer half of the fore wings, and heavily infuscated on the hind wings so that the hind wings appear strongly washed with olive-green, or sometimes entirely dull light olive-green. The females are much more heavily infuscated than the males, the entire under surface of the hind wings and the outer portion of the fore wings being dull olive-green of the same tone as in *Colias hecla*, though not quite so dark.

In the summer forms the spot in the middle of the under surface of the hind wings consists of a circular red-brown ring surrounding a pearly circular center, with a conspicuous rounded lobe, also with a pearly center, on the side toward the dark spot on the costal margin. The width of the ring is usually about half the diameter of the enclosed pearly spot. The ring may be evenly red-brown throughout, or there may be a very narrow dark line immediately surrounding the pearly spot with traces of another partially outlining its outer border, the rest of the ring being sparsely scaled; or in extreme cases the large and small pearly spots may be quite independent of each other, each being surrounded by an exceedingly narrow deep red-brown border. Rather rarely there is merely a single circular pearly spot very narrowly ringed with dark red-brown beyond which is a very faint and indefinite ring only slightly differentiated from the ground color.

In the winter individuals the supplementary spot decreases in size and in some cases disappears entirely, while the large pearly spot tends to become elliptical with the long axis of the ellipse parallel with the long axis of the cell. At the same time the brown border of the pearly

spot on the side toward the margin of the wing, and to a lesser extent on the inner side, becomes broadened so that the pearly spot lies in an oval near the proximal end at about its own diameter away from the distal end. An exactly similar transformation from the usual double spot into a more or less elongated spot with a considerable area of red-brown on the side away from the wing base is characteristic of a number of Arctic and alpine species that are similarly dark green on the under surface of the hind wings, as for instance *C. hecla* and *C. nastes werdandi*.

The white females of the winter forms are a more or less dark dull green on the hind wings above, lighter greenish on the fore wings.

The males of the winter forms, no matter which of the forms they represent, have a weak, slow, uncertain, desultory and more or less direct flight which is usually high, 3 or 4 feet or more above the ground. When frightened they fly away in a straight line and rather rapidly, though much less rapidly than males of the same size do in summer. In a prolonged autumn with gradually decreasing temperatures all the forms of this butterfly little by little take on the features of the winter form, slowly converging toward the common pale color type and wing shape characteristic of that form. But the fully developed winter forms occur only in very exceptional years. Since this butterfly became established in the vicinity of Washington we have seen it only twice—in 1935, when it was on the wing until December 24, and in the winter of 1946-47, when it was on the wing up to January 27, 1947.

Occurrence.—The orange clover butterfly is a recent immigrant into Virginia from the south and west, now thoroughly established and abundant everywhere. It is perhaps the most conspicuous and characteristic butterfly of open fields, especially clover and alfalfa fields in the Piedmont region. It is common, though less conspicuous, in the peanut and cotton areas in the southeast. In the western part of the State it is found in abundance in the valleys but is less numerous or even infrequent in the higher and more exposed mountain pastures where the native *philodice* still predominates. Over most of Virginia it is far more abundant than *philodice*, but in the southwest, from Montgomery County southward and westward, it is in many places scarcely more numerous than *philodice*, in some, indeed, less numerous. It is primarily a butterfly of low open country, particularly farmlands, and does not appear to thrive, as does *philodice*, in the more rugged areas.

Immigration and establishment.—Although at present this is one

of the commonest butterflies in Virginia, it is a very recent addition to the fauna of the State, into which it spread from the south and southwest.

Prof. Ellison A. Smyth, Jr., writes us that during his residence in Blacksburg, Montgomery County, up to 1925, he never saw *eurytheme* there. Dr. George W. Rawson also writes us that he does not remember having taken *eurytheme* anywhere in Virginia in his collecting up to 1925.

Dr. Frank Morton Jones writes that on coming north by rail on August 10, 1894, he noted the last *eurytheme*, seen from the train, at Salisbury, Rowan County, N. C., and the first *philodice* at Danville, Va. Between April 18 and 30, 1906, he took *philodice* at Virginia Beach, but he can find no record for *eurytheme* over that period.

He did not see *eurytheme* on the Delaware-Maryland-Virginia peninsula until July 29, 1920, when he took a fresh male at Ocean City, Md. In 1923, proceeding southward from Wilmington, Del., by motor, Dr. Jones found *philodice* prevalent until he reached Berlin, Worcester County, Md., where *eurytheme* began to appear. Farther south, at Wachapreague, Accomack County, Va., only *eurytheme* was seen. In the last week of July, 1925, *eurytheme* was among his captures in the Dismal Swamp. In the spring of 1929 Austin B. J. Clark found *eurytheme* abundant as far northwest as Lexington, Rockbridge County, where it was much more numerous than *philodice*, though northeast of Lexington *philodice* was much more numerous than *eurytheme*.

In considering the spread of *eurytheme* into Virginia it is of interest to review the history of its establishment in the adjacent District of Columbia. On November 11, 1886, Dr. Otto Lugger saw a "*eurytheme*, or rather a very pale variety of it, looking like a *Pieris*," flying about some flowers of dandelion in the Department of Agriculture grounds. This may have been an example of the pale winter phase. In the United States National Museum there is a male of the small pale form (*eurytheme*) taken in the District on September 6, 1904, by the late Prof. C. R. Ely, and we have seen a male of the dark-orange form (*amphidusa*) that was taken in the District about 1910. These individuals were apparently only casuals. There is a single broken male of the dark-orange form taken in the District, but without date, in the Henry F. Schönborn collection. In view of the fact that Mr. Schönborn kept only small series of perfect specimens, this would indicate that it was an unusual capture.

The next recorded individual was a female taken by Austin B. J.

Clark on September 24, 1923. In 1925 *eurytheme* was occasional in September in the meadows along the river west of Cabin John, Md. In 1926 it was much more numerous and was found from August 27 until the end of the season. In 1927 it was abundant from the middle of July until the end of the season. In the higher and more exposed areas, as about Silver Spring and Somerset, Md., its numbers were equal to more than half the numbers of *philodice* when the latter was at its maximum—indeed on some days there seemed to be no difference in the frequency of the two. In 1928 it was first taken on June 21 and was very common from the first of July onward. In 1929 it was taken as early as May 12. It disappeared during the last week in May, but fresh individuals appeared in the second week in June and by the end of the month it had become abundant, its numbers being, in some places at least, equal to the numbers of *philodice*. It remained abundant until the end of the season. In 1930 it was first noticed on April 27, and at the end of the summer it far outnumbered *philodice*.

It has frequently been stated, following Scudder, that prior to 1889 *eurytheme* was known east of the Appalachians only from a very few casuals. Our friend the late Prof. Ellison A. Smyth, Jr., assured us that this is an error and that it was common in his boyhood days about Charleston, S. C. He wrote us that his earliest recollection of butterflies, in 1874, and his efforts at his then very youthful start at forming a collection are vividly concerned with the late-winter or early-spring form, *eurytheme*, as common around Charleston. He still has in his collection two specimens dated 1876, and later he added others of the summer forms caught near Charleston.

In February 1889, when he was adjunct professor of biology at the University of South Carolina at Columbia, he found *eurytheme* quite common. He wrote to William H. Edwards about this, and Mr. Edwards urged him to try breeding it. This he did for 2 years. He found that the eggs of *eurytheme* laid on clover in February produced the form *keewaydin*, and eggs from this form gave individuals that were apparently identical with the bright and large western summer form (*amphidusa*). He also sent eggs to Mr. Edwards.

Professor Smyth never saw *philodice* around Charleston or Columbia, S. C. In fact, he never saw it at all until he went to Princeton, N. J., in 1880.

In March 1907 Drs. C. S. Brimley and Franklin Sherman, Jr., wrote that *eurytheme* occurs in North Carolina from the east-central portion (Raleigh) eastward, while *philodice* is generally distributed

and abundant in the mountains. In a recent letter Dr. Brinley tells us that *eurytheme* is common all over the State and has been ever since he first began keeping records in 1900.

When William H. Edwards was living at Coalburg, in the Kanawha valley in southern West Virginia, *eurytheme* was entirely unknown there. The senior author and Hugh Upham Clark found it common in the Greenbrier, New River, and Kanawha Valleys in 1929.

The evidence appears to indicate that *eurytheme* is endemic in South Carolina and in the Piedmont of North Carolina, or at least has been in these regions for a very long time, but until recently it did not occur in Virginia or West Virginia. It was first recorded from the Delaware-Maryland-Virginia peninsula in the summer of 1920. By 1923 it was common as far north as Wachapreague, where it had supplanted *philodice*, and to the northward it occurred with *philodice* as far as Berlin, Md. In the same year it appeared in the vicinity of Washington, D. C., where it had been earlier noted as a rare casual in autumn. Two years later, in 1925, it was occasional in autumn. In 1926 it was found as early as August 27 and in autumn was much more numerous than it had been in the year preceding. In 1927 it appeared in the middle of July and later became abundant. In 1928 it appeared on June 21, and in 1929 it was taken in May, presumably, therefore, having overwintered for the first time. In the western part of Virginia it was abundant in 1929 as far north as Lexington, farther north occurring in lesser numbers. In that year it was also common in the valleys of southern West Virginia.

Several interesting features have been noticed in connection with the acclimatization of *eurytheme* in Virginia. Prior to 1931 the spring individuals found in the District of Columbia, and presumably also in nearby Virginia, were all of the dark-colored *amphidusa* form, though of rather small size. The small pale form (*eurytheme*) did not appear until the last week in July, from that time on slowly increasing in numbers, though being at no time very numerous. In the spring of 1931 the butterfly first appeared on April 22, and 2 days later the males had become abundant and females appeared. For the first time the spring individuals were almost exclusively of the small pale form (*eurytheme*), only two individuals of the dwarfed *amphidusa* form being noted, one on April 22 and the other on April 24. Ever since then the early-spring individuals have been of the *eurytheme* form, though some of the later spring emergences may be of the *amphidusa* type.

Up to 1937 it was noticed that whereas the males of *philodice* were to be seen individually or in groups of various sizes on every muddy

spot, the males of *eurytheme* remained always in the fields, except that a few males of the *eurytheme* form might sometimes be found in a group of males of *philodice*. In the summer of 1937 in several different places in western Virginia we noticed for the first time males of the large brightly colored forms of *eurytheme* resting on mud singly or in groups. For instance, near Moscow, Augusta County, on August 14 we saw about 35 males of *eurytheme* in a compact group on mud in a road, together with 3 males of *philodice* and a few males of *Eurema lisa*, these last at some distance from the others.

With the increase in the numbers of *eurytheme* in Virginia the numbers of *philodice* have diminished both relatively and absolutely. By 1934 *philodice* had become decidedly uncommon except in the mountain pastures. At this time at the height of the season several days might pass without a single *philodice* being seen among the hundreds of *eurytheme*.

In the spring of 1936 Dr. Carroll M. Williams wrote us that *philodice* was more common in the vicinity of Richmond than it had been for several years past. Warren H. Wagner, Jr., independently reported an increase in the number of *philodice* in several districts in Virginia, and we ourselves noticed it in Fairfax County. But it disappeared almost completely after the spring brood.

In the spring of 1937 Dr. Williams wrote us that, strange to say, *eurytheme* was rare at Richmond, and in Fairfax County we found it much less numerous than it had been in the years immediately preceding. Later in the season it became common, and *philodice* also remained common. But we are not certain whether these yellow individuals, most of which seemed to be different from our series of true *philodice*, were not hybrids. For the first time we found several mated pairs in which one individual was orange, the other yellow.

Seasons.—Three, four, or five broods. The orange clover butterfly usually first appears early in April, sometimes as early as the end of the third week in March, and flies continuously until the end of the season, usually about the middle or toward the end of October, though often into November, occasionally as late as the last week in December, or even until January 27. The second brood begins to appear in May, sometimes early in the month, the third about the first of July, the fourth in August, and the fifth in September. Fresh individuals on the wing in late autumn or early winter, which often differ more or less widely in color and in wing shape from those seen in summer, are probably delayed emergences from the fifth brood. The prolonged emergence period of the spring brood and the progressively longer emergence periods of the later broods make it quite im-

possible to determine the broods from observations in the field, for after early May worn and fresh individuals are found flying together at all times. In the higher country this butterfly usually does not appear until late in April, and there are here probably three broods and a more or less complete fourth. Up to 1931 this butterfly did not appear in the vicinity of Washington until toward the end of April or early in May, but since then it has appeared early in April or even late in March.

According to V. L. Wildermuth the time from the laying of the eggs to the appearance of the adults in California and Arizona varies from 16 to 29 days. It is probably from 3 to 4 weeks or somewhat longer in Virginia.

Mr. Wildermuth says that the winter is usually passed in the pupa, although in the Southwest both larvae and adults have been taken during every month of the winter. It would appear from the relatively late appearance of the butterfly in spring in the early years of its establishment in Virginia that at that time the winter was passed as a nearly or quite full-grown caterpillar; as it now appears in the spring 3 weeks or more earlier than it did some years ago it probably passes the winter chiefly in the pupa, from which comes the small pale form, *eurytheme*, but also as a caterpillar, the overwintering caterpillars producing the small spring individuals of the form *amphidusa* which fly with the later emergences of *eurytheme*. This, however, requires confirmation.

COLIAS INTERIOR Scudder

Plate 17, *c, d, g, h*

Range.—Known only from a large male with the fore wings 30 mm. long caught by John E. Graf on Middle Mountain, Highland County, at an altitude of 4,010 feet, on June 14, 1936, and another similar male taken by William D. Field in the same locality on June 19, 1948.

Occurrence.—During a visit to Middle Mountain in 1936 John E. Graf was so kind as to collect a number of butterflies for us. These were examined and recorded as soon as received and then turned over to a preparator for setting. At the time the specimen was regarded as an example of *Colias philodice*, as we had no idea that *C. interior* occurred in Virginia. However, when it was set it was added to the series of *C. interior* in the Museum collection, presumably by John F. Gates Clarke, who was then in charge. We have to thank Dr. William Hovanitz, who found it while studying the

Museum's series of *C. interior*, for calling our attention to it. The records of this species from Virginia by Hovanitz (1950) and Klots (1951) are based on these specimens.

It is quite possible that this species occurs regularly in certain Canadian areas in western Virginia, having been overlooked because of its superficial similarity to *C. philodice*.

Genus ZERENE Hübner
ZERENE CAESONIA (Stoll)

Plate 2, *d*

Range.—Recorded from Suffolk, Nansemond County, July 27, 1938 (Otto Buchholtz), and from Bayford, Northampton County (Florence Walker).

Sidney A. Hessel writes us that sometime between October 12 and 20, 1937, when driving from Norfolk to Washington he "recognized a *caesonia* flying across in front of the car, and being my first I could not resist a short stop. I must have seen 10 or more in 20 minutes or less. They were in an overgrown field not more than 2 acres in area. The general picture I recall of the locality was that the adjacent fields were in truck farming and the vicinity definitely unattractive for collecting. The land along the roadside was in small parcels, with houses, gas stations, etc., rather frequent. For want of the exact locality the specimens were labeled '30 miles south of Washington, D. C.'" This would place the locality in the vicinity of Quantico (Triangle) in Prince William County.

Occurrence.—The dog's-head clover is an infrequent casual visitor from the south found in open country.

Genus PHOEBIS Hübner
PHOEBIS PHILEA (Linné)

Plate 10, *d*

Range.—Recorded from Gala, Botetourt County, October 11, 1941. (Donald Stoutamire), and from Salem, Roanoke County, October 15, 1928 (Prof. Ellison A. Smyth, Jr.); both specimens are males.

Occurrence.—A rare casual or accidental visitor.

PHOEBIS SENNAE (Linné)

Plate 10, *c*

Range.—Throughout the State.

Variation.—According to F. Martin Brown the form *eubule*, with the under side of the hind wings and the apical portion of the fore

wings rather deep yellow, contrasting with the lighter greenish yellow of the inner portion of the under side of the fore wings, and the under side of the hind wings sparsely spotted, appears in the southern States in spring and autumn. It ranges as far north as the Coastal Plain of Virginia, where it occurs in autumn (specimen in the U. S. National Museum from Suffolk, October 2, 1937) together with the following form. The form *drya*, uniformly slightly greenish yellow with the under side of the hind wings immaculate or nearly so, occurs throughout the range of the local subspecies and is by far the commoner form in Virginia, ranging throughout the State. Farther south, according to Mr. Brown, it appears in autumn.

Occurrence.—A summer visitor, appearing usually after the middle of June, occasionally late in May, rarely late in April, on the outer Coastal Plain, and moving up the shores of Chesapeake Bay to the Northern Neck and inland as far as Richmond. On the Eastern Shore it appears first on the western coast, passing across the northern part of Accomack County to Chincoteague Island. Soon afterward it appears in the southwestern portion of the State moving north-eastward, chiefly along the eastern side of the Blue Ridge, though also in the Shenandoah Valley. By early August it has usually become very common on the entire Coastal Plain and locally in the west, and has spread over most of the State, with local foci of abundance coinciding with centers of abundance of its chief local food plant (*Cassia chamaecrista*). In September it is usually abundant all over the Coastal Plain, common in nearly all sections of the west, reaching even the mountain tops, and frequent everywhere else except in the extreme north, where it is usually more or less casual.

This butterfly is irregular in its occurrence. In some years (as in 1939) it may cross the border into the south-central part of the State as early as the last week in April. In other years (as in 1940) it may be almost wholly absent, represented only by a few individuals on the outer Coastal Plain and in the extreme southwest. In still other years (as in 1941) it is everywhere common to abundant.

A single record from the Dismal Swamp near Suffolk on April 1, 1938, and a female captured at Rocky Run, Fairfax County, May 19, 1935, suggest that this butterfly occasionally overwinters in Virginia.

Migratory flights in Virginia.—Although we have kept a special watch for migratory flights of this butterfly in Virginia, very few such flights have been noticed. This species is often exceedingly common on the Coastal Plain and abundant wherever the food plant

grows, but the individuals dash about irregularly over the fields in any direction. The spread of the butterfly over the State each year follows a definite pattern, but this may be due to the distribution of the food plant on the Coastal Plain and along the western mountains rather than to a directional migration on the part of the butterfly.

During the course of a drive from Richmond to Burkeville, Notoway County, on September 24, 1933, we noticed many individuals of this species all flying toward the southeast across the road. They flew as widely separated individuals, far apart, but all in the same direction.

At Greenville and Lyndhurst, Augusta County, on August 10, 1937, and at Lovingston, Nelson County, 2 days later, occasional individuals were observed flying toward the northeast. Although the individuals seen were few, all seen were traveling in the same direction. At Roseland and Massies Mills, Nelson County, on August 12, 1937, the food plant (*Cassia chamaecrista*) was extraordinarily abundant, some old fields being completely filled with it. Here the butterflies were very common. Most of the individuals seen were flying irregularly about the weedy fields, but some were observed in traveling flight toward the northeast. This region would seem to be an excellent relay point in the seasonal extension of the range toward the northeast.

At the Agricultural Station north of Alexandria on September 12, 1937, occasional individuals were seen traveling with great speed in direct flight toward the southeast.

At Hanover Court House, Hanover County, on August 31, 1935, and again on September 23, 1937, a few individuals were seen flying directly toward the east.

These few directional flights that we have observed in Virginia were in no sense mass migrations. The individuals were in all cases widely separated and seldom in sight of each other. The maintenance of the same direction by each individual as it came in sight was, however, striking and significant.

Seasons.—Two broods. Our records indicate an early-spring brood reaching a peak in the latter half of April and disappearing toward the end of May. The individuals of this brood in Virginia are probably all immigrants from the south. In the last half of June the butterfly reappears and becomes increasingly common until the first half of September, after which the numbers fall off.

Genus **NATHALIS** Boisduval**NATHALIS IOLE** BoisduvalPlate 16, *g, h*

Range.—Recorded from Roanoke River, South Salem, Roanoke County, September 26, 1944; and from Katz Hill, Salem, on the same date (Dr. Carl W. Gottschalk). One of the specimens was presented by Dr. Gottschalk to the United States National Museum.

Occurrence.—A rare casual; Dr. Gottschalk wrote that the specimen from Katz Hill was perfect, and he was sure it had not flown for but a day or so, and that it must have come from a larva hatched out in Salem.

Genus **EUREMA** Hübner**EUREMA NICIPPE** (Cramer)Plate 2, *e*

Range.—Throughout the State, but in the mountainous regions living only in the valleys along the larger streams.

Variation.—The males of this species are occasionally clear brilliant yellow instead of orange. We have seen none of these, in Virginia, but the Schönborn collection in the United States National Museum contains two fine specimens from the District of Columbia. The females are sometimes very light yellow, rarely white. In the females the dark border of the wings may be broad and complete, or it may not extend below vein 2 on the fore wings, or beyond vein 2 on the hind wings; commonly the ground color of the fore wings extends to the outer margin between veins 1 and 2.

As in many other species of this group, the fore wings, more rarely both fore and hind wings, may be more or less heavily suffused with black scales.

The under side of the hind wings varies greatly in the extent of the dark markings, which in extreme cases may occupy most of the central portion; it is sometimes strongly suffused with pink.

Occurrence.—Found in open country, usually near woods, especially in broad river bottoms, along the sides of streams bordered with more or less level ground, and near ponds; regularly present and locally frequent or common in the southwestern portion of the State, in the Shenandoah Valley, and along the eastern side of the Blue Ridge, as far northeast as Augusta and Madison Counties; also regularly present, though less numerous, on the Coastal Plain (except the Eastern Shore) and on the Chain Bridge flats along the Potomac River opposite Arlington County; elsewhere of irregular or more

or less casual occurrence, though in some years (as in 1941) frequent to common everywhere. Except in the western valleys, on the Coastal Plain, and on the Chain Bridge flats this butterfly seldom survives the winter in this region.

Seasons.—From three to six broods, depending upon local conditions. The nicippe appears on the outer Coastal Plain at the end of March, later elsewhere, and flies into early October or later, fresh individuals emerging after a few warm days up to at least the middle of December. The number of broods during the summer varies from three to six and probably is usually four or five. In hot weather in regions where the food plant is abundant the entire life cycle occupies less than a month.

Dr. Warren H. Wagner, Jr., has a male taken March 21, 1938, in downtown Washington, and a female taken April 27, 1935, at Cabin John, Md.

EUREMA LISA (Boisduval and LeConte)

Plate 9, *h*

Range.—Throughout the State.

Variation.—Most individuals have the fore wings 15 to 18 mm. long, but in some they reach 20 mm. In the males the ground color of the upper surface is usually light clear yellow, rarely deep yellow, or with a dull orange tinge. In some individuals the dark borders, especially on the hind wings, are considerably broadened, while in others they may be narrowed as in the West Indian and Central American *E. euterpe*. Occasionally the dark border on the hind wings is reduced to a small dark patch at the outer angle followed by a thin marginal line (form *clappi* Maynard), such individuals more or less resembling females except for the brighter color. Rarely the fore wings are more or less heavily dusted with black scales.

The females are almost always paler than the males, not infrequently cream white, much more rarely chalky white (form *alba* Strecker). Of this last, pure white, variety we have seen only one from Virginia, captured by Dr. Warren H. Wagner, Jr., in Westmoreland County.

Occurrence.—Found in open fields and along roadsides, sometimes entering open woods; in the last half of the summer usually common to abundant everywhere, though in some years (as in 1940) local and not common.

So far as we have been able to determine, this little butterfly, although it overwinters locally far to the northward, is only a summer visitor to Virginia, coming in each year from farther south. Our

earliest record is for an individual taken near Fredericksburg on May 29. After the middle of June we have found it fairly common on the eastern Coastal Plain, along the shores of Chesapeake Bay, on the Northern Neck, and casually as far north as Prince William and Fairfax Counties, but we have no June records from elsewhere in the State. By the end of July it has penetrated in greater or lesser numbers to every portion of the State, and in August and later it is usually one of the commonest butterflies everywhere, reaching even the high mountain pastures. In some years, however, it is absent from the greater part of the State, occurring in small numbers only on the Coastal Plain and in the southwest.

Seasons.—Usually four broods. The *lisa* appears toward the end of May and flies until about the middle of June. It reappears in the last week in June and from that time onward flies continuously in increasing numbers until the end of the season, usually the first week in October, but in some years as late as about the middle of November. The butterflies found late in May and early in June are individuals that have strayed from farther south, or the young of such individuals. The second brood begins to appear usually toward the end of June, the third after the middle of July, and the fourth in August. The fresh individuals on the wing at the end of the season may be in part representatives of a fifth brood. So far as is known, this common little butterfly does not survive the winter in Virginia.

EUREMA JUCUNDA (Boisduval and LeConte)

Plate 16, *i, j*

Range.—Recorded only from the southern portion of the State, in Roanoke, Giles, Bedford, Rockbridge, Prince Edward, Henrico, and Prince George Counties. Most of the records are from Roanoke County.

Variation.—All the specimens from Virginia are typical *jucunda*, with the under side of the hind wings pure white.

Occurrence.—This species is for the most part an irregular visitor to Virginia, appearing from time to time in various localities east of the mountains, occasionally in considerable numbers. All but two of the records are dated after the first week in July, which would indicate a summer visitor. Unfortunately the single spring individual is not available for study. It was seen by the late Prof. Ellison A. Smyth, Jr., who wrote us under date of June 26, 1937: "Two or three springs ago I saw a *jucunda* flying down the hillside about 100 yards from my house, here near Salem. I ran back to

the house for my net, but could not again locate it when I returned. The black border on rear of fore wings, and the white under surface of hind wings were very much in evidence, however, and it was beyond question *jucunda*."

It is possible that this species is established in this section of the State, though the number of records from Roanoke County may be due simply to the fact that the records from this area are more complete than from any other.

In Virginia this butterfly has been found only in open country.

Seasons.—There would appear to be four broods in Virginia, one in spring, the second in June and early July, the third in the last week in July extending into early August, and the fourth late in August and September.

Family PAPILIONIDAE

Subfamily PAPILIONINAE

Genus *BATTUS* Scopoli

BATTUS PHILENOR (Linné)

Plate 19, *a, b, c, d*

Range.—Throughout the State.

Variation.—Lord Rothschild and Dr. Karl Jordan have pointed out that individuals of the blue swallowtail from the Atlantic States generally have a more elongate hind wing than the majority of southern and western specimens; the submarginal spots of both wings are often smaller, the spots on the upper side of the fore wings are more often absent or vestigial in the males, and the outer margin of this wing is rather more concave; the metallic distal area of the under side of the hind wings is less often green, and the body is rarely so shaggy as in some western specimens. But they remark that these distinctions are by no means reliable, the species being apparently in a process of separating into an Atlantic, a southern, and a Pacific coast form.

Early-spring individuals in Virginia (pl. 19, *d*) are small, with the fore wing about 40 mm. long. In contrast to the other local swallowtails, except *G. marcellus*, both sexes appear at the same time and are of the same size. The hair on the body is very long, and there is a tuft of long hair on the frons. The fore wings are less pointed than those of summer individuals, and the outer border is straight, while the hind wings are more rounded and the tails are relatively shorter. The whitish spots on the wings are enlarged, these in spring males resembling those in summer females, and the color

is dull, the males being scarcely brighter than the brightest summer females.

These early-spring individuals approach some varieties of the form from northern California known as *hirsuta* Skinner and possibly might be referred to it. This is another example of a form representing a geographical race in one area, but only a seasonal variant in another.

Together with the *hirsuta*-like form there occurs sporadically in northern Virginia another small form of the same size with the tails reduced to mere vestiges, the white spots much larger, and the metallic distal area of the under side of the hind wing more or less reduced in width, its inner edge, and the white discal dots, being more or less distant from the cell. In Virginia this form seems to appear only when the butterfly emerges in warm weather immediately following prolonged and severe cold. We know it in Virginia only from Leesburg. This is almost, perhaps quite, identical with the form *acauda* Oberthür, which appears as a mutant in various places under certain conditions. It is recorded from Yucatán and Guadalajara, México; New Mexico; the Mesa Verde National Park, Colo.; northern Virginia; near College Park, Md.; and Brooklyn, N. Y.

Late-spring individuals, as in the case of the yellow (*Papilio glaucus*) and the zebra (*Graphium marcellus*) swallowtails, approach more and more closely the summer form. As with *P. glaucus*, the fully developed early-spring form does not appear after mild winters, the earliest individuals to emerge under these conditions being of the late-spring form. Also as in *P. glaucus*, the early-spring form seems not to occur on the eastern Coastal Plain.

In summer individuals from Virginia (pl. 19, *a-c*) the fore wings are 50–55 mm. long in the males, and 50–60 mm. in the females.

Occurrence.—Found in open places in woods, in open country near woods, and in the farming districts wherever the Dutchman's-pipe (*Aristolochia macrophylla*) is grown as an ornamental; very common throughout the higher country, particularly in the mountains, less common and more local on the lower Piedmont, infrequent on the Coastal Plain, and generally rare or local on the Eastern Shore.

Seasons.—Two broods and a partial third. The blue swallowtail appears shortly after the middle of April and continues on the wing through May and into early June. Shortly before the middle of June the first individuals of the second brood appear, and the butterflies gradually increase in numbers. The individuals of this brood continue to emerge through July and August and into September. In September they are joined by more or fewer individuals of a third

brood that fly until the end of the season, usually early in October, though sometimes as late as near the middle of November.

Genus **PAPILIO** Linné

PAPILIO CRESFONTES Cramer

Plate 19, *e*

Range.—Throughout the State.

Variation.—The giant swallowtail is subject to considerable variation in size and in the extent of the yellow markings on the upper surface, particularly the width of the median band on the fore wings and the band across the base of the hind wings. These variations appear to be individual and to have no demonstrable relation to locality and but little to season. Spring individuals as a rule are somewhat smaller than those flying in summer, spring males having the fore wings 55–60 mm. long. But one of the largest individuals we have seen was a female taken on May 29, 1939, near Bloomery, W. Va., about a mile and a half west of the Frederick County line. The largest specimen we have seen is in the Schönborn collection in the United States National Museum and was taken in southern Maryland; it is a female with the fore wings 73 mm. in length.

Occurrence.—Found in open country with scattered trees, particularly about farmhouses, in brushy land, in open deciduous or pine woods, and commonly seen in gardens. It is fairly common, sometimes quite common, in the extreme southeastern portion of the State, particularly on Knotts Island, and is regularly present, though not in large numbers, northward along the outer Coastal Plain as far as Gloucester County, and on the Eastern Shore (Northampton and Accomack Counties). It also appears to be regularly present, though not very common, in a few localities in the west and north, as about Narrows in Giles County, between Front Royal and Limeton in Warren County, and at Great Falls in Fairfax County. Elsewhere it is of irregular or casual occurrence.

Dr. Frank Morton Jones writes us that this species breeds regularly on Chincoteague Island, Accomack County, on *Zanthoxylum clavaherculis*. On August 27, 1891, he found larvae of various ages and pupae. Adults were feeding on the flowers of milkweed (*Asclepias*). On September 28, 1928, larvae collected here earlier in the month pupated.

The males of this species have the habit of frequenting definite flyways in open pine or deciduous woods. These flyways are near and parallel to water and may be a mile or more long, but are nar-

row, perhaps a hundred feet in width. Here the males fly back and forth 5 to 8 feet above the ground. We have noticed such flyways at Kiptopeake in Northampton County and along the cliffs forming the east bank of the Shenandoah at Limeton in Warren County. Dr. Warren H. Wagner, Jr., reported one near Lynnhaven in Princess Anne County, and on July 17, 1947, David Shappirio found this butterfly common along the south bank of the Potomac at Great Falls, Fairfax County. Many years ago a flyway was reported on the Maryland side of the river at Great Falls.

Seasons.—Two broods. The giant swallowtail appears just before the middle of May and flies through June and into early July. The second brood appears after the middle of July and flies until the end of the season, usually about the end of the first week in September, though sometimes until the end of the month.

PAPILIO PALAMEDES Drury

Plate 22, *c, d*

Range.—Swamps of Princess Anne, Norfolk, Nansemond, Isle of Wight, Gloucester, King William, and Northampton Counties; accidental in Fauquier County and the District of Columbia.

Variation.—Individuals from Virginia are usually somewhat smaller than those from farther south, with the fore wings 50–53 mm. long, those from South Carolina and Florida having the fore wings usually about 60 mm. long. Late in summer, however, large individuals become rather common in the Dismal Swamp, where we have taken several with the fore wings 59 mm. long. In Virginia individuals of the spring brood average smaller than those of the summer brood. In Virginia, also, the butterflies on the wing at any one time are of fairly uniform size. Farther south the variation in size is greater, small individuals resembling in size those found in Virginia flying with the larger ones. There appears to be no constant local difference in color.

When freshly emerged this species is deep sooty black with brilliantly contrasting cream-colored markings, but the black soon fades to brown and the light markings darken. Most museum specimens give a poor idea of this handsome swallowtail in life.

Occurrence.—Confined to the great swamps and wet woods of the Coastal Plain and their immediate vicinity, but usually abundant in the restricted areas in which it is found.

Seasons.—Two broods. This species appears in the last half of May and by the end of the month has become common. By the

middle of June the individuals are all more or less worn and faded, and at the end of the month few are to be seen. The earliest individuals of the second brood are on the wing shortly after the middle of July, and the butterfly soon becomes abundant. Toward the end of August the individuals become worn, though a few, in exceptional years many, fresh ones are still in evidence, and after early September they decrease in numbers, disappearing at the end of the month or early in October.

PAPILIO TROILUS Linné

Plate 22, *a, b*

Range.—Throughout the State.

Variation.—In southern Florida and as far north as eastern South Carolina and west to Houston, Tex., a form of this butterfly occurs in which the submarginal spots of both wings are much enlarged and light-colored, and on the under side there is frequently a narrow yellow band on the hind wings corresponding to the yellow band in *Papilio palamedes*, sometimes also a subbasal band on the fore wings, and a streak behind vein SM₂.

This is the prevailing form in southern Florida, but the typical form, with which it intergrades, occurs everywhere with it. Northward from South Carolina and the Gulf coast this form (*ilioneus* J. E. Smith) departs less and less widely from the usual form, and becomes less and less frequent. In coastal and also in southwestern Virginia in summer and early autumn individuals are occasionally found that resemble the less extreme examples of *ilioneus* from Florida. One of the most striking of these was captured at Cabin John, Md., and another almost as extreme in Augusta County. The enlarged light submarginal spots render these individuals conspicuously different from the usual form when in flight. Farther north the difference between this and the usual form becomes less and less marked until in eastern Massachusetts it is represented by individuals with the submarginal spots only slightly enlarged, those on the hind wing having more or less extensive light centers; the yellow stripe on the under side of the hind wings is very rare, though it does occur.

The form *ilioneus* has been commonly treated as a subspecies. But it occurs throughout the range of the species, at least in the east, differing widely from the typical form in Florida, but northward departing less and less from it so that in the northern portion of the range the two are scarcely to be distinguished. In this it agrees with the brown males of *Papilio glaucus*, which, scarcely differing from

the usual males in Massachusetts, where they are usually overlooked, reach an extreme development in Florida.

In the males the broad band across the hind wings may be yellow-green or blue-green or, much more rarely, a delicate grayish blue. The submarginal lunules on the hind wings are usually pale yellow-green or blue-green, often more or less extensively yellow in the center, rarely entirely yellow like those on the fore wings.

The normally orange spot on the anterior border of the hind wings is occasionally green, like the submarginal lunules. Rarely it is followed by from one to three progressively smaller spots in the interspaces below, these additional spots being situated over the corresponding spots on the under side of the wing.

Early-spring individuals are small with the fore wings 42-45 mm. long; the body is hairy and there is a tuft of long hair on the front of the head, and the submarginal spots are somewhat enlarged. They resemble individuals from the northern border of the range. These small individuals are soon joined by larger ones of intermediate character. In summer individuals the fore wings are usually 50-55 mm. long.

Occurrence.—Found in open woods and swamps, in scrubby land with sassafras, in fields more or less near woods, and in gardens; generally distributed, and everywhere common to abundant; except on the Eastern Shore and the Northern Neck, and in the coastal swamps, this in the summer is usually the commonest swallowtail. In spring it is outnumbered by the yellow swallowtail (*Papilio glaucus*), but with the yellow swallowtail the summer brood is only partial, many of the pupae that might be expected to give forth adults in the summer remaining dormant until the following spring, which is not the case, or at least does not occur to anything like the same extent, with *P. troilus*.

Seasons.—Two broods, with a partial third. The males of the spicebush swallowtail appear usually just after the middle of April, occasionally earlier, sometimes as early as the first of the month on the Coastal Plain, and the females appear about a week later. The individuals increase in numbers, and the butterfly becomes common after the middle of May. It flies until late September or even well into October, occasionally until almost the middle of November. The second brood puts in its appearance about the middle of June, increasing in numbers through July; the period of greatest abundance is in August and early September. Fresh individuals found from late September until the end of the season, usually few in numbers though numerous in some years, are undoubtedly of the third generation.

PAPILIO GLAUCUS Linné

Plates 19, *f*; 20; 21

Range.—Throughout the State.

Variation.—The yellow swallowtail is the most widely distributed and over the greater part of its range the commonest of the swallowtails, at least in spring. The western race (*rutulus*) shows surprisingly little variation throughout its range, but in the north and east this is one of the most variable of all our butterflies, and certainly the most variable of the American swallowtails.

This variation, which is much more marked in the females than in the males, is correlated in part with locality. Far northern individuals (pls. 20, *a, b*; 21, *a-c*) and the earliest individuals of the spring brood farther south are much smaller than southern summer and extreme southern individuals, and they also differ in color pattern, especially the females. In the north this variation is correlated in part with local differences in humidity and other factors. In sub-Arctic regions where it becomes more or less localized this butterfly tends to vary from place to place, and to occur in a great number of usually slightly different local forms somewhat after the fashion of the species of *Boloria*, *Oeneis*, and *Erebia* living in the same region. In the central eastern portion of the range, from southern New England to North Carolina, the variation, other than seasonal, is for the most part purely individual, several more or less widely different forms occurring together.

Except in the matter of size there is little definite correlation between any of the several forms and locality. All far-northern individuals are small, but the earliest spring individuals from as far south as the mountains of North Carolina may be equally small and similar in wing shape and color pattern, though here the later spring and summer individuals are large. Furthermore, small northern individuals may be of a type chiefly confined to the north, or they may be dwarf representatives of a southern form. There are therefore no grounds for a further subdivision of the species in this region, though its great variability, partially correlated with locality, should be recognized.

In the extreme northern portion of the range the fore wings in both sexes measure from 40 to 45 mm. in length. In males from Florida the fore wings measure about 65 mm. in length, and in Florida females the fore wings measure up to 76 mm., these females being very nearly twice as large as the smaller northern females.

In the East the yellow swallowtail occurs in two widely different

forms between which every conceivable intergrade occurs. One of these forms is most highly developed along the southern border of the range. In this form the male is always yellow (pl. 20, *d*), varying from light clear yellow to a fairly deep yellow-brown, and the female is usually blackish brown (pl. 19, *f*), if yellow (pl. 20, *g*) having a great amount of blue on the dark border of the hind wings. In this form sexual diversity reaches the maximum, whether the females are blackish or yellow. The caterpillars usually live high in the trees, preferring especially different species of ash (*Fraxinus*), magnolia (*Magnolia*), and the tuliptree (*Liriodendron*), though feeding also on many other plants, including the introduced camphor (*Cinnamomum camphora*).

The other form is most highly developed in New England, northern New York, and the adjacent parts of Quebec and New Brunswick. In this form the male and female are alike in size, wing shape, color, and color pattern (pl. 20, *c, e, f*). The caterpillars feed mainly on the leaves of bushes and of the lower limbs of trees, preferring wild cherry, birch, and poplar, though also feeding on many other kinds of plants.

The males of the second form differ from the males of the first in having the fore wings somewhat more pointed, the hind wings narrower and usually more strongly scalloped, the tails more slender, the black markings, especially the black outer border of the hind wings, narrower and more sharply defined, and the black abdominal border of the hind wings usually much broadened. On the under side the submarginal spots on the fore wings are usually coalesced into a tapering light band, and on the hind wings the dark border is very narrow and is heavily washed with light scaling, and the included submarginal lunules are large and less strongly curved than in the first form, with a large central orange patch, or in extreme cases wholly orange.

This form shows a decided approach to the western *rutulus* in the usual occurrence of a broad submarginal band instead of a row of spots on the under side of the fore wings, in the occasional narrowing of the submarginal spots on the fore wings above, in the straightening of the lunules, which are sometimes narrowed, on the hind wings, in the occasional obsolescence or even in extreme cases the complete disappearance of the orange spot at the anterior angle of the hind wings, and occasionally in the great reduction of the light center of the subapical comma-shaped mark on the fore wings below. The similarity of the sexes, and the similarity of the food plants and habits

of the caterpillars, increase its resemblance to *rutulus*, with which it has often been confused.

In the extreme south the females are mostly blackish brown (pl. 19, *f*), but not very far to the northward yellow females (pl. 20, *g*) become frequent. These gradually increase in relative abundance, though in most of Virginia, West Virginia, Kentucky, southern Illinois, and central Nebraska dark females are still more numerous than yellow ones. North of this line dark females rather rapidly become less common than yellow ones, then merely occasional, and in the vicinity of New York City, Buffalo, northern Ohio, southern Wisconsin, central Iowa, and South Dakota they are rare. As very rare casuals dark females are known from Newfoundland (pl. 21, *c*) and southern Alberta, and even from the Upper Liard River in British Columbia. In southern Florida the females are always yellow.

In the extreme south the yellow females, as far as we have seen, are all of a single type, but farther northward, as the proportion of yellow to dark females increases, the yellow females—and to a certain extent the dark females also—become diversified, appearing in a number of more or less distinct types differing in wing shape, in color, and in color pattern. Some of these types are well marked and fairly stable, while others are simply inconstant intergrades. Some are common, while others are rare, or even very rare. Some are generally distributed, and others are known from a restricted area only. These different female types seem to be most numerous and most diversified within the zone wherein dark and yellow females are about equal in numbers, or at least the former are common, but some are to be found north of this zone wherever dark females occur, and one is almost exclusively confined to the area wherein dark females are never found.

Within the zone in which the dark females are rare—that is, from central New York to northern Ohio, southern Illinois, southern Wisconsin, central Iowa and South Dakota—the size of the individuals is considerably less than it is in the region where dark females are abundant, though large individuals, especially females, are not infrequent in the second brood.

North of this zone the size of the individuals rather rapidly decreases with latitude, and also with altitude. From Alaska to Newfoundland throughout the whole of Canada, except in southern British Columbia and Ontario, and southward into the mountains of Montana, central New York, and New Hampshire, the great majority of the individuals have the fore wings between 40 and 45 mm. in length, while even smaller ones are not infrequent.

In addition to decreasing in size, the butterfly here exhibits another peculiarity—a greater or less proportion of the females tend to resemble the males in wing shape and in color pattern. This assumption by the female of the male wing shape and color shows curious geographical irregularities. There is the least difference between the sexes in New England (pl. 20, *c, e, f*) except in the southern and southeastern portions, and in central and northern New York, where the great majority of the females, at least in the spring brood, are practically indistinguishable from the males. Within this area the size varies from large in southern New England (pl. 20, *e, f*) to very small in the White Mountains of New Hampshire, but it is everywhere less than the size farther south, and usually much less. As the form with the sexes alike is especially characteristic of, and most highly developed in, New England it will be referred to as the New England form.

In Newfoundland the individuals are always small (pls. 20, *a, b*; 21, *a-c*). In the collections we have examined from that island some females are almost identical with the males in coloration, though the black markings are usually somewhat broader and less sharply defined. In both sexes the submarginal spots on the under side of the fore wings are usually coalesced into a tapering band, and the dark border of the hind wings beneath is as narrow as in individuals from New England. Other specimens, however, are quite different, the males having the submarginal spots on the under side of the fore wings more or less completely separated from each other (pl. 20, *b*) and the dark border of the hind wings on both surfaces as broad as in perhaps the majority of the males from Virginia. With these males fly females which are very different from the males and, except for being always of small size, are similar to corresponding females from southern Maryland. Though they are very rare, black females of this type occur (pl. 21, *c*).

Thus in Newfoundland a close approximation to the New England type is shown by certain individuals of both sexes, but the butterfly is chiefly represented by individuals which, though dwarfs and usually somewhat dusky, are obviously of the type found in Maryland and Virginia, like that type having an alternative black female, and quite different from the New England form in which black females are never found. This southern form just reaches southern New England, and there are a few records of black females from southern Connecticut. It is somewhat surprising to see it reappear far to the northeast in Newfoundland where it is presumably a local development from endemic stock of the New England type. In both sexes

complete intergradation between these two types occurs in Newfoundland, just as it occurs in the corresponding, but much larger, individuals in southern New England and in New York.

Practically all the specimens from Newfoundland that we have been able to examine have been without definite locality. It is probable that in portions of the island the New England form prevails, or at least is common, while in other portions the dwarf representative of the southern type more or less completely replaces it. In a single small bog in Essex, Mass., on Cape Ann, we have taken during the course of a week late in July large and small females indistinguishable from males, very large deep-yellow females with a large amount of blue in the dark border of the hind wings, and every possible intergrade between the two forms. But just west of Boston, about 30 miles away, we have never found any but malelike females.

Only two individuals from the Hudson Bay region have been available for study. A female from Kettle Rapids on the Nelson River is quite like many females from New England. The fore wings are 50 mm. in length. The hind wings above show only a trace of blue—no more than in some New England males—in the dark border. A male from the Piquitenay River on the Hudson Bay Railway has the fore wing 44 mm. long and resembles New England males.

Specimens from southern Ontario resemble others from southern New York, but are smaller.

In western Ontario, northern Saskatchewan, and along the Athabasca River in northern Alberta both sexes are of the New England type with the females showing relatively little variation. The dark border of the hind wings is often narrower than in the New England form, and on the under side more strongly suffused with light scales, with the included submarginal lunules commonly narrower and more straightened and bandlike, while the submarginal spots on the fore wings above may be narrowly linear.

Farther to the northwest in the region of Great Slave Lake in Mackenzie, the females again become variable and may be duller than the males with broader and less sharply defined black markings, and a considerable amount of blue on the black outer margin of the hind wings above. But the wing shape is only slightly different from that of the males, more or less suggesting, though by no means closely approaching, the wing shape of the more extreme females from Newfoundland, and the dark border of the hind wings is less broadened than in the latter. The submarginal lunules on the hind wings are straightened and bandlike, and the submarginal spots on the fore wings are narrowly linear.

Still farther to the northwest, in eastern and central Alaska, the females again become very similar to the males in wing shape and in color, usually having no more blue on the hind wings above than the males, and never having much more. In this region the females are more uniformly like the males than they are anywhere else except in New England. In both sexes the dark border of the hind wings is commonly narrower than it is in individuals from any other region, though it is not much narrower than in some from the Athabasca River and in many from New England, and the amount of yellow scaling on the black and of black scaling on the yellow just above the orange anal spot is reduced to a minimum as in the more extreme New England specimens. On the under side of the fore wings the light tapering marginal band outwardly narrowly edged with black is usually about as broad as the dark band along its inner border, but it may be somewhat narrower, and in extreme specimens is broader. The comma-shaped subcostal mark in the apical portion of the fore wing is usually the same as in individuals from other regions, but it may be more extensively black, and even entirely black with merely a sprinkling of light scales near the outer border and along the middle of its extension toward the apex of the wing. On the hind wings beneath, the submarginal lunules are very large and much straightened, forming broad slightly curved bands which usually nearly touch each other and are never more than slightly separated. Although in many specimens the orange spot is no larger than in many, or perhaps most, specimens from New England, in those with the dark border most reduced in width the orange centers are much broadened, the lunules being wholly orange except for a narrow edging of yellow at the two ends. The spot in the uppermost interspace on the hind wings is often, though not invariably, reduced to a narrow straight line as is frequently the case in New England and often in north-central Canada, or it may be obsolescent. But if present it is always orange, or at least mostly orange. The dark border of the hind wings below is margined interiorly by black lines which are often broader than in specimens from elsewhere, except British Columbia, though usually they are no broader than in examples from New England. The lines in the interspaces as far as the vein running to the tail meet end to end forming a straight line, as is commonly the case in New England specimens. Just beyond this black line there is a very heavy light-blue scaling. When the dark border is very narrow this blue scaling, which is about as broad as the black line separating it from the yellow of the wing, is separated from the lunules by a line of black plentifully sprinkled with blue scales nar-

rower than the blue scaling itself. Thus in specimens with the dark border of the hind wings very narrow the broad black regularly linear inner margin is followed by a line of bright blue, slightly or vaguely interrupted at the veins, of about its own width or somewhat broader, which is separated from the large and mostly orange lunules in each interspace by a narrower line of black mixed with lighter. In many Alaskan specimens, however, the dark border of the hind wings beneath does not differ from that in New England examples.

Mr. Scudder long ago wrote that specimens from Alaska agree in coloration and markings with New England specimens in every particular, although they are slightly smaller than White Mountain specimens, and these are generally smaller than the average of specimens from other parts of New England, and are apt to be duskier. This statement is perfectly true for a large proportion of Alaskan individuals, but extreme Alaskan specimens cannot be matched by any specimens from elsewhere.

Certain specimens from Alaska are worthy of special mention. In one from the Yukon River the black borders on both wings are unusually narrow. In another from Chatanika, Alaska, the submarginal lunules on the hind wings are rather narrowly linear instead of broad as usual, and the subcostal comma-shaped mark on the under side of the fore wings near the apex is almost entirely black, the resemblance to the subspecies *rutulus* being very close. But the first submarginal spot on the upper side of the hind wings is orange. We have seen a similar specimen from Fairbanks. Another from the Yukon and one from the Porcupine River show a rather close approach to *rutulus*. In the revised edition of "The Butterfly Book" Dr. W. J. Holland figured a female from Alaska with the wing shape of a male but slightly duller and with conspicuous blue spots somewhat smaller than the very large lunules in each interspace in the very narrow black border of the hind wings. He did not say where this specimen came from, and we have seen none like it from central or eastern Alaska. In the first edition of "The Butterfly Book" he said that he had numerous specimens from Sitka in southeastern Alaska, so that this female is probably from that region.

In males at hand from Arrowhead Lake, British Columbia, the ground color is rather darker than usual, and the black border of both fore and hind wings is broad. The inner margin of the dark border of the hind wings beneath is broadly black, and the black abdominal border, almost always broader in northern than in southern individuals, is unusually heavy. There is a submarginal light band on the fore wings beneath. No females are available from this locality.

Speaking generally, the small northern males of *glaucus* on the whole resemble males from New England very closely, except only in size. In some regions, as in the White Mountains of New Hampshire and in Newfoundland, the black markings are often somewhat broadened and have ill-defined borders; in others, as in British Columbia, they may be unusually heavy; and in still others they may be prevailingly narrow and sharply defined, standing out clearly against the light-yellow ground color, as in central and eastern Alaska, the Athabaska River region, and most of New England and New York. On the fore wings the submarginal spots are almost always somewhat narrowed, and in many specimens from central Canada and Alaska they are narrowly linear; in most specimens from Newfoundland, however, they are scarcely narrower than in others from the south, and not so narrow as in many from New England. On the under side the fore wing shows a tapering marginal light band outwardly edged with black; but in Newfoundland, in southern Ontario, and in the southern portion of western Canada this band may be more or less completely broken up into large spots. Inwardly this band is bordered by a dark band as wide as, or slightly wider than, itself, though in Alaska occasionally distinctly narrower. The black band crossing the cell just beyond the middle is usually continued downward as a solid band, or at least a broad E-shaped mark, to vein 2 or slightly beyond, sometimes to vein 1; but frequently in Newfoundland and occasionally elsewhere the band ends at the lower border of the cell beyond which there are even less distinct traces of it than in many specimens from the south. The comma-shaped subcostal mark near the apex of the fore wings is sometimes reduced in size, and in specimens from Alaska it is occasionally wholly black above and almost wholly black beneath.

On the hind wings above, the dark border is usually only very slightly broader than the dark border of the fore wings. It is narrowest in specimens from Alaska and central Canada, while in many specimens from Newfoundland it is as broad as in the average southern individual. The uppermost submarginal spot is reduced in size and usually linear, most commonly orange or with an orange center, rarely entirely yellow or absent altogether. The submarginal lunules are always only slightly curved and are also of more or less uniform width so that they are short bands rather than lunules; in specimens from Alaska they are sometimes narrowly linear. The black abdominal border is usually very broad, occupying more than half the area between the edge of the wing and the cell and vein 2. In western specimens it commonly covers all, or nearly all, this area

and broadly overlaps the base of the cell itself, but in specimens from Newfoundland it is frequently so narrow as to occupy less than half the area, as in most southern specimens. On the under side the dark border is narrow, the width from the inner margin to the inner angle of the serrations, measured along the veins, being about the same as the width of the dark border of the fore wings in its widest part. In some Alaskan specimens it is even narrower, so narrow that the lower inner corner of the enlarged, broadly bandlike, and only slightly curved lunules as far as the vein running into the tail are separated from the blue bands bordering the black lines forming the inner margin of the dark border by a space less than the width of the black lines themselves. The black lines forming the inner margin of the dark border in each interspace are straight and, joined end to end, form a continuous line as far as the vein running into the tail; this line is usually rather broad and is especially broad in specimens from British Columbia and in some from Alaska. In certain specimens from Newfoundland the dark border of the hind wings beneath may be twice as broad as the dark border of the fore wings in its widest part, with the included lunules small and having pointed instead of truncate ends, and bordered interiorly in each interspace by curved instead of straight lines which are more or less discontinuous. Such specimens resemble those from Maryland and Virginia more closely, except in size, than they resemble others from New England and the north. In small northern males the much-broadened and bandlike lunules have a conspicuous orange spot in the center, and in many specimens from Alaska the lunules above the tail are wholly orange except for a narrow yellow margin at each end. Often in northern specimens the outer point of the lunule just below the tail is prolonged for some distance down the inner side of the latter.

The typical northern female exactly resembles the male in size, in wing shape, and in color, and this type of female occurs throughout New England and everywhere in Canada and in Alaska, in some regions predominating to the almost complete exclusion of any other type of female, and in others representing only a minority of the females present. The females are everywhere more variable than the males. The amount of variation in the females differs greatly in different regions. There seems to be least variation among females in New England, except along the southern and eastern coasts, and in eastern and central Alaska. In Newfoundland they vary to an extent greater than anywhere else north of southern New York. Exceedingly small females are of sporadic occurrence everywhere, but dwarfs are rare among the males.

On August 30, 1906, Lord Rothschild and Dr. Karl Jordan described *Papilio glaucus canadensis* from 80 males and 2 females, giving the range as Newfoundland, Anticosti, New Brunswick, Canada, the northern districts of British Columbia, and Alaska. The type locality is Newfoundland. The description covers both sexes. It was said to be a small form, but no measurements were given. On the upper side, according to the authors, the third band from the base of the fore wing reaches nearly always down to vein M_2 in the male and to SM_2 in the female. The marginal spots are thinner and longer than in *Papilio glaucus glaucus*. The black abdominal border of the hind wings is broader than the yellow interspace between it and the cell. On the under side of the fore wings the submarginal spots form a continuous band, only the last one or two spots being separated. The abdominal border of the hind wings is as broad as above. The submarginal spots on the whole are less curved than in *P. g. glaucus*, the blue spots are larger, and the black proximal borders to them are on the whole more straight.

This description fits perfectly well certain individuals of both sexes found from Newfoundland to central Alaska and southward into the mountains of Montana, New York, and New England. Although it applies to individuals of both sexes from Newfoundland, it describes Newfoundland specimens as a whole less accurately than it does specimens from any other northern region. On the basis of the differential characters given, many individuals of both sexes from Newfoundland would, except that they are small, be unhesitatingly assigned to *P. g. glaucus*. For instance, in some females from Newfoundland the marginal spots above are neither thinner nor longer than in *P. g. glaucus*; the black abdominal border of the hind wings is narrow; the submarginal spots on the under side of the fore wings are not united into a band; the submarginal lunules are not less curved than in *P. g. glaucus*; the blue spots are not larger; and the black inner border of the dark margin of the hind wings below is scarcely straighter. Some males depart quite as widely from the description.

The name *canadensis* as defined by Rothschild and Jordan does cover a subspecies in the sense of a definite geographical race. It covers a form highly characteristic of the north with which almost everywhere other dwarf forms coexist which, intergrading with it, depart more or less widely in the direction of *P. g. glaucus*. It is not in any way separable from the type characteristic of New England where, although in Massachusetts reaching a size approximately equal to that of *P. g. glaucus* from much farther south, it remains less

variable than in Newfoundland. It is only fair to Rothschild and Jordan to say that when they described *P. g. canadensis* they had only two females, and no specimens from New England at all.

In December 1906 Dr. Henry Skinner described *Papilio rutulus arcticus*. He said that this subspecies is smaller than *P. r. rutulus*, the distance from the center of the thorax to the tip of the fore wing being 43 mm. The orange spot at the anterior angle of the hind wings, generally absent in *rutulus*, is large and distinct. The marginal lunules of the hind wings are wider and not so elongate as in *rutulus*, and the blue bands on the hind wings below are narrower and more distinct. On the under side of the hind wings the marginal lunules are orange, and there is an orange wash running to the cell. This new form was described from six males and one female. Five males and the female were from Eagle City, Alaska, in the middle of the Alaska-Yukon border, taken between June 1 and 15, and one male was from the Athabasca River. Dr. Skinner indicated no differences between the sexes in this new form.

Dr. Skinner's *arcticus* is not a form of the western *rutulus* but, as was shown by Barnes and McDunnough in 1916, is a form of the eastern and northern *glaucus*. The name *arcticus* is applicable to the form represented by the small Alaskan specimens in which the width of the dark border of the hind wings below is reduced to a minimum, and the broadly bandlike slightly curved lunules are orange and are separated from the broadly black inner margin by conspicuous blue bands narrowly edged outwardly with blackish. As such individuals usually fly together with a greater or less number of others which are less extreme and do not differ from individuals found throughout the north and as far east as Newfoundland, the name *arcticus* cannot be considered as covering a true geographical race or subspecies any more than can *canadensis*. But just as the name *canadensis* is useful in designating the form of the species in which the sexes are alike, although it may occur with and grade imperceptibly into the southern form, so *arcticus* is useful in designating those individuals, confined to the Northwest, that represent the extreme development of the *canadensis* type.

In the light of a knowledge of the various forms in which *Papilio glaucus glaucus* occurs in different portions of its extensive range, the different forms which it assumes within a single limited area—the District of Columbia and adjacent Virginia—take on an increased interest.

This butterfly makes its first appearance in this region in late March or early April—usually in April. All the earliest individuals

are males. They are always small, with the fore wings from 42 to 45 mm. in length, and they keep almost entirely to the more or less open woods, coursing along in a fairly direct line 4 or 5 feet above ground, rarely rising higher, with a rather nervous flight.

These early males have the body clothed with long hair, and there is a conspicuous tuft of long hair on the front of the head. The shape of the wings is very characteristic. The fore wings have the angle between the costal margin (measured as a straight line from the base of the wing to the apex) and the inner margin more acute (47°) than it is in the summer form (53°), and the distal portion of the costal border is less strongly recurved. The apex of the wing is more pointed, and the straight or slightly convex outer margin (which is slightly concave in the summer form) makes a greater angle with the longitudinal axis of the body. The hind wings are distinctly subtriangular, the outer margin not being markedly convex as is usually the case in the summer form. The outer margin is deeply scalloped, and the tails are narrow with the outer half only slightly broadened. The lobe at the anal angle is small, but abruptly developed and conspicuous.

On the fore wings the dark margin is broadest at the apex and slowly decreases in width posteriorly. On the upper side the included yellow dashes are large. On the under side the spots corresponding to these dashes are fused into a yellowish-white band tapering posteriorly, only the lowest one or two spots being isolated. In the upper half of the wing the dark band bordering the light submarginal band interiorly is only slightly broader. The three bands crossing the cell are equally spaced, and the central one is as narrow as, or narrower than, the outer. The outermost band commonly includes an ill-defined light spot near the lower end, or near both ends. On the hind wings the black border is very narrow, scarcely broader than the border of the fore wings, the included lunules are large, and there is a minimum of light scaling on the black, and black scaling on the yellow, at its lower end. The uppermost submarginal spot is usually subcircular or oval, but it may be much narrowed or even linear; it is always orange, usually with a few yellow scales at the upper and lower ends, and often also along the outer margin. The lunule next below may have more or fewer scattered orange scales in the middle. The black abdominal border is usually about half as broad as the space between the edge of the wing and the cell and vein M_2 , but it may be much broader, and sometimes occupies nearly all this space. On the under side the black lines forming the inner margin of the dark border in each in-

terspace are straight and usually rather broad; they follow each other end to end, forming a continuous line as far as the vein running to the tail (R_3). Just beyond these black lines is a series of bright-blue metallic lines that are rather sharply set off from the very abundant olive-gray scaling that runs outward as far as the narrow black inner margin of the lunules. The lunules are very large and broad with broadly truncated ends—slightly curved broad bands rather than lunules—and the orange centers are broad and conspicuous, often occupying more than half the area of the lunules. The outer point of the lunule just below the tail is prolonged and more or less extended down the inner side of the latter.

These early-spring individuals from the District of Columbia and from adjacent Virginia, although very different from summer individuals from the same localities, do not differ appreciably from specimens taken in the far north on the Athabasca River and in Alaska. They are usually of the same size, with the fore wings measuring 42–45 mm. in length, and the shape and proportions of the wings are identical. On the fore wings the black bands may be slightly broader, especially that across the end of the cell, and the broad E-shaped mark beneath the middle band across the cell characteristic of northern examples, though in them of variable development, is as a rule only partially indicated, though occasionally strongly developed.

The points of agreement between the early-spring individuals from the District of Columbia and adjacent Virginia and individuals from Alaska involve the wing shape, all the major features of the color pattern, and the hairiness, while the points of difference have to do only with minor variations in the extent of the development of the black markings, which are more or less variable in all localities. Although there is an average difference in these black markings, this difference is slight, and in all their variations early-spring specimens from the District of Columbia and nearby Virginia may be matched with others from the far north.

Lord Rothschild and Dr. Jordan wrote that southern spring specimens of *Papilio glaucus glaucus* somewhat resemble the small northern form which they called *canadensis*, but are easily distinguishable by the much narrower black abdominal border of the hind wings. This supposed difference does not hold good. Although in some individuals this border is narrow, it is often very broad in early-spring specimens—indeed it is often quite as broad as in most Alaskan examples. Early-spring individuals from the District of Columbia and adjacent Virginia are very close to others from Alaska, and

some from the two regions are quite indistinguishable. In all there is a very broad overlapping in all their characters.

Early in spring in this region females are very rare. We have seen only a single specimen, which resembled the males. All individuals seen on the wing are yellow, so we have no evidence that dark females occur. Throughout the north wherever the form of the male corresponding to the early-spring form in this region is found the sexes are alike or nearly alike, and dark females do not occur. This is as true in New England as it is farther north and northwest. Dark females are, however, produced in New York west and south of New England, by the dwarf representative of the southern summer form northeast of New England in Newfoundland, and in the west as far north as northern British Columbia.

It is impossible to diagnose the dwarf northern representatives of *Papilio glaucus glaucus* in such a way as to exclude typical early-spring individuals from the District of Columbia and northern Virginia. If their origin were unknown such individuals would unhesitatingly be placed with others from the far north, especially with specimens from Alaska and from the region of the Athabasca River. Nomenclatorily they would unhesitatingly be referred to Skinner's *arcticus*, being more or less intermediate between *arcticus* and *canadensis*, though rather nearer the former.

Ten days or two weeks after the first appearance of this butterfly in the District of Columbia and northern Virginia it rather suddenly becomes much commoner. The individuals are noticeably larger, their flight is less hurried and more devious and often higher, and they are seen more often in the open, especially in gardens. These individuals are of a type which is not the same as that to which the individuals earlier on the wing belonged, nor do they resemble the summer individuals. Although as a whole the males form an unbroken series between the early and the typical form, the great majority are easily distinguishable from both.

The body is usually more or less conspicuously hairy. In wing form and in color pattern they resemble individuals from southern New England and New York and westward within the area in which the species is partially 2-brooded. Flying with the males there are two types of females, one yellow and one dark blackish brown.

These late-spring individuals are readily distinguished by the hairy body and the tuft of hair on the front of the head; the complete isolation of the submarginal yellow spots on the under side of the fore wings; the relatively large size of the yellow dashes on the upper surface of the fore wings corresponding to these spots, par-

ticularly noticeable in the black females; and the relative narrowness, as compared with the summer form, of the dark border on the under side of the hind wings, which is rather heavily suffused with light scales.

The dark females (pl. 21, *d*, *e*) are usually markedly smaller than the summer dark females, with larger, sometimes much larger, submarginal spots on the fore wings and lunules on the hind wings, the submarginal spots on the fore wings below rarely replaced by a tapering band, and with the marginal region of the hind wings beneath somewhat, occasionally considerably, narrower and more heavily washed with blue and olive-gray scales so as to appear noticeably lighter and inwardly delimited by a continuous series of curved black lines, one in each interspace. Except that they are somewhat larger, these late-spring females closely resemble a dark female at hand from Newfoundland.

Although as a rule spring and summer dark females are at a glance distinguishable from each other, complete intergradation occurs when the end of the spring brood overlaps the beginning of the summer brood. Furthermore, late in summer occasional dark females are sometimes found which, though usually large, resemble more or less closely the dark females of the late spring form. This form flies until the end of the spring brood.

The summer brood, developing from eggs laid by both spring forms, is composed of still larger individuals with the dark border of the hind wings broader and, on the under side where it is delimited internally by a scalloped line, darker; with the submarginal lunules on the hind wings and dashes on the fore wings much reduced in size; and with the dark border of the fore wings on the under side including a series of separate spots instead of a continuous light band as in the individuals found early in spring.

The males are rather variable and, taken collectively, form a continuous series from the late-spring type to a form with the dark border of the hind wings much broader. They also vary in color from a light to a darker and somewhat ochreous-yellow, though most of them are clear bright yellow. In most years there is an interval of a week or more between the disappearance of the last ragged individuals of the spring brood and the appearance of the first individuals of the summer brood. Occasionally, however, the two broods broadly overlap, and when this occurs there is perfect intergradation between the late-spring and the summer forms. But it is only in exceptional cases that these two forms in the District of Columbia and in northern Virginia cannot be at once distinguished by the rela-

tive hairiness, especially on the front of the head, and the relative size of the yellow dashes parallel to and near the outer border of the fore wings.

In the summer form there are seven or more different and fairly constant, though intergrading, types of females ranging in color from creamy white to sooty black and varying in the shape of the hind wings as well as in color.

The interrelationships of the three seasonal forms of the yellow swallowtail occurring in northern and western Virginia are shown in the following key.

KEY TO THE SEASONAL FORMS OF *PAPILIO GLAUCUS GLAUCUS* OCCURRING
IN VIRGINIA

- a*¹. Body conspicuously hairy; a conspicuous tuft of long hair on the frons; submarginal yellow dashes on upper side of fore wings thick and rather long; dark border of hind wings below narrow, interiorly delimited by a straight or approximately straight line and abundantly suffused with light scales.
- b*¹. Submarginal yellow spots on the fore wings below fused into a broad band that tapers posteriorly, only one or two of the lowest spots being isolated; submarginal lunules on the hind wings below much enlarged, with their ends broadly truncated; lunule at base of tail with the outer horn prolonged and running far down the inner side of the tail (flying in March and April).....*Early-spring form*
- b*². Submarginal yellow spots on the fore wings below all isolated; submarginal lunules on the hind wings below smaller, crescentic, with pointed or at least not truncated ends; lunule at base of tail with the outer horn not produced into the tail (flying from late April to the middle of June)*Late-spring form*
- a*². Body not conspicuously hairy, and hair on the frons not elongated; submarginal dashes on upper side of fore wings thin and short, widely separated; dark border of hind wings below broader, interiorly delimited by a strongly scalloped line, and only moderately sprinkled with light scales (flying from late June to October).....*Summer form*

Summing all this up, the eastern and northern yellow swallowtail (*Papilio glaucus glaucus*) is represented early in spring in the District of Columbia and in northern and western Virginia by far-northern forms (*arcticus* or *canadensis*, or intergrades between the two), or by a close approximation to them. These are soon joined by the form found in the northern portion of the United States, and not long afterward they disappear. As the spring advances the individuals become, on the average, more and more like those of the summer form, though seldom quite like them.

The spring brood disappears in June. Late in June or early in July the summer brood appears. Though variable, the individuals of

this brood are almost without exception easily distinguishable from those of the spring brood.

On the Coastal Plain and on the southern and eastern Piedmont of Virginia the earliest spring individuals, so far as we have seen, are larger and somewhat deeper yellow than those from farther north and west, though the color pattern is the same. These resemble others from New England, as those from the northern and western portions of the State resemble those from farther north.

But everywhere the facies of the early-spring individuals is dependent upon meteorological conditions at the time of its first appearance. The extreme development of the spring form, as in the case of *Battus philenor*, appears to occur if the weather is cold, rather suddenly becoming warm at the time of emergence. If it becomes gradually warm, with abundant moisture, the extreme spring form appears to be omitted.

In the summer form in Virginia the males have the fore wings 50 to 60 mm. in length, most of them having the fore wings about 55 mm. or slightly less. Summer females have the fore wings 55 to 69 mm. long, usually slightly less than 60 mm.; individuals with the fore wings more than 65 mm. long are uncommon.

The summer males are divisible into the usual clear light yellow males, which are by far the commonest; ochreous males, which are rather rare; and short-winged males in which the outer and lower margins of the fore wings are at right angles to each other and the hind wings are unusually broad. Farther south the color of the ochreous males deepens into yellow-brown, but such dark individuals are not recorded from north of South Carolina. The ochreous type of male occurs as far north at least as eastern Massachusetts, though here the difference between males of the ochreous and light clear yellow types is slight.

The females are highly variable; including the spring forms, 11 main color types may be distinguished, as shown in the following key:

KEY TO THE FORMS OF THE FEMALE OF *PAPILIO GLAUCUS GLAUCUS*
OCCURRING IN VIRGINIA

*a*¹. Predominantly yellow.

*b*¹. Under side of fore wings with a submarginal yellow or whitish band tapering to a point near the lower angle; little or no blue scaling in the dark border of the hind wings above (color pattern of the early-spring males) No. 1

*b*². Under side of fore wings with a submarginal row of spots; dark outer border of hind wings above with abundant blue scaling.

- c*¹. Hair on front of head long, forming a conspicuous tuft; submarginal yellow dashes on the black border of the fore wings above large; dark border of the under side of the hind wings narrow and heavily suffused with light scales (late spring).....No. 2
- c*². Hair on front of head short; submarginal yellow dashes in the black border of the fore wings above smaller and narrower; dark border on the under side of the hind wings wide and less heavily suffused with light scales (summer forms).
- d*¹. Yellow areas of the wings thickly and uniformly speckled with black scalesNo. 3
- d*². Yellow areas of the wings not thickly and uniformly speckled with black scales.
- e*¹. Region between the base of the wings, the innermost band of the fore wings, and the narrow stripe on the hind wings heavily infuscated with sooty brown or black scales, which are also speckled over the remaining yellow areas; light areas of hind wings thickly speckled with blue scales (pl. 21, *h*).....No. 4
- e*². Yellow areas of the wings clear, without dark scaling.
- f*¹. Yellow of wings ochreous, usually darkest on the fore wings and on the inner half of the hind wings; tails slender, narrow throughout, or much broadened in the outer half; scallops of the hind wings deep; process between tail and anal angle long, with the sides of the black central portion parallel for some distanceNo. 5
- f*². Yellow of wings light and clear, creamy; tails broad; scallops of the hind wings relatively shallow; process between tail and anal angle short, the sides of the black central portion converging.
- g*¹. Few or no blue scales on the yellow discal area of the hind wingsNo. 6
- g*². Yellow of the hind wings thickly speckled with metallic blue scales, appearing opalescent whitish; blue scales also occur along the inner side of the lower end of the innermost black stripe of the fore wings (pl. 20, *g*).....No. 7
- a*². Predominantly deep brown or brownish black.
- b*¹. No yellow or whitish scales on the upper surface of the wings other than those in the submarginal spots.
- c*¹. Submarginal yellow dashes on the fore wings above large; submarginal lunules on the hind wings large; dark border of the under side of the hind wings narrow and heavily suffused with light scales (spring).
- d*¹. Under side of fore wings with a tapering submarginal band, only the two lowest spots separate; submarginal dashes on fore wings and lunules on hind wings very large and conspicuous; wings narrow (early spring)No. 8
- d*². Under side of fore wings with a row of well-separated spots; submarginal dashes on fore wings and lunules on hind wings smaller; wings broader (late spring) (pl. 21, *d, e*).....No. 9
- c*². Submarginal yellow dashes on the fore wings above smaller and narrower; submarginal lunules on the hind wings smaller and narrower, and more curved; dark border of the under side of the hind wings

- broad and less heavily suffused with light scales (summer) (pl. 19 *f*)
 No. 10
- b*². Wings beyond the position of the innermost black band on the fore wings and the narrow black stripe on the hind wings with the black markings standing out prominently against the lighter background which is more or less heavily dusted with yellow or whitish scales, these becoming more numerous toward the lower margin of the fore wings and the upper margin of the hind wings (pl. 21, *f, g*).....No. 11

No. 1.—Females with the color pattern of the males and with a submarginal band instead of a row of spots on the under side of the fore wings occur only in early spring and appear to be very rare; we have seen only a single individual, caught in the District of Columbia.

No. 2.—The late-spring females are rather variable and grade completely into the summer females. Although when typically developed they are quite distinctive, they represent a transition form.

No. 3.—Yellow females with the yellow areas of the wings uniformly speckled with black scales are rare. We have seen two from Virginia.

No. 4.—Yellow females with the yellow of the inner portions of the wings heavily infuscated represent a step toward the dark females. Heavy infuscation of the inner portions of the wings is found in yellow females of both (*a*) type 5 and (*b*) type 6. A different step from the yellow to the dark females is seen in type 7. We have seen no specimens of type 4 from Virginia, but we have seen specimens of both varieties *a* and *b* from Silver Spring, Md.

No. 5.—This is the commonest of the yellow females, and includes more than half the yellow females found in Virginia. Farther south, so far as we have seen, all the yellow females are of this type. We have a fine typical example taken in a bog in Essex, Mass.

No. 6.—The light clear yellow or cream-colored females are, next to type 5, the commonest yellow type, and become relatively more numerous farther north. As in type 5, the three black bars on the fore wings are typically evenly spaced.

No. 7.—This cream-colored or whitish female (pl. 20, *g*) shows an initial step toward the dark form in the abundant blue scaling on the upper surface of the hind wings and also in the approximation of the two outer black bars on the fore wings. The delicate opalescence of the upper surface of the hind wings is very striking. This modification of type 6 (*a*) is duplicated by a corresponding variant of type 5 (*b*). Neither is common.

No. 8.—This type, with the very large submarginal lunules on the hind wings and submarginal spots on the fore wings, and the wings narrow, is essentially a black variant of the *arcticus-canadensis* form. We know of only one specimen, which was taken in the District of Columbia.

No. 9.—The dark females appearing in late spring (pl. 21, *d, e*) are usually quite distinctive. They are smaller than summer dark females, though not so small as type 8, with larger submarginal spots and lunules, and sometimes have the submarginal spots on the under side of the fore wings united into a band. They appear to be quite distinct from type 8, but grade more or less completely into type 10. They are not common.

No. 10.—This is the common black female everywhere. There are various minor varieties. In one (*a*) such light scales as may occur on the upper surface, particularly in the form of a bar across the cell near the outer end, are whitish; in another (*b*) they are deep yellow.

No. 11.—This dark female, showing a tendency toward the yellow form in the more or less abundant yellow scaling on the outer half of the wings, is not uncommon in the vicinity of Washington. There are two main varieties. In one (*a*) the light scales are whitish, in the other (*b*) they are more or less deep yellow.

The steps in the passage from the male type of coloration to abundant extreme form of black female are represented by the following sequences: 1, 2, 5, 7*a* or 4*a* or 3, 11*b*, 10*b*; or 1, 2, 6, 7*b* or 4*b* or 3, 11*a*, 10*a*. No intermediates between the two types, early and late, of yellow and black spring females, 1 and 8, and 2 and 9, have been found. Both yellow and black females have corresponding light and ochreous varieties.

There are two records of black males, neither from the region under consideration.

The extreme of diversity in this species is found in an area extending southward along the Piedmont to North Carolina and through the mountain valleys of western Virginia and West Virginia. Of the 11 female types, 5 (Nos. 3, 4, 7, 8, and 11) have been noted only in this region. Here the conditions in *Papilio glaucus* suggest a parallel with those in *Limenitis arthemis* from Nova Scotia to Pennsylvania.

It is tempting to consider the variations of *Papilio glaucus* in this area as parallel with those of *Graphium marcellus*. But the parallelism is true only of certain aspects of the seasonal sequence of forms. In *G. marcellus* there is a linear series of variants from the small early-spring individuals to the largest summer ones, and the deviation from this linear series is negligible. In *P. glaucus* there is great diversity at all points along the line between two constant, or practically constant, extremes, as in *Limenitis arthemis*.

Some of the forms of *P. glaucus* suggest hybrids between the northern type with the sexes alike and the southern type. For instance, female forms 8 and 9, which are quite anomalous, have the pattern of northern females but the color of southern females. It may be that in this area originally the New England type, or an approximation to it, predominated in the mountains and on the Piedmont and that deforestation induced the intrusion of the southern type with a resultant large proportion of inconstant hybrids.

Occurrence.—Found in and about deciduous woods, especially along their borders and in glades and clearings, in orchards and brushy areas, and about isolated groves. It wanders widely over clover fields and is a common visitor to gardens. This butterfly is everywhere common in spring. In summer it is much less numerous over most of

the State, though usually common in the mountain regions, especially in the southwest. In wet summers it is sometimes common on the Piedmont and on the Coastal Plain as well as in the mountains.

Seasons.—Two broods. The yellow swallowtail appears in the last half of March or early in April. From the time of its first appearance this species is usually on the wing continuously until the end of the season, though in June its numbers decrease and it may disappear altogether after the middle of the month. The individuals of the second brood begin to appear in small numbers toward the end of June or even as early as the middle of the month, becoming common in July and continuing to emerge into early August, or in exceptionally cold and wet summers even into early September. During September the numbers decrease and after the middle of the month the much-worn individuals are few in numbers; they disappear entirely in the first or second week in October.

PAPILIO POLYXENES Fabricius

This wide-ranging species is represented in Virginia by—

PAPILIO POLYXENES ASTERIUS Cramer

Plate 22, e, f, g, h

Range.—Throughout the State.

Variation.—In Virginia the males occur in the same three slightly different intergrading forms that are found in the District of Columbia (U. S. Nat. Mus. Bull. 157, pp. 193-196, 1932). These three male forms are the eastern representatives of three much more widely different forms, *asterius*, *curvifascia*, and *ampliata*, occurring in the Southwest and in Central America.

It may be recalled that *Battus philenor* in Virginia has a form approaching the western *hirsuta* though less extreme, and another approaching the southwestern and Mexican *acauda*. *Phoebis senae* also in Virginia has variants suggesting the different forms in the West.

Dr. E. P. Meiners has pointed out that spring individuals of *P. p. asterius* in the vicinity of St. Louis, Mo., where there are three broods, are somewhat smaller than those of the summer broods, though not so markedly so as in the case of some of the other swallowtails. He noted that the spots of the yellow bands are somewhat restricted in size, and there is usually an absence of the spot in the cell of the hind wings as in the form *curvifascia*. He said he had never seen any specimens of this variety in the summer broods. They occur, though rarely, in the summer broods in Virginia.

In this species the fore wings of the males are usually 40–48 mm. long; those of the female 45–53 mm. Giants are occasionally found, especially among the females. In the United States National Museum there is a giant female from Dade City, Fla., with the fore wings 65 mm. long.

Occurrence.—Found in open fields and especially about farms, frequently visiting gardens; an open-country butterfly, avoiding wooded regions; generally and quite uniformly distributed, and common everywhere; the commonest swallowtail on the Eastern Shore and on the Northern Neck.

It is probable that originally this butterfly was much less widely distributed and more localized than it is at present, as are its relatives farther north and in Europe and Asia. The clearing away of the forests and the introduction of the wild carrot (*Daucus carota*), now its favorite wild food plant, presumably are responsible for its present abundance throughout the eastern States.

Seasons.—Three broods, the third brood incomplete except on the outer Coastal Plain. The parsnip swallowtail appears usually during the last week in April and by the second week in May has become common. It is found continuously until the end of the season early in October, sometimes as late as the middle of November, and is most abundant late in July and in August. Over most of Virginia there are two broods, the second brood putting in its appearance just before the end of June or early in July. In September the butterflies become worn and their numbers decrease, but a few fresh individuals representing a partial third brood, the number of which varies from year to year, may usually be found until the end of the season. On the outer Coastal Plain the third brood is almost or quite complete, the butterflies appearing in considerable numbers from the first to about the middle of September and flying into October or November.

Genus *GRAPHIUM* Scopoli

GRAPHIUM MARCELLUS (Cramer)

Plate 19, *g, h*

Range.—Throughout the State, except the Eastern Shore (Accomack and Northampton Counties).

Variation.—The individuals of both sexes flying in early spring are small with the fore wings usually 32–35 mm. long; the hair on the body is long, giving the insect a shaggy appearance, and there is a tuft of long hair on the front of the head; the black bands on the wings are reduced in width, the light areas correspondingly extended;

there is usually no distinct pale band along the abdominal fold of the hind wings; the red anal spot on the hind wings is large and undivided; and only the tip of the tail is white.

On the outer Coastal Plain of Virginia the size of the early-spring form increases considerably, the fore wings being up to 40 mm. in length, though the color remains the same. Farther southward the dark bands become broader, and finally as broad as in the summer form, but the tails have only the tips white, and the red anal spot on the hind wings is large and undivided. This early-spring form with the broad dark bands (*floridensis* Holland) ranges northward, according to our friend John Boyd, to eastern North Carolina, where it intergrades with the normally colored but large early-spring form found along the coast farther north.

The late-spring and summer forms in Virginia resemble those from elsewhere. In the summer form the fore wings are about 45 mm. long.

Early in September 1940 we were surprised to find occasional individuals in the Dismal Swamp and elsewhere on the Coastal Plain. Although only the tip of the tails was white and the red anal spot on the hind wings was large as in the spring form, these late-summer individuals had the dark bands much broader than others taken in the same region early in spring. They resembled closely the southeastern spring form *floridensis* and, were the origin and date of capture unknown, would certainly be referred to it. Not infrequently the late-spring form, *telamonides*, reappears in autumn in small numbers.

Occurrence.—Found in open deciduous woods in more or less hilly country, on scrubby hillsides, and in the swamps and pine barrens of the Coastal Plain, often visiting gardens; generally distributed and common—locally the commonest swallowtail—in the southwestern portion of the State as far northeastward as Albemarle County, more or less local elsewhere, though usually common where it occurs. The spring brood is more generally distributed and in most places much more numerous than the later brood or broods.

Seasons.—From one to four or five broods according to locality. Over most of Virginia there are two broods in the first half of the season, followed by two or three vestigial broods in the last half. In most localities only the first is a complete brood, the second varying from not quite complete to much reduced, and those following being represented, if at all, only by very few individuals so that the butterfly disappears almost completely after the middle of July or the first

of August. The numbers in the second and following broods vary greatly in different localities, and in different years.

In the region from Cabin John to Great Falls on the Maryland side of the Potomac the zebra swallowtail is usually fairly common early in spring, later occurring in reduced numbers and becoming very scarce late in summer, though it may be found into early October. In 1929 and 1930 it was not to be found anywhere in this region after the first week in May, in those years being represented only by the first brood; but in 1931 it was more numerous than it had been for many years, occurring throughout the summer.

In the Dismal Swamp region it is very common from late March until the middle of July, at the end of June being usually the commonest of the swallowtails. After the middle of July its numbers rapidly decrease and it disappears almost completely by the middle of August, our last record in a normal year being August 18. Here there are two full, or nearly full, broods, followed by one vestigial one.

In the extreme southwestern part of the State and about as far northeastward as Bland and Pulaski Counties, though especially in Lee and Scott Counties, there is little, if any, diminution in the numbers of this butterfly throughout the summer, and in many localities in this region it is the commonest summer swallowtail.

The zebra swallowtail appears toward the end of March or early in April, both sexes at the same time, and soon becomes common. The second brood begins to appear early in June or even in the last week in May and flies until after the appearance of the third brood, about the middle of July. The succeeding broods are on the wing about the end of August, and in late September and October.

Family HESPERIIDAE

Subfamily PYRGINAE

Genus PROTEIDES Hübner

PROTEIDES CLARUS (Cramer)

Plate 23, *a*

Range.—Throughout the State.

Occurrence.—The most generally distributed butterfly in Virginia, found everywhere and almost everywhere abundant, or at least common; it is most numerous in scrubby and brushy regions with an abundance of black locust (*Robinia pseudacacia*) and least numerous in deep woods and swamps; in certain localities in hilly or moun-

tainous country with open woods and scrub and an abundance of its food plant it is the commonest butterfly.

Seasons.—Two broods with a third incomplete brood the individuals of which are more numerous on the outer Coastal Plain than elsewhere. The silver-spotted skipper first appears shortly after the end of the third week in April, sometimes as early as the nineteenth; slowly increasing in numbers, it becomes common toward the end of May and abundant by the end of June. It is most abundant in the last half of July and the first half of August after which its numbers rather rapidly decrease, though occasional individuals may be found as late as the first week in October. The individuals of the first brood continue to emerge until about the middle of June, when most of those seen are worn and faded. A little before the middle of July the first individuals of the second brood appear; these gradually increase in numbers, the worn individuals of the first brood becoming less and less common. The butterflies of the second brood continue to emerge during most of August. Toward the end of August and in September a third brood appears that is often more or less complete on the outer Coastal Plain, but elsewhere is represented only by occasional individuals.

Genus **URBANUS** Hübner

URBANUS PROTEUS (Linné)

Plate 23, *d*

Range.—Recorded only from the Coastal Plain as far north and west as Richmond. The records are: Henrico County, Richmond, beneath the Boulevard Bridge, August 1933 (George I. Allen); Princess Anne County, 2 miles west of Lynnhaven, August 19, 20, 1936 (W. H. Wagner, Jr.); Virginia Beach, September 24, 1934; Dinwiddie County, Petersburg, 1944 (B. Mather).

Occurrence.—Found in open country, particularly in and near fields of beans; an uncommon casual visitor, but in some years locally frequent on the outer Coastal Plain.

Seasons.—In Florida there are three broods of the swallowtailed skipper, but in Virginia and northward only representatives of the late-summer brood, rarely also of the midsummer brood, have been reported.

Genus **ACHALARUS** Scudder

ACHALARUS LYCIADES (Geyer)

Plate 23, *e*

Range.—Throughout the State.

Occurrence.—Found especially in open deciduous woods and on

brushy hillsides, also in weedy pastures and in adjacent open country; usually infrequent, though in some places fairly common.

Seasons.—One full brood, a second partial brood, and a vestigial third brood. The frosted skipper usually first appears during the last week in May, sometimes shortly before the middle of the month, and slowly increases in numbers, being most numerous in the last half of June. During the first half of July the numbers fall off, but about the middle of the month a new brood appears, which reaches its maximum in the first half of August and disappears about the end of the third week of that month. Scattered individuals on the wing late in August and early in September represent a vestigial third brood.

Genus **RHABDOIDES** Scudder

RHABDOIDES CELLUS (Boisduval and LeConte)

Plate 23, *b, c*

Range.—Known from Buckingham, Fairfax, Fauquier, Montgomery, Nelson, Page, Prince Edward, and Roanoke Counties.

Occurrence.—Found in or near damp wooded ravines in hilly or mountainous regions, and most frequently seen along the sides of streams or near bogs or ponds; very local, the widely separated colonies consisting usually of few individuals.

Seasons.—One brood and a partial second. The gold-banded skipper first appears (at Great Falls, Md.) toward the end of May and flies through June and into the first week in July. A second partial brood, much less numerous than the first, is on the wing at the end of the third week in July and flies until after the middle of August. In Roanoke County we have records for May 3 and 7, 1938.

Genus **THORYBES** Scudder

THORYBES BATHYLLUS (J. E. Smith)

Plates 23, *g, h*; 25, *e*

Range.—Throughout the State.

Variation.—There is considerable variation in the size of the white markings on the fore wings, especially in the males. In some males they are so reduced that these might easily be mistaken for males of *T. pylades* were it not for the absence of the costal fold.

Recently emerged individuals of this and the related species are sooty blackish, but they soon fade to dark golden-brown, when old becoming a medium or even a rather light brown. Some individuals captured are so worn as to have lost most of the scales on the upper surface, making them difficult to identify.

Occurrence.—Found in scrub land, open pine woods, and open fields; generally distributed and everywhere frequent to common, in certain localities abundant.

Seasons.—Two broods with, locally, a partial third. The southern smoky skipper appears shortly after the end of the third week in April and is on the wing almost continuously until the first week in October. The first brood, slowly increasing in numbers, becomes most numerous in June and disappears at about the end of the first week in July. Shortly after the first of July the second brood appears, reaching its maximum in the first half of August and flying until nearly the middle of September. On the Coastal Plain and in the southern portions of the State a few fresh individuals appear about the middle of September, flying until about the first of October. The second brood at its maximum is about twice as numerous as the first, but the third is represented by very few individuals.

THORYBES PYLADES (Scudder)

Plate 25, a, b

Range.—Throughout the State.

Occurrence.—Found in open fields and open woods, mainly in hilly or mountainous regions, and generally distributed; frequent to common in suitable localities on the Piedmont and in the mountains, but less numerous on the Coastal Plain.

Seasons.—One brood and a partial second. The northern smoky skipper first appears usually about the first of May (rarely as early as April 23) and slowly increases in numbers, reaching a maximum in the first half of June, after which its numbers decline and the first brood disappears toward the middle of July. Shortly after the first of July fresh individuals appear, this second brood reaching its maximum in the last half of July and disappearing before the first week of August. The individuals of the second brood at its maximum number only a small fraction of those of the first brood.

THORYBES CONFUSIS Bell

Plate 25, c, d

Range.—Probably throughout the State, but definite records are few because this species has been confused with *T. pylades*. Our records are from Augusta, Caroline, Fairfax, King William, Middlesex, Prince Edward, Prince George, Princess Anne, Southampton, Spotsylvania, Surry, and Wythe Counties.

Variation.—The white spots on the fore wings, especially in the

males, may be greatly reduced and occasionally are wholly absent. Individuals are sometimes captured in which nearly all the scales have been rubbed off the upper surface of the wings.

Occurrence.—Found in open fields together with *T. bathyllus* and *T. pylades*, but apparently more local and occurring chiefly on the Coastal Plain; frequent to common in the regions in which it occurs. The males frequent the same playgrounds as the males of the other two species.

Seasons.—One full and one partial brood, with possibly a vestigial brood late in the season. Bell's smoky skipper first appears, as shown by our records, at the end of the third week in May and becomes common in June, remaining common until the end of the month when its numbers fall off and it disappears early in the second week in July. The second brood, in which the individuals are much less numerous than in the first, appears shortly after the middle of July and flies until the latter part of August. It is possible that fresh individuals on the wing late in August and until the last week in September (September 23) represent a vestigial third brood.

Genus PYRGUS Hübner

PYRGUS CENTAUREAE (Rambur)

The subspecies represented in Virginia is—

PYRGUS CENTAUREAE WYANDOT (W. H. Edwards)

Plate 24, *a, d*

Range.—From northern Fairfax County westward to Frederick County and southwestward along the Blue Ridge and the Alleghenies to the southern border of the State. Our records are from Augusta, Fairfax, Frederick, Giles, Highland, Montgomery, Rappahannock, and Roanoke Counties.

Occurrence.—Found in clearings and open places in woods, and in open fields near woods; generally distributed, occurring in all suitable localities; frequent to abundant in Frederick County and in the mountains, infrequent east of Frederick County. It is most commonly noticed resting with the wings partially extended on leaves near the ground, or on the ground itself, or on the flowers of the common creeping *Potentilla* (*P. canadensis*).

Season.—One brood. In southwestern Virginia the grizzled darter first appears at about the end of March, but in the north not until after the middle of April, at the higher altitudes at the end of April or early in May. The date of its first appearance varies considerably

from year to year. It is common for about 10 days or 2 weeks after which its numbers rapidly decline and the males disappear, the females continuing to fly until about the end of the third week.

PYRGUS COMMUNIS (Grote)

Plate 24, *b, c, e, f*

Range.—Throughout the State.

Variation.—Speaking of this species as it occurs in Kansas, William D. Field says that the dark form is common in spring and early in summer and that later in summer almost all individuals are of the whiter form.

In Virginia the males have the fore wings 13–15 mm. long, the females averaging slightly larger. The amount of white on the upper surface is variable. The males usually have more white than the females, with a more definite and continuous postmedian line. Occasionally in the males the postmedian line is broadened and quite continuous, not being interrupted at the veins. The females are sometimes very dark with the white markings above much reduced in size. The ground color above, especially in the males, may be light and grayish.

The markings on the under side of the hind wings are usually light to medium yellow-brown, with some dark brown or blackish, and the spots very distinct. But not infrequently, especially late in summer, they are faint and more or less indistinct, the under side of the hind wings presenting a washed-out appearance as in the western form *albescens* Ploetz. Specimens caught in the winter in southern Maryland just across the Potomac from Virginia have the spots on the under side of the hind wings black shading into dark gray with no trace of yellowish.

Occurrence.—Found in open fields and along roadsides, and especially in and near farmyards where the common mallow or cheeses (*Malva rotundifolia*) grows; generally distributed and about equally numerous at all points; usually infrequent to frequent, but locally common.

Seasons.—Three broods, the last incomplete. This darter usually first appears in the first half of May, rarely as early as April 24, and increases in numbers until the last half of July and the first half of August, after which the numbers gradually fall off and the butterfly disappears early in October, occasional individuals persisting, in some years, until nearly the middle of November, rarely until the last week in December. The first individuals of the second brood

appear toward the end of June, and those of the third brood toward the end of August, broadly overlapping the later individuals of the second brood.

Genus PHOLISORA Scudder

PHOLISORA CATULLUS (Fabricius)

Plate 26, r

Range.—Throughout the State.

Occurrence.—Found occasionally to frequently in open fields and along roadsides, and commonly or even abundantly in and about cultivated areas, particularly truck farms and gardens, and in unkept town and city lots where its chief food plant (*Chenopodium album*) thrives. The caterpillars are common on this plant everywhere and the presence of the insect often may be determined from these when no adults are in evidence.

Seasons.—Two broods and a partial third. The pigweed skipper first appears usually toward the end of the first week in May, on the Coastal Plain toward the end of April, and flies continuously until about the end of the second or third week in September, reaching its maximum abundance in the last half of July and the first half of August. In the first half of June the numbers decline, but toward the end of the month the second brood appears, and the butterfly becomes increasingly common, reaching its peak late in July. Late in August and in September the appearance of numerous fresh individuals indicates a third brood in which, however, the numbers do not reach half of those of the midsummer brood.

PHOLISORA HAYHURSTII (W. H. Edwards)

Plate 15, i, j

Range.—Confined to the Coastal Plain. Our records are: Caroline County, between Port Royal Forks and Windsor, May 29, 1937; Isle of Wight County, Rescue, September 4, 1940; Nansemond County, western border of the Dismal Swamp about 2 miles south of Suffolk, September 4, 1936, Dismal Swamp, May 14, 1945 (Otto Buchholz), Holland, July 13-26, 1944 (Otto Buchholz); Norfolk County, Wallaceton, July 6, 1941.

Occurrence.—Found in and near more or less wet open pine woods; very local and rare.

Seasons.—Our records indicate three broods, one in the last half of May, one in July, and the third in September.

Genus *ERYNNIS* Schrank*ERYNNIS* *ICELUS* (Scudder and Burgess)Plate 24, *g, h*

Range.—Northern and western portions of the State and locally eastward and southward to Amelia, Henrico, New Kent, and Westmoreland Counties. Our records are from Albemarle, Amelia, Bedford, Fairfax, Frederick, Henrico, Madison, Nelson, New Kent, Page, Patrick, Pulaski, Roanoke, Rockbridge, Shenandoah, Smyth, Tazewell, Warren, and Westmoreland Counties.

Variation.—The fore wings in this species are usually about 15–16 mm. long. There is considerable variation in the amount of grayish white on the outer half of the fore wings, the light area in the outer third being much more marked in some individuals than in others. It is usually prominent in blackish individuals fresh from the pupa, becoming more or less inconspicuous in old, worn, faded, brownish ones.

In Burkes Garden, Tazewell County, on June 4, 1940, John E. Graf captured a male with the wings rather light bronzy in color, the fore wings being faintly clouded and almost immaculate.

Occurrence.—Found in hilly and mountainous country in rich open woods, along the borders of more or less damp woods, along roads through woods, and widely dispersed over fields near woods; common to abundant in all suitable localities from Fairfax to Frederick and Page Counties and southwestward to the southern border of the State, becoming increasingly local and infrequent farther south and east. In some places, notably on the Peaks of Otter and in certain localities in Fairfax, Frederick, and Page Counties, we have found it in its season the most abundant butterfly.

Season.—One brood; a few individuals taken in Bedford, Patrick, Pulaski, and Smyth Counties between July 22 and August 4 indicate the occurrence of a partial second brood in the southwestern mountain region. This butterfly usually appears about the middle of April, sometimes as early as the 9th, later in the higher altitudes, and reaches the peak of its abundance in the first half of May in the lower altitudes, in the last half of May in the higher. It remains abundant for about 10 days or 2 weeks, after which its numbers fall off and it usually disappears in the first week in June, though occasional individuals may be found up to nearly the end of the month. In the southwestern mountains it reappears in small numbers in the last week in July and the first week in August.

ERYNNIS BRIZO (Boisduval and LeConte)

Plate 24, *i*

Range.—Throughout the State. We have records from Albemarle, Amelia, Bedford, Buckingham, Clarke, Frederick, Giles, Henrico, James City, Loudon, Montgomery, Nansemond, Nelson, Page, Powhatan, Prince Edward, Roanoke, Surry, and Warren Counties.

Variation.—The fore wings are usually about 18 mm. long. At Williamsburg on April 16, 1940, we captured a specimen which was a rather light bronze with the fore wings uniformly colored except for a few small black spots.

Occurrence.—Found in open woods, especially along the roads and paths and along the borders of adjacent fields; it is abundant and generally distributed in the woods of Frederick County, and common in the mountains as far, at least, as Montgomery County; east of the mountains it is locally distributed, though common wherever it occurs. At Williamsburg on April 16, 1940, we found it much the commonest species of the genus.

Season.—One brood. In the lower sections of Virginia this species usually appears about the first of April, sometimes late in March, but at the higher elevations its appearance is delayed until the latter part of April. It becomes common about a week after its first appearance, or shortly after the first females are on the wing, and remains common for about 2 weeks, after which the number of the males declines and later that of the females, until only a few very worn females are left. It flies until near the middle of May in the lowlands, and until about the first of June in the highest elevations.

ERYNNIS LUCILIUS (Scudder and Burgess)

Plate 24, *k*

Range.—Higher mountain regions in the western part of the State; our records are from Bedford, Highland, Page, Roanoke, and Smyth Counties.

Occurrence.—Found in usually rocky woodlands and in adjacent fields in hilly or mountainous country; uncommon.

Seasons.—Two broods. The records from April 23 to June 12 seem to represent the first brood, those from July 22 to August 17 the second.

ERYNNIS PERSIUS (Scudder)

Plate 24, *j, l*

Range.—Mountains in the western part of the State and the Potomac valley. Our records are from Bedford, Fairfax, Highland, Roa-

noke, and Tazewell Counties; most of them are from Highland County.

Occurrence.—Found in open fields, usually near woods, in boggy places, and along roads near woods; it appears to be rather common in Highland County, uncommon elsewhere.

Season.—One brood. This species appears shortly after the end of the third week in April (April 23) and flies until after the middle of June (June 17); it is most numerous from the last of May to the middle of June.

ERYNNIS BAPTISIAE Forbes

Plate 24, *m*

Range.—Throughout the State. Our records are from Accomack, Alleghany, Arlington, Augusta, Bedford, Caroline, Fairfax, Giles, Isle of Wight, King William, Madison, Montgomery, Page, Roanoke, Rockbridge, Rockingham, Shenandoah, Smyth, Southampton, and Surry Counties.

Occurrence.—This recently described species, the range of which is as yet very imperfectly known, is found in open fields more or less near woods and in very open woods, especially in grassy areas and along roads. It is the commonest of the smaller species of the genus with the exception of the less generally distributed *E. icelus* with which, in life, it is easily confused.

Seasons.—Two broods. Although we have no records before the first of May, this species probably first appears shortly after the end of the third week in April, the first brood flying through May and into the first week in June. The second brood appears during the first week in July, reaches its maximum in the last half of the month, and disappears early in September.

ERYNNIS MARTIALIS (Scudder)

Plate 24, *n*

Range.—Mountains in the western portion of the State and locally eastward to Prince Edward, Henrico, and Fairfax Counties. Our records are from Alleghany, Augusta, Bedford, Fairfax, Giles, Henrico, Highland, Montgomery, Page, Prince Edward, Roanoke, Russell, Warren, and Wythe Counties.

Occurrence.—Found in roads and clearings in woods and in fields near woods in hilly or mountainous regions; local and usually infrequent, though in some places fairly common.

Seasons.—Two broods. This butterfly first appears usually in the

last half of April, sometimes as early as April 11, and flies until the end of the third week in June. The second brood appears early in July and flies until just beyond the middle of August. Freshly emerged individuals, which are very dark, are easily confused in life with *E. baptisiae*.

ERYNNIS JUVENALIS (Fabricius)

Plates 24, *o*, *p*; 25, *f*

Range.—Throughout the State.

Variation.—This species is usually easily distinguished by the presence of two small circular white or whitish spots on the under side of the hind wings near the outer angle, but one or even both of these spots may be absent. There is considerable variation in color, some individuals having the fore wings much grayer than others, with the dark markings more distinct, and the dark markings vary considerably in size and in extent. There is frequently some difference in the markings of the fore wings on the two sides. The size of the hyaline spots varies, and one or more may be lacking. Occasional females are very light, with the ground color above light sandy, becoming dirty whitish on the outer half of the fore wings.

Occurrence.—Found in open woods, especially along the roads and paths, and in adjacent open fields; generally distributed and everywhere common to abundant.

Seasons.—One full brood, a partial second brood, mainly on the Coastal Plain and the outer Piedmont, and a sporadic third brood represented by occasional individuals on the wing late in autumn in certain years. This species first appears about the first of April, sometimes late in March, and by the middle of April has become abundant over most of the State. On the Coastal Plain it is commonly abundant by the end of the first week in April, but in the higher mountain regions it does not usually become abundant until toward the end of April. After the first of May, or the middle of May at the higher altitudes, the individuals are worn and their numbers decrease, but a few are still to be found until the end of the third week in June or even the first week in July. About the middle of July fresh individuals appear and the butterfly may be found in small numbers until toward the end of August. Occasional individuals on the wing in October probably represent a vestigial third brood. In some years we have seen this species rather frequent in October at Cabin John, Md., just across the Potomac from Fairfax County.

ERYNNIS HORATIUS (Scudder and Burgess)

Plate 25, *j, k*

Range.—Throughout the State.

Variation.—Occasional females of this species are light sandy in color with the outer half of the fore wings dirty whitish.

Occurrence.—Found in open fields and open woods; generally distributed and frequent to common everywhere.

Seasons.—Two broods and a vestigial third brood. This species first appears about the first of April and slowly increases in numbers, reaching a maximum in the first half of May, the second half at the higher altitudes, the numbers then declining. In July a new brood appears which becomes abundant in the last half of the month and remains numerous through the first of August, continuing on the wing, in diminishing numbers, through September. Fresh individuals on the wing in late September and October probably represent a vestigial third brood. In this species the second brood appears to be more nearly complete than the second brood of *E. juvenalis*. In the spring *E. horatius*, though common, is far outnumbered by *E. juvenalis*, but in midsummer and later we have found *E. horatius* much more numerous than *E. juvenalis*. We are not prepared to say, however, that these relative seasonal proportions would be maintained over a long series of years.

ERYNNIS ZARUCCO (Lucas)

Plate 25, *g, h*

Range.—Throughout the Coastal Plain, and farther inland north to Prince Edward, Pittsylvania, Roanoke, Montgomery, Giles, and Augusta Counties. Our records are from Accomack, Augusta, Giles, Grayson, Isle of Wight, Mathews, Montgomery, Nansemond, Norfolk, Northampton, Pittsylvania, Prince Edward, Prince George, Princess Anne, Pulaski, Roanoke, and Surry Counties.

Occurrence.—Found in open country, usually near the borders of woods.

Seasons.—Two broods. This species first appears in April, reaches a maximum in the first half of June, and flies until the end of the month. In July a new brood appears, and the butterfly is most common in July and the first half of August, after which time the numbers decrease and it disappears after the first week in September.

The very few records for April (April 15, Salem) and May (May 19, Farmville; May 30, Dismal Swamp) seem to indicate that Virginia is the northern limit of the range, and that mortality during the

winter is very heavy. It is probable that this species is for the most part an immigrant from farther south entering the State each year, a few individuals occasionally surviving the winter. However, it may be more common in spring than the records indicate, for in the field it is scarcely distinguishable from the abundant *E. juvenalis* and the common *E. horatius*. In the summer when the numbers of *E. juvenalis* are greatly reduced and all the individuals of the larger species of *Erynnis* are captured and examined it is more likely to be detected.

Subfamily HESPERIINAE

Genus ANCYLOXYPHA Felder

ANCYLOXYPHA NUMITOR (Fabricius)

Plate 3, *k*

Range.—Throughout the State.

Variation.—In this species the fore wings are usually about 11 mm. long, but occasional individuals are much larger. At Rescue, Isle of Wight County, on September 3, 1940, we captured one with the fore wings 15 mm. long. Not infrequently the fore wings are wholly black (form *longleyi* French). We found this form rather common at Rescue on September 3, 1940, and at Sunken Meadows Beach, Surry County, on the following day. A specimen from the Dismal Swamp taken on September 1, 1940, has the fore wings above light bronzy, slightly dusky over the normally black areas; the under surface is a strongly opalescent dull straw yellow.

Occurrence.—Found in wet grassy regions and along the grassy borders of sluggish streams, ponds, and roadside ditches; generally distributed and common everywhere. In all wet grassy areas not subject to too extensive spring flooding or to too severe drying late in summer this little skipper is certain to occur in more or less abundance.

Seasons.—Three broods. The least skipper first appears just after the middle of May (earliest date May 17) and by the last week in the month has become common. The first brood is most numerous in the first half of June, its numbers falling off rapidly in the last half of the month. Toward the end of June a new brood appears which reaches its maximum in the last half of July and the first half of August, when this little butterfly is at the peak of its abundance. In the last half of August the numbers decline, but toward the end of August they are reinforced by the appearance of a third brood, which remains on the wing until shortly after the first of October, or even until the second week. The second and third broods spread out

over a considerably larger area than the first brood, especially if the summer be wet. An extraordinary record we cannot explain is furnished by a specimen captured at Richmond on March 30, 1936, by Dr. Carroll M. Williams.

Genus *HESPERIA* Fabricius

HESPERIA METEA (Scudder)

Plate 28, *a, b*

Range.—Known from Fairfax, Frederick, Henrico, Prince Edward, Roanoke, and Montgomery Counties; but undoubtedly much more generally distributed in the western part of the State than these records would indicate.

Variation.—Although the distinctness of the light markings on the under side of the hind wings is fairly constant in the males, it varies considerably in the females. In some females these light markings are represented merely by indistinct vestiges, and we have seen one female from Rocky Run, Fairfax County, in which they appeared to be wholly absent.

Occurrence.—Found in open brushy clearings in dry woods, usually with pines, and in dry open fields near woods, in hilly or mountainous country; very local, but frequent to common wherever it occurs.

Season.—One brood. This skipper usually appears in the middle of April, sometimes in the first week in the month, and exceptionally as early as March 12, and flies until the last week in May (latest date May 26). It is usually most numerous in the first half of May, in some years in the last week in April and the first week in May.

HESPERIA LEONARDUS Harris

Plate 26, *a, b*

Range.—From Arlington and Fairfax Counties westward and southwestward in the mountains to Giles, Montgomery, and Patrick Counties. Our records are from Arlington, Fairfax, Giles, Madison, Montgomery, and Patrick Counties.

Occurrence.—Found in permanently wet meadows and bogs; generally distributed, though not common, in Arlington and Fairfax Counties, very local and rather rare in the western part of the State.

Season.—One brood. Our few records run from August 15 (Poverty Hollow, Montgomery County) to September 22 (Rocky Run, Fairfax County). In the vicinity of Washington Leonard's skipper appears about the first of September, reaches its maximum about the middle of the month, and usually disappears before the first of

October. In the mountains it appears at least as early as the middle of August and presumably reaches its peak of abundance in the last week in August, as it does in eastern Massachusetts.

HESPERIA SASSACUS Harris

Plate 27, *m, p*

Range.—Confined to the mountains in the western portion of the State from Frederick, Warren, and Page Counties southwestward. Our records are from Frederick, Highland, Montgomery, Page, Roanoke, Tazewell, and Warren Counties.

Variation.—Prof. A. W. Lindsey writes (Denison Univ. Bull., Journ. Sci. Lab., vol. 37, p. 48, April 1942) that the darkest specimen of the form *manitoboides* Fletcher he has is from Frederick County, Va. This was one of a series of 34 specimens taken at Chambersville on May 28, 1939, that we sent him in connection with his revision of the genus *Hesperia*.

Occurrence.—Found in open fields in or near woods in hilly or mountainous country; generally distributed in Frederick, Warren, and Page Counties, becoming increasingly localized southwestward. This species varies greatly in abundance from year to year. In the northern counties it is usually the commonest butterfly during its flight period.

Season.—One brood. The Indian skipper appears early in May (May 6) and flies until the middle of June (June 19). It is abundant in the last week in May and early in June.

HESPERIA ATTALUS (W. H. Edwards)

Plate 27, *i*

Range.—Two records: Loudoun County, Clark's Gap, September 22, 1940 (A. H. Clark); Prince Edward County, Farmville, June 9, 1940 (Frank W. Trainer).

Variation.—Both specimens, now in the United States National Museum, are females. They are quite alike and represent exceptionally dark examples of the form *seminole* Scudder. They are the darkest specimens of the species we have seen.

Genus HYLEPHILA Billberg

HYLEPHILA PHYLEUS (Drury)

Plate 28, *c*

Range.—Throughout the State.

Variation.—The females of this species occur in three forms: (1)

The usual form, which is by far the commonest; (2) a light form with the light markings above greatly extended, which is rare; and (3) a dark form, very dark with the light markings above much reduced and the under side uniformly dark with an angular band of light spots and a light dash extending inward from the angle along the cell toward the base of the hind wings. This very dark form, which is not uncommon in Virginia, is sometimes puzzling as it suggests in its color pattern a species of *Hesperia*. Intergrades occur between these three forms.

Occurrence.—Found in fields, along roadsides, and very commonly in gardens.

Although our records are far too few to be regarded as giving more than an indication, a fair inference from them is that this species is only a summer visitor to Virginia. The only captures that could be referred to a spring brood are one on May 31, 1936, at Creeds on the North Carolina line in Princess Anne County, and another on June 11, 1938, in the Dismal Swamp in Nansemond County. These records would seem to indicate that in certain years this butterfly may overwinter in the extreme southeastern portion of the State.

We have no other records before July when, in the first half of the month, we have this species from Henrico, King and Queen, Nansemond, Norfolk, Northumberland, Princess Anne, and Surry Counties, and in the last half from Accomack, Giles, Northampton, Prince Edward, Pulaski, and Roanoke Counties. In the first half of August we have found it in Prince William and Nelson Counties, and also in the District of Columbia.

It would appear that, in most years, this species first enters Virginia early in July, coming north along the Coastal Plain, in the latter half of the month spreading widely over the Coastal Plain and also entering the State in the southwestern and south-central sections. By the end of the season it is usually abundant throughout the Coastal Plain and common in the southern half of the State, becoming less numerous in the northern Piedmont and mountain counties.

The numbers of this butterfly fluctuate considerably from year to year, and not infrequently it is wholly absent from the northern Piedmont and mountain counties, and scarce elsewhere except on the outer Coastal Plain where it is always to be found in greater or less numbers, and is normally, with the possible exception of *Atalopedes campestris*, the commonest of the skippers in the last half of the summer.

Seasons.—Three broods. The first brood, flying in May and early

June, is usually not represented in Virginia, though we have two records, for May 31 and June 11, the latter based upon a worn female. The second brood appears early in July and flies through July and August. Apparently there is a third brood that first appears late in August and continues to emerge until the end of the season, usually about the end of October, sometimes as late as the middle of November (November 12). The butterfly is on the wing continuously from about the first of July until the end of the season.

Genus ATALOPEDES Scudder

ATALOPEDES CAMPESTRIS (Boisduval)

Plate 26, *f, g, h, i*

Range.—Throughout the State.

Variation.—In Virginia the fore wings of the males are 14–15 mm. long; those of the females 17–18 mm. There appears to be but little variation. Occasional females are much lighter and more yellowish than the average, and some are much darker (pl. 26, *f*).

Occurrence.—Found in open fields, along weedy roadsides, and in gardens. Very scarce in spring, the sagemoth appears in numbers early in July, and from the middle of July onward it is everywhere abundant except in the highest mountain regions, where it is frequent or sometimes common. Late in summer and in autumn it is in almost all sections the commonest of the skippers.

Virginia is approximately the northern limit of this species as a permanent resident. Although we have spring records from 13 counties situated in all sections of the State and including Frederick County in the extreme north, and also from the District of Columbia and from Montgomery County, Md., across the Potomac from Fairfax County, these records are very few, indicating that only a small number of individuals succeed in surviving the winter. So scarce is this insect in spring that we believe the large population in mid-summer and later is mainly the result of immigration from farther south.

Seasons.—Three broods. This species first appears in the first half of May (May 5) and increases in numbers until the last week in the month, after which the numbers slowly fall off and it disappears shortly before the middle of June. The males appear a week or so in advance of the females. The second brood appears about the first of July, and the butterfly attains its maximum abundance in the last half of this month and the first half of August. During the last half of August the numbers decrease, but toward the end of the month

they are augmented by the appearance of a third brood which is on the wing until late in October or even until nearly the middle of November (November 12).

Genus **POLITES** Scudder

POLITES VERNA (W. H. Edwards)

Plate 28, *d*

Range.—Throughout the State. Our records are from Accomack, Albemarle, Bland, Fairfax, Fauquier, Frederick, Grayson, Hanover, Henrico, Highland, Loudoun, Madison, Montgomery, Nansemond, Prince Edward, Prince William, Princess Anne, Rockingham, Scott, Shenandoah, Smyth, Tazewell, Washington, and Westmoreland Counties.

Occurrence.—Found in damp or wet open woods, brushy bogs, and wet pastures near woods; very local; in the mountains and on the northern Piedmont occurring in most suitable situations, usually in small numbers, though in some places common, especially in and near bogs; rare on the Coastal Plain.

Seasons.—Two broods. This skipper appears at about the end of May and slowly increases in numbers, becoming common in the last half of June and in the first half of July, after which the numbers fall off and it becomes scarce or disappears toward the end of the month. At the end of July fresh individuals appear, and the butterfly is again common in August, flying until about the end of the first week in September, or even later (September 22).

POLITES MANATAAQUA (Scudder)

Plates 15, *d*; 28, *e*

Range.—Throughout the State.

Variation.—Occasional males of this species entirely lack the fulvous on the upper surface, being plain dark brown with a black stigma, like the males of *Atrytone ruricola*. Although we have not found this variety in Virginia, we have seen one specimen from the District of Columbia and another from nearby Maryland.

In Stafford County late in the season we captured a male that was pale yellowish bronze with silky reflections above, the fulvous patches being scarcely distinguishable from the ground color.

Occurrence.—Found in open fields and along weedy roadsides in open country; one of the most generally distributed of the skippers, though nowhere abundant and seldom very common, and in some years infrequent. On the highest mountain pastures this species is

especially noticeable, not because it is common, but because it is often the only skipper to be found.

Seasons.—Two broods. This species first appears after the middle of May (earliest date May 18) and becomes common toward the end of the month and in early June, disappearing at the end of June. The second brood is on the wing shortly before the middle of July (July 10), reaches its maximum in August, and continues on the wing until the end of the season, toward the end of September. It is possible that fresh individuals found late in September may represent a partial third brood.

POLITES THEMISTOCLES (Latreille)

Plate 28, *f*

Range.—Throughout the State.

Variation.—We have not found any appreciable variation in the males of this species in Virginia. The females may resemble those of *P. manataaqua* except in being smaller and with the spots on the fore wings more strongly yellow, but usually there is more or less fulvous along the costal border of the fore wings and in the cell, not infrequently quite as much as in the males. A female from Virginia Beach taken on September 24, 1934, is very dark, with no fulvous along the costal border of the fore wings and with the spots greatly reduced in size.

Occurrence.—Found in fields and along roadsides, everywhere one of the commoner skippers.

Seasons.—Two broods. This species first appears usually in the last half of May (rarely as early as May 7), becoming common toward the end of the month and through the first 3 weeks of June, the numbers then decreasing, though occasional individuals are to be found as late as the end of the first week in July. About the middle of July a new brood appears, and the butterfly increases in numbers, reaching a maximum in the first half of August and continuing on the wing in diminishing numbers until the end of the season. It is possible that fresh individuals taken late in September may represent a vestigial third brood.

POLITES PECKIUS (Kirby)

Plate 28, *g, h*

Range.—Northern and western portions of the State, as far east as Westmoreland, Essex, Prince Edward, and northern Pittsylvania Counties. Our records are from Albemarle, Alleghany, Amherst,

Arlington, Augusta, Bath, Campbell, Clarke, Essex, Fairfax, Fauquier, Floyd, Frederick, Giles, Highland, King George, Loudoun, Madison, Montgomery, Nelson, Orange, Page, Patrick, Pittsylvania, Prince William, Pulaski, Rappahannock, Roanoke, Rockbridge, Rockingham, Russell, Scott, Shenandoah, Smyth, Spotsylvania, Stafford, Tazewell, Warren, Washington, Westmoreland, and Wythe Counties.

Occurrence.—In the western mountains and in the northern counties this is one of the commonest and most generally distributed skippers, found in greater or less numbers in every open field, most abundantly in the valleys and in mountain bogs and damp pastures. Farther east and south it rapidly becomes increasingly localized, occurring in colonies in low damp areas, or near water.

Seasons.—Two broods. Peck's skipper usually appears about the end of the third week in May and by the end of the month has become common, remaining common through early June and disappearing about the middle of the month. The second brood appears in the third week in July, reaches its maximum in August, and flies in diminishing numbers until the end of the season, about the end of the third week in September, though sometimes much later. It is possible that individuals on the wing late in September and early in October, seen in certain years, represent an occasional partial third brood. The broods of this species, confined to the cooler regions of the State, appear to be more definitely marked than those of its more generally distributed relatives *P. verna*, *P. manataaqua*, and *P. themistocles*.

POLITES MYSTIC (Scudder)

Plate 26, *j, k*

Range.—Known only from Highland, Giles, Montgomery, and Roanoke Counties. The records are: Highland County, Middle Mountain, June 19, 1948 (common); Giles County, Mountain Lake, July 21, 1940 (2 females, Lloyd G. Carr), Rich Creek, August 1, 1938 (2 females); Montgomery County, Old Preston graveyard, Blacksburg, June 2, 6, 1899 (22 males and females, Ellison A. Smyth, Jr.); Roanoke County, Ash Bottom, near Salem, June 1, 1937 (Carl W. Gottschalk, specimens identified by Ellison A. Smyth, Jr.).

Occurrence.—Found in fields near woods. We have met with this species personally only twice, along the edge of the woods on a hillside near Rich Creek, Giles County, on August 1, 1938, and on the crest of Middle Mountain, Highland County, on June 19, 1948, where we found it common, flying with *Hesperia sassacus*.

POLITES VIBEX (Geyer)Plates 27, *f*; 28, *i*

Range.—One record, Montgomery County, near Blacksburg (2 males taken by Prof. Ellison A. Smyth, Jr., probably about 1900).

Occurrence.—Probably a casual or irregular visitor.

Genus **WALLENGRENIA** Berg**WALLENGRENIA OTHO** (J. E. Smith)

Two subspecies are represented in Virginia.

WALLENGRENIA OTHO OTHO (J. E. Smith)Plate 26, *o*

Diagnostic features.—The under side of the hind wings is dull orange or orange-red.

Range.—North to the south-central part of the State and along the coast to Gloucester and Mathews Counties. The records are: Gloucester County, Bellamy, September 1, 1941, Severn, August 31, 1941; Mathews County, Foster, August 30, 1941; Middlesex County, Urbanna, September 2, 1941; Nansmond County, Dismal Swamp, 1941, June 2, 5, 1944 (Otto Buchholz), May 20, 1945 (Otto Buchholz); Prince Edward County, Farmville, September 11, 1940 (Frank W. Trainer).

Occurrence.—We have found this form only in swamps or in more or less wet localities.

There is something of a mystery about the occurrence of this form in Virginia. There is no record before 1940, when Frank W. Trainer took it at Farmville. In 1941 we found it common in Gloucester and Mathews Counties, and received it from the Dismal Swamp where previously we had taken only the form *egeremet*, which is rather common there. Our friend Otto Buchholz found it in the Dismal Swamp in 1944 and 1945. It does not seem possible that this well-marked form could have been overlooked in previous years.

WALLENGRENIA OTHO EGEREMET (Scudder)Plate 26, *m, n*

Diagnostic features.—The under side of the hind wings is dark purplish brown.

Range.—Throughout the State.

Occurrence.—Found in fields and meadows, along roadsides, and in gardens, but avoiding the driest localities; everywhere frequent, though never very numerous.

Seasons.—Two broods. This species first appears toward the end of May, sometimes as early as the end of the third week, and flies until about the end of June, worn individuals continuing on the wing into July. The second brood appears in the second week in July and flies until the end of the season, usually about the middle of September. The single record for November 12 may represent a third brood.

Genus *POANES* Scudder

POANES VIATOR (W. H. Edwards)

Plate 29, *j*

Range.—Brackish marshes from the Northern Neck to the North Carolina border. Our records are: Essex County, Tappahannock, September 2, 1941, marsh north of Tappahannock, September 2, 1941; Gloucester County, Allmondsville, September 1, 1941; Isle of Wight County, Smithfield, at the bridge over the Pagan River at Route 10, June 11, 1938, June 10, 1939; James City County, Jamestown, June 14, July 5, 1939; King George County, swamp 2 miles down the road from the Potomac River bridge, August 31, 1941; King William County, Port Richmond, June 7, 1936; Mathews County, Foster, August 30, 1941; Middlesex County, Urbanna, September 2, 1941; Nansemond County, Chuckatuck, June 15, 1938, east of Nansemond River to Kings Highway bridge (Otto Buchholz), northeast of Suffolk, 1944 (Otto Buchholz), Dismal Swamp, June 6, July 25, 1944 (Otto Buchholz); Princess Anne County, Knotts Island, July 4, 1939, Lake Tecomseh, West Neck Creek at Gum Swamp road (603); Richmond County, east end of the bridge from Tappahannock, June 27, 1937, August 31, 1941; Westmoreland County, swamp along Mattox Creek, Route 205, bridge, August 31, 1941 (W. H. Wagner, Jr.).

Variation.—Individuals from the several colonies show slight differences.

Occurrence.—The broad-winged skipper is confined to marshes with an abundance of wildrice (*Zizania aquatica*); very local, but common to incredibly abundant wherever found.

Seasons.—Apparently two broods. The records indicate one brood from June 6 to July 5, and another from July 25 to September 2. At Jamestown on July 5 most of the exceedingly numerous individuals were fresh males, indicating that the first brood must fly much longer than would be inferred from the records. A curious feature of our records is that, except in Richmond County, we have never found any indication of more than one brood in any one locality, al-

though we have visited some of the localities, as Smithfield and the Dismal Swamp, at various times throughout the summer. In Richmond County we found this species in early summer in 1937, and in late summer in 1941, not at both times in the same year.

POANES HOBOMOK (Harris)

Plate 28, *j, k, l*

Range.—From Fairfax to Caroline and Prince Edward Counties and westward, in the mountains southwestward to the North Carolina border. Our records are from Arlington, Bedford, Caroline, Fairfax, Frederick, Giles, Highland, Montgomery, Page, Prince Edward, Rappahannock, Roanoke, and Warren Counties. Also the Dismal Swamp, Nansemond County (Otto Buchholz).

Variation.—Both light and dark females, together with various intermediates, occur everywhere in Virginia.

Occurrence.—Found in deciduous woods along streams with more or less grassy banks, and along the borders of woodland bogs, the males only in the woods, the females also along the edges of the woods, along roads, and in adjacent fields; generally distributed and frequent to common in the mountains.

Season.—One brood. This species usually first appears about the end of the first week in May, rarely as early as the end of April (April 28), and reaches its maximum in the last week in May and the first week in June, disappearing at the end of the latter month (June 30).

POANES ZABULON (Boisduval and LeConte)

Plate 27, *a, b*

Range.—Throughout the State.

Occurrence.—On the Coastal Plain this species is found in wet open woodlands, but in the higher country and in the mountains it lives along the more or less grassy banks of woodland streams, the females and more rarely the males straying out into adjoining fields; most generally distributed and most numerous in the higher western part of the State where it is often frequent or even rather common, though never abundant; local and infrequent on the Coastal Plain.

Seasons.—Two broods. This species first appears toward the end of April, sometimes as early as the end of the third week, reaches a maximum in the last half of May, and disappears about the middle of June. The second brood is on the wing shortly after the end of the third week in July, reaches a maximum in the first half of August,

and flies in decreasing numbers until about the end of the third week in September, or until the end of the season.

POANES AARONI (Skinner)

Plate 28, *m, n, o, r*

Range.—Salt marshes of Chesapeake Bay and the Eastern Shore (Accomack and Northampton Counties) and offshore islands, and southward. Our records are as follows: Accomack County, Chincoteague Island, August 27, 1891 (F. M. Jones), September 13, 1938 (W. H. Wagner, Jr.), August 21, 1941 (W. H. Wagner, Jr.), August 22, 1944 (Otto Buchholz), Assateague Island, May 31, 1929 (F. M. Jones); Gloucester County, Gloucester Point, August 31, 1941; Nansemond County, Dismal Swamp, June 5, 1944, May 28, 1945 (Otto Buchholz); Richmond County, east end of the bridge from Tappahannock, August 31, 1941 (W. H. Wagner, Jr.); Westmoreland County, Potomac Beach, August 31, 1941 (W. H. Wagner, Jr.).

Variation.—This species is usually regarded as having two races, typical *aaroni* in the north and the larger and darker *howardi* in Florida. Specimens from Virginia are practically all of the large dark Florida type, some females, indeed, having broader dark margins than any we have seen from Florida. The form *aaroni* represents nothing more than a depauperate light and somewhat undersized variety of the species which in reality is typified by the Florida *howardi*. This depauperate form *aaroni* occurs occasionally in the Chesapeake Bay region, especially in the first brood. The relation between the form *aaroni* and the normal form *howardi* seems to us to be quite the same as that between the small form of *Atrytone logan* that occurs in the vicinity of Boston, Mass., and in the mountains farther south, and the larger typical form.

Dr. Frank Morton Jones and Dr. Warren Herbert Wagner, Jr., both independently reached the conclusion that there is no real difference between *aaroni* and *howardi*. Dr. Jones writes us that this species occurs both in peninsular Maryland and in Sussex County, Del. He said he doubted any real distinction between *aaroni* and *howardi* except average size. Some examples equal in size those from Florida, while others closely match New Jersey specimens of *aaroni*. He said that the 21 specimens in his collection gave the following data, the expanse being the distance from the apex of the fore wing to the center of the thorax, doubled: Anglesea, N. J. (2), 32, 34 mm., average 33 mm.; Rehobeth, Del. (2), 34, 38 mm., average 36 mm.;

Ocean City, Md. (6), 34, 36, 36, 37, 38, 42, average 37 mm.; Shellton, Md. (1), 35 mm.; Royal Palm State Park, Fla. (10), 32, 32, 34, 37, 38, 38, 38, 40, 40, 40, average 37 mm. He noted that the New Jersey specimens are perhaps a trifle paler than the others of like freshness. On the characters given for their separation most peninsula specimens fall to *howardi* rather than to *aaroni*. We have examined a large series of specimens taken by Mr. Wagner at Chincoteague Island and at various points in Chesapeake Bay nearly all of which are referable to *howardi*. We see no reason for the retention of the name *howardi*. Dr. W. J. Holland in the revised edition of "The Butterfly Book," 1931, wrote under *Poanes howardi*: "All of the specimens I possess show a pale longitudinal streak on the lower side of the hind wing, which does not occur in *P. aaroni*." There is really no difference in this respect between the two forms.

Occurrence.—Found in the salt marshes, as noticed by Dr. Wagner always in association with the salt-marsh grass (*Spartina alterniflora* var. *glabra*), often straying for some distance into adjacent fields; local, but common to abundant wherever found; abundant along the causeway from the mainland to Chincoteague Island.

Seasons.—Two broods. Our records, supplemented by others from Maryland and Delaware kindly given us by Drs. Frank Morton Jones, George W. Rawson, and Warren Herbert Wagner, Jr., indicate that this species first appears at the end of May and flies almost or quite through June. The second brood appears at about the end of the third week in August (August 21) and flies until the end of the season, about the middle of September (September 13).

During a recent visit to Emory University, Atlanta, Ga., in company with Lucien Harris, Jr., Mr. Harris showed the senior author a bound volume of original water colors by John Abbot that he had recently presented to the University library. The figures were chiefly of birds, but some of the plates included butterflies also. Among the butterflies figured was this species, as well as the somewhat similar *Atrytone arogos*.

POANES YEHL (Skinner)

Plates 28, *q*; 30, *d, f, g*

Range.—Deep swamps in Nansemond, Norfolk, and Prince George Counties. Our records are: Nansemond County, Dismal Swamp, near Suffolk, fourth week of July, 1925 (F. M. Jones), September 1, 1935, July 5 to August 20, 1944 (Otto Buchholz), Suffolk, September 4, 1936, July 27, 1938, Holland, July 5 to August 20, 1944

(Otto Buchholz); Norfolk County, Green Sea, September 2, 1935, North Landing River swamp, September 5, 1936; Prince George County, Second Swamp near New Bohemia, July 19, 1941.

Variation.—This species is unusually variable. There are two quite distinct forms connected by a complete series of intergrades. In one of the forms the under side of the hind wings is cinnamon with the light spots clearly defined and conspicuous (pl. 30, *g*). In the other the under side of the hind wings is yellow with the spots vaguely and indefinitely outlined and scarcely contrasting with the light background (pl. 30, *d*). In the males the dark border may be scarcely half the usual width, the ground color may be light and rather bright yellow, and the stigma may be yellow with narrow black edges (pl. 28, *q*).

Occurrence.—Found in thick and very wet deciduous swamps, occasionally straying to more open and drier localities; we found it abundant in the North Landing River swamp, and Mr. Buchholz found it abundant in the Dismal Swamp and at Holland. It is exceedingly shy and difficult to catch.

Season.—Apparently one brood, flying from July 4 to September 4.

POANES MASSASOIT (Scudder)

The subspecies represented in the vicinity of Virginia is—

POANES MASSASOIT HUGHI A. H. Clark

Frontispiece, fig. 11; plate 26, *c, d*

Range.—This butterfly has not been taken in Virginia, but it is abundant in bogs at Hyattsville and Beltsville, Md., a short distance north of the Potomac, and probably will be found in nearby Virginia.

Occurrence.—Found in very wet bogs surrounded by woods and subject to inundation in the spring; very local, but abundant wherever found.

Season.—One brood. This butterfly is on the wing from July 1 to the last week in July.

Genus ATRYTONE Scudder

ATRYTONE AROGOS (Boisduval and LeConte)

Plate 11, *a, b*

Range.—Known only from Montgomery County. Prof. Ellison A. Smyth, Jr., writes us that he has taken this species at Blacksburg but that it is not common.

Occurrence.—Found in open fields.

Season.—Apparently one brood. The records for Tryon, N. C., are from the latter part of June to August.

ATRYTONE LOGAN (W. H. Edwards)

Plate 27, *c, d, e*

Range.—Throughout the State.

Variation.—This species varies very considerably in size along the eastern seaboard. In a series from Newtonville, near Boston, Mass., the fore wings are 12–13 mm. long. Over most of Virginia the fore wings are 14–15 mm. long. In southern Princess Anne County large individuals occur with the fore wings 16–18 mm. long; they resemble others from Florida. In Isle of Wight County we have found large individuals resembling those from southern Princess Anne County, or from southern Florida, flying with more numerous smaller ones.

Occurrence.—Found in bogs and wet meadows in the higher country, in marshy areas and near wet woods on the Coastal Plain; very local; infrequent to frequent; never very common.

Seasons.—Two broods. This species first appears at the end of May and flies until the second week of July (July 10). The second brood is on the wing shortly after the middle of July (July 17) and flies until the end of the season in the first week of September.

ATRYTONE PALATKA (W. H. Edwards)

Plate 29, *g, h, i*

Range.—Southern Princess Anne County; Otto Buchholz took this species near Munden, June 21, 1939; in southern Princess Anne County on June 16, 1941; and along Route 614 2 miles north of the North Carolina line on June 16–22, 1944. He was so kind as to present a pair of Virginia specimens to the United States National Museum. We have not found it.

ATRYTONE DION (W. H. Edwards)

Plate 29, *e*

Range.—Bogs and swamps in Nansemond, Norfolk, and Princess Anne Counties. Our records are: Nansemond County, Dismal Swamp near Suffolk, June 11, 14, 1937, June 11, 1939, Dismal Swamp, April 20, 1945 (Otto Buchholz); Norfolk County, Green Sea, September 2, 1935, North Landing River swamp, June 12, 1939, June

19, 1944 (Otto Buchholz), Northwest, May 31, 1937, Wallaceton, June 12, 1938, July 5, 1941; Princess Anne County, Gum Swamp road at the bridge over West Neck Creek, September 2, 1940, Lake Tecomseh, July 3, 1939, North Landing River swamp, July 5, 6, 1941, Seaside State Park, September 5, 1936.

Occurrence.—Found in wet sedgy hollows in pine barrens and in sedgy areas in swamps; usually infrequent to frequent, sometimes common. We have found this species most numerous where the Gum Swamp road crosses West Neck Creek, 1 mile west of Pungo, Princess Anne County. It is fairly common in the wet hollows among the sand dunes west of the road north from Virginia Beach.

Seasons.—Two broods. This species first appears toward the end of April (April 20) and flies through May and June and into the first week in July. The second brood probably appears toward the end of August and flies until the end of the season in September. We have found this butterfly most numerous early in September.

ATRYTONE ALABAMAE Lindsey

Plate 29, f

Range.—Known only from Accomack and Nansemond Counties. Our records are: Accomack County, central portion of the Dahl Swamp three-quarters of a mile southeast of Cashville, July 23, 25, 1935; Nansemond County, Dismal Swamp, May 29, 1945 (Otto Buchholz).

Discussion.—We do not believe that this form can be conspecific with *dion*, for the following reasons: Though it is very similar to *dion*, we have seen no intergrades between the two. It is most numerous in the latter part of July when *dion* is not flying. It is associated with a different type of sedge (*Carex striata* var. *brevis*), which is presumably its food plant.

We have before us a series of 27 males from the Dahl Swamp, and also Professor Lindsey's type specimen, a male from Mobile, Ala., for the privilege of examining which we are indebted to Dr. Hugo Kahl, who personally brought it to us from Pittsburgh, Pa.

On the upper surface some of our males agree perfectly with Lindsey's type specimen, though most of them are somewhat brighter with the fulvous band on the fore wings bordering the stigma externally somewhat broader; one is even darker, with this band narrower. This fulvous band is usually less than half as broad as the distance between its outer edge and the edge of the wing, whereas in *dion* it is nearly or quite as broad as the distance between its outer

border and the edge of the wing. In *alabamae* the fulvous band is relatively short, ending abruptly at the upper end of the stigma, and is not practically continuous with the subapical spots as it is in *dion*. In the type of specimen of *alabamae* the subapical spots on the fore wings are reduced to one, small and inconspicuous, with a faint vestige of another above it. They are similarly reduced in some specimens from the Dahl Swamp, though in these there are usually two present.

In *alabamae* the fulvous dash on the hind wings is always short, about 3 mm. long as in the type specimen, and in some individuals it is absent. In *dion* it is always present and is 5–6 mm. long.

On the under side the specimens from the Dahl Swamp agree perfectly with the type specimen, except that in all but one the spots on the under side of the fore wings are larger. The ground color of the under side of the hind wings is darker and duller than in *dion*.

An interesting feature of the type specimen of *alabamae* is the narrow stigma, which is not much more than half as broad as the stigma of the type specimen of *dion*. In a few of the specimens from the Dahl Swamp, the stigma is similarly narrow, though usually it is more as it is in *dion*.

In the eight females from the Dahl Swamp, which we have compared directly with the female type of *dion* from Whiting, Ind., the spots on the fore wings are smaller, especially the lowest, and the one above this is usually absent. The dash on the hind wings is short, dark, and inconspicuous.

Occurrence.—In the Dahl Swamp confined to the wet, open, sedgy areas in the central portion; very common in the limited areas in which it occurs.

Seasons.—Probably two broods. Mr. Buchholz took it on May 29, and we found it on July 23 and 25.

ATRYTONE DUKESI Lindsey

Plate 29, *a, b, c, d*

Range.—Known only from the deep swamp bordering the North Landing River and Pocaty Creek in Norfolk and Princess Anne Counties. Our records are: Norfolk and Princess Anne Counties, swamps bordering the North Landing River, Pocaty Creek, and the Chesapeake and Albemarle Canal, June 14, July 3, 1938, June 12, 13, 23, July 2, 1939, July 5, 16, 1941, June 16–26, 1944 (Otto Buchholz).

Occurrence.—Found in the interior and along the borders of very wet gum (*Nyssa aquatica*) swamps, seldom venturing out of the deep

shade of the swamp vegetation so that it is easily overlooked; common in the very limited areas in which it occurs.

The most practicable way to obtain this species in quantity is from a boat on the North Landing River and along the Chesapeake and Albemarle Canal. It may also be collected in quantity by wading through the swamp, which must be done with caution because of the presence of water moccasins (*Agkistrodon piscivorus*) and, in the drier areas, of canebrake rattlers (*Crotalus horridus*).

Variation.—When freshly emerged this species is sooty black, but it soon becomes more or less brown. Museum specimens are always brown contrasting strongly with freshly caught individuals.

Season.—One brood, June 12 to July 16.

ATRYTONE CONSPICUA (W. H. Edwards)

Plate 27, *g, h*

Range.—Known only from Giles and Nansemond Counties. Our records are: Giles County, Little Meadows, near Mountain Lake, July 21, 25, 26, 1940, July 1941 (Lloyd G. Carr and Carroll E. Wood, Jr.), July 21, 1949 (Carl W. Gottschalk); Nansemond County, Dismal Swamp, June 3, 1944 (Otto Buchholz). Mr. Wood has kindly presented specimens taken on July 25, 1940, to the United States National Museum.

Occurrence.—Found in bogs in, or adjacent to, woods, and along the sedgy and marshy banks of slow woodland streams in hilly country; very local, but usually abundant wherever found.

Mr. Wood raised this species on *Carex stricta*, and presented larvae to the United States National Museum.

Season.—One brood. All the specimens from Giles County were taken from July 21 to 26. At Beltsville, Md., this species flies from the last week in June to about the end of July. Apparently it flies earlier in the Dismal Swamp, as might be expected.

ATRYTONE BIMACULA (Grote and Robinson)

Plate 27, *j, k*

Range.—One Virginia record, August County, Mountain Lake (Shenandoah Acres), July 5, 1937.

Occurrence.—Confined to permanently wet meadows and bogs. This species is common at Caudy's Castle in Hampshire County, W. Va., a few miles west of the Frederick County line, where numerous specimens have been taken by Warren Herbert Wagner, Jr.

Season.—One brood. In this region this butterfly probably flies from about the middle of June to about the middle of July.

ATRYTONE RURICOLA (Boisduval)

The subspecies represented in Virginia is—

ATRYTONE RURICOLA METACOMET (Harris)

Plates 11, *c*; 26, *e*

Range.—Throughout the State.

Variation.—Intergrades between the eastern form (*metacomet* Harris) and typical western *ruricola* are occasionally found in eastern Virginia, and some individuals would certainly be referred to the western form if their origin were not known. We have seen two males from the Dismal Swamp in which the stigma was bordered on the outer side by a continuous narrow whitish stripe. Immaculate females are occasionally found.

Occurrence.—Found in damp meadows and boggy pastures and along the grassy borders of swamps and marshes, straying more or less into drier territory; fairly numerous everywhere, except in the highest mountain areas, and locally common.

Seasons.—Two broods. This species first appears at about the end of the third week in May (May 21) and becomes common later in the month and in the first half of June. The numbers then decrease, though individuals of the first brood are still on the wing when the second brood appears at about the end of the third week in July. The second brood is most numerous toward the end of July and in the first half of August, after which time the numbers decline and the butterfly disappears in the first week in September.

Genus ATRYTONOPSIS Godman and Salvin

ATRYTONOPSIS HIANNA (Scudder)

Plate 26, *q*

Range.—From Fairfax to Westmoreland and Henrico Counties, and westward to Alleghany County; probably also southwestward in the mountains, as it occurs in central and western North Carolina (Raleigh and Tryon). Our records are from Alleghany, Fairfax, Fauquier, Henrico, Prince Edward, Roanoke, and Westmoreland Counties.

Variation.—Most individuals have two small, but conspicuous, white spots on the under side of the hind wings near the anterior edge,

one near the base and the other just beyond the middle, but the outer spot is frequently absent, and both spots may be absent. Occasional individuals may have more spots, sometimes as many as six, scattered over the under surface of the hind wings.

Occurrence.—Found in dry open fields and brushy woodland clearings; very local, but often frequent or even common where it occurs. It is often found in the same localities as *Hesperia metea*.

Season.—One brood. This species appears in the first week in May (rarely in April), becomes numerous in the last half of the month, and disappears early in June.

Genus **LEREMA** Scudder

LEREMA ACCIUS (J. E. Smith)

Plate 27, *o, r*

Range.—Throughout the Coastal Plain, in the extreme southern part of the central portion of the State, and in the valley bottoms of the western mountains as far northeast as Augusta and Madison Counties. Our records are from Accomack, Arlington, Augusta, Giles, Isle of Wight, King William, Lancaster, Madison, Mecklenburg, Montgomery, Nansemond, Norfolk, Northampton, Patrick, Prince George, Princess Anne, Roanoke, Southampton, Sussex, Warwick, and Wythe Counties.

Occurrence.—Found in open fields, particularly along the roadsides and the borders of woods, along the sides of roads through woods, and occasionally in open woods, in low and usually more or less damp regions or valley bottoms; very irregular in its occurrence; usually common in late summer on the outer Coastal Plain, sometimes (as in 1935) the commonest skipper, though in some years scarce or (as in 1941) apparently absent; elsewhere infrequent or casual, or apparently absent.

Seasons.—Three broods. From our records it would appear that this species is only a summer visitor to Virginia—at least in most years. The only Virginia record that can represent the spring brood is that of a single individual taken on May 12, 1938, in Roanoke County. This butterfly appears usually in the second week in June, its numbers reaching a maximum in the first half of July, and becoming greatly reduced in August. A new brood, much more numerous than the midsummer brood, appears about the first half of September and flies until the end of the season early in October.

Genus **AMBLYSIRTES** Scudder**AMBLYSIRTES VIALIS** (W. H. Edwards)Plate 27, *n, q*

Range.—Throughout the State.

Occurrence.—Found in rich open deciduous woods, along roads through woods, and along the borders of woods; in the north and in the western mountains generally distributed and often locally common; more local, though in some places common, on the Piedmont and on the Coastal Plain; rare in the south-central and southeastern sections.

Seasons.—Two broods. The roadside skipper appears in the second week in April (April 11) and flies through May and into the first week in June (June 6). The second brood appears early in July (July 6) and flies until just after the middle of August (August 18).

AMBLYSIRTES HEGON (Scudder)Plates 25, *i*; 27, *l*

Range.—Known only from Henrico, Warren, Botetourt, Roanoke, and Montgomery Counties. Our records are: Henrico County, Richmond, May 16, 1937; Warren County, Limeton, May 12, 1941; Botetourt County, Gala, May 16, 1943; Roanoke County, Ash Bottom, near Salem, April 23, 1938, Dixie Caverns, May 5, 1940, Fort Lewis Mountain, May 2, 1937, April 23, 1938, Salem, 1927, April 24, 1938; Montgomery County, Blacksburg, June 2, 1899. It is probably locally distributed in the northern half of the State and throughout the western mountains.

Occurrence.—Found in open places in woods, along roads through woods, and about the borders of woods; very local and never very numerous; it is common at Berkeley Springs, W. Va.

Season.—One brood. According to our records this species is on the wing from April 23 to June 2.

AMBLYSIRTES ALTERNATA (Grote and Robinson)Plate 25, *l, m*

Range.—Nansemond County, taken by Otto Buchholz on June 5 and from July 15 to August 15, 1944, and in the Dismal Swamp on April 26, 1945. Mr. Buchholz has kindly presented a pair of Virginia specimens to the United States National Museum.

AMBLYSCIRTES TEXTOR (Hübner)

Plate 3, *j*

Range.—From Princess Anne westward to Surry, Prince George, and Greensville Counties. Our records are from Greensville, Nansemond, Norfolk, Prince George, Princess Anne, and Surry Counties.

Occurrence.—Found in thick wet woods, especially in the glades and along the roads; generally distributed but usually not common, and met with as occasional individuals resting on leaves; locally where conditions are especially favorable and flowers (particularly *Prunella* or *Elephantopus*) are present, as in various localities along the western border of the Dismal Swamp, it is common to exceedingly abundant. This species varies considerably in numbers in different years, wet years being most favorable for it.

Seasons.—Two broods. This butterfly first appears in the latter part of May, becomes abundant in June and early July, and disappears before the first of August. The second brood is on the wing at the end of August, becomes common in early September, and flies until the end of the season in late September (September 23). Otto Buchholz has taken it in the Dismal Swamp as early as April 27, so it is possible that there is a spring brood we have overlooked.

AMBLYSCIRTES CAROLINA (Skinner)

Plates 28, *p*; 30, *a, b, c*

Range.—From Princess Anne County westward to Prince George and eastern Greensville Counties.

Variation.—This species, always easily recognizable by the spotting on the upper side of the fore wings (pl. 28, *p*), varies greatly in the color of the under side of the hind wings. Most commonly the under side of the hind wings is light, rather dull yellow with a submarginal row of cinnamon or rusty-brown spots, and a number of similar spots are evenly distributed between this row and the wing base (pl. 30, *a*). In a large percentage of the individuals the ground color of the hind wings is a uniform cinnamon or rusty brown with a submarginal row of small yellow spots and a long or short streak in the cell (form *reversa* F. M. Jones, pl. 30, *b*). In extreme cases these submarginal spots may be reduced to two or three very small spots, or in worn individuals they may be wholly obscured so that the under side of the hind wings is uniform brown varying from a rich chestnut to light yellow-brown, with a more or less conspicuous narrow or broad streak in the cell (pl. 30, *c*).

The usual form in Virginia is *carolina*, but *reversa* is found every-

where with it and is especially common in the Dismal Swamp near Suffolk, where sometimes more than half the individuals captured are referable to it. The immaculate form is not common; we have taken it in the Dismal Swamp near Suffolk, and near Surry.

Occurrence.—Found in wet woods with an undergrowth of *Arundinaria tecta* near swamps or sluggish streams; generally distributed but not common; most numerous locally along the western border of the Dismal Swamp and in southern Princess Anne County.

Seasons.—There appear to be three broods. In 1938 we captured three worn females on April 1 so that the butterfly must have been on the wing since about the middle of March, and Otto Buchholz has taken it in the Dismal Swamp on April 26. It reappears at the end of May, becomes common in June, and flies through July and into August. The third brood is on the wing toward the end of August, and the individuals are most numerous in early September.

Genus **LERODEA** Scudder

LERODEA L'HERMINIERI (Godart)

Plate 11, *c, d*

Range.—Throughout the State.

Variation.—The males of this species may be uniform brown above, or the fore wings may have a more or less diffuse large dark brick-red patch including the inner half of the interspace between veins 2 and 3, the basal portion of the interspace just above, the entire lower border of the wing below vein 1, and the borders, or almost the whole of the interspace between veins 1 and 2. We have taken specimens with this patch extensively developed at Aylett, King William County, and elsewhere. All degrees of development of this patch are found. In faded specimens this patch becomes dark dull yellowish.

Occurrence.—Found in open fields, more or less damp or with a thick growth of luxuriant grass or clover, within which it is very local, confined to limited areas sometimes of only a few hundred square feet within which it may be common but from which it seldom strays. Because of its localization, its habit of usually keeping well down in the grass, its small size, and its inconspicuousness, it is easily overlooked.

Virginia appears to be approximately the northern limit of this species as a permanent resident, for here it seems to be mostly killed out during the winter. Our records for May are all from the Coastal Plain (Norfolk, Nansemond, Westmoreland, and Caroline Counties) and from the west (Roanoke and Albemarle Counties), and the indi-

viduals represented by these records are very few. June records add Prince George, Dinwiddie, and Fairfax Counties, and the District of Columbia area in the east, Prince Edward County in the center, and Montgomery County in the west. These additions only confirm the localization indicated by the May records, except for Prince Edward County, which might easily be reached by individuals raised in North Carolina. We are inclined to believe that over most of Virginia this species is only a summer visitor.

Seasons.—Two broods. This species first appears about the middle of May (earliest date May 12) and is common in the latter part of May and in the first half of June, after which its numbers fall off and it disappears in the first week in July. The second brood is on the wing shortly after the middle of July (July 18), and the insect is common from the end of July until about the middle of September, sometimes continuing on the wing into early October. It is most numerous in August, especially in the first half of the month.

LERODEA EUFALA (W. H. Edwards)

Plate 24, *q*

Range.—Found on the outer Coastal Plain as far west as Nansemond County, and in the southwest as far northeast as Roanoke and Nelson Counties. Our records are: Nansemond County, Brinkley, September 26, 1937, Chuckatuck, October 1, 1937, Suffolk, September 26, 1937, North Carolina line at Route 53, September 24, 1937; Nelson County, Lovingston, August 12, 1937; Norfolk County, east of the Dismal Swamp, September 2, 1935; Princess Anne County, Virginia Beach, dunes south of the military airport, September 30, 1937; Roanoke County, Fort Lewis, September 6, 1937, July 23, 1939, Salem.

Occurrence.—Found in open fields. So far as is known this species is only a summer visitor to Virginia, where there is no evidence that it survives the winter. It has recently been recorded from the District of Columbia. This species is reported as apparently a recent invader in California, rapidly becoming common at Indio. Leussler says that whereas it was formerly rare in Nebraska it is now abundant there during September and early October, and is spreading northward.

Season.—Only the summer brood is known from Virginia, flying from the last week in July (July 23) until early in October (October 1); most of the records are in the first week in September. Dr. Warren Herbert Wagner, Jr., captured a male in the District of Columbia on September 7, 1935.

Genus **CALPODES** Hübner**CALPODES ETHLIUS** (Cramer)

Plate 23, f

Range.—Confined to the Coastal Plain, extending westward to Southampton County, Petersburg, Richmond, Fredericksburg, Alexandria, and Washington, D. C. Our records are from Alexandria, and Accomack (Tangier Island, September 18, 1939), Arlington, Dinwiddie, Gloucester, Henrico, Isle of Wight, James City, King William, Nansmond, New Kent, Norfolk, Princess Anne, Southampton, Spotsylvania, Surry, Sussex, Warwick, Westmoreland, and York Counties.

Occurrence.—Very erratic; commonly, or perhaps usually, present in small numbers on the outer Coastal Plain, though in some years wholly absent; occasionally abundant over the entire Coastal Plain, doing great damage to garden cannas.

All our records, from 52 localities, are for the late summer of 1937, between September 8 and October 3, except the following: Tangier Island, September 18, 1939; Richmond, July 1934 (Carroll M. Williams), September 10, 1938 (Carroll M. Williams); and Virginia Beach, August 21, 1936 (Warren H. Wagner, Jr.).

In 1937 we planned an extensive investigation of the Dismal Swamp region between September 24 and October 3, but the weather was rainy and no butterflies were flying. So we devoted ourselves to the examination of canna beds to determine the presence of the larvae of this species. Larvae were found throughout the Coastal Plain, where they had done extensive damage to cannas everywhere.

We have never seen the adult of this species in Virginia although we have found thousands of the larvae, some of which we raised to maturity. All our records are for larvae except for a single adult from Virginia Beach taken on August 21, 1936, by Dr. Warren Herbert Wagner, Jr., and one seen at Franklin, Southampton County, by Dr. Carroll M. Williams on September 8, 1937. In the Department of Agriculture grounds at Washington, D. C., we saw two females ovipositing on canna leaves between 1 and 1:30 p.m. on September 14, 1937.

Dr. Carroll M. Williams, who reared this butterfly from larvae found on cannas at Richmond in July 1934, made a special study of it in the great outbreak of 1937. His attention was first drawn to it in the week of June 20 when, as a result of a telephone call from his cousin, Gordon Williams, he found several larvae on the identical plant on which he had found others in 1934. Later he found larvae in great abundance at all points on the Coastal Plain. But he did not

see an adult under natural conditions until September 8. He writes us that on that date, at Franklin, at 2:45 p.m., he observed a female ovipositing. Upon being attracted to a group of green cannas by their tattered appearance, he saw a female dashing madly about, so fast that the eye could scarcely follow it. At intervals it would return and come to rest on the canna leaves. After about half a minute or less it would again dart into flight. Upon examination of the point where it had been resting, from one to four bluish-green eggs were found. These were dome-shaped and minutely reticulated. Close examinations of the plants revealed many eggs deposited on both surfaces of the leaves, as well as fragments of eggs from which the larvae had emerged. Hundreds of larvae in all stages were present, as well as a few pupae and larvae that were suspended for pupation.

In the Department of Agriculture grounds we noted that the female dashes up to the cannas, alights on a leaf, and with much deliberation attaches an egg. When this is done, after a minute or so, she dashes off at great speed and is soon lost to view.

On August 26, 1927, Dr. Williams made an examination of a canna bed in a cemetery at Richmond and found much damage to have been done. A few very young larvae were still present, but most of the insects had disappeared. A week before, he had seen dozens of full-grown larvae in this one canna bed, but he now found only three pupae and one larva that was ready to pupate. He examined what had formerly been the shelters of the larvae but in practically every case the folds seemed to have been devoured. He did find a partial explanation. Of the three pupae he took, only one was in its leaf roll in accordance with its habits as reported in the literature on the subject. The two others were on the under side of the leaf and next to the midrib. No complete fold was made, but rather the leaf was drawn downward in a sort of inverted trough effect, in the upper concave of which the pupa was suspended.

On September 12, 1937, we examined a large plat of fancy cannas at the Agricultural Station north of Alexandria. Larvae in all stages, and pupae, were abundant. In making the shelters the edge of the leaf may be broadly folded inward without any cuts, usually over the upper surface, but sometimes over the lower, or the leaf may be cut above or below the fold, or cut and more or less eaten in both places. The pupae are usually found on the higher fully developed leaves. They usually lie in a broad fold over the upper surface of the leaf, though they may be in a fold on the lower surface, or they may lie transversely on the lower surface with the leaf gabled above them.

We have watched a caterpillar fold over the edge of a leaf. Several very wet threads were spun, making a slight concavity in the leaf surface. As the threads dried they shortened and the edge of the leaf was thus drawn in over the upper surface. The actual folding of the leaf is not done by the caterpillar, but by the drying and shrinking of the threads.

The upper leaves of the cannas are those usually attacked, and we have seen many canna beds in which the upper leaves of all the plants were reduced to little more than the midribs. Dr. Williams tells us that in some beds in Richmond the leaf infestation seemed to be nearly 100 percent, what had formerly been leaves being represented in many cases by only the central thick midrib.

We noticed in the Department of Agriculture grounds at Washington that larvae were found on September 20, 1937, in all the beds of cannas with green leaves, but none were found in a bed of red-leaved cannas.

Season.—Probably one brood in Virginia. The earliest records for adults that we have are for July 9 and 11, 1937, when two emerged from pupae sent us from Richmond by Dr. Williams. From this time on the butterfly is continuously on the wing in increasing numbers until the end of the season early in October. Caterpillars have been reported from Richmond about the middle of June. These are from eggs that have been deposited by females coming from the south, for this butterfly is not known to survive the winter north of South Carolina. From June onward caterpillars in all stages may be found, but from about the third week in August large caterpillars become scarce and small ones relatively much more numerous. These small caterpillars are evidently the young of adults raised in Virginia, but there is no evidence that any young from Virginia-raised parents reach maturity before the end of the season.

Genus **PANOQUINA** Hemming

PANOQUINA PANOQUIN (Scudder)

Plate 26, 1

Range.—Found in salt marshes along the entire coast. We have records from Accomack, Gloucester, Mathews, Middlesex, Northampton, Princess Anne, Richmond, and Westmoreland Counties.

Variation.—When fresh the under side of the hind wings has a marked yellowish tinge and the veins are dull yellow, contrasting with the white streak beyond the end of the cell. In flight freshly emerged

individuals appear brownish yellow. The yellow soon fades to dull grayish and is never preserved in museum specimens.

Occurrence.—Confined to salt marshes with an abundance of sedge (*Scirpus*), the roots of which are covered at high tide, seldom straying inland much beyond the high-tide mark; common to abundant wherever found.

Seasons.—Three broods. The first brood appears at the end of May (May 31) and flies until the first week in July. The second brood flies abundantly in the last half of July. The third brood appears at about the end of the third week in August (August 23) and flies until after the middle of September (September 18).

PANOQUINA OCOLA (W. H. Edwards)

Plate 26, *p*

Range.—Occurs chiefly on the outer Coastal Plain, ranging westward to Arlington, Fairfax, Prince William, Henrico, Sussex, and Greensville Counties; also found in the southwest as far northeast as Nelson County. Our records are from Arlington, Gloucester, Greensville, Henrico, Isle of Wight, Mathews, Nansemond, Nelson, Norfolk, Prince William, Princess Anne, Roanoke, Southampton, Stafford, Sussex, and Wythe Counties.

Occurrence.—This species is an inhabitant of open fields and gardens in low and more or less damp regions. It is very variable in its occurrence, being usually fairly common late in summer, in some years (as in 1937) abundant, in others (as in 1941) scarce.

Seasons.—Three broods. Apparently this species does not usually survive the winter in Virginia but comes into the State each summer from farther south. We have only two records that can be considered as representing the spring brood, one in late May (May 28, Suffolk), and one near the middle of June (June 13, North Landing River). The midsummer brood usually appears shortly after the first of July (July 3) and flies until about the first week in September. The third brood, in which the individuals are much more numerous than they are in the midsummer brood, appears after the third week in September and flies into early October, sometimes as late as October 26.

ERRONEOUS RECORDS

The following species have been erroneously credited to Virginia in the literature:

Limenitis arthemis (Drury): The white-banded form credited to Virginia by Emmons does not occur in the State.

Lycorca cleobaca (Godart) : Recorded from Virginia by error for Virgin Islands.

Ithomia drymo (Hübner) : From Virginia, Minas Gerais, Brazil.

Hemiargus hanno (Stoll) : Credited to Virginia by Boisduval and LeConte, but there is no evidence that it occurs in the State.

Pieris virginiensis W. H. Edwards : Credited to Virginia by Strecker in error for West Virginia.

Colias alexandra edwardsii W. H. Edwards : Given in Seitz from Virginia by error for Virginia City, Nev.

Eurema elathea (Cramer) : We have no evidence that this species is found in the State.

Erora lacta (W. H. Edwards) : Listed by Strecker from Virginia by error for West Virginia.

Erynnis martialis ab. *ausonius* (Lintner) : Given by Strecker from Virginia : probably *E. martialis*.

Potanthus mingo (W. H. Edwards) : A Philippine species described from West Virginia, identified by Evans, who gave the locality as Virginia.

Ochlodes sylvanus (Esper) : In the revised edition of "The Butterfly Book," 1931, Dr. W. J. Holland wrote: "I have in my possession a male of this European species taken at Richmond, Virginia. Its chrysalis may have been brought over in hay, or packing material, and the butterfly emerged on this side of the Atlantic. It differs in no respect from specimens from Germany, of which I have many . . . It is a stray immigrant." We wrote to Dr. Walter R. Sweadner, curator of entomology, Carnegie Museum, Pittsburgh, regarding this record. He very kindly looked up the matter for us, and replied on November 3, 1947: "We have no specimen of *Augiades* [= *Ochlodes*] *sylvanus* from North America. I do not know anything with regard to the specimens about which Dr. Holland wrote."

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A few early records from "Virginia" refer to West Virginia, which was a part of Virginia until 1863. Rothschild and Jordan record

certain swallowtails collected by Col. Wirt Robinson near his home in Nelson County as from "W. Va." instead of western Virginia. A number of species have been recorded from Virginia by error for the Virgin Islands; Virginia, Brazil; and Virginia City, Nev.

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EXPLANATION OF FRONTISPIECE

(Photograph by Frederick M. Bayer.)

(All figures natural size.)

1. *Boloria selene marilandica* (A. H. Clark), under side, near Landover, Md., W. H. Wagner, Jr., July 15, 1941.
2. *Boloria selene marilandica* (A. H. Clark), upper side, type specimen, Beltsville, Md., A. H. Clark, July 6, 1929.
3. *Polygonia faunus smythi* A. H. Clark, upper side, Hardscrabble, Highland County, Va., A. H. Clark, July 26, 1929.
4. *Glaucopsyche lygdamus nittanyensis* F. H. Chermock, upper side, Ice Mountain, W. Va., A. H. Clark, April 19, 1938.
5. *Glaucopsyche lygdamus nittanyensis* F. H. Chermock, under side, Forks of Cacapon, W. Va., W. H. Wagner, Jr., April 16, 1941.
6. *Polygonia faunus smythi* A. H. Clark, under side, White Top Mountain, A. H. Clark, August 6, 1940.
7. *Strymon cecrops* ab. *gottschalki* A. H. Clark, under side, type specimen, Fort Lewis, Roanoke County, Va., Carl W. Gottschalk, August 11, 1937.
8. *Erora laeta* (W. H. Edwards), under side, Mountain Lake, Giles County, Va., Lorus J. and M. J. Milne, June 23, 1938.
9. *Melitaea ismeria* Boisduval and LeConte, under side, Old Fort Mountain, Ga., Lucien Harris, Jr., May 2, 1950.
10. *Atlides halesus* (Cramer), under side, Nashville, Tenn. (Barnes Collection.)
11. *Poanes massasoit hughii* A. H. Clark, under side, Hyattsville, Md., W. H. Wagner, Jr., July 2, 1941.



PLATES

PLATE I

(All figures reduced by one-third)

- a. *Lethe creola*, male, western edge of the Dismal Swamp about 8 miles south of Suffolk, September 1, 1935.
- b. *Lethe creola*, male, under side, Dismal Swamp near Suffolk, September 3, 1936.
- c. *Lethe creola*, female, Dismal Swamp near Suffolk, September 3, 1936.
- d. *Lethe creola*, female, under side of the specimen shown in figure c.
- e. *Lethe portlandia portlandia*, female, Princess Anne, September 24, 1934.
- f. *Lethe portlandia portlandia*, female, under side of the specimen shown in figure e.
- g. *Lethe portlandia anthedon*, type specimen, Lava, Sullivan County, N. Y.
- h. *Lethe portlandia anthedon*, under side of the specimen shown in figure g.
- i. *Lethe eurydice*, Beltsville, Md., July 17, 1929.
- j. *Lethe eurydice*, under side of the specimen shown in figure i.



BUTTERFLIES OF VIRGINIA



BUTTERFLIES OF VIRGINIA

PLATE 2

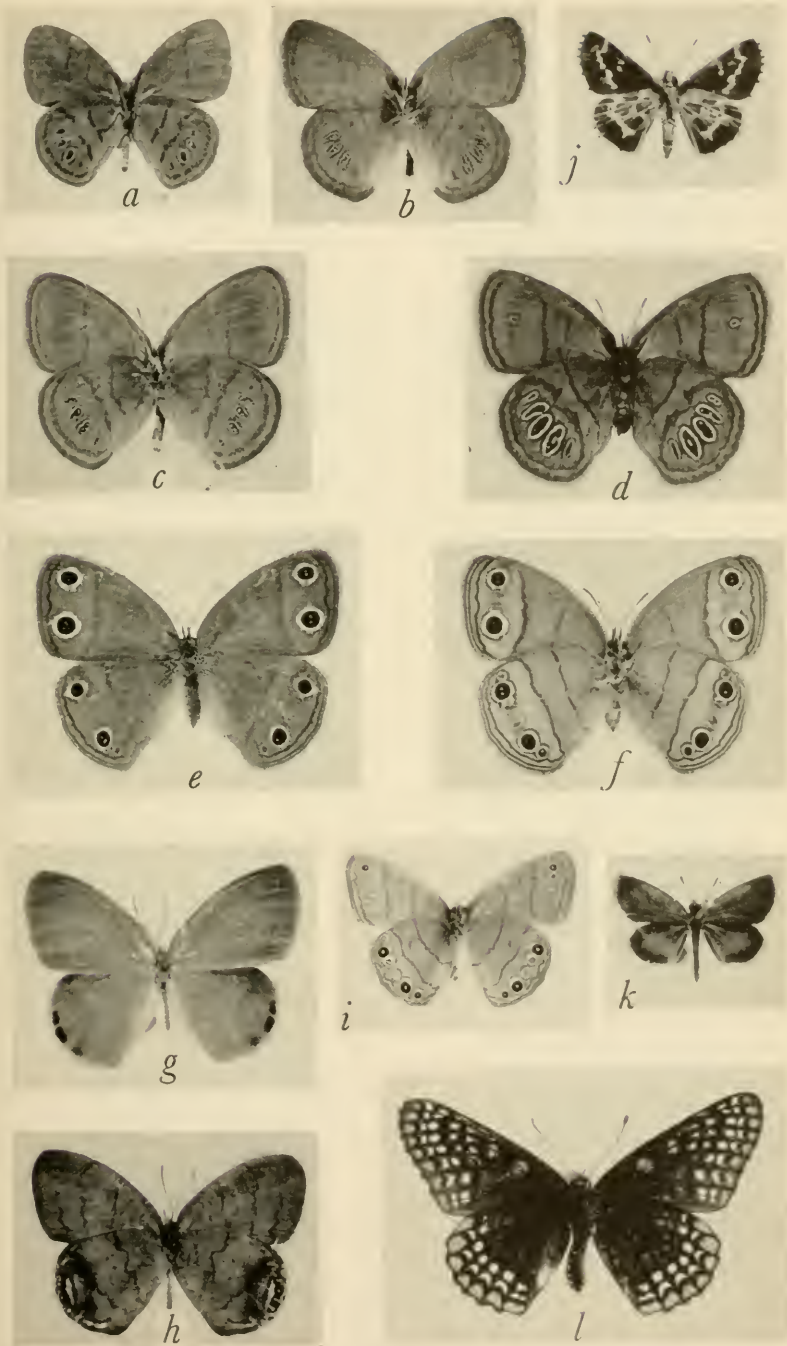
(All figures reduced by one-third)

- a. *Limenitis arthemis astyanax*, female, white-banded form, Nelson County, Col. Wirt Robinson, July 23, 1919.
- b. *Nymphalis antiopa*, female, Cabin John, Md., September 1, 1929.
- c. *Speyeria cybele*, male, under side.
- d. *Zerene cacsonia*, Cotulla, Tex.
- e. *Eurema nicippe*, male, Kansas.
- f. *Minois pegala alope*, male, Sitka Church, Md., July 4, 1929.
- g. *Minois pegala alope*, female, Beltsville, Md., July 23, 1928.
- h. *Minois pegala pegala*, male, Fort Macon, N. C., August 4, 1929.
- i. *Minois pegala pegala*, female, Fort Macon, N. C., August 4, 1929.

PLATE 3

(All figures natural size)

- a. *Euptychia arcolatus septentrionalis*, under side, 8 miles south of Suffolk, September 3, 1935.
- b. *Euptychia arcolatus arcolatus*, under side, Florida.
- c. *Euptychia arcolatus septentrionalis*, under side, 8 miles south of Suffolk, May 30, 1937.
- d. *Euptychia arcolatus arcolatus*, under side, Texas.
- e. *Euptychia cymela*, female, Cabin John, Md., July 18, 1926.
- f. *Euptychia cymela*, female, under side of the specimen shown in figure e.
- g. *Euptychia gemma*, Florida.
- h. *Euptychia gemma*, under side of the specimen shown in figure g.
- i. *Euptychia sosybius*, male, under side, Florida.
- j. *Amblyscirtes textor*, under side, Dismal Swamp near Suffolk, September 1, 1935.
- k. *Ancyloxypha numitor*, Newtonville, Mass., August 17, 1923.
- l. *Euphydryas phaëton*, male, Cabin John, Md., June 20, 1926.



BUTTERFLIES OF VIRGINIA



BUTTERFLIES OF VIRGINIA

PLATE 4

(All figures reduced by one-third)

- a. *Asterocampa clyton*, female, dark form, Cabin John, Md., September 8, 1926.
- b. *Asterocampa clyton*, female, light form, Cabin John, Md., September 11, 1926.
- c. *Asterocampa celtis*, female, Cabin John, Md., September 11, 1926.
- d. *Vanessa cardui*, female, under side, Essex, Mass., August 4, 1924.
- e. *Vanessa cardui*, female, Cabin John, Md., June 25, 1926.
- f. *Vanessa virginicensis*, female, Cabin John, Md., September 11, 1926.
- g. *Vanessa virginicensis*, female, under side, Cabin John, Md., September 11, 1926.
- h. *Junonia evarete coenia*, dry form, under side.
- i. *Junonia evarete coenia*, intermediate form, under side.
- j. *Junonia evarete coenia*, intermediate form approaching the wet form, under side.

PLATE 5

(All figures natural size)

- a. *Polygonia faunus smythi*, White Top Mountain, July 10, 1936.
- b. *Polygonia faunus smythi*, under side of the specimen shown in figure a.
- c. *Polygonia progne*, male, Center, N. Y., September 24, 1872.
- d. *Polygonia progne*, male, under side of the specimen shown in figure c.
- e. *Polygonia comma*, female, light form, Cabin John, Md., October 21, 1929.
- f. *Polygonia comma*, female, under side of the specimen shown in figure e.
- g. *Junonia evarete coenia*, female, wet form, Cabin John, Md., September 27, 1925.
- h. *Junonia evarete coenia*, female, wet form, under side, Cabin John, Md., September 27, 1925.



BUTTERFLIES OF VIRGINIA



BUTTERFLIES OF VIRGINIA

PLATE 6

(All figures reduced by one-third)

- a. *Euptoieta claudia*, female, Silver Spring, Md., August 1, 1927.
- b. *Euptoieta claudia*, female, under side of the specimen shown in figure a.
- c. *Limenitis arthemis astyanax*, male, under side, Silver Spring, Md., September 11, 1928 (upper side in figure h).
- d. *Limenitis archippus floridensis*, Miakka City, Fla., July 1900.
- e. *Limenitis archippus floridensis*, under side of the specimen shown in figure d (faint traces of the pattern of *L. a. astyanax* are seen in the cells of both wings).
- f. *Limenitis archippus archippus*, Decatur, Ill.
- g. *Limenitis arthemis astyanax*, male, white-banded form, Nelson County, Col. Wirt Robinson.
- h. *Limenitis arthemis astyanax*, male, Silver Spring, Md., September 11, 1928 (under side of this specimen shown in figure c).

PLATE 7

(All figures half natural size)

- a. *Speyeria diana*, male, Spring Grove, Surry County, June 15, 1938.
- b. *Speyeria diana*, male, under side of the specimen shown in figure a.
- c. *Speyeria diana*, female.
- d. *Speyeria diana*, female, under side of the specimen shown in figure c.
- e. *Agraulis vanillae nigrior*, Fernandina, Fla., August 7, 1929.
- f. *Agraulis vanillae nigrior*, under side of the specimen shown in figure e.
- g. *Speyeria cybele*, female, Rock Creek Park, Washington, D. C., June 23, 1923.
- h. *Speyeria cybele*, female, under side of the specimen shown in figure g.
- i. *Speyeria idalia*, female, Cabin John, Md., July 17, 1926.
- j. *Speyeria idalia*, male, Silver Spring, Md., June 16, 1929.



BUTTERFLIES OF VIRGINIA



BUTTERFLIES OF VIRGINIA

PLATE 8

(All figures reduced by one-third)

- a. *Speyeria aphrodite*, Buckeye, Highland County, July 27, 1939.
- b. *Speyeria aphrodite*, under side of the specimen shown in figure a.
- c. *Speyeria atlantis*, Middle Mountain, Highland County, June 19, 1948.
- d. *Speyeria atlantis*, under side of the specimen shown in figure c.
- e. *Minois pegala maritima*, male, Rock Creek Park, Washington, D. C., W. H. Wagner, July 6, 1935.
- f. *Vanessa atalanta*, female, wet form, Cabin John, Md., August 27, 1926.
- g. *Ascia phileta*, dark female.
- h. *Ascia phileta*, dark female, under side of the specimen shown in figure g.
- i. *Ascia phileta*, male, Cochise County, Ariz., July.
- j. *Ascia phileta*, male, under side of the specimen shown in figure i.

PLATE 9

(All figures natural size)

- a. *Boloria selene myrina*, Essex, Mass., August 12, 1925.
- b. *Boloria selene marilandica*, Beltsville, Md., July 6, 1929.
- c. *Boloria selene marilandica*, under side of the specimen shown in figure b.
- d. *Boloria toddi ammiralis*, Essex, Mass., August 30, 1925.
- e. *Boloria toddi ammiralis*, under side of the specimen shown in figure d.
- f. *Melitaea nycteis*, Lunenburg, September 2, 1936.
- g. *Melitaea nycteis*, under side of the specimen shown in figure f.
- h. *Eurema lisa*, male.
- i. *Anthocharis genutia*, male.
- j. *Anthocharis genutia*, female, Cabin John, Md., May 2, 1926.



BUTTERFLIES OF VIRGINIA



BUTTERFLIES OF VIRGINIA

PLATE 10

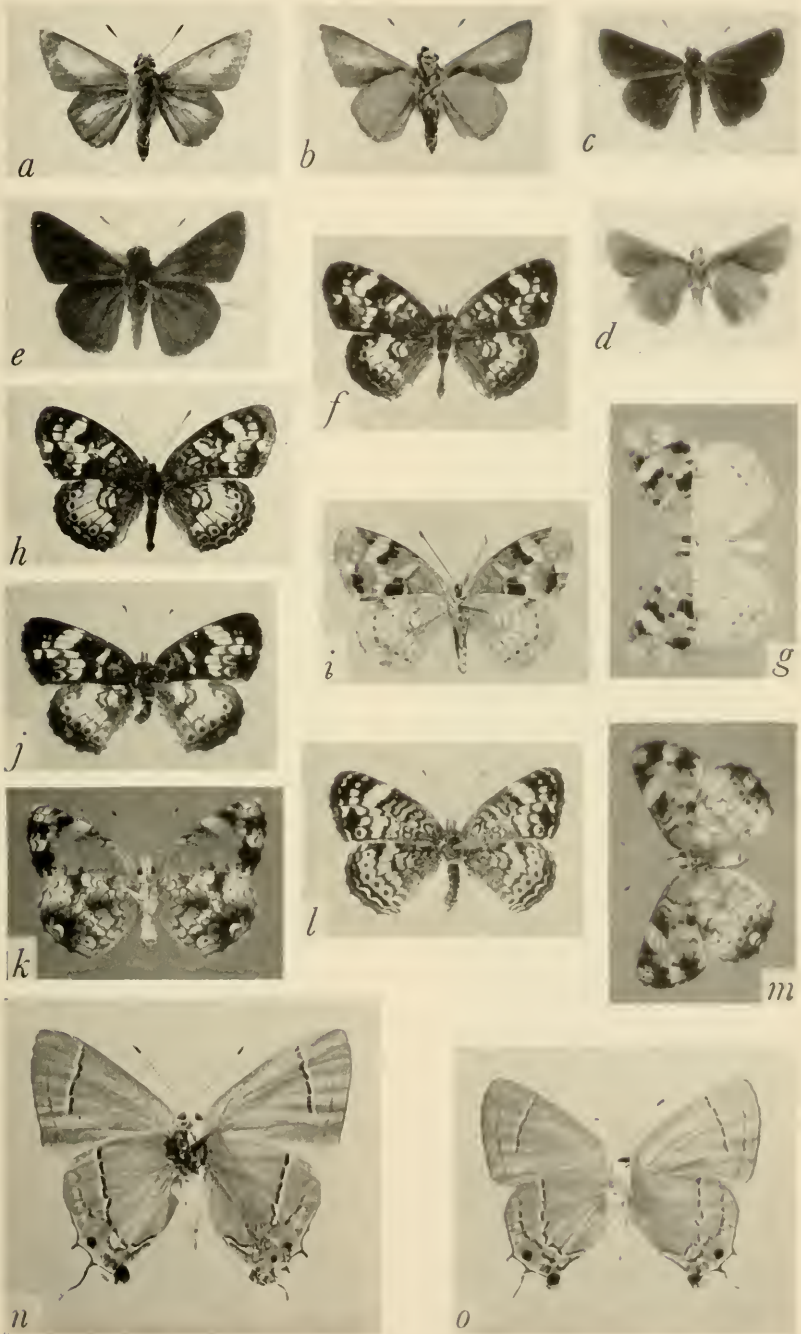
(All figures reduced by one-third)

- a. *Danaus plexippus plexippus*, female.
- b. *Danaus plexippus megalippe*, female, British Guiana.
- c. *Phoebis sennae*, male.
- d. *Phoebis philea*, male.
- e. *Colias eurytheme*, female, Cabin John, Md., September 14, 1928.

PLATE II

(Figures *n*, *o*, $\times 1\frac{1}{2}$, others natural size)

- a. Atrytone arogos*, St. Petersburg, Fla.
- b. Atrytone arogos*, under side of the specimen shown in figure *a*.
- c. Lerodea Pherminieri*.
- d. Lerodea Pherminieri*, under side of the specimen shown in figure *c*.
- e. Atrytone ruricola metacomel*, male, Jamesburg, N. J., August 4, 1907.
- f. Phyciodes batesii*, male, Albany, N. Y., June 6, 1876.
- g. Phyciodes batesii*, male, under side of the specimen shown in figure *f*.
- h. Phyciodes batesii*, female, Apple Orchard Mountain, 3,200 feet, Carroll E. Wood, Jr., June 1, 1938.
- i. Phyciodes batesii*, female, under side of the specimen shown in figure *h*.
- j. Phyciodes tharos*, male, Silver Spring, Md., July 7, 1928.
- k. Phyciodes tharos*, female, under side, Cabin John, Md., May 10, 1925.
- l. Phyciodes tharos*, female, upper side of the specimen shown in figure *k*.
- m. Phyciodes tharos*, under side.
- n. Strymon melinus melinus*, Florida.
- o. Strymon melinus humuli*, Apple Orchard Mountain, over 4,000 feet, July 24, 1934.



BUTTERFLIES OF VIRGINIA

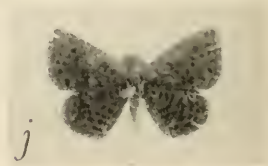


PLATE 12

(Figures *c*, *d*, natural size, others $\times 1\frac{1}{2}$)

- a. Erora lacta*, Mountain Lake, Giles County, Lorus J. Milne, June 23, 1938.
- b. Erora lacta*, under side of the specimen shown in figure *a*.
- c. Atlides halesus*, male, Florida.
- d. Atlides halesus*, male, under side of the specimen shown in figure *c*.
- e. Eupsyche m-album*, male, Silver Spring, Md., September 2, 1927.
- f. Eupsyche m-album*, male, under side of the specimen shown in figure *c*.
- g. Mitoura gryneus*, male, under side.
- h. Strymon cecrops*, under side.
- i. Calophelis borealis*, Kerrville, Tex.
- j. Calophelis virginicensis*, Miami, Fla.

PLATE 13

(All figures $\times 1\frac{1}{2}$)

- a. *Incisalia polios*, under side, Digby, Nova Scotia.
- b. *Incisalia niphon niphon*, under side, Washington, D. C., W. H. Wagner, April 26, 1938.
- c. *Strymon falacer*, male, under side, Essex, Mass., July 9, 1925.
- d. *Strymon edwardsii*, female, under side, Kerrville, Tex.
- e. *Strymon liparops*, under side, Essex, Mass., July 7, 1925.
- f. *Strymon ontario*, female, under side, Kirkwood, Mo., Mary E. Murtfeldt.
- g. *Strymon titus titus*, female, under side, New York.
- h. *Strymon titus mopsus*, female, under side, Washington, D. C., W. H. Wagner, June 24, 1934.



BUTTERFLIES OF VIRGINIA



BUTTERFLIES OF VIRGINIA

PLATE 14

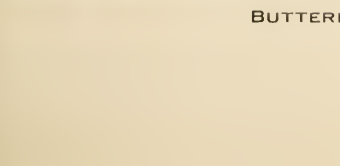
(All figures $\times 1\frac{1}{2}$)

- a. *Cyaniris argiolus pseudargiolus*, male, early spring form.
- b. *Cyaniris argiolus pseudargiolus*, female, early spring form.
- c. *Cyaniris argiolus pseudargiolus*, male, late spring form.
- d. *Cyaniris argiolus pseudargiolus*, female, late spring form.
- e. *Cyaniris argiolus pseudargiolus*, male, summer form, Beltsville, Md., July 9, 1928.
- f. *Cyaniris argiolus pseudargiolus*, female, summer form, Cabin John, Md., June 16, 1929.
- g. *Glaucopsyche lygdamus nittanyensis*, male, Ice Mountain, W. Va., May 7, 1939.
- h. *Cyaniris argiolus pseudargiolus*, female, under side of the specimen shown in figure f.
- i. *Everes comyntas*, male, Cabin John, Md., June 10, 1928.
- j. *Everes comyntas*, male, under side of the specimen shown in figure i.

PLATE 15

(Figures *a, b, c, l, m, n*, $\times 1\frac{1}{2}$, others natural size)

- a. Glaucopsyche lygdamus couperi*, under side, Chicago, May 20, 1917.
- b. Glaucopsyche lygdamus lygdamus*, female, under side, Georgia.
- c. Glaucopsyche lygdamus nittanyensis*, under side, Forks of Cacapon, W. Va., May 8, 1939.
- d. Polites manataaqua*, left side male, right side female, Washington, D. C., W. H. Wagner, August 12, 1935.
- e. Feniseca tarquinius*, larva from Weston, Mass., emerged at Washington, D. C., November 19, 1923.
- f. Lycaena thoë*, female, Essex, Mass., September 1, 1925.
- g. Lycaena thoë*, male, Detroit, Mich., G. W. Rawson, June 7, 1927.
- h. Lycaena thoë*, male, under side of the specimen shown in figure *g*.
- i. Pholisora hayhurstii*, male, Texas.
- j. Pholisora hayhurstii*, male, under side of the specimen shown in figure *i*.
- k. Feniseca tarquinius*, larva from Weston, Mass., emerged at Washington, D. C., August 22, 1923.
- l. Lycaena phlacas americana*, male, Beltsville, Md., September 7, 1929.
- m. Lycaena phlacas americana*, male, under side of the specimen shown in figure *l*.
- n. Lycaena phlacas americana*, female, Rock Creek Park, Washington, D. C., May 6, 1923.



BUTTERFLIES OF VIRGINIA



BUTTERFLIES OF VIRGINIA

PLATE 16

(Figures *c, d, e*, $\times 1\frac{1}{2}$, others natural size)

- a. Euchloë olympia*, west of Cross Junction, Frederick County, April 24, 1938.
- b. Euchloë olympia*, under side of the specimen shown in figure *a*.
- c. Incisalia irus*, Washington, D. C., W. H. Wagner, April 26, 1938.
- d. Incisalia henrici*, west of Cross Junction, Frederick County, April 24, 1928.
- e. Incisalia augustinus croesioides*, under side, Difficult Run, Fairfax County, April 29, 1931.
- f. Polygonia interrogationis*.
- g. Nathalis iole*, Brownsville, Tex.
- h. Nathalis iole*, under side of the specimen shown in figure *g*.
- i. Eurema jucunda*, Glenwood, Fla.
- j. Eurema jucunda*, under side of the specimen shown in figure *i*.

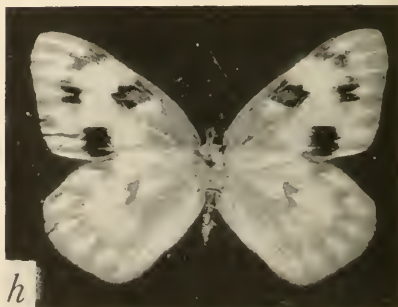
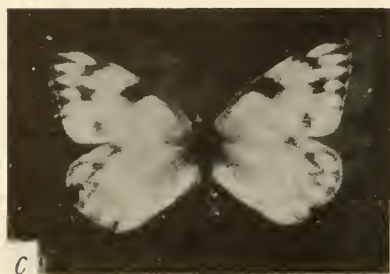
PLATE 17

(All figures natural size)

- a. *Colias philodice*, male, Silver Spring, Md., August 3, 1927.
- b. *Colias philodice*, male, under side.
- c. *Colias interior*, male, Middle Mountain, Highland County, John E. Graf,
June 14, 1936.
- d. *Colias interior*, male, under side of the specimen shown in figure c.
- e. *Colias philodice*, female, Cabin John, Md., May 9, 1926.
- f. *Colias eurytheme*, female, under side.
- g. *Colias interior*, female, Nepigon, Ontario.
- h. *Colias interior*, female, under side of the specimen shown in figure g.



BUTTERFLIES OF VIRGINIA



BUTTERFLIES OF VIRGINIA

PLATE 18

(All figures natural size)

- a. *Pieris rapae*, male, spring form, Cabin John, Md., April 8, 1925.
- b. *Pieris virginiana*, under side, west of Cross Junction, Frederick County, April 24, 1938.
- c. *Pieris protodice*, female, spring form, Paint Branch, Md.
- d. *Pieris protodice*, female, spring form, under side of the specimen shown in figure c.
- e. *Pieris protodice*, male, summer form, Cabin John, Md., July 25, 1926.
- f. *Pieris protodice*, male, summer form, under side of the specimen shown in figure e.
- g. *Pieris protodice*, female, summer form, Cabin John, Md., September 27, 1925.
- h. *Pieris protodice*, female, summer form, under side of the specimen shown in figure g.

PLATE 19

(All figures half natural size)

- a. *Battus philenor*, male, Cabin John, Md., September 19, 1925.
- b. *Battus philenor*, male, under side of the specimen shown in figure a.
- c. *Battus philenor*, female, Cabin John, Md., September 19, 1925.
- d. *Battus philenor*, male, early spring form.
- e. *Papilio cresphontes*, Decatur, Ill.
- f. *Papilio glaucus*, female, dark form.
- g. *Graphium marcellus*, female, spring form, Great Falls, Md., May 2, 1926.
- h. *Graphium marcellus*, female, summer form, Cabin John, Md., July 29, 1928.



BUTTERFLIES OF VIRGINIA



BUTTERFLIES OF VIRGINIA

PLATE 20

(All figures half natural size)

- a. *Papilio glaucus*, male, Newfoundland.
- b. *Papilio glaucus*, male, under side of the specimen shown in figure a.
- c. *Papilio glaucus*, male, Essex, Mass., July 13, 1925.
- d. *Papilio glaucus*, male, Cabin John, Md., August 22, 1926.
- e. *Papilio glaucus*, female, Essex, Mass., July 26, 1925.
- f. *Papilio glaucus*, female, under side of the specimen shown in figure e.
- g. *Papilio glaucus*, female, Silver Spring, Md., August 6, 1927.
- h. *Papilio glaucus*, male, under side of the specimen shown in figure d.

PLATE 21

(All figures half natural size)

- a. *Papilio glaucus*, female, Newfoundland.
- b. *Papilio glaucus*, female, under side of the specimen shown in figure a.
- c. *Papilio glaucus*, female, dark form, Newfoundland.
- d. *Papilio glaucus*, female, dark form, spring type, Great Falls, Md., W. H. Wagner, April 24, 1938.
- e. *Papilio glaucus*, female, dark form, spring type, under side of the specimen shown in figure d.
- f. *Papilio glaucus*, female, dark form with the outer portion of the wings thickly sprinkled with yellow scales, Washington, D. C.
- g. *Papilio glaucus*, female, dark form with the outer portion of the wings thickly sprinkled with yellow scales, under side of the specimen shown in figure f.
- h. *Papilio glaucus*, female, with the inner portion of the wings thickly sprinkled with dark scales, Silver Spring, Md., August 3, 1927.





a



b



c



d



e



f



g



h

BUTTERFLIES OF VIRGINIA

PLATE 22

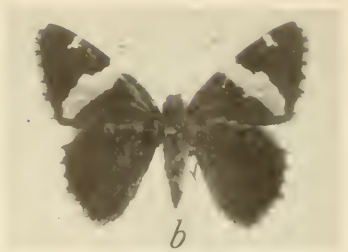
(All figures half natural size)

- a. *Papilio troilus*, male, Manassas, August 18, 1935.
- b. *Papilio troilus*, female, Silver Spring, Md., August 6, 1927.
- c. *Papilio palamedes*, male, Virginia Beach, William Schaus.
- d. *Papilio palamedes*, male, under side of the specimen shown in figure c.
- e. *Papilio polyxenes asterius*, male, with an unusually broad yellow band, Silver Spring, Md., August 14, 1927.
- f. *Papilio polyxenes asterius*, male, with a narrow yellow band, Silver Spring, Md., July 24, 1927.
- g. *Papilio polyxenes asterius*, female, Silver Spring, Md., July 21, 1927.
- h. *Papilio polyxenes asterius*, female, with patches of the male coloration, especially on the left hind wing, Nelson County, Col. Wirt Robinson.

PLATE 23

(All figures natural size)

- a. *Proteides clarus*, male, under side, Cabin John, Md., June 1, 1925.
- b. *Rhabdoides cellus*, near Great Falls, Md., June 3, 1934.
- c. *Rhabdoides cellus*, under side of the specimen shown in figure b.
- d. *Urbanus proteus*, female, Florida.
- e. *Achalarus lyciades*, female, under side, Cabin John, Md., June 13, 1926.
- f. *Calpodes ethlius*, Brownsville, Tex.
- g. *Thorybes bathyllus*, male, Silver Spring, Md., July 3, 1928.
- h. *Thorybes bathyllus*, female, Cabin John, Md., August 28, 1926.
- i. *Libythcana bachmanii*, Cotulla, Tex., J. C. Crawford, May 11, 1906.



BUTTERFLIES OF VIRGINIA



a



b



c



d



e



f



g



j



k



h



i



l



n



m



q



o



p

BUTTERFLIES OF VIRGINIA

PLATE 24

(All figures natural size)

- a. *Pyrgus centaureae wyandot*, Cabin John, Md., April 19, 1926.
- b. *Pyrgus communis*.
- c. *Pyrgus communis*.
- d. *Pyrgus centaureae wyandot*, under side of the specimen shown in figure a.
- e. *Pyrgus communis*, under side of the specimen shown in figure b.
- f. *Pyrgus communis*, under side of the specimen shown in figure c.
- g. *Erymnis icclus*, male, Cabin John, Md., May 25, 1930.
- h. *Erymnis icclus*, female, Cabin John, Md., May 25, 1930.
- i. *Erymnis briso*, male, Albany, N. Y., May 19, 1870.
- j. *Erymnis persius*, male.
- k. *Erymnis lucilius*, male.
- l. *Erymnis persius*, female.
- m. *Erymnis baptisiac*, male, Camp Letts, Md., W. H. Wagner, July 9, 1941.
- n. *Erymnis martialis*, female, June 3, 1876.
- o. *Erymnis juvenalis*, male.
- p. *Erymnis juvenalis*, female.
- q. *Lerodca eufala*, Brownsville, Tex.

PLATE 25

(All figures natural size)

- a. *Thorybes pylades*, female, Cabin John, Md., June 6, 1926.
- b. *Thorybes pylades*, female, under side of the specimen shown in figure a.
- c. *Thorybes confusis*, Difficult Run, Fairfax County, June 16, 1935.
- d. *Thorybes confusis*, under side of the specimen shown in figure c.
- e. *Thorybes bathyllus*, female, under side, Cabin John, Md., August 28, 1926.
- f. *Erynnis juvenalis*, female, under side.
- g. *Erynnis zarucco*, male.
- h. *Erynnis zarucco*, male, under side of the specimen shown in figure g.
- i. *Amblyscirtes hegon*.
- j. *Erynnis horatius*, male, Miami, Fla.
- k. *Erynnis horatius*, female.
- l. *Amblyscirtes alternata*, Suffolk, Otto Buchholz, May 9, 1945.
- m. *Amblyscirtes alternata*, under side of the specimen shown in figure l.



BUTTERFLIES OF VIRGINIA



BUTTERFLIES OF VIRGINIA

PLATE 26

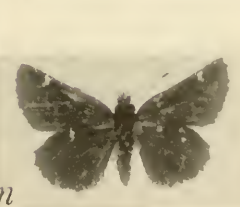
(All figures natural size)

- a. *Hesperia leonardus*, male, Silver Spring, Md., September 11, 1928.
- b. *Hesperia leonardus*, female, under side, Silver Spring, Md., September 14, 1928.
- c. *Poanes massasoit hughii*, male, Beltsville, Md., July 15, 1928.
- d. *Poanes massasoit hughii*, female, under side, Beltsville, Md., July 15, 1928.
- e. *Atrytone ruricola metacomct*, male, under side, Jamesburg, N. J., August 4, 1907.
- f. *Atalopedes campestris*, female, dark form, under side, Manassas, August 25, 1935.
- g. *Atalopedes campestris*, male, Silver Spring, Md., August 13, 1927.
- h. *Atalopedes campestris*, female, Silver Spring, Md., July 28, 1928.
- i. *Atalopedes campestris*, female, under side of the specimen shown in figure h.
- j. *Polites mystic*, male, Middle Mountain, Highland County, June 19, 1948.
- k. *Polites mystic*, male, under side of the specimen shown in figure j.
- l. *Panoquina panoquin*, Anglesea, N. J., June 1923.
- m. *Wallengrenia otho egeremet*, male, Aylett, July 18, 1937.
- n. *Wallengrenia otho egeremet*, male, under side of the specimen shown in figure m.
- o. *Wallengrenia otho otho*, under side, Florida.
- p. *Panoquina ocola*.
- q. *Atrytonopsis hianna*, female, Cabin John, Md., June 2, 1929.
- r. *Pholisora catullus*, female, Onaga, Kans.

PLATE 27

(All figures natural size)

- a. *Poanes zabulon*, male, High Island, Md.
- b. *Poanes zabulon*, male, under side of the specimen shown in figure a.
- c. *Atrytone logan*, male, Newtonville, Mass., August 16, 1923.
- d. *Atrytone logan*, male, under side of the specimen shown in figure c.
- e. *Atrytone logan*, female, Beltsville, Md., July 23, 1928.
- f. *Polites vibex*, male, under side, St. Petersburg, Fla.
- g. *Atrytone conspicua*, male, Beltsville, Md., July 15, 1928.
- h. *Atrytone conspicua*, male, under side, Newtonville, Mass., July 11, 1923.
- i. *Hesperia attalus*, male, under side, St. Petersburg, Fla., April 24, 1914.
- j. *Atrytone bimacula*, male, Albany, N. Y., June 15, 1870.
- k. *Atrytone bimacula*, male, under side of the specimen shown in figure j.
- l. *Amblyscirtes hegon*, under side.
- m. *Hesperia sassacus*, male, Middle Mountain, Highland County, June 19, 1948.
- n. *Amblyscirtes vialis*, Wellington, British Columbia, June 27, 1903.
- o. *Lerema accius*, male, Indian River, Fla.
- p. *Hesperia sassacus*, male, under side of the specimen shown in figure m.
- q. *Amblyscirtes vialis*, under side of the specimen shown in figure n.
- r. *Lerema accius*, male, under side of the specimen shown in figure o.





a



b



c



d



e



f



g



h



i



j



k



l



m



n



o



p



q



r

PLATE 28

(All figures natural size)

- a. *Hesperia metea*, male.
- b. *Hesperia metea*, male, under side of the specimen shown in figure a.
- c. *Hylephila phyleus*, male, Cabin John, Md., August 29, 1929.
- d. *Polites verna*, male, July 14, 1907.
- e. *Polites manataqua*, male, Washington, D. C., August 18, 1883.
- f. *Polites themistocles*, male, Silver Spring, Md., June 3, 1928.
- g. *Polites peckius*, female, Cabin John, Md., August 10, 1927.
- h. *Polites peckius*, female, under side of the specimen shown in figure g.
- i. *Polites vibex*, male, St. Petersburg, Fla.
- j. *Poanes hobomok*, female, Cabin John, Md., June 2, 1929.
- k. *Poanes hobomok*, female, New Jersey.
- l. *Poanes hobomok*, female, under side of the specimen shown in figure k.
- m. *Poanes aaroni*, male, New Jersey.
- n. *Poanes aaroni*, male, under side of the specimen shown in figure m.
- o. *Poanes aaroni*, female, Chincoteague Island, W. H. Wagner, August 21, 1941.
- p. *Amblyscirtes carolina*, Dismal Swamp near Suffolk, April 1, 1938.
- q. *Poanes ychl*, male, New Bohemia, W. H. Wagner, July 19, 1941.
- r. *Poanes aaroni*, female, under side of the specimen shown in figure o.

PLATE 29

(All figures natural size)

- a. *Atrytone dukesi*, male, Mobile, Ala., September 10, 1934.
- b. *Atrytone dukesi*, male, under side of the specimen shown in figure a.
- c. *Atrytone dukesi*, female, Mobile, Ala., September 10, 1934.
- d. *Atrytone dukesi*, female, under side of the specimen shown in figure c.
- e. *Atrytone dion*, male, Cape Henry, September 4, 1936.
- f. *Atrytone alabamæ*, male, Dahl Swamp, Accomack County, July 25, 1935.
- g. *Atrytone palatka*, male, Princess Anne County, Otto Buchholz, June 16, 1941.
- h. *Atrytone palatka*, male, under side of the specimen shown in figure g.
- i. *Atrytone palatka*, female, Miami, Fla.
- j. *Poanes viator*, female, Newark, N. J.



a



b



c



d



e



f



g



i



h



j



BUTTERFLIES OF VIRGINIA

PLATE 30

(Figures *h, i*, $\times 1\frac{1}{2}$, others natural size)

- a. *Amblyscirtes carolina*, under side, Dismal Swamp near Suffolk, April 1, 1938.
- b. *Amblyscirtes carolina* var. *reversa*, paratype male, under side, Southern Pines, N. C., July 28, 1911.
- c. *Amblyscirtes carolina*, unmarked variety, under side, Suffolk, May 30, 1936.
- d. *Poanes yehl*, male, under side, New Bohemia, W. H. Wagner, July 19, 1941.
- e. *Euphydryas phaeton*, aberration, Gala, Warren Stoutamire, July 19, 1941.
- f. *Poanes yehl*, female, New Bohemia, W. H. Wagner, July 19, 1941.
- g. *Poanes yehl*, female, under side, Nashville, Tenn., August 23, 1895.
- h. *Incisalia niphon clarki*.
- i. *Incisalia niphon clarki*, paratype, Constance Bay, Ontario, G. S. Walley, May 23, 1913.
- j. *Vanessa virginicensis*, aberration, Gilbert Yobst, Scotts Run, Fairfax County, May 1936.
- k. *Vanessa virginicensis*, aberration, under side of the specimen shown in figure j.



INDEX



INDEX

(Numbers in boldface are principal references.)

- aaroni, *Poanes*, 8, 25 (in key), **170**;
 pl. 28, *m, n, o, r*
- aaroni aaroni, *Poanes*, 170, 171
- aaroni howardi, *Poanes*, 170, 171
- abeona, *Tisiphone*, 50
- abeona aurelia, *Tisiphone*, 50, 51
- abeona joanna, *Tisiphone*, 50
- abeona morrisi, *Tisiphone*, 50, 51
- abeona rawnsleyi, *Tisiphone*, 51
- acauda, *Battus philenor*, 119, 144
- accius, *Lerema*, 26 (in key), **178**; pl.
 27, *o, r*
- Achalarus, **148**
 lyciades, 22 (in key), **148**; pl.
 23, *c*
- Agkistrodon piscivorus, 176
- Agraulis, **64**
 vanillae, 1, 8, 12 (in key), **64**
 vanillae nigrior, **65**; pl. 7, *e, f*
- alabamae, *Atrytone*, 7, 25 (in key).
174, 175; pl. 29, *f*
- alba, *Eurema lisa* form, 116
- albescens, *Pyrgus communis*, 153
- albofasciata, *Limenitis arthemis*, 51
- alcestis, *Speyeria aphrodite*, 59
- alexandra edwardsii, *Colias*, 187
- alope, *Minois pegala*, 32, 33, **34**, 35, 36;
 pl. 2, *f, g*
- alternata, *Amblyscirtes*, 8, 27 (in key),
179; pl. 25, *l, m*
- Amblyscirtes, **179**
 alternata, 8, 27 (in key), **179**; pl.
 25, *l, m*
- carolina, 8, 24 (in key), **180**; pls.
 28, *p, 30, a, b, c*
- carolina reversa, 180
- hegon, 6, 27 (in key), **179**; pls. 25,
i, 27, l
- textor, 8, 26 (in key), **180**; pl. 3, *j*
- vialis, 27 (in key), **179**; pl. 27,
n, q
- americana, *Lycaena phlaeas*, **71**; pl.
 15, *l, m, n*
- americana ab. fulliolus, *Lycaena*
 phlaeas, 71
- ammiralis, *Boloria toddi*, **61**, 62, 63;
 pl. 9, *d, e*
- amphidusa, *Colias eurytheme*, 102, 104,
 107, 108, 109, 111
- ampliata, *Papilio polyxenes*, 144
- Ancyloxypha, **159**
 numitor, 24 (in key), **159**; pl. 3, *k*
- numitor longleyi, 159
- anthonedon, *Enodia portlandia*, 5
Lethe portlandia, 5, **31**; pl. 1, *g, h*
- Anthocharis, **86**
 genutia, 18 (in key), **86**; pl. 9, *i, j*
- genutia flavida, 86
- antiopa, *Nymphalis*, 2, 12 (in key),
42; pl. 2, *b*
- Apaturidae, 10 (in key), 12 (key to
 species), **39**
- Apaturinae, **39**
- aphrodite, *Speyeria*, 3, 5, 15 (in key),
59; pl. 8, *a, b*
- aphrodite alcestis, *Speyeria*, 59
- aphrodite ab. bakeri, *Speyeria*, 60
- aphrodite ab. hughii, *Speyeria*, 61
- archippus, *Limenitis*, 13 (in key), **52**
- archippus archippus, *Limenitis*, **52**, 53,
 54; pl. 6, *f*
- archippus eros, *Limenitis*, 54
- archippus floridensis, *Limenitis*, 8, 52,
53, 54; pl. 6, *d, e*
- arcticus, *Papilio glaucus*, 134, 137, 139,
 142
Papilio rutulus, 134
- areolatus, *Euptychia*, 12 (in key), **36**
- areolatus areolatus, *Euptychia*, 8, **36**;
 pl. 3, *b, d*
- areolatus septentrionalis, 8, **37**; pl. 3,
a, c
- argiolus, *Cyaniris*, 2, 16 (in key), **73**
- argiolus pseudargiolus, *Cyaniris*, **73**,
 75; pl. 14, *a, b, c, d, e, f, h*
- argiolus pseudargiolus form intermedia,
Cyaniris, 73
- argiolus pseudargiolus form lucia, *Cy-*
aniris, 73
- argiolus pseudargiolus form marginata,
Cyaniris, 73
- argiolus pseudargiolus form neglecta,
Cyaniris, 73, 74
- argiolus pseudargiolus form neglecta-
 major, *Cyaniris*, 74
- argiolus pseudargiolus form nigra, *Cy-*
aniris, 73

- argiolus pseudargiolus form pseudargiolus, *Cyaniris*, 73, 74
 argiolus pseudargiolus form violacea, *Cyaniris*, 73
Argynnidae, 10 (in key), 12 (key to species), 49
Argynninae, 54
 ariadne, *Colias eurytheme*, 102
Aristolochia macrophylla, 119
 arizonensis, *Limnitis arthemis*, 50
 arogos, *Atrytone*, 1, 24 (in key), 171, 172; pl. 11, *a, b*
 arthemis, *Limnitis*, 14 (in key), 49, 50, 51, 143, 186
 arthemis albofasciata, *Limnitis*, 51
 arthemis arizonensis, *Limnitis*, 50
 arthemis astyanax, *Limnitis*, 50, 51, 53; pls. 2, *a, 6, c, g, h*
 arthemis rubrofasciata, *Limnitis*, 50, 51
Arundinaria, 32
 gigantea, 3, 31
 tecta, 3, 30
Ascia, 93
 monuste, 93
 phileta, 1, 18 (in key), 19 (in key), 93
 phileta phileta, 93; pl. 8, *g, h, i, j*
Asclepias, 120
 asterius, *Papilio polyxenes*, 144; pl. 22, *c, f, g, h*
Asterocampa, 39
 celtis, 14 (in key), 39, 40; pl. 4, *c*
 clyton, 14 (in key), 39; pl. 4, *a, b*
 astyanax, *Limnitis arthemis*, 50, 51, 53; pls. 2, *a, 6, c, g, h*
 astyanax proserpina, *Limnitis*, 51
 atalanta, *Vanessa*, 2, 13 (in key), 43, 44, 45; pl. 8, *f*
Atalopedes, 163
 campestris, 27 (in key), 162, 163; pl. 26, *f, g, h, i*
 atlantis, *Speyeria*, 4, 15 (in key), 61; pl. 8, *c, d*
Atlides, 77
 halesus, 8, 15 (in key), 77; frontispiece, fig. 10; pl. 12, *c, d*
Atrytone, 172
 alabamiae, 7, 25 (in key), 174, 175; pl. 29, *f*
 arogos, 1, 24 (in key), 171, 172; pl. 11, *a, b*
 bimacula, 5, 26 (in key), 176; pl. 27, *j, k*
 conspicua, 1, 5, 29 (in key), 176; pl. 27, *g, h*
 Atrytone dion, 8, 25 (in key), 173, 174; pl. 29, *e*
 dukesi, 8, 25 (in key), 175; pl. 29, *a, b, c, d*
 logan, 24 (in key), 170, 173; pl. 27, *c, d, e*
 palatka, 8, 24 (in key), 173; pl. 29, *g, h, i*
 uricola, 25 (in key), 164, 177
 uricola metacomet, 177; pls. 11, *e, 26, e*
Atrytonopsis hianna, 6, 27 (in key), 177; pl. 26, *q*
 attalus, *Hesperia*, 28 (in key), 161; pl. 27, *i*
 Augiades sylvanus, 1, 187
 augustinus, *Incisalia*, 5, 17 (in key), 83, 84
 augustinus croesioides, *Incisalia*, 83; pl. 16, *e*
 aurelia, *Tisiphone abeona*, 50, 51
 ausonius, *Erynnis martialis*, 187

Baccharis halmifolia, 82
 bachmanii, *Libytheana*, 68; pl. 23, *i*
 bakeri, *Speyeria aphrodite* ab., 60
 baptisiae, *Erynnis*, 23 (in key), 156; pl. 24, *m*
 batesii, *Phyciodes*, 5, 15 (in key), 49; pl. 11, *f, g, h, i*
 bathyllus, *Thorybes*, 22 (in key), 149; pls. 23, *g, h, 25, e*
Battus, 118
 philenor, 21 (in key), 118, 140, 144; pl. 19, *a, b, c, d*
 philenor acauda, 119, 144
 philenor hirsuta, 119, 144
 bimacula, *Atrytone*, 5, 26 (in key), 176; pl. 27, *j, k*
Boloria, 3, 61, 124
 selene, 2, 3, 12 (in key), 62
 selene marilandica, 1, 2, 63, frontispiece, figs. 1, 2; pl. 9, *b, c*
 selene myrina, 5, 62; pl. 9, *a*
 toddi, 3, 5, 14 (in key), 61
 toddi ammiralis, 61, 62, 63; pl. 9, *d, e*
 borealis, *Calephelis*, 5, 15 (in key), 69, 70; pl. 12, *i*
 boydi, *Glaucopteryx lygdamus*, 72, 73
 brizo, *Erynnis*, 23 (in key), 155; pl. 24, *i*

 caesonina, *Zerene*, 19 (in key), 112; pl. 2, *d*

- Calephelis*, 69
borealis, 5, 15 (in key), 69, 70;
 pl. 12, *i*
virginiensis, 8, 15 (in key), 69;
 pl. 12, *j*
- Calpodas*, 183
ethlius, 1, 26 (in key), 183; pl.
 23, *f*
- campestris*, *Atalopedes*, 27 (in key),
 162, 163; pl. 26, *f, g, h, i*
- canadensis*, *Papilio glaucus*, 133, 134,
 136, 137, 139, 142
- cardui*, *Vanessa*, 1, 2, 14 (in key), 44,
 45; pl. 4, *d, e*
- Carex*, 3
striata var. *brevis*, 174
stricta, 176
- carolina*, *Amblyscirtes*, 8, 24 (in key),
 180; pls. 28, *p, 30, a, b, c*
Minois pegala, 35
- carolina reversa*, *Amblyscirtes*, 180
- Cassia chamaecrista*, 113, 114
- catullus*, *Pholisora*, 22 (in key), 153;
 pl. 26, *r*
- cecrops*, *Strymon*, 16 (in key), 78,
frontispiece, fig. 7; pl. 12, *h*
- cecrops ab. gottschalki*, *Strymon*, 78,
frontispiece, fig. 7
- cellus*, *Rhabdoides*, 22 (in key), 149;
 pl. 23, *b, c*
- celtis*, *Asterocampa*, 14 (in key), 39,
 40; pl. 4, *c*
- centaureae*, *Pyrgus*, 5, 23 (in key), 151
- centaureae wyandot*, *Pyrgus*, 151; pl.
 24, *a, d*
- Chelone glabra*, 47
- chrysotheme eurytheme*, *Colias*, 1
- Cinnamomum camphora*, 125
- clappi*, *Eureme lisa* form, 116
- clarki*, *Incisalia nippon*, 83; pl. 30, *h, i*
- clarus*, *Proteides*, 22 (in key), 147;
 pl. 23, *a*
- claudia*, *Euptoieta*, 14 (in key), 60,
 63; pl. 6, *a, b*
- cleobaea*, *Lycorea*, 187
- clyton*, *Asterocampa*, 14 (in key), 39;
 pl. 4, *a, b*
- coenia*, *Junonia evarete*, 45; pls. 4, *h*,
i, j, 5, g, h
- Colias*, 7, 93
alexandra edwardsii, 187
chrysotheme eurytheme, 1
eogene, 100
eurytheme, 6, 18 (in key), 20 (in
 key), 96, 97, 101, 102, 103, 104,
 107, 108, 109, 110, 111; pls. 10,
e, 17, f
- Colias eurytheme amphidusa*, 102, 104,
 107, 108, 109, 111
eurytheme ariadne, 102
eurytheme eurytheme, 102
eurytheme keewaydin, 102
hecla, 105
interior, 4, 20 (in key), 111, 112;
 pl. 17, *c, d, g, h*
nastes werdandi, 106
philodice, 5, 6, 18 (in key), 20 (in
 key), 93, 97, 101, 102, 103, 106,
 107, 108, 109, 110, 111, 112; pl.
 17, *a, b, c*
- comma*, *Polygonia*, 13 (in key), 40;
 pl. 5, *e, f*
- communis*, *Pyrgus*, 23 (in key), 152;
 pl. 24, *b, c, e, f*
- communis albescens*, *Pyrgus*, 152
- comyntas*, *Everes*, 16 (in key), 48, 75;
 pl. 14, *i, j*
- confusus*, *Thorybes*, 22 (in key), 150;
 pl. 25, *c, d*
- conspicua*, *Atrytone*, 1, 5, 29 (in key),
 176; pl. 27, *g, h*
- creola*, *Lethe*, 8, 11 (in key), 30; pl.
 1, *a, b, c, d*
- creosphontes*, *Papilio*, 20 (in key), 120;
 pl. 19, *e*
- croesioides*, *Incisalia augustinus*, 83;
 pl. 16, *e*
- Crotalus horridus*, 176
- curvifascia*, *Papilio polyxenes*, 144
- Cyaniris*, 73
argiolus, 2, 16 (in key), 73
argiolus pseudargiolus, 73, 75; pl.
 14, *a, b, c, d, e, f, h*
argiolus pseudargiolus form inter-
media, 73
argiolus pseudargiolus form lucia,
 73
argiolus pseudargiolus form mar-
ginata, 73
argiolus pseudargiolus form neg-
lecta, 73, 74
argiolus pseudargiolus form neg-
lecta-major, 74
argiolus pseudargiolus form nigra,
 73
argiolus pseudargiolus form pseud-
argiolus, 73, 74
argiolus pseudargiolus form vio-
lacea, 73
- cybele*, *Speyeria*, 3, 12 (in key), 56,
 58, 60; pls. 2, *c, 7, g, h*
- cymela*, *Euptychia*, 11 (in key), 38;
 pl. 3, *e, f*

- Danaidae, 10 (in key), 12 (key to species), 65
- Danaïnae, 65
- Danaus, 65
- plexippus, 2, 13 (in key), 65, 67
- plexippus ab. fumosus, 65
- plexippus megalippe, 2, 67, 68; pl. 10, *b*
- plexippus plexippus, 65, 67, 68; pl. 10, *a*
- Daucus carota, 145
- diana, Speyeria, 1, 3, 14 (in key), 55, 91; pl. 7, *a, b, c, d*
- dion, Atrytone, 8, 25 (in key), 173, 174, 175; pl. 29, *e*
- drya, Phoebis sennae, 113
- drymo, Ithomia, 187
- dukesi, Atrytone, 8, 25 (in key), 175; pl. 29, *a, b, c, d*
- edwardsii, Colias alexandra, 187
- Strymon, 6, 17 (in key), 80; pl. 13, *d*
- egeremet, Wallengrenia otho, 167; pl. 26, *m, n*
- elathea, Eurema, 187
- Elephantopus, 180
- Enodia portlandia anthedon, 5
- eogene, Colias, 100
- Erebia, 124
- Erora, 85
- laeta, 5, 17 (in key), 85, 187; frontispiece, fig. 8; pl. 12, *a, b*
- eros, Limenitis archippus, 54
- Erynnis, 154, 159
- baptisiae, 23 (in key), 156; pl. 24, *m*
- brizo, 23 (in key), 155; pl. 24, *i*
- horatius, 23 (in key), 158, 159; pl. 25, *j, k*
- icelus, 22 (in key), 154; pl. 24, *g, h*
- juvenalis, 23 (in key), 157, 158, 159; pls. 24, *o, 25, f*
- lucilius, 5, 23 (in key), 155; pl. 24, *k*
- martialis, 23 (in key), 156, 187; pl. 24, *n*
- martialis ab. ausonius, 187
- persius, 5, 23 (in key), 155; pl. 24, *j, l*
- zarucco, 23 (in key), 158; pl. 25, *g, h*
- ethlius, Calpodus, 1, 26 (in key), 183; pl. 23, *f*
- Euchloë, 87
- olympia, 18 (in key), 87, 88; pl. 16, *a, b*
- olympia rosa, 87, 88
- eufala, Lerodea, 8, 26 (in key), 182; pl. 24, *q*
- Euphydryas, 47
- phaëton, 5, 14 (in key), 47; pls. 3, *l, 30, e*
- Euploea, 56
- Eupsyche, 78
- m-album, 16 (in key), 78; pl. 12, *e, f*
- Euptoieta claudia, 14 (in key), 60, 63; pl. 6, *a, b*
- Euptychia, 36
- areolatus, 12 (in key), 36
- areolatus areolatus, 8, 36; pl. 3, *b, d*
- areolatus septentrionalis, 8, 37; pl. 3, *a, c*
- cymela, 11 (in key), 38; pl. 3, *c, f*
- gemma, 8, 12 (in key), 36, 38; pl. 3, *g, h*
- sosybius, 8, 12 (in key), 38; pl. 3, *i*
- Eurema, 115
- elathea, 187
- euterpe, 116
- jucunda, 19 (in key), 117, 118; pl. 16, *i, j*
- lisa, 20 (in key), 110, 116; pl. 9, *h*
- lisa form alba, 116
- lisa form clappi, 116
- nicippe, 20 (in key), 115; pl. 2, *e*
- eurydice, Lethe, 11 (in key), 31
- eurydice appalachia, Lethe, 32; pl. 1, *i, j*
- eurytheme, Colias, 6, 18 (in key), 20 (in key), 96, 97, 101, 102, 103, 104, 107, 108, 109, 110, 111; pls. 10, *e, 17, f*
- Colias chrysotheme, 1
- eurytheme amphidusa, Colias, 102, 104, 107, 108, 109, 111
- eurytheme ariadne, Colias, 102
- eurytheme eurytheme, Colias, 102
- eurytheme keewaydin, Colias, 102
- euterpe, Eurema, 116
- evarete, Junonia, 13 (in key), 45
- evarete coenia, Junonia, 45; pls. 4, *h, i, j, 5, g, h*

- Everes, **75**
 comyntas, 16 (in key), 48, **75**;
 pl. 14, *i, j*
- fabricii, *Polygonia interrogationis*, 40
 falacer, *Strymon*, 17 (in key), **80**;
 pl. 13, *c*
- faunus, *Polygonia*, 13 (in key), **41**
 faunus smythi, *Polygonia*, 4, **42**; fron-
 tispiece, figs. 3, 6; pl. 5, *a, b*
- Feniseca, **70**
 tarquinius, 17 (in key), **70**; pl.
 15, *c, k*
- flavida, *Anthocharis genutia*, 86
 floridensis, *Graphium marcellus*, 146
 Limenitis archippus, 8, 52, **53, 54**;
 pl. 6, *d, e*
- Fraxinus, 125
- fulliolus, *Lycaena phlaea americana*
 ab., 71
- fumosus, *Danaus plexippus*, 65
- gemma, *Euptychia*, 8, 12 (in key), **36**,
 38; pl. 3, *g, h*
- genutia, *Anthocharis*, 18 (in key), **86**;
 pl. 9, *i, j*
- genutia flavida, *Anthocharis*, 86
- Glaucopsyche, **72**
 lygdamus, 1, 5, 15 (in key), **72**
 lygdamus boydi, 72, 73
 lygdamus lygdamus, pl. 15, *b*
 lygdamus nittanyensis, **72, 73**,
 frontispiece, figs. 4, 5; pls. 14,
 g, 15, c
- glaucus, *Papilio*, 7, 20 (in key), 21
 (in key), 119, 122, 123, **124**,
 143; pls. 19, *f, 20, 21*
- glaucus arcticus, *Papilio*, 134, 137,
 139, 142
- glaucus canadensis, *Papilio*, 133, 134,
 136, 137, 139, 142
- glaucus glaucus, *Papilio*, 133, 134, 136,
 137, 139, 140
- glaucus rutulus, *Papilio*, 124, 125, 126,
 130, 134
- Graphium, **145**
 marcellus, 20 (in key), 119, 143,
 145 pl. 19, *g, h*
 marcellus floridensis, 146
 marcellus telamonides, 146
- gryneus, *Mitoura*, 16 (in key), 84;
 pl. 12, *g*
- halesus, *Atlides*, 8, 15 (in key), **77**;
 frontispiece, fig. 10; pl. 12, *c, d*
- hanno, *Hemiargus*, 187
- hayhurstii, *Pholisora*, 22 (in key),
 153; pl. 15, *i, j*
- hecla, *Colias*, 105
- hegon, *Amblyscirtes*, 6, 27 (in key),
 179; pls. 25, *i, 27, l*
- Heliconiinae, **64**
- Hemiargus hanno, 187
- henrici, *Incisalia*, 17 (in key), **84**; pl.
 16, *d*
- Hesperia, **160, 162**
 attalus, 28 (in key), **161**; pl. 27, *i*
 leonardus, 6, 28 (in key), **160**;
 pl. 26, *a, b*
 metae, 6, 27 (in key), **160, 178**;
 pl. 28, *a, b*
 sassacus, 5, 28 (in key), **161**,
 166; pl. 27, *m, p*
 sassacus manitoboides, 161
- Hesperidae, **147**
- Hesperinae, 11 (in key), 24 (key to
 species), **159**
- hianna, *Atrytonopsis*, 6, 27 (in key),
 177; pl. 26, *q*
- hirsuta, *Battus philenor*, 119, 144
- hobomok, *Poanes*, 1, 5, 28 (in key),
 169; pl. 28, *j, k, l*
- horatius, *Erynnis*, 23 (in key), **158**,
 159; pl. 25, *j, k*
- horridus, *Crotalus*, 176
- howardi, *Poanes*, 171
 Poanes aaroni, 170, 171
- lughii, *Poanes massasoit*, 1, **172**;
 frontispiece, fig. 11; pl. 26, *c, d*
 Speyeria aphrodite ab., 61
- humuli, *Strymon melinus*, 81, **82**, pl.
 11, *o*
- Hylephila, **161**
 phyleus, 24 (in key), **161**; pl. 28, *c*
- Hystrix patula, 31
- icelus, *Erynnis*, 22 (in key), **154**; pl.
 24, *g, h*
- idalia, *Speyeria*, 3, 12 (in key), **54**;
 pl. 7, *i, j*
- ilioneus, *Papilio troilus*, 122
- Incisalia, **82**
 augustinus, 5, 17 (in key), **83, 84**
 augustinus croesioides, **83**; pl. 16, *e*
 henrici, 17 (in key), **84**; pl. 16, *d*
 irus, 5, 17 (in key), **84**; pl. 16, *c*
 niphon, 17 (in key), **82**
 niphon clarki, **83**; pl. 30, *h, i*
 niphon niphon, **82**; pl. 13, *b*
 polios, 5, 17 (in key), **83**; pl. 13, *a*
- interior, *Colias*, 4, 20 (in key), **111**,
 112; pl. 17, *c, d, g, h*

- intermedia, *Cyaniris argiolus pseudargiolus* form, 73
 interrogationis, *Polygonia*, 13 (in key), 40; pl. 16, *f*
 interrogationis fabricii, *Polygonia*, 40
 interrogationis umbrosa, *Polygonia*, 40
 iole, *Nathalis*, 19 (in key), 115; pl. 16, *g, h*
 irus, *Incisalia*, 5, 17 (in key), 84; pl. 16, *c*
 ismeria, *Melitaea*, 48; frontispiece, fig. 9
 Ithomia, *drymo*, 187

 joanna, *Tisiphone abeona*, 50
 jucunda, *Eurema*, 19 (in key), 117, 118; pl. 16, *i, j*
 Juniperus virginensis, 85
 Junonia, 45
 evarete, 13 (in key), 45
 evarete coenia, 45; pls. 4, *h, i, j, 5, g, h*
 juvenalis, *Erynnis*, 23 (in key), 157, 158, 159; pls. 24, *o, p, 25, f*

Kalmia latifolia, 83
 keewaydin, *Colias eurytheme*, 102

 laeta, *Erora*, 5, 17 (in key), 85, 187; frontispiece, fig. 8; pl. 12, *a, b*
 leonardus, *Hesperia*, 6, 28 (in key), 160; pl. 26, *a, b*
 Lerema, 178
 accius, 26 (in key), 178; pl. 27, *o, r*
 Lerodea, 181
 eufala, 8, 26 (in key), 182; pl. 24, *q*
 l'herminieri, 25 (in key), 181; pl. 11, *c, d*
 Lespedeza, 82
 Lethe, 30
 creola, 8, 11 (in key), 30; pl. 1, *a, b, c, d*
 eurydice, 11 (in key), 31
 eurydice appalachia, 32; pl. 1, *i, j*
 portlandia, 11 (in key), 30
 portlandia anthedon, 5, 31; pl. 1, *g, h*
 portlandia portlandia, 8, 30, 32; pl. 1, *e, f*
 Lethiinae, 10 (in key), 11 (key to species), 30
 l'herminieri, *Lerodea*, 25 (in key), 181; pl. 11, *c, d*

 Libytheana, 68
 bachmanii, 68; pl. 23, *i*
 Libytheidae, 10 (in key), 68
 Limenitinae, 49
 Limenitis, 49
 archippus, 13 (in key), 52
 archippus archippus, 52, 53, 54; pl. 6, *f*
 archippus eros, 54
 archippus floridensis, 8, 52, 53, 54; pl. 6, *d, e*
 arthemis, 14 (in key), 49, 50, 51, 143, 186
 arthemis albofasciata, 51
 arthemis arizonensis, 50
 arthemis astyanax, 50, 51, 53; pls. 2, *a, 6, c, g, h*
 arthemis proserpina, 51
 arthemis rubrofasciata, 50, 51
 liparops, *Strymon*, 16 (in key), 81; pl. 13, *e*
 Liriiodendron, 125
 lisa, *Eurema*, 20 (in key), 110, 116; pl. 9, *h*
 lisa form alba, *Eurema*, 116
 lisa form clappi, *Eurema*, 116
 logan, *Atrytone*, 24 (in key), 170, 173; pl. 27, *c, d, e*
 longleyi, *Ancyloxypha numitor*, 159
 lucia, *Cyaniris argiolus pseudargiolus* form, 73
 lucilius, *Erynnis*, 5, 23 (in key), 155; pl. 24, *k*
 Lycaena, 71
 phlaeas, 2, 15 (in key), 71
 phlaeas americana, 71; pl. 15, *l, m, n*
 phlaeas americana ab. fulliolus, 71
 thoë, 72, pl. 15, *f, g, h*
 Lycaenidae, 10 (in key), 15 (key to species), 70
 Lycaeninae, 11 (in key), 71
 lyciades, *Achalarus*, 22 (in key), 148, pl. 23, *e*
 Lycorea cleobaea, 187
 lygdamus, *Glaucopsyche*, 1, 5, 15 (in key), 72
 lygdamus boydi, *Glaucopsyche*, 72, 73
 lygdamus lygdamus, *Glaucopsyche*, pl. 15, *b*
 lygdamus nittanyensis, *Glaucopsyche*, 72, 73, frontispiece, figs. 4, 5; pls. 14, *g, 15, c*

 Magnolia, 125
 m-album, *Eupsyche*, 16 (in key), 78; pl. 12, *e, f*

- Malva rotundifolia*, 152
manataaqua, *Polites*, 27 (in key), 164, 166; pls. 15, *d*, 28, *e*
manitoboides, *Hesperia sassacus*, 161
marcellus, *Graphium*, 20 (in key), 119, 143, 145; pl. 19, *g*, *h*
marcellus floridensis, *Graphium*, 146
marcellus telamonides, *Graphium*, 146
marginata, *Cyaniris argiolus pseudargiolus* form, 73
marilandica, *Boloria selene*, 1, 2, 63; frontispiece, figs. 1, 2; pl. 9, *b*, *c*
maritima, *Minois pegala*, 32, 33, 34; pl. 8, *e*
martialis, *Erynnis*, 23 (in key), 156, 187; pl. 24, *n*
martialis ab. ausonius, *Erynnis*, 187
massassoit, *Poanes*, 25 (in key), 172
massassoit hughi, *Poanes*, 1, 172; frontispiece, fig. 11; pl. 26, *c*, *d*
megalippe, *Danaus plexippus*, 2, 67, 68; pl. 10, *b*
melinus, *Strymon*, 16 (in key), 81
melinus humuli, *Strymon*, 81, 82; pl. 11, *o*
melinus melinus, *Strymon*, 81; pl. 11, *n*
Melitaea, 47
ismeria, 48, frontispiece, fig. 9
nycteis, 15 (in key), 47; pl. 9, *f*, *g*
Melitaeinae, 47
metacomet, *Atrytone ruricola*, 177; pls. 11, *e*, 26, *e*
metea, *Hesperia*, 6, 27 (in key), 160, 178; pl. 28, *a*, *b*
mingo, *Potanthus*, 187
Minois, 32
pegala, 11 (in key), 32
pegala alope, 32, 33, 34, 35, 36, pl. 2, *f*, *g*
pegala carolina, 35
pegala maritima, 32, 33, 34; pl. 8, *e*
pegala nephele, 33
pegala pegala, 8, 34, 35; pl. 2, *h*, *i*
pegala texana, 36
Mitoura, 84
gryneus, 16 (in key), 84; pl. 12, *g*
monuste, *Ascia*, 93
mopsus, *Strymon titus*, 79; pl. 13, *h*
morrissi, *Tisiphone abeona*, 50, 51
myrina, *Boloria selene*, 5, 62; pl. 9, *a*
mystic, *Polites*, 5, 29 (in key), 166; pl. 26, *j*, *k*
nastes werdandi, *Colias*, 106
Nathalis, 115
iole, 19 (in key), 115; pl. 16, *g*, *h*
neglecta, *Cyaniris argiolus pseudargiolus* form, 73, 74
neglecta-major, *Cyaniris argiolus pseudargiolus* form, 74
nephele, *Minois pegala*, 33
nicippe, *Eurema*, 20 (in key), 115; pl. 2, *e*
nigra, *Cyaniris argiolus pseudargiolus* form, 73
nigrior, *Agraulis vanillae*, 65; pl. 7, *e*, *f*
niphon, *Incisalia*, 17 (in key), 82
niphon clarki, *Incisalia*, 83; pl. 30, *h*, *i*
niphon niphon, *Incisalia*, 82; pl. 13, *b*
nittanyensis, *Glaucopsyche lygdamus*, 72, 73; frontispiece, figs. 4, 5; pls. 14, *g*, 15, *c*
numitor, *Ancyloxypha*, 24 (in key), 159; pl. 3, *k*
numitor longleyi, *Ancyloxypha*, 159
nycteis, *Melitaea*, 15 (in key), 47; pl. 9, *f*, *g*
Nymphalidae, 10 (in key). 12 (key to species), 40
Nymphalinae, 40
Nymphalis, 42
antiopa, 2, 12 (in key). 42; pl. 2, *b*
Nyssa aquatica, 8, 175
occidentalis, *Pieris protodice*, 92
Ochlodes sylvanus, 187
ocola, *Panoquina*, 25 (in key). 186; pl. 26, *p*
Oeneis, 124
olympia, *Euchlōe*, 18 (in key), 87, 88; pl. 16, *a*, *b*
olympia rosa, *Euchlōe* 87, 88
ontario, *Strymon*, 1, 16 (in key), 79
ontario ontario, *Strymon*, 80; pl. *f*
otho, *Wallengrenia*, 26 (in key), 167
otho egeremet, *Wallengrenia*, 167; pl. 26, *m*, *n*
otho otho, *Wallengrenia*, 167; pl. 26, *o*
palamedes, *Papilio*, 7, 8, 21 (in key), 121, 122; pl. 22, *c*, *d*
palatka, *Atrytone*, 8, 24 (in key). 173; pl. 29, *g*, *h*, *i*
panoquin, *Panoquina*, 8, 26 (in key), 185; pl. 26, *l*
Panoquina, 185
ocola, 25 (in key), 186; pl. 26, *p*
panoquin, 8, 26 (in key), 185; pl. 26, *l*
Papilio, 120
crispontes, 25 (in key), 120; pl. 19, *e*

- Papilio glaucus*, 7, 20 (in key), 21 (in key), 119, 122, 123, 124, 143; pls. 19, *f*, 20, 21
glaucus arcticus, 134, 137, 139, 142
glaucus canadensis, 133, 134, 136, 137, 139, 142
glaucus glaucus, 133, 134, 136, 137, 139, 140
glaucus rutulus, 124, 125, 126, 130, 134
palamedes, 7, 8, 21 (in key), 121, 122; pl. 22, *c*, *d*
polyxenes, 21 (in key), 144
polyxenes ampliata, 144
polyxenes asterius, 144; pl. 22, *e*, *f*, *g*, *h*
polyxenes curvifascia, 144
rutulus arcticus, 134
troilus, 21 (in key), 122, 123; pl. 22, *a*, *b*
troilus ilioneus, 122
 Papilionidae, 11 (in key), 20 (key to species), 118
 Papilioninae, 118
Passiflora incarnata, 2, 64, 65
peckius, *Polites*, 29 (in key), 165; pl. 28, *g*, *h*
pegala, *Minois*, 11 (in key), 32
pegala alope, *Minois*, 32, 33, 34, 35, 36; pl. 2, *f*, *g*
pegala carolina, *Minois*, 35
pegala maritima, *Minois*, 32, 33, 34; pl. 8, *e*
pegala nephele, *Minois*, 33
pegala pegala, *Minois*, 8, 24, 35; pl. 2, *h*, *i*
pegala texana, *Minois*, 36
Persea borbonia, 3
persius, *Erynnis*, 5, 23 (in key), 155; pl. 24, *j*, *i*
phaëton, *Euphydryas*, 5, 14 (in key), 47; pls. 3, *l*, 30, *e*
philea, *Phoebis*, 1, 19 (in key), 112; pl. 10, *d*
philenor, *Battus*, 21 (in key), 118, 140, 144; pl. 19, *a*, *b*, *c*, *d*
philenor acauda, *Battus*, 119, 144
philenor hirsuta, *Battus*, 119, 144
phileta, *Ascia*, 1, 18 (in key), 19 (in key), 93
phileta phileta, *Ascia*, 93; pl. 8, *g*, *h*, *i*, *j*
philodice, *Colias*, 5, 6, 18 (in key), 20 (in key), 93, 97, 101, 102, 103, 106, 107, 108, 109, 110, 111, 112; pl. 17, *a*, *b*, *e*
phlaeas, *Lycaena*, 2, 15 (in key), 71
phlaeas americana, *Lycaena*, 71; pl. 15, *l*, *m*, *n*
phlaeas americana ab. *fulliolus*, *Lycaena*, 71
Phoebis, 112
philea, 1, 19 (in key), 112; pl. 10, *d*
sennae, 1, 19 (in key), 112; pl. 10, *c*
sennae drya, 113
Pholisora, 153
catullus, 22 (in key), 153; pl. 26, *r*
hayhurstii, 22 (in key), 153; pl. 15, *i*, *j*
Phoradendron flavescens, 3, 77
Phyciodes, 48
batesii, 5, 15 (in key), 49; pl. 11, *f*, *g*, *h*, *i*
tharos, 15 (in key), 48, 49; pl. 11, *j*, *k*, *l*, *m*
phyleus, *Hylephila*, 24 (in key), 161; pl. 28, *c*
 Pieridae, 11 (in key), 18 (key to species), 86
 Pierinae, 86
Pieris, 88, 107
protodice, 18 (in key), 92; pl. 18, *c*, *d*, *e*, *f*, *g*, *h*
protodice occidentalis, 92
rapae, 1, 2, 18 (in key), 19 (in key), 88, 91; pl. 18, *a*
virginiensis, 1, 5, 19 (in key), 90, 91, 187; pl. 18, *b*
piscivorus, *Agkistrodon*, 176
plexippus, *Danaus*, 2, 13 (in key), 65, 67
plexippus ab. *fumosus*, *Danaus*, 65
plexippus megalippe, *Danaus*, 2, 67, 68; pl. 10, *b*
plexippus plexippus, *Danaus*, 65, 67, 68; pl. 10, *a*
 Poanes, 168
aaroni, 8, 25 (in key), 170; pl. 28, *m*, *n*, *o*, *r*
aaroni aaroni, 170, 171
aaroni howardi, 170, 171
hobomok, 1, 5, 28 (in key), 169; pl. 28, *j*, *k*, *l*
howardi, 171
massasoit, 25 (in key), 172
massasoit hughii, 1, 172; *frontis-piece*, fig. 11; pl. 26, *c*, *d*
viator, 8, 28 (in key), 168; pl. 29, *j*

- Poanes yehl, 8, 28 (in key), **771**; pls. 28, *a, 30, d, f, g*
 zabulon, 24 (in key), **169**; pl. 27, *a, b*
- polios, Incisalia, 5, 17 (in key), **83**; pl. 13, *a*
- Polites, **164**
 manataaqua, 27 (in key), **164**, 166; pls. 15, *d, 28, e*
 mystic, 5, 29 (in key), **166**; pl. 26, *j, k*
 peckius, 29 (in key), **165**; pl. 28, *g, h*
 themistocles, 27 (in key), **165**, 166; pl. 28, *f*
 verna, 27 (in key), **164**, 166; pl. 28, *d*
 vibex, 24 (in key), **167**; pls. 27, *f, 28, i*
- Polygonia, **40**
 comma, 13 (in key), **40**; pl. 5, *e, f*
 faunus, 13 (in key), **41**
 faunus smythi, 4, **42**; frontispiece, figs. 3, 6; pl. 5, *a, b*
 interrogationis, 13 (in key), **40**; pl. 16, *f*
 interrogationis fabricii, 40
 interrogationis umbrosa, 40
 progne, 5, 13 (in key), **41**; pl. 5, *c, d*
- polyxenes, Papilio, 21 (in key), **144**
 polyxenes ampliata, Papilio, 144
 polyxenes asterius, Papilio, **144**; pl. 22, *e, f, g, h*
- polyxenes curvifascia, Papilio, 144
 portlandia, Lethe, 11 (in key), **30**
 portlandia anthedon, Enodia, 5
 portlandia anthedon, Lethe, 5, **31**; pl. 1, *g, h*
- portlandia portlandia, Lethe, 8, **30, 32**; pl. 1, *e, f*
- Potanthus mingo, 187
 Potentilla canadensis, 151
 progne, Polygonia, 5, 13 (in key), **41**; pl. 5, *c, d*
- proserpina, Limenitis astyanax, 51
 Proteides, **147**
 clarus, 22 (in key), **147**; pl. 23, *a*
- proteus, Urbanus, 1, 21 (in key), **148**; pl. 23, *d*
- protodice, Pieris, 18 (in key), **92**; pl. 18, *c, d, e, f, g, h*
- protodice occidentalis, Pieris, 92
 Prunella, 180
- pseudargiolus, Cyaniris argiolus, **73**, 75; pl. 14, *a, b, c, d, e, f, h*
 pseudargiolus form intermedia, Cyaniris argiolus, 73
 pseudargiolus form lucia, Cyaniris argiolus, 73
 pseudargiolus form marginata, Cyaniris argiolus, 73
 pseudargiolus form neglecta, Cyaniris argiolus, 73, 74
 pseudargiolus form neglecta-major, Cyaniris argiolus, 74
 pseudargiolus form nigra, Cyaniris argiolus, 73
 pseudargiolus form pseudargiolus, Cyaniris argiolus, 73, 74
 pseudargiolus form violacea, Cyaniris argiolus, 73
- pylades, Thorybes, 22 (in key), 149, **150, 151**; pl. 25, *a, b*
- Pyrginae, 11 (in key), 21 (key to species), **147**
- Pyrgus, **151**
 centaureae, 5, 23 (in key), **151**
 centaureae wyandot, **151**; pl. 24, *a, d*
 communis, 23 (in key), **152**; pl. 24, *b, c, e, f*
 communis albescens, 152
- rapae, Pieris, 1, 2, 18 (in key), 19 (in key), **88, 91**; pl. 18, *a*
- rawnsleyi, Tisiphone abeona, 51
 reversa, Amblyscirtes carolina, 180
 Robinia pseudacacia, 147
 rosa, Euchloë olympia, 87, 88
 Rhabdoides, **149**
 cellus, 22 (in key), **149**; pl. 23, *b, c*
- Riodinidae, 10 (in key), 15 (key to species), **69**
- rubrofasciata, Limenitis arthemis, 50, 51
- Rumex acetosella, 71
 ruricola, Atrytone, 25 (in key), 164, **177**
- ruricola metacomet, Atrytone, **177**; pls. 11, *e, 26, e*
- rutulus, Papilio glaucus, 124, 125, 126, 130, 134
 rutulus arcticus, Papilio, 134
- sassacus, Hesperia, 5, 28 (in key), **161, 166**; pl. 27, *m, p*
 sassacus manitoboides, Hesperia, 161

- Satyridae, 10 (in key), 30
 Satyrinae, 10 (in key), 11 (key to species), 32
 Scirpus, 3, 186
 selene, Boloria, 2, 3, 12 (in key), 62
 selene marilandica, Boloria, 1, 2, 63;
 frontispiece, figs. 1, 2; pl. 9, *b, c*
 selene myrina, Boloria, 5, 62; pl. 9, *a*
 sennae, Phoebis, 1, 19 (in key), 112;
 pl. 10, *c*
 sennae drya, Phoebis, 113
 septentrionalis, Euptychia areolatus, 8,
 37; pl. 3, *a, c*
 smythi, Polygonia faunus, 4, 42; fron-
 tispiece, figs. 3, 6; pl. 5, *a, b*
 sosybius, Euptychia, 8, 12 (in key),
 38; pl. 3, *i*
 Spalginae, 10 (in key), 70
 Spartina alterniflora var. glabra, 3, 171
 Speyeria, 3, 54
 aphrodite, 3, 5, 15 (in key), 59;
 pl. 8, *a, b*
 aphrodite alcestis, 59
 aphrodite ab. bakeri, 60
 aphrodite ab. hughi, 61
 atlantis, 4, 15 (in key), 61; pl. 8,
c, d
 cybele, 3, 12 (in key), 56, 58, 60;
 pls. 2, *c, 7, g, h*
 diana, 1, 3, 14 (in key), 55, 91;
 pl. 7, *a, b, c, d*
 idalia, 3, 12 (in key), 54; pl. 7,
i, j
 Strymon, 78
 cecrops, 16 (in key), 78; frontis-
 piece, fig. 7; pl. 12, *h*
 cecrops ab. gottschalki, 78; frontis-
 piece, fig. 7
 edwardsii, 6, 17 (in key), 80; pl.
 13, *d*
 falacer, 17 (in key), 80; pl. 13, *c*
 liparops, 16 (in key), 81; pl. 13, *e*
 melinus, 16 (in key), 81
 melinus humuli, 81, 82; pl. 11, *o*
 melinus melinus, 81; pl. 11, *n*
 ontario, 1, 16 (in key), 79
 ontario ontario, 80; pl. 13, *f*
 titus, 16 (in key), 79
 titus mopsus, 79; pl. 13, *h*
 titus titus, 79; pl. 13, *g*
 sylvanus, Augiades, 1, 187
 Ochloides, 187
 tarquinius, Feniseca, 17 (in key), 70;
 pl. 15, *e, k*
 telamonides, Graphium marcellus, 146
 texana, Minois pegala, 36
 textor, Amblyscirtes, 8, 26 (in key),
 180; pl. 3, *j*
 tharos, Phyciodes, 15 (in key), 48,
 49; pl. 11, *j, k, l, m*
 Theclinae, 11 (in key), 77
 themistocles, Polites, 27 (in key), 165,
 166; pl. 28, *f*
 thoë, Lycaena, 72; pl. 15, *f, g, h*
 Thorybes, 149
 bathyllus, 22 (in key), 149; pls.
 23, *g, h, 25, e*
 confusus, 22 (in key), 150; pl. 25,
c, d
 pylades, 22 (in key), 149, 150,
 151; pl. 25, *a, b*
 Tisiphone abeona, 50
 abeona aurelia, 50, 51
 abeona joanna, 50
 abeona morrisi, 50, 51
 abeona rawnsleyi, 51
 titus, Strymon, 16 (in key), 79
 titus mopsus, Strymon, 79; pl. 13, *h*
 titus titus, Strymon, 79; pl. 13, *g*
 toddi, Boloria, 3, 5, 14 (in key), 61
 toddi ammimalis, Boloria, 61, 62, 63;
 pl. 9, *d, e*
 troilus, Papilio, 21 (in key), 122, 123;
 pl. 22, *a, b*
 troilus ilioneus, Papilio, 122
 umbrosa, Polygonia interrogationis, 40
 Urbanus, 148
 proteus, 1, 21 (in key), 148; pl.
 23, *d*
 Vanessa, 43
 atalanta, 2, 13 (in key), 43, 44,
 45; pl. 8, *f*
 cardui, 1, 2, 14 (in key), 44, 45;
 pl. 4, *d, e*
 virginicensis, 14 (in key), 44; pls.
 4, *f, g, 30, 7, k*
 vanillae Agraulis, 1, 8, 12 (in key), 64
 vanillae nigrior, Agraulis, 65; pl. 7,
e, f
 verna, Polites, 27 (in key), 164, 166;
 pl. 28, *d*
 vialis, Amblyscirtes, 27 (in key), 179;
 pl. 27, *n, q*
 viator, Poanes, 8, 18 (in key), 168;
 pl. 29, *j*
 vibex, Polites, 24 (in key), 167; pls.
 27, *f, 28, i*

- Vicia caroliniana*, 3
 violacea, *Cyaniris argiolus pseudargiolus* form, 73
virginiensis, *Calephelis*, 8, 15 (in key), 69; pl. 12, *j*
Pieris, 1, 5, 19 (in key), 90, 91, 187; pl. 18, *b*
Vanessa, 14 (in key), 44; pls. 4, *f, g, 30, j, k*
Wallengrenia, 167
 otho, 26 (in key), 167
 otho egeremet, 167; pl. 26, *m, n*
 otho otho, 167; pl. 26, *o*
werdandi, *Colias nastes*, 106
wyandot, *Pyrgus centaureae*, 151; pl. 24, *a, d*
yehl, *Poanes*, 8, 28 (in key), 171; pls. 28, *q, 30, d, f, g*
zabulon, *Poanes*, 24 (in key), 169; pl. 27, *a, b*
Zanthoxylum clavaherculis, 120
zarucco, *Erynnis*, 23 (in key), 158; pl. 25, *g, h*
Zerene, 112
 caesonia, 19 (in key), 112; pl. 2, *d*
Zizania palustris, 3, 168