

THE SYSTEMATICS OF *ANTHOCHARIS MIDEA* HÜBNER (LEPIDOPTERA: PIERIDAE)

BY

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AND

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TABLE OF CONTENTS

Introduction	2
Nomenclature	2
Neotypes and type localities	5
Geographic variation	8
Distribution	9
Conclusion	11
Synonymies	12
a. <i>Anthocharis (Falcapica) midea</i> (Hübner)	12
b. <i>Anthocharis (Falcapica) midea midea</i> (Hübner)	15
c. <i>Anthocharis (Falcapica) midea annickae</i> n. ssp.	17
Life history	22
Foodplants	23
Parasites	23
Acknowledgments	24
Bibliography	24

ABSTRACT: The geographic variation and systematics of *Anthocharis midea* (Hübner) of eastern North America are described. The species is placed in the subgenus *A. (Falcapica)* Klots, 1930. Neotypes are designated for *Maucipium vorax midea* Hübner, *Pieris lherminieri* Godart and the homonomous *Papilio danaus genutia* Fabricius. The nominate subspecies *A. m. midea* occurs in the southern Coastal Plain. The northeastern subspecies is named as *A. m. annickae* dos Passos and Klots, type locality New Haven, Connecticut. Complete bibliographies are given for the species and subspecies. Some notes on the life history and parasites are included.

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INTRODUCTION

For many years the authors have recognized the need for a detailed study of the North American falcate orange-tip butterfly, *Anthocharis midea* Hübner ("1806" [1809]), to clarify its geographic variation and nomenclature and have been accumulating data and specimens for this purpose. They have been materially aided by many persons in Europe and North America and are especially indebted to Lucien Harris, Jr., Bryant Mather, and Richard Heitzman for the loan of important series of specimens from Georgia, Mississippi, and Missouri.

NOMENCLATURE

Generic. This species should be considered (Klots, 1930, pp. 82–83; 1931, p. 254; and "1931" [1933], p. 151) a member of the genus *Anthocharis* Boisduval, Rambur and Graslin [1833], the type-species of which is *Papilio cardamines* Linnaeus (1761, p. 271). Following Hemming (1967, p. 46), we employ the spelling *Anthocharis* instead of *Anthocaris* in this paper because it is the original spelling of the authors Boisduval, Rambur and Graslin [1833], and no reason is apparent for its emendation. Earlier Hemming (1934, p. 132) had used the spelling *Anthocaris* and referred the name to the same authors. This was a *lapsus calami*.

In a subgeneric sense we employ also *Falcapica* Klots, 1930, the type-species of which is *Papilio genutia* Fabricius (*nec* Cramer "1782" [1780], 1793). *Midea* Herrich-Schäffer, 1867, of which *P. genutia* is also the type, is a preoccupied name having been proposed by Bruzelius in 1854 and by Walker in 1863, so that in effect *Falcapica* is a substitute name for *Midea* Herrich-Schäffer although not expressly so stated in the original description.

We are not unmindful of the fact that Kuznezov (1929, p. 58 footnote) proposed the subgeneric name *Paramidea* for a falcate orange-tip butterfly with the type-species *Midea scolymus* Butler, 1866. This is a Palearctic butterfly occurring in West China and Japan. While both *midea* and *scolymus* have falcate forewings, their facies are very distinct so that subjectively we refer each to separate subgenera. It should be noted in passing that Bernardi (1961, p. 111) misspelled "Paramidae" and gave an incorrect page reference "52." It should have been 58. The genitalia are of little use in separating species of *Anthocharis* (*Falcapica*) as will be seen in referring to figures of *genutia* and *scolymus* (Klots, 1930, p. 94, figs. 4 and 5).

Specific. Four species-group names are available for the species:

1. *Papilio danaus genutia* Fabricius (1793, p. 193)
2. *Mancipium vorax midea* Hübner ("1806" [1809], pl. 142)

3. *Pieris lherminieri* Godart (1819, p. 118)
4. *Anthocharis flavida* Skinner (1917, p. 438)

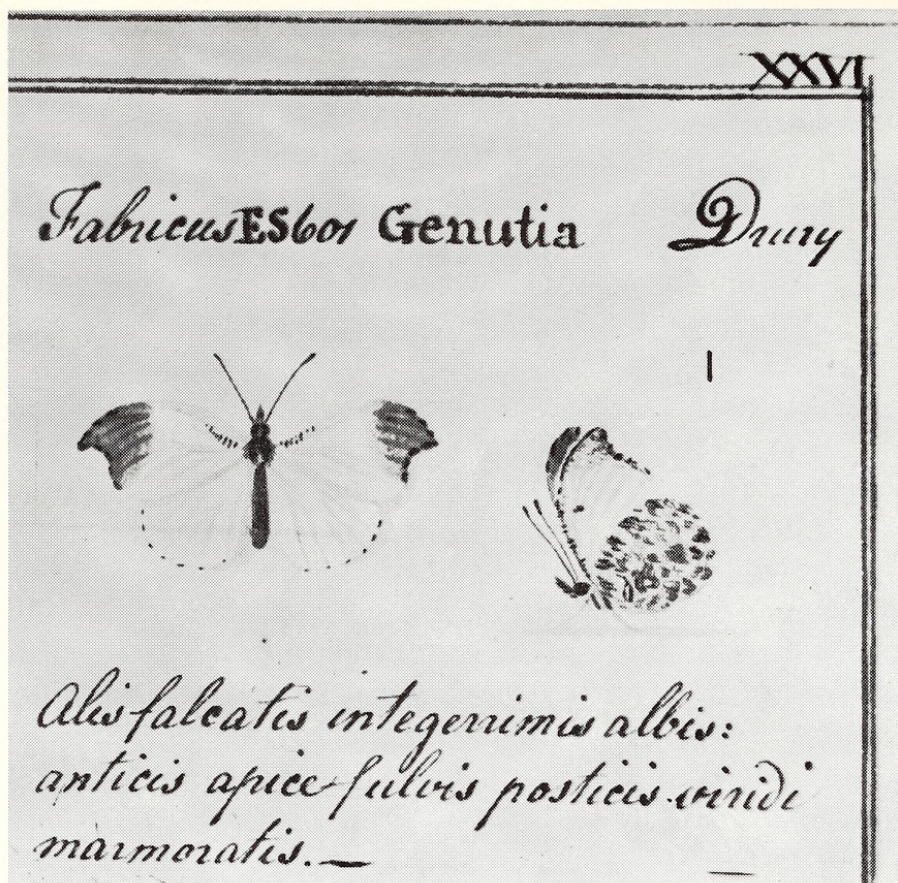
1. *Papilio danaus genutia* Fabricius, although the oldest available name, is a homonym of *Papilio genutia* Cramer ("1782" [1780]) and therefore unavailable. No type of Fabricius' exists at the British Museum (Natural History), London; the Zoologisk Museum, Copenhagen (Zimsen, 1964, p. 560, no. 967); the Zoological Museum of the University, Kiel; or anywhere else insofar as we have been able to ascertain.

In the original description of *genutia*, Fabricius stated that the habitat was "in Indiis" and that the specimen was in the collection of Drury. He also referred to (the unpublished) Jones's Icones (figured picture 3, pl. 26, fig. 2). We have examined the Icones at the Hope Museum, Oxford, and have a photograph of this figure kindly furnished by Miss Audrey Smith which we reproduce here (Fig. 1). Considering the standards of its time, it is a good and recognizable representation of the North American falcate orange tip, although it does not show the black discocellular spot on the upper side of the forewing and has the apical orange patch running down too far along the outer margin. It shows a very extensive orange patch which extends basad to at least the end of the discal cell where the black discocellular spot would be. We are indebted to Prof. G. C. Varley of the Hope Museum for permission to reproduce this photograph which has not been published heretofore.

The oldest published figure of *genutia* is in Donovan's *Insects of India* (1802, [pl. 27], fig. ***).³ This does not agree very well with the North American insect but resembles even less the Chinese and Japanese *A. scolymus* Butler and not at all anything from India. Since Donovan gives a reference to Fabricius' original description,

³ The pages and plates in this work are not numbered. The title page is followed by two pages entitled "Advertisement" and 16 signatures, some of which are numbered and others lettered, some of the numbers being duplicated. Each signature appears to have been accompanied by one or more colored plates. There is little or no consistency to these numbers and letters.

The copy of this work in the Library of the British Museum (Natural History) contains 57 plates. The one in the Library of The American Museum of Natural History contains 58 plates. That this work should contain 58 plates is evidenced by the index, which lists that many plates. Each plate bears a date between 1 Jan. 1800 and 1 Feb. 1804, but they are not numbered in the index in accordance with their dates of issue, a systematic method of numbering having been adopted. The signatures are not dated, but most likely appeared with the plates. Whether they did or not, the plates bear the scientific names and the dates of their publication. An edition by Westwood (1842) contains 58 plates.



(All figures are approximately natural size)

FIG. 1. Photograph of the figures of upper- and undersides of *Papilio danaus genutia* Fabricius in Jones's Icones.

it is possible that his figure is a poor representation of Drury's specimen or of the Icones figure.

2. *Mancipium vorax midea* Hübner ("1806" [1809]) is the next oldest available name. Hemming (1937, p. 429) states that the specimen figured by Hübner came from either "Georgien" German text or "Brasilia" Latin text. Since Brazil is an impossible locality for the species, we may safely assume that the specimen came from Georgia. No trace of any Hübnerian specimen that might be his type was found in any of the European museums; it is safe to assume that none exists.

3. *Pieris lherminieri* Godart (1819) is the next oldest available name. The locality given in the original description is "Charlestown." We feel safe in assuming that this meant Charleston, South Carolina, where the species is known to occur. Charlestown, Massachusetts, has been suggested as an alternative, but we regard this as highly improbable. Scudder (1889, p. 1150) mentions Boisduval's reporting the butterfly to be found about Boston, but believes that this was erroneous. The closest records to Boston, then as now, are

from New Haven, Connecticut in the coastal plain, and Holyoke, Massachusetts in the Connecticut River Valley, far inland from Boston and Charlestown. No possible Godart specimen of *lherminieri* was found by us in the Museum d'Histoire Naturelle, Paris, where many of Godart's types are preserved; and we have been assured by Dr. Pierre E. L. Viette of that institution that it is not there. Neither is any Godart specimen in the Edinburgh Museum of Science and Art, Edinburgh, where some of Godart's North American types are preserved or elsewhere so far as we have been able to ascertain. It is safe to assume that the type no longer exists.

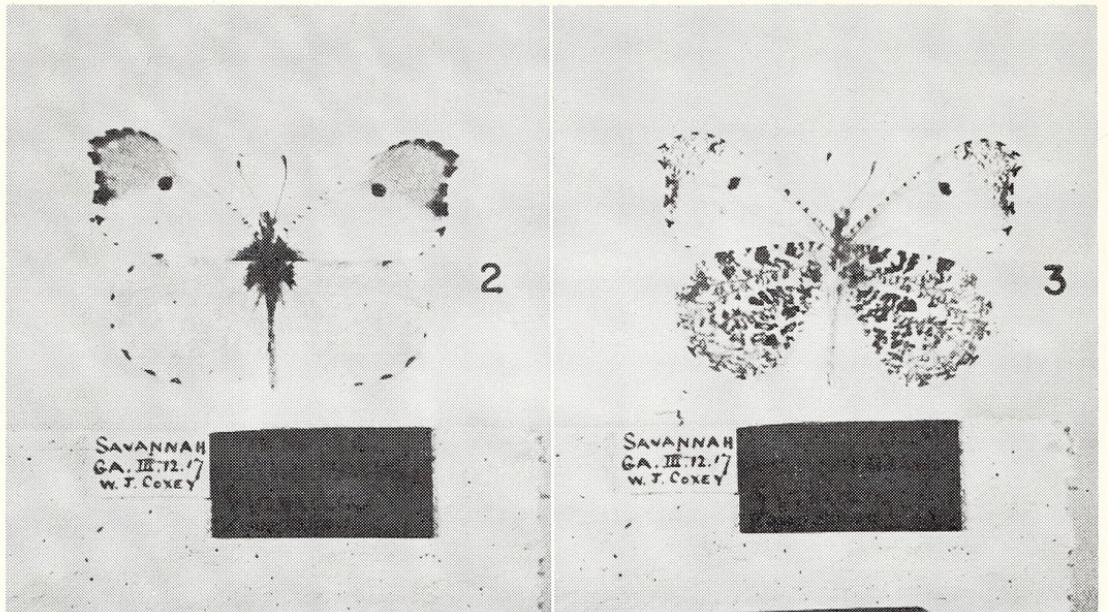
4. *Anthocharis flavida* Skinner (1917) was described from a single male from Savannah, Georgia (March 12, 1917, collected by W. T. Coxe). We figure this type (Figs. 2 & 3) which is in the Academy of Natural Sciences, Philadelphia. Although named as a variety, it is actually a normal specimen of the population about Savannah.

NEOTYPES AND TYPE LOCALITIES

As we show below, there is considerable geographic variation in the populations of the species. In the study and nomenclature of this, however, the lack of types and exact type localities for the nominal species *Papilio genutia* Fabricius, *Mancipium midea* Hübner, and *Pieris lherminieri* Godart is a grave handicap preventing the exact application of specific-subspecific names. We therefore, under Article 75 of the International Code of Zoological Nomenclature, herewith designate neotypes for these nominal species. In doing so we have chosen specimens consistent with the original information and data, and coming as nearly as practicable from the original type localities as discussed above. We do this after consultation with other specialists in North American butterflies, from none of whom was any objection received.

1. *Papilio danaus genutia* Fabricius (1793). The locality ("in Indiis") given in the original description is obviously wrong. Fabricius' specimen may well have come from the coastal plain region of Georgia, whence John Abbot had been sending material to Europe for many years. The specimen figured in Jones's *Icones* (*loc. cit.*) referred to by Fabricius most closely resembles those from the coastal plain of Georgia. We therefore designate as the **neotype** of this nominal species a male specimen from Wilmington I., near Savannah, Georgia, April 2-11, 1947, which is the property of The American Museum of Natural History (Figs. 4 & 5).

2. *Mancipium vorax midea* Hübner ("1806" [1809]). As noted above, "Georgien" and not "Brasilia" is almost certainly the true



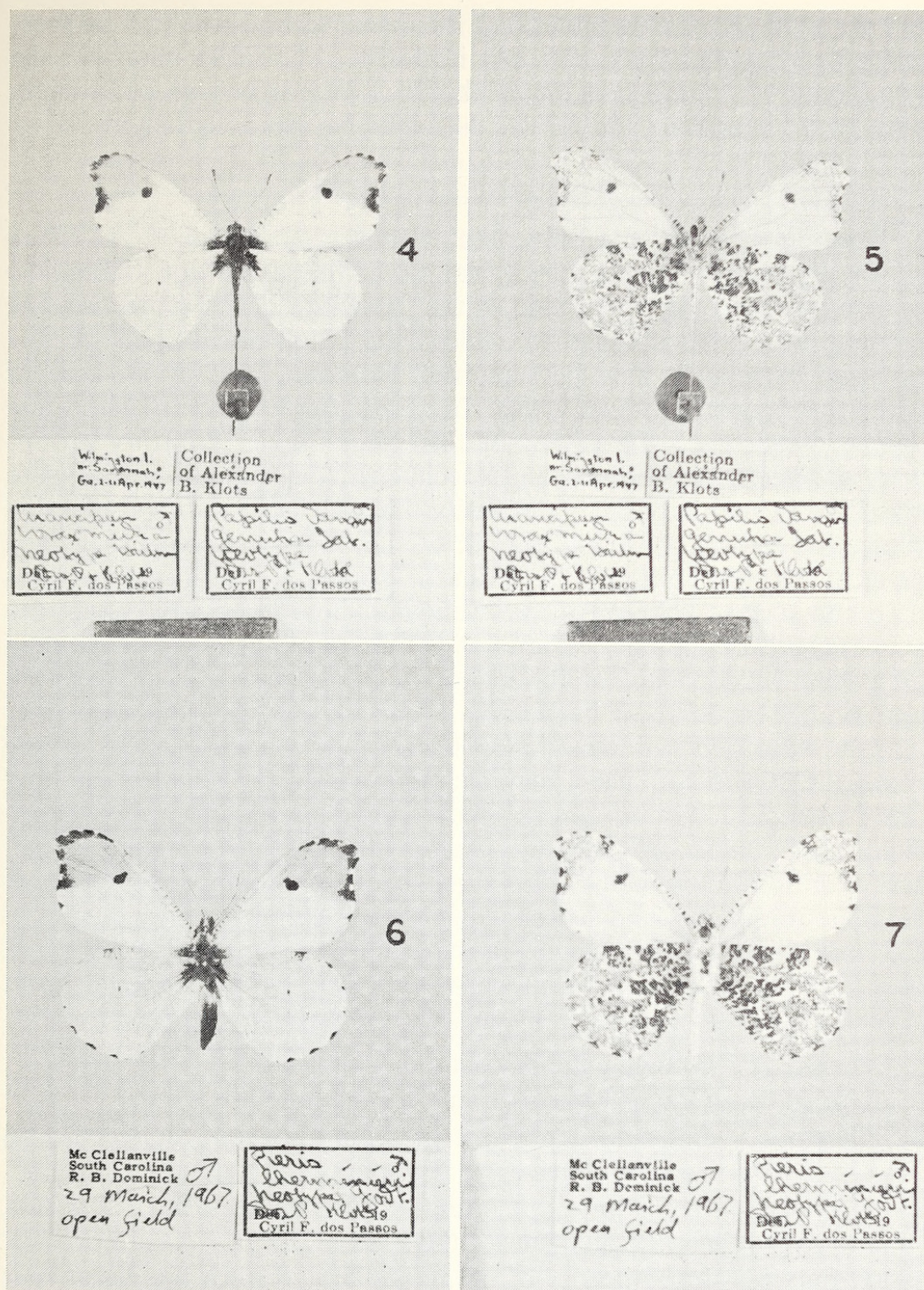
FIGS. 2-3. *Anthocharis flavida* Skinner ♂ type, upper- and undersides, Savannah, Ga., 12 March 1917, W. T. Coxey.

type locality. We therefore designate as the **neotype** of this nominal species the same male specimen designated as the neotype of *Papilio danaus genutia* Fabricius, from Wilmington I., near Savannah, Georgia, April 2-11, 1947, which is the property of The American Museum of Natural History (Figs. 4 & 5).

3. *Pieris lherminieri* Godart (1819). For the reasons stated above we designate as the **neotype** of this nominal species a male specimen from McClellanville (Charleston Co.), South Carolina, 29 March 1967, leg. R. B. Domenick which is the property of The American Museum of Natural History (Figs. 6 & 7). We are indebted to Dr. R. B. Domenick of McClellanville, South Carolina, for this specimen.

4. *Anthocharis genutia flavida* Skinner (1917) although named as a variety is based on a normal specimen characteristic of the Savannah, Georgia population. It must therefore be treated as a species-group name in accordance with Article 10b of the International Code of Zoological Nomenclature. We believe that it was first given this status by Clark and Clark (1951, p. 86) (Figs. 2 & 3).

In accordance with the above, the restricted type localities of both *Papilio danaus genutia* Fabricius and *Mancipium vorax midea* Hübner are Wilmington I., near Savannah, Georgia; and that of *Pieris lherminieri* Godart is Charleston, South Carolina. All three of these names, and *Anthocharis flavida* Skinner also, then apply to the population of the Southern Coastal Plain that is characterized, as discussed



FIGS. 4-5. *Papilio danaus genutia* Fabricius ♂ neotype, upper- and undersides, Wilmington I. near Savannah, Ga., 2-11 April 1947. This specimen is also the neotype of *Mancipium vorax midea* Hübner.

FIGS. 6-7. *Pieris lherminieri* Godart ♂ neotype, upper- and undersides, McClellanville, South Carolina, 29 March 1967, leg. R. B. Domenick.

below, by the great extent basad of the apical orange patch of the forewing of the male. Since *midea* is in effect a substitute name for the homonymous *Papilio genutia*, it should be used for this population, with both *lherminieri* and *flavida* as subjective junior synonyms.

GEOGRAPHIC VARIATION

The chief, if not the only reliable, character in which *A. midea* shows significant geographic variation is the extent of the apical orange patch on the upper side of the forewings of the male. At one extreme this extends basad to enclose the black discal spot. At the opposite extreme it may be separated from the spot by an area of white that is nearly its own width. In an attempt to quantify with some degree of accuracy the extent of this patch, seven arbitrary groups were decided upon and series of specimens from many localities were classified in such groups. Admittedly this was subject to considerable subjective error. The inner margin of the patch is never either even or clear-cut, but considerably diffused (sometimes with varying hues of dilute orange or orange and yellow scales) especially along the veins costad of the cell. The spot varies individually in diameter a great deal independent of the extent of the orange. Counting white and orange scale rows between the end of the cell and the outer margin was tried but abandoned because of the diffuseness of the orange edge and the inaccuracy caused by even the slightest rubbing away of scales. Group counts are recorded in general only when a significant number of specimens was available from a locality, small series of specimens being eliminated because of the possibilities of bias due to edaphic and seasonal variation. Although not included in the group counts, odd specimens have been commented upon when they seemed significant. Unfortunately, little or no material from several important regions was available for study.

Group A—Orange extends basad of discal spot.

Group B—Orange extends basad to touch discal spot.

Group C—Inner border of orange separated from the discal spot by less than the diameter of the spot.

Group D—Inner border of orange separated from the discal spot by $1-1\frac{1}{2} \times$ the diameter of the spot.

Group E—Inner border of orange separated from the discal spot by $1\frac{1}{2}-2\frac{1}{2} \times$ the diameter of the spot.

Group F—Inner border of orange separated from the discal spot by $2\frac{1}{2}-3\frac{1}{2} \times$ the diameter of the spot.

Group G—Inner border of orange separated from the discal spot by $3\frac{1}{2}-4\frac{1}{2} \times$ the diameter of the spot.

The following table shows the result of our examination of 320 specimens of *midea* from 12 states and gives the geographic variation of the size of the orange spot on the male forewings:

TABLE I

Pattern Groups	A	B	C	D	E	F	G	Totals
GEORGIA								50
Savannah & vicinity	8	3	2					13
Savannah, Ft. Pulaski	5	1						6
Jekyll Island	2	1						3
St. Simons Island	1							1
Atlanta & vicinity	2	3	1	2	1			9
Kennesaw Mt. (Cobb Co.)		3	2	5				10
Marietta (Cobb Co.)		3	1		1			5
Chatsworth (Whitefield Co.)		1	1					2
Trenton (Dade Co.)		1						1
SOUTH CAROLINA								13
Beaufort (Beaufort Co.)	3		1					4
McClellanville (Charleston Co.)	8	1						9
MISSISSIPPI								50
Clinton (Hinds Co.)	10	17	11	8	4			50
TEXAS			2	2	5	38	2	49
TENNESSEE	1	5	1	1				8
ARKANSAS	4	6	2	2	1			15
MISSOURI								39
Warsaw (Benton Co.)	9	6	3	1	11			30
St. Louis & vicinity	2	1	3		3			9
WEST VIRGINIA					2	3	1	6
VIRGINIA				2	11	1		14
NEW JERSEY								42
Paterson, Essex Co., etc.		1		2	5	17	1	26
Other (coastal plain)					3	10	3	16
NEW YORK								19
Ramapo Mts. & vicinity			1	3	8	6	1	19
CONNECTICUT								15
West Rock, New Haven				1	10	4		15
ALL LOCALITIES								320

DISTRIBUTION

As will be seen from our table, the coastal population of southern South Carolina and Georgia is strongly characterized by the great extent of the orange patch (groups A, B, and C), totaling A—27 = 75%, B—6 = 17%, C—3 = 8%, D—G—0, Totals—36. It may be

noted that in this region the males often show tinges, sometimes strong, of yellow about the apex of the hindwing and that females sometimes show a tinge of yellow about the apex of the forewing. This is the population to which the names *A. genutia* (Fabricius), *midea* (Hübner), *lherminieri* (Godart), and *flavida* Skinner must be applied.

The population of inland Georgia above the fall line is also characterized by an extensive orange patch, but this is less extensive and less consistent in this population than in the coastal one as shown by the totals: A—2 = 7%, B—10 = 37%, C—5 = 19%, D—8 = 30%, E—2 = 7%, F—G—0, Totals—27. Only 2/27 specimens have the extremely large patch, while 10/27 have the relatively reduced patch of groups D and E.

A. midea apparently does not occur in Florida, even in the Gulf Coast panhandle, and we have no specimens from Alabama. In Mississippi, however, it is locally common. The population shows a very high incidence of an extensive orange patch (A + B + C—38/50 = 76%) but also contains many individuals with a somewhat reduced patch (D + E—12/50 = 24%).

No material is available from Louisiana.

The material from Texas shows a very different picture. The 49 specimens examined come from a wide range (Dallas, Harris, Harrison, Brazos, Bexar, Kerr, Comal, San Patricio, and Smith counties). Among them there are no specimens with a very extensive patch (groups A & B), and by far the largest group (38/49 = 77%) has the patch greatly reduced. This is all the more surprising because of the dominance of large-patch populations in most of the southern and western range of the species. It would be difficult, in fact, to find any consistent points of difference between the series from Texas and those from the most distant northeastern part of the species' range in New Jersey, New York, and Connecticut.

The populations of Tennessee, Arkansas, and Missouri on the other hand contain a very large proportion of large-patch individuals. In the adequate Missouri series these comprise 62% (A + B + C), while 38% have a somewhat reduced patch (D + E). The latter figure is especially important indicating that the gene pool of this population must be far more mixed than that of those from the southeastern coastal plain.

The concentration of large-patch individuals in coastal South Carolina, Georgia, and Mississippi and also in the northwestern part of the range of the species, presents a special problem. It may very well be, as one of us has postulated (Klots, 1965, p. 462–463) that the southeastern coastal plain large-patch characteristic arose in peninsular Florida during the Pleistocene when, due to changes in

ocean level, this area was an island separated from the mainland; and that the character later spread both northeastward and northwestward, chiefly along the coast, but not into Texas, while the refugium population died out in Florida. The large-patch character of the northwestern population could then be a part of this or could have arisen independently. The small-patch Texas population would then be the descendants of a Pleistocene population in a different refugium, perhaps in Texas itself and Mexico. We are unable to surmise how or where the northwestern (i.e., Missouri) large-patch character arose.

Northward from Georgia and South Carolina in the Coastal Plain and Piedmont the populations show a sharp diminution of the amount of orange. Unfortunately, adequate material from northern South Carolina and North Carolina is lacking. In Virginia, Clark and Clark (1951, p. 86) comment on seasonal changes and state that the latest individuals "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*." Our small Virginia series agrees with this. We have, however, seen one specimen from the District of Columbia with the orange patch extended inward to enclose the discal spot (group A).

Unfortunately, adequate material from Maryland and Delaware has not been available to us. The few specimens we have seen, however, indicate that the populations of these states have decidedly small patches. This is definitely true of New Jersey, New York, and Connecticut populations, of which $74/76 = 97\%$ of the specimens studied fall in Groups D–G. The New Jersey series represent both Coastal Plain and Piedmont (hilly country above the fall line) areas; in New York and Connecticut these distinctions largely break down. These populations, occupying the extreme northeastern parts of the range of the species, are clearly extreme in the reduction of the orange patch.

CONCLUSION

What to do with this situation nomenclatorially is a moot question. There is obviously something of a north–south cline east of the Appalachians from Connecticut to Georgia, albeit probably a strongly stepped cline with perhaps a major break south of Virginia. Nothing is known about the possibilities of gene exchange between the isolated colonies in which the species occurs, and therefore of rates of gene flow and gene exchange between areas nearly a thousand miles apart. Nor is anything known about the genetics of the character involved. Phenetically the species shows a clinal condition, but we do not know that anything of the sort exists genetically. Needless to say, we can

only guess at the possible evolutionary relationships of the very similar Texas and Connecticut populations located at opposite extremes of the range of the species, or at those of the similarly widely separated large-patch populations of coastal Georgia and Missouri. We believe that at least the major population differences that exist should be indicated nomenclatorially, since this is the chief function of biological nomenclature. We have accordingly chosen to designate the Connecticut population at the northeastern extremity of the range of the species as a subspecies.

The matter of referring populations to one subspecies or another is subjective and can only be done on the basis of material available at the moment. Such decisions are always subject to review as new populations and more specimens come under study. The population of *midea* along the Georgian coast and on the off-shore islands is usually of the form having more extensive orange areas on the forewings that touch the black spot in the cell. Conversely, populations in the north have a more restricted orange patch. The latter are referred to our new subspecies. Strangely isolated colonies of one form or the other sometimes occur in alien territory. One interesting example of this is presented by a series from Warsaw, Barton County, Missouri, kindly loaned to us by Mr. Richard Heitzman. Of this rather large series of 54 males, exactly one half of the specimens, if labeled "Georgia," would pass for the southern subspecies; while the other half, if labeled "New York," would pass for the northern subspecies.

We now present under three headings the complete synonymies of *Anthocharis midea*, *A. midea midea*, and our new subspecies. Of course, it has not been possible to assign all references with certainty to their respective headings. To do so correctly one would have to see the actual specimen referred to by the respective authors. In many cases that is no longer possible. However, with a reasonably good knowledge of the eastern Atlantic states and those bordering them, it is possible to assign most names correctly.

SYNONYMIES

***Anthocharis (Falcapica) midea* (Hübner)**

(Figures 4 and 5 neotype)

The citations listed under this heading consist of check lists and general catalogues, not of a revisional nature, together with miscellaneous references where no precise locality for the occurrence of the insect is given, or where the locality given is apparently false. Local catalogues and lists are placed under the respective subspecies

to which they are deemed to refer. Preparatory stages of the insect are also given under this heading.

E[uchloë] Midea Hübn., "1816" [1819], p. 94, no. 997.

Anth[ocharis] Genutia Boisd., (= ♀ *Pi[eris] Lherminieri* Godt. = *Mancipium Vorax Midea* Hübn. = *Euchloë Mi[dea]* Hübn.) Doubleday, "1846-50" (1847), vol. 1, p. 57, no. 12 (United States).

Anthocharis Boisd. Dup. *genutia* Fab., (= Fem. *Lherminieri* Godt.) Morris, 1860, p. 4. (N. Am.).

A[nthocharis] Boisd. *genutia* Fab., (= *Lherminieri* (fem.) Godt. = *A. Midea?* Hübn.) Morris, 1862, p. 20, no. 1 (southern states).

[*Anthocharis*] (*Anthocharis!*) *genutia*, = (*lHerminieri*) Weidemeyer, 1863, vol. 2, pp. 151, 154 (United States).

Midea genutia, F., (= *l'herminieri*) Herrich-Schäffer, 1867, vol. 21, p. 143 (Nordamerika).

M[idea] Genutia, Fabr., (= *Mancipium vorax Midea*, Hübn. = *Pieris L'herminieri et Genutia*, Godt.) Kirby, 1871, pp. 508, 509, no. 1 (Unio Amer.).

E[uchloë] Hübn. Genutia Fabr., (= *Pieris Lherminieri* God. = *Mancipium vor. Midea* Hübn.), Scudder (*partim*), 1872, p. 43, no. 1 (southern New England to Georgia and Texas).

[*Anthocharis*] *Genutia*, Scudder, 1875, vol. 10, p. 113.

Midea Genutia, Scudder, 1875, vol. 10, p. 218.

[*Anthocharis*, Bd.] *Genutia*, Bd., Edwards (*partim*), 1877, vol. 6, p. 15, no. 49 (New York to Virginia; western states, Texas).

[*Anthocharis* Bdv.] *Genutia* Fb., Möschler, 1878, vol. 39, p. 299.

[*Anthocharis*, Bdl.] *Genutia*, Fabr., (= *Mancipium vorax Midea*, Hüb. = *Pieris L'herminieri*, Godt.) Strecker (*partim*), 1878, p. 77, no. 38. (U. S. east of Texas, [?except New England States]).

[*Anthocharis*, Bd.] *Genutia*, F., anonymous [Publication Committee] "1882" [1881], vol. 4, p. 1, no. 45.

[*Anthocharis*, Bd.] *Genutia*, Fabr., Edwards, 1884, p. 348, no. 53.

[*Anthocharis* Bdv.] *genutia* Fabr., Smith *et al.*, 1891, p. 14, no. 393.

Anthocharis genutia, Dyar, 1894, p. 100.

A[nthocharis] genutia, Beutenmüller, 1897, vol. 5, p. 208.

E[uchloë] genutia, Butler, 1899, vol. 32, p. 2.

M[idea] genutia, Butler, 1899, vol. 32, p. 3.

Midea genutia, Grote, 1900, vol. 39, p. 41.

[*Synchloë* Hübner] *genutia* Fabricius, (= *midea* Hübner) Dyar (*partim*), "1902" [1903], no. 52, p. 7, no. 48 (southern Atlantic states).

[*Anthocharis* Bdv.] *genutia* Fabr., Smith *et al.*, 1903, p. 9, no. 421.

[*Anthocharis*] *Genutia* Fabr., Skinner, [1905], no. 1, p. 22.

Anthocharis Genutia, Fabricius, Wright, 1905, p. 50, no. 61, p. 107,

pl. 7, figs. 61 male, b female (eastern states).

M[idea] H.-Schäffer genutia F., (= *midea* Hbn., *l'herminieri* Godt.) Röber, (1910), vol. 5, p. 96, fig. 28b (United States).

[*Anthocharis* Bdv.] *genutia* Fabr., (= *Midea* Hbn.) Barnes and McDunnough, 1917, p. 3, no. 43.

Euchloë genutia, Lutz, 1918, p. 137, pl. 34 ♂.

Euchloë genutia, Lutz [1921], pp. 137, 490, pl. 34 ♂.

[*Anthocharis* Bdv.] *midea* (Hbn.) (= *genutia* [Fabr.], [*nec* Cram.], = *l'herminieri* [Godt.]) Barnes & Benjamin, 1926, vol. 25, p. 7, no. 44.

[*Anthocharis* Bdv.] *midea* (Hbn.) *flavida* Skin., Barnes & Benjamin, 1926, vol. 25, p. 7, no. 44a.

[*Anthocharis* Boisduval, Subgenus *Falcapica*] *genutia* Fabricius, Klots, 1930, vol. 25, pp. 83, 93, pl. 6, fig. 4 ♂ (genitalia).

Anthocharis genutia, Rummel, *fide* Siepmann, 1931, vol. 26, p. 268.

[*Euchloë*] Hübner *midea* Hb., Hemming, 1934, vol. 1, p. 131, no. 358.

[*Anthocharis* Boisduval, Rambur and Graslin] *genutia* Fab., Hemming, 1934, vol. 1, p. 132, no. 359.

Synchloë genutia, Fazzini, 1934, p. 48. (In the East).

Euchloë (or *Anthocharis*) *genutia*, Lutz, 1935, p. 136, pl. 26 ♂.

Euchloë genutia, Engelhardt, *fide* Siepmann, 1937, vol. 32, p. 87.

Mancipium vorax Midea Hübner = *Euchloë Midea* Hübner MS, Hemming, 1937, vol. 1, p. 429 (*Brasilia* [Latin text]).

Euchloë Midea Hübner MS = *Genutia* Fabr., Hemming, 1937, vol. 2, p. 115 (Latin text, *in Brasilia*).

E[uchloë] genutia (Fabricius), Davenport & Dethier, "1937" [1938], vol. 17, p. 179.

[*Anthocharis* Bdv.] *midea* Hbn., (= *genutia* Fabr.), McDunnough, 1938, vol. 1, p. 7, no. 30.

[*Anthocharis* Bdv.] *midea* Hbn. *l'herminieri* (= *flavida* Skin.) Godt., McDunnough, 1938, p. 7, no. 30a.

Anthocharis Boisduval *midea* (Hübner) (= *genutia* [Fabricius] *nec* [Cramer]), Field, 1938, vol. 39, no. 10, p. 279, no. 74.

Papilio genutia, Zimsen, 1964, p. 560, no. 967.

Scudder (1889, p. 1147) lists two unpublished works in his synonymy of *Anthocharis genutia*. The first is Abbot's drawings of the insect of Georgia in the British Museum (Natural History), volume 20 which figures *genutia* (figs. 79–81). These drawings were prepared about 1800. That work is certainly unpublished, but the second work to which Scudder refers is more doubtful. This is Townend Glover's 1878 *Illustrations of North America Lepidoptera*, pl. 27, figs. 2, 3. This work was copyrighted by Glover and is to be found in some libraries including that of The American Museum of Natural History. Since whether it is published or not is immaterial to the questions discussed in this paper, we do not feel obliged to take any position on that interesting problem.

***Anthocharis (Falcapica) midea midea* (Hübner)**

(Figures 4 and 5)

The citations listed under this heading consist of references to *A. midea midea* wholly or in part, the latter being included also under the following heading. Some of these citations cannot be pinpointed with certainty because, Georgia and South Carolina being states in which both populations occur, a reference to those states alone may indicate either or both subspecies.

P[apilio] D[anaus] Genutia Fabricius (*partim*), 1793, vol. 3, p. 193, [no.] 601 ("India").

Papilio Genutia, Donovan (*partim*), "1800" [1802], sig. F. p. [2], pl. [27], fig. *** (India).

Mancipium vorax Midea Hübner (*partim*), "1806" [1809], vol. 1, pl. [142], figs. 1-4 [MS Georgien (German text)].

Pieris Lherminieri Godart, 1819, vol. 9, pp. 118, "197" [167], no. 164 ("Charles-Town" [= Charleston, South Carolina]).

Pieris Genutia, Godart, 1819, vol. 9, pp. 118, 168, no. 165 (les Indes orientales).

Pier.[is] Genutia, Godart, "1819" [1824], vol. 9, p. 806.

Genutia, Scudder, 1872, vol. 4, p. 74. (Georgia, May 21 in Oak Woods; north as well as south) Abbot MS folio 20, figs. 79-81.

[*Anthocharis*, Bdl.] *Genutia*, Fabr., (= *Mancipium vorax Midea*, Hüb., = *Pieris L'herminieri*, Godt.) Strecker (*partim*), 1878, p. 77, no. 38 (U. S. east of Texas [except New England states]).

Anthocharis, Bd. *Genutia*, Bd., Worthington, 1880, vol. 12, p. 47 (Illinois).

M[idea] Genutia Fabr., Staudinger (*partim*), 1888, vol. 1, p. 47 (southern states of North America).

Anthocharis genutia, Scudder (*partim*), 1889, vol. 2, pp. 1147-1153; vol. 3, pl. 15, figs. 13, 15, pl. 26, fig. 3, (distribution) pl. 35, fig. 14, pl. 40, fig. 5, pl. 46, fig. 41, pl. 56, fig. 7, (*imago*) pl. 65, fig. 29, (*ova*) pl. 73, fig. 9, pl. 76, fig. 5, pl. 79, fig. 54, (*larva*) pl. 84, fig. 59 (*pupa*) (southern half of Alleghenian, northern half of Carolinian faunas, from Atlantic to southern Mississippi Valley; Pennsylvania, central Texas at Dallas; nearly all Atlantic states from Connecticut to Georgia; Savannah, Ga., Kanawha Co., W. Va.; Mexican border; Illinois; Ohio at Cincinnati; Newburgh, N.Y.; Connecticut at Greenwich, New Haven, New Britain, Farmington and tops of Meriden Hills, vicinity Holyoke, Mass., May to June).

[*Synchloë* Hübner] *genutia* Fabricius, (= *midea* Hübner) Dyar (*partim*), "1902" [1903], no. 52, p. 7, no. 48 (southern Atlantic states).

[*Anthocharis genutia*] *flavida* [new variety] Skinner, 1917, vol. 28, p. 438 (Savannah, Georgia, March 12, 1917).

Anthocharis genutia, Comstock & Comstock (*partim*), 1923, p. 385

(southeastern United States not Florida; north to New Haven, Connecticut).

Synchlöë genutia, (*Anthocaris genutia* or *Euchloë genutia*), Weed (*partim*), 1924, pp. 94 (*ova*), 97, 256, pl. [fig. 2.] (east of Rocky Mountains; north to New England; southern states, south to Texas; western portion of North Carolina).

Synchlöë genutia, Comstock & Comstock (*partim*), 1929, p. 82, pl. 15, figs. 1–2 (southeast United States, except Florida; north to New Haven, Connecticut).

Euchloë [(*Anthocharis*)] *genutia* (Fabricius), Holland, (*partim*), 1931, p. 287, pl. 4, fig. 6 (*ova*); pl. 32, figs. 37♂ 38♀; pl. 2, fig. 5 (*larva*); pl. 5, fig. 59 (*pupa*) (New England to Texas).

[*Euchloë* (*Anthocharis*) *genutia* (Fabricius)] Var. *flavida* (Skinner), Holland, 1931, p. 287, pl. 71, fig. 15 male "paratype" (Georgia).

Mancipium vorax Midea Hübner = *Euchloë Midea* Hübner MS, Hemming, 1937, vol. 1, p. 428 (Georgien [German text]).

Euchloë Midea Hübner MS, Hemming, 1937, vol. 2, p. 115 (German text, in Georgien).

Anthocharis midea (Hbn.) = *genutia* Fab., Harris, [1950], p. 3 (uncommon in Georgia, April).

Anthocharis midea (Hbn.) = *genutia* Fab. subspecies *flavida*, Skinner, Harris, 1950, p. 3 (near Savannah [Georgia]).

Anthocharis genutia (Fabricius) subspecies *flavida*, Clark & Clark, 1951, vol. 116, no. 7, p. 86 (coast of Georgia).

Anthocaris genutia Fabricius, Klots (*partim*), 1951, pp. 49, 181, 208, pl. 6, fig. 5 (*pupa*) pl. 25, fig. 7♂ (Ramapo Mts.) (Massachusetts and Connecticut, s. to Georgia, w. to Illinois and Texas [Dallas]).

A[nthocaris] g[enutia] midea Huebner, Klots, 1951, p. 182 (Georgia).

Anthocaris midea (Hbn.), Mather, 1952, vol. 6, p. 42 (Hinds County, Mississippi, March and April).

Euchloë Hüb. *genutia* Fab. *l'herminieri* Godt., = *flavida* Skin. Tietz [1952], p. 2, no. 30a (Savannah, Georgia, April and May).

Anthocaris midea Arnhold, "1952" [1953], vol. 6, p. 99 (Missouri).

Anthocharis genutia genutia (Fabricius), Lambremont, 1954, vol. 1, no. 10, pp. 131, 148 (Louisiana, upland regions northern part of state, April).

E[uchloë] genutia Fabricius, Forbes (*partim*), 1960, pp. 108, 110 (southern Massachusetts to Illinois and Arkansas, south to Georgia and Texas).

Anthocaris genutia Fabricius, Ehrlich & Ehrlich, [1961], p. 73 (New England to Texas, east of Rocky Mountains, Kansas).

Anthocaris midea (Hübner), Klots (*partim*), 1965, p. 463 (shore region [including the sea islands] of Georgia and South Carolina).

***Anthocharis (Falcapica) midea annickae*, new subspecies**
(Figures 8, 9, 10, and 11 holotype ♂ and allotype ♀)

This new subspecies for which, as heretofore pointed out, no name is available, differs from the nominate subspecies in that on the forewing the orange apical area is more restricted and does not touch or closely approach the cell or the black discal spot. The range of this population covers most of North America east of the Appalachian Mountains from southern Massachusetts to Virginia.

The holotype, male from West Rock, New Haven, Connecticut, was taken on 20 April 1952 and the allotype, female from the same locality was taken on 1 May 1964, both by Dr. Charles L. Remington to whom we are indebted for them. They have been deposited in The American Museum of Natural History.

There are also four male and two female paratypes also furnished to us by Dr. Remington from the same locality as follows: males, 30 April 1952, 22 April 1954, 1 May 1954, and 19 April 1954; females, 16 May 1952 and 1 May 1954. These are also in the collection of The American Museum of Natural History.

The great phenetic similarity of the populations in Texas and in the northeast (*annickae*) is by no means evidence that they are genetically so similar that they should be considered subspecifically congruent. To do so would, in fact, contravene everything that is now known about the evolutionary differentiation of populations on the specific and subspecific level during periods of spatial isolation from each other. We have no trustworthy evidence what the *A. midea* are like that inhabit the inland areas between the *A. midea annickae* of the Appalachians and the northern coastal plain and the *A. midea* of Texas. The same applies to the similar populations of the southern coastal plain (*A. midea midea*) and of the far-distant Missouri-Kansas region. Many careful population studies will have to be made in the mid-West before any safe conclusions can be made about the taxonomic status of the western populations.

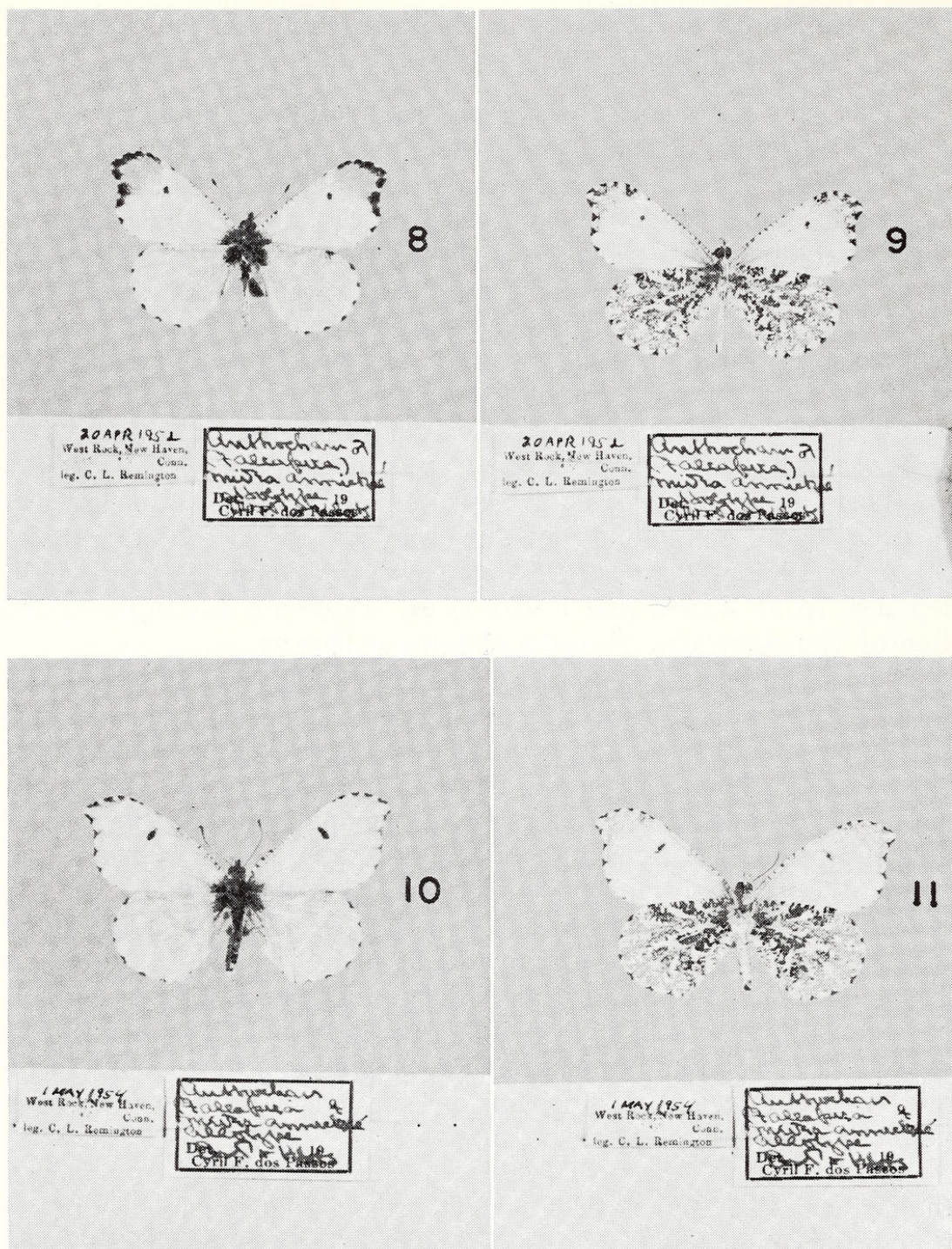
Anthocharis (Falcapica) midea annickae is named in honor of the former Mlle. Annick de Toulgoët Treanna, elder daughter of our friends the Comte and Comtesse de Toulgoët Treanna of Paris, France, who is now Mme. Michel Mauer.

The synonymy of this subspecies is as follows:

P[apilio] D[anaus] Genutia Fabricius (*partim*), 1793, vol. 3, p. 193, [no.] 601 (India).

Papilio Genutia, Donovan (*partim*), "1800" [1802], sig. F., p. [2], pl. [27], fig. *** (India).

Mancipium vorax Midea Hübner, "1806" [1809], vol. 1, pl. [142], figs. 1-4 [*MS*: Georgien (German text)].



FIGS. 8-11. *Anthocharis midea annickae* holotype ♂ and allotype ♀, upper- and undersides, both West Rock, New Haven, Conn., ♂ 22 April 1954, ♀ 16 May 1952, leg. C. L. Remington. (The specimens of Figs. 4-11 are in The American Museum of Natural History. All photographs except Fig. 1 are by the senior author.)

Anthocharis Genutia, Boisduval (= *Mancipium vorax Midea*, Hübn. = la femelle *Pieris Lherminieri*, God.) 1836, vol. 1, p. 565, no. 10 (Amerique Septentrionale; environs de Boston et de Charlestown).

Anthocaris Genutia Boisd., Scudder, 1868, vol. 11, p. 376, no. 12 (New Haven, Connecticut, May 16).

Anthocaris Genutia Boisd., Scudder, 1868, p. 4, no. 12 (New England).

Anthocaris genutia, Doubleday, 1869, Scudder (ed.), vol. 1, p. 121 (Edwards County, Illinois).

Anthocaris midea, Riley, 1871, p. 158 (Missouri).

[*Anthocharis*, Boisduval] *Genutia* Fabricius, Edwards, "1872" [1869], p. 5, no. 1. (New York to Virginia; middle and western states; Texas).

Euchloë Genutia, Butler, "1869" [1870], p. 214, no. 1 (Illinois, United States).

E[uchloë] Hübn. *Genutia* Fabr., (= *Pieris Lherminieri* God. = *Mancipium vor. Midea* Hübn.) Scudder (*partim*), 1872, p. 43, no. 1 (southern New England to Georgia and Texas).

[*Anthocharis*, Bd.] *Genutia*, Bd., Edwards (*partim*), 1877, vol. 6, p. 15, no. 49 (New York to Virginia; western states, Texas).

Anthocharis genutia Bois., Drury, [1878], vol. 1, p. 12, no. 14 (Cincinnati, Ohio).

Anthocharis Genutia Edwards, "1874-1884" [1878], vol. 2, pt. 7, p. [83-84], pl. *Anthocaris* II, figs. ♂ 1-2, ♀ 3-4 (Dallas, Texas; New Jersey; near Philadelphia; near Baltimore, Maryland; Newburgh, New York; Coalburgh, West Virginia, April; Illinois; Boston).

Anthocaris Genutia, Edwards, 1881, vol. 13, p. 211 (Coalburgh, [West Virginia], 17 April-14 May).

Anthocaris midea, Riley, 1881, p. 308 (Missouri).

[*Anthocharis* Boisduval] *Genutia* Fab., Edwards, 1884, vol. 11, p. 261, no. 53 (New York to Virginia; western states).

Anthocaris Genutia Fab., E. M. & S. F. Aaron, 1884, vol. 4, p. 172 (prairies southern Texas, 1st week April).

Anthocaris Genutia Fab., French, 1886, p. 118, no. 17 (New York to Virginia; Western States, Texas).

Anthocaris genutia Maynard, 1886, p. 48, no. 66, pl. 8, figs. 66 ♂, 66a ♂ (New England, Connecticut, western Massachusetts, 2 broods, first [sic] in July).

M[idea] *Genutia* Fabr., Staudinger (*partim*), 1888, in Staudinger & Schatz, vol. 1, p. 47 (southern states of North America).

Anthocharis genutia, Scudder (*partim*), 1889, vol. 2, pp. 1147-1153; vol. 3, pl. 15, figs. 13, 15, pl. 26, fig. 3 (distribution), pl. 35, fig. 14, pl. 40, fig. 5, pl. 46, fig. 41, pl. 56, fig. 7 (*imago*), pl. 65, fig. 29 (*ova*), pl. 73, fig. 9, pl. 76, fig. 5, pl. 79, fig. 54 (*larva*), pl. 84, fig. 59 (*pupa*) (southern half of Alleghenian, northern half of Carolinian faunas, from Atlantic to southern Mississippi valley; Pennsylvania, central Texas at Dallas; nearly all Atlantic states from Connecticut to Georgia; Savannah, Ga.; Kanawha Co., W. Va.; Mexican border; Illinois; Ohio at Cincinnati; Newburgh, N. Y.; Connecticut at Greenwich, New Haven, New

Britain, Farmington and tops of Meriden Hills, vicinity Holyoke, Mass., May to June).

Anthocharis genutia, Skinner and Aaron, 1889, vol. 21, p. 129. (Westville, New Jersey, May 6).

Anthocharis genutia, F., Beutenmüller, "1889-1891" [1890], vol. 5, p. 200 (Delaware Water Gap, Pennsylvania; Nyack, New York).

Anthocharis genutia, Rowley, 1890, vol. 22, p. 123 (Coalburgh, West Virginia, May).

Anthocharis genutia, Maynard, 1891a, p. 48, no. 66, pl. 8, figs. 66♂, 66a♂ (rare in New England, taken in Connecticut and western Massachusetts, 2 broods, first [*sic*] in July).

Anthocharis genutia Fabr., Maynard, 1891b, p. 29, no. 52, figs. 14b, 14g, pl. 2, fig. 1 male (New York to Virginia, western states and Texas. Rare in southern New England, February, March, Texas, April further north).

[*Anthocharis*] *Genutia*, Edwards, 1892, vol. 24, pp. 52, 109 [Coalburgh, W. Virginia].

Anthocharis genutia Fabr., Blatchley, 1892, in Gorby, p. 372, no. 12 (53) (Vanderburgh County, Indiana).

Anthocharis genutia, Skinner, 1892, vol. 3, p. 240 (Arcola, Perkio-men Creek, Pennsylvania, May 9).

Anthocharis genutia (Fabr.) Beutenmüller, 1893, vol. 5, p. 248, pl. 2, fig. 5 (Nyack and Newburgh, New York; Delaware Water Gap, Pennsylvania, May).

Anthocharis Genutia, Scudder (*partim*), 1893, p. 140 (eastern half of southern portion of our district, [eastern United States] even into New England; southern Illinois and Ohio, May to June).

Anthocharis genutia, [Anonymous], 1895, vol. 6, p. 145 (near Westville, New Jersey; Fox Chase, west of Quaker City, [Pennsylvania]).

Anthocharis Genutia, Edwards, "1888" [1897], vol. 3, pt. 6, pp. [57-61], pl. *Anthocharis* 1, figs. 5 male a-h3 (Washington, D. C.).

[*Anthocharis* Boisduval] *Genutia* Fabr., (= *midea* Hüb.), Skinner, 1898, p. 65, no. 397 (Connecticut, New York to Virginia, western states).

Euchloë genutia Fabricius, Holland, 1898, p. 284, p. 4, fig. 6 (*ova*); pl. 32, figs. 37♂, 38♀; pl. 2, fig. 5 (*larva*); pl. 5, fig. 59 (*pupa*) (New England to Texas).

Euchloë genutia (Fabr.), Beutenmüller, 1898, vol. 10, p. 246, pl. 14, fig. 7 (Massachusetts to Texas).

Anthocharis Genutia Fabr., Smyth, 1900, vol. 11, p. 465 (Blacksburg, Virginia, summit Alleghenies, April to May).

[*Synchloë* Hübner] *genutia* Fabricius, (= *midea* Hübner) Dyar (*partim*), "1902" [1903], no. 52, p. 7, no. 48 (southern Atlantic states).

Anthocharis genutia, Hornig, 1903, vol. 14, p. 252 (Westville, New Jersey, May).

Anthocharis genutia Fabr., Grossbeck, 1905, vol. 16, p. 131 (preparatory stages; Garret Mountain, Paterson, New Jersey).

A[nthocharis Bdv.] *genutia* Fab., Smith, 1910, p. 418 (New Jersey, April and May).

Anthocharis genutia, Skinner, 1917, vol. 28, p. 438 (Illinois).

[*Synchloë* Hübner] *genutia* Fabricius, Britton, 1920, no. 31, p. 159 (Connecticut).

Anthocharis genutia, Comstock & Comstock (*partim*), 1923, p. 385 (southeastern United States not Florida; north to New Haven Connecticut).

Synchloë genutia, (*Anthocharis genutia* or *Euchloë genutia*), Weed (*partim*), 1924, pp. 94, 97, 256, pl. [fig. 2]. (east of Rocky Mountains; north to New England; Southern states south to Texas; western portion North Carolina).

Anthocharis genutia, Clark, 1927, pp. 424, 428, pl. 2, figs. 10, 11 (Washington, D. C.).

A[nthocharis Boisduval] *genutia* Fab., Forbes, "1926" [1928] in Leonard, p. 677, no. 43 (highlands of Hudson, Greenwood, Tuxedo, Newburgh, Ramapo Mts., Canarsie, [New York] Apr.-May).

Synchloë genutia, Comstock & Comstock (*partim*), 1929, p. 82, pl. 15, figs. 1-2 (southeast United States, except Florida; north to New Haven, Connecticut).

Euchloë [(*Anthocharis*)] *genutia* (Fabricius) Holland (*partim*), 1931, p. 287, pl. 4, fig. 6 (*ova*); pl. 32, figs. 37 ♂ 38 ♀; pl. 2, fig. 5 (*larva*); pl. 5, fig. 59 (*pupa*) (New England to Texas).

Euchloë genutia Fabricius, [anonymous] [Wyss comp.] [1932], p. [24], no. 45 (Cincinnati, Ohio).

Anthocharis genutia (Fabricius), Clark, 1932, pp. 2, 3, 6, 7, 9, 12, 21, 23, 26, 30, 32, 43, 44, 61, 148, 164, 167, 168, 173, 234, 238, 252, pl. 2, figs. 10, 11, pl. 29, figs. 1-4 (Maryland; District of Columbia; Virginia).

(*Anthocharis*) Subgenus *Falcapica* Klots *genutia* Fabr., Talbot, 1934, in Strand, pt. 60, p. 321 (United States [New England to Texas]).

E[uchloë Hübner] *genutia* Fab., Brimley, 1938, p. 259 (Raleigh, Chapel Hill, Roanoke Rapids, [North Carolina], March and April).

Anthocharis medea [sic] (Hbn.), Leussler, 1938, vol. 49, p. 77 (Crete and Omaha, Nebraska).

Anthocharis (Falcapica) midea (Hübner), Field, 1938, vol. 39, no. 10, p. 176, no. 74 (New England south to Virginia and west to Texas and Kansas, Douglas, Greenwood and Leavenworth Counties, Kansas).

Anthocharis genutia Fab., Engelhardt, *fide* Tulloch, 1939, vol. 34, p. 227 (Lincoln, New Jersey, April and May).

[*Anthocharis* Boisduval] *midea* Hübner, (= *genutia* Fabricius), W. P. Comstock, 1940, vol. 48, p. 70, no. 30 (locally common throughout state [New Jersey]).

Anthocharis midea (Hübner), Field, 1940, vol. 13, p. 28 (Douglas and Leavenworth counties, Kansas, April).

Anthocharis midea (Hübner), Macy and Shepard, [1941], p. 36, fig. 7; pp. 52, 53, pl. 4, [fig. 4] (New England westward and southward

to Ohio, Illinois, and Texas; common near Washington, D. C.; Oakland, New Jersey; Athens County, Ohio, March to May).

Anthochris [*sic*] *midea*, Cook, 1948, vol. 2, p. 22 (Crailhope, Kentucky).

Anthocaris [(*Falcapica*)] *genutia* [= *midea*], Edwards, dos Passos (ed.) 1951, vol. 59, p. 163 (Washington, D. C.).

Anthocaris genutia midea Hbn., Rawson, 1951, vol. 5, p. 70 (Mt. Peter, Greenwood Lake, New York).

[*Anthocaris*] *midea*, Remington, 1951, (New Haven, Connecticut).

Anthocharis genutia (Fabricius), Clark & Clark, 1951, vol. 116, no. 7, pp. 86, 87, pl. 9, figs. i-j (Maryland and Virginia).

Anthocaris genutia Fabricius, Klots (*partim*), 1951, pp. 49, 181, 208, pl. 6, fig. 5 (*pupa*), pl. 25, fig. 7 ♂ (Ramapo Mts., N. Y.) (Massachusetts and Connecticut, s. to Georgia, w. to Illinois and Texas [Dallas]).

Anthocaris midea, Muesebeck & Walkley, 1951, p. 128-130.

[*Euchloë* Hüb.] *genutia* Fab. = *midea* Hüb., Tietz, [1952], p. 2, no. 30 (Pennsylvania).

E[*uchloë*] *genutia* Fabricius, Forbes (*partim*), 1960, pp. 108-110 (southern Massachusetts to Illinois and Arkansas, south to Georgia and Texas).

Anthocaris midea (Hübner), Klots (*partim*), 1965, p. 463 (in the Piedmont, westward to Texas and northward into Connecticut and Missouri).

LIFE HISTORY

The life history of *midea* is well known and all stages are beautifully figured and described by Edwards in the third series of the Butterflies of North America, [1888], pt. 6, pl. *Anthocharis* I, figs. a-h3, pp. [57]-[61].

One interesting fact that we have observed concerning the life history of this insect is that the imagines do not always emerge the year following pupation. Among those reared by the senior author in 1933 from specimens taken at Edison, New Jersey, one male did not emerge from the pupa until 26 April 1935. Others reared from specimens taken by us at Harrisville and New Gretna, both in Burlington County, New Jersey, 8-9 May 1953 and reared by the senior author on *Arabidopsis Thaliàna* (Linnaeus) resulted in seven out of thirteen specimens not emerging until the second year, the record being four males and two females the first year, while three males and four females emerged the second year. All of these specimens are in the senior author's collection except for one male, Harrisville, ex pupa, 1 March 1955 and one pupal shell which is in the junior author's collection.

The late Charles E. Rummel of Green Village, New Jersey, ob-

served many years ago (1931, p. 268) a case where an imago did not emerge until the third year, but we have never had that experience.

In the northern part of its range, the species is monogenetic. In Virginia *teste* Clark & Clark (1951, p. 86) there may be a partial second generation influenced by local climatic conditions, and this may well be the case in many parts of its southern range.

FOODPLANTS

The larva of *midea* feeds on various Cruciferae (Mustard Family), among which the following have been reported: *Bursa Bursa-pastòris* (Linnaeus), (1753, p. 647) Britton (Shepherd's purse, -bag, or -pouch); *Arabidopsis Thaliàna* (Linnaeus), (1753, p. 665), (Mouse-ear or Thale-cress, Wall-cress); *Barbarèa Barbarèa* (Linnaeus), (1753, p. 660), MacMillan, (Yellow Rocket or Cress); *Arabis glàbra* (Linnaeus), (1753, p. 666), Bernhardt, (Tower Mustard or Cress); and a species of *Cardamine* ([Tournefort] Linnaeus), (1753, p. 654) the specific name of which does not appear to have been reported but may be the one mentioned below.

We have reared the insect on *A. glàbra* when taken in the mountainous section of New Jersey and on *A. Thaliàna* when taken on the coastal plain. Dr. Charles L. Remington of the Gibbs Research Laboratories, Yale University, reports finding eggs and larvae at New Haven, Connecticut, on *Arabis laevigàta* (Mühlenberg), (1801, p. 543), Poiret (Smooth Rock-cress); *A. lyrata* Linnaeus (1753, p. 665), (Lyre-leaved Rock-cress); and *Cardamine parviflòra* Linnaeus and *C. arenicola* Britton, (1892, p. 220,) (Sand Bitter-cress or Small Flowered Bitter-cress), and rearing the insect on all three. Doubtless there are other foodplants such as *Cardamine rhomboidea* De Candolle (1821, p. 246), (Bulbous Cress) probably a synonym of *Cardamine bulbosa* (Schreber) Britton (1793, p. 174).

According to Smyth (1900, p. 465), eggs of *midea* were laid on *Dentaria laciniata* Mühlenberg (1800, p. 479), (Cut-leaved Toothwort or Pepper-root) which seems to be the only foodplant in Blacksburg, Virginia.

PARASITES

From larvae collected on *Arabis glàbra* (see above) were reared some parasitic wasps determined by Miss Luella M. Walkley of the United States National Museum, who stated that it was the first record of that parasite on *midea*, to be *Hyposoter exiguae* (Viereck) (1912, p. 638) (Ichneumonidae). One male wasp and cocoon are in that institution, and others in the collection of the senior author. This wasp has also been recorded on *Heliothis armiger* (Hübner),

([July 1803]–[1808]), *Prodenia ornithogalli praeifica* Grote, 1875 (both Noctuidae), and *Colias eurytheme* Boisduval, 1852 (Pieridae).

Also reported on *Anthocharis midea* are *Apanteles flaviconchae* Riley (1881, p. 308) (Braconidae) and *A. limenitidis* (Riley) (1871, p. 158) according to Muesebeck (1951, p. 128).

Another reported parasite is *Apanteles pergandei* Grossbeck (1905, p. 133) *nec* Ashmead (Braconidae). We do not find that this name was ever published by Ashmead. Grossbeck (*supra*) stated in a footnote that, "The species is described only in *MS* and will appear in Dr. Ashmead's monograph of the North American Braconidae now in preparation." Ashmead died a few years later (1908) without however having published any such monograph or described *Apanteles pergandei*. The name is, therefore, a *nomen nudum*.

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