Volume 1 **1 October 1998** **Number 1**

The Taxonomic Report

OF THE INTERNATIONAL LEPIDOPTERA SURVEY

AN ADDENDUM TO *ANTHOCHARIS MIDEA* DOS PASSOS AND KLOTS 1969. (DESCRIPTION OF A NEW SUBSPECIES FROM TEXAS.)

RONALD R. GATRELLE[1]
126 Wells Road, Goose Creek, South Carolina 29445

ABSTRACT. This paper verifies and expands upon the information presented by dos Passos and Klots in their 1969 systematic revision of *Anthocharis midea*. Their restriction of the range of *A. midea midea* to the coastal islands and immediate coast of Georgia and South Carolina is confirmed and expanded north into southern coastal North Carolina. Their range of *A. m. annickae* is expanded southward from Virginia to central Georgia. A new subspecies, *A. midea texana,* is described from Texas. *Texana* is *annickae's* ancestor. It differs from *annicka*e only in having greatly reduced black scaling at the base of the dorsal wings. Klots' theory that *midea midea* is descended from an extinct Florida ancestor is confirmed. *Midea* (coastal) and *annickae* (Sandhills) occur within 40 km of each other in Georgia and South Carolina. *Midea* is confirmed to not only be characterized by expanded orange of the dorsal FW of males, but also by frequent orange on the dorsal HW apex of males, and by females with frequent orange scaling on the dorsal FW apex.

Additional key words: Biogeographical evolution, convergent evolution.

C. F. dos Passos and A. B. Klots (1969) surveyed the phenetic variation of *Anthocharis midea* (Hübner) throughout its range. This present article is an addendum to their research, and merely confirms and expands their original findings. The sum of their research revealed the existence of four regionally distinct phenotypic populations of *A. midea* as follows:

1) along the coast of Georgia and South Carolina, characterized by extensive dorsal orange apical patches in males. They restricted the nominate subspecies, *A. m. midea,* to this area.
2) from Massachusetts to Virginia, characterized by males with a small orange apical patch. This they named as a new subspecies *A. midea annickae.*
3) Texas, also characterized by restricted male orange apical patches. They believed these to be indistinguishable from *annickae* in phenotype, but not synonymous with that subspecies.
4) remainder of species range, polytypic and thus characterized by no defining character(s).

Nearly 30 years have passed since their research was published. Having lived for the last 29 years in the area of the type locality of *A. midea midea,* I have been provided with the unique opportunity to compare hundreds of typical *A. midea midea* from various sights in Charleston, Colleton, Beaufort, and Jasper counties, South Carolina, and Chatham County, Georgia, against dos Passos and Klots' observations. Further, I have collected/observed hundreds of *midea* from inland Georgia and South Carolina, which has revealed significant information regarding the subspecies *annickae* and its relation to *midea midea.* I have also examined typical *annickae* from New Jersey and series of *midea* from Missouri, Texas, Kansas, Mississippi and other states. These specimens provide a clear picture of not only *midea's* subspeciation, but of its biogeographical evolution.

[1] Research Associate Florida State Collection of Arthropods, Gainesville, Florida.

FIGS. 1-8. *Anthocharis midea* subspecies. **1, holotype** ♂ ***Anthocharis midea texana***, 16 March 1989, 6 mi. w. of Buffalo, Freestone Co., Texas. **2,** ♂ *A. m. annickae* 2 May 1971 Lakehurst, NJ. **3,** ♂ *A. m. annickae* 11 March 1997 Burke Co., GA. **4,** ♂ *A. m. midea* 29 March 1975 Edisto Island, Colleton Co., SC. **5, allotype** ♀ ***A. m. texana*** 16 March 1989, 6 mi. w. of Buffalo, Freestone Co., Texas. **6,** ♀ *A. m. annickae* 1 May 1971 Lakehurst, NJ. **7,** ♀ *A. m. annickae* 10 April 1992 Oconee Co., SC. **8,** ♀ *A. m. midea* 29 March 1975 Edisto Island, Colleton Co., SC.

REEXAMINATION OF *MIDEA MIDEA* AND *MIDEA ANNICKAE*

In their research, dos Passos and Klots were only able to examine a very small number of male specimens of *A. m. midea* from coastal Georgia (23) and South Carolina (13). They did not mention how many coastal females were examined, but it was surely less than the number of males. Nonetheless, they were able to document the three characters that separate *midea midea* from the other populations.

The foremost character was the larger size of the orange patch in the apical area of male forewings. The remaining two characters were noted, but their significance underrated due to the limited series they examined. On their page 10 they stated, "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" (Emphasis mine).

The several hundred *midea midea* specimens I have collected/observed over the years confirm that approximately 25 to 50% of males (Fig. 4) possess the yellow HW apical character and about 25 to 30% of females have yellow scales in their FW apical area (Fig. 8). (% varies from colony to colony.) These two characters should also be considered as primary diagnostic traits along with the broad orange apical patch in males. Further, these three diagnostic characters of *midea midea* are of great significance because it is now known that they are genetic and not environmentally induced ecoforms.

We know this because the *A. midea* populations only a few kilometers inland in Screven, Burke, and Richmond counties, Georgia, and Aiken, Barnwell, Allendale, Bamberg, and Orangeburg counties, South Carolina are identical to northeastern *annickae* from New Jersey and are referable to that subspecies. These Georgia and South Carolina *A. m. annickae* populations never possess the yellow apex in females and very rarely the yellow dusting on HW apexes of males. It is also rare in these Sandhill counties to find any males with *midea midea*-like expanded apical orange areas.

Several years ago, Mr. Bob Cavanaugh informed me that this same situation existed in southern North Carolina. South coastal North Carolina specimens were *A. m. midea* and specimens only 30-40 kilometers inland were clearly *A. m. annickae.*

Dos Passos and Klots examined no specimens from North Carolina, inland South Carolina, or from the Sandhills of Georgia. This enormous geographical "gap" in material led them to the false assumption that a cline existed from south to north -- from *midea* to *annickae.* This is not the case. No clinal variation

exists along the eastern US seaboard. (Isolated pockets of genetic mixture may exist in north coastal NC and southern VA through intersubspecific contact.)

Dos Passos and Klots limited the range of *A. midea midea* to the coastal islands and immediate coast of Georgia and South Carolina. I extend this to include the south coast of North Carolina in the range of *A. m. midea*

They described *annickae* from a mere 8 specimens from West Rock, New Haven, Connecticut and limited the range of *A m. annickae* to Massachusetts south through Virginia. Having examined large numbers of *A. m. annickae* from the above mentioned Georgia and South Carolina counties, and also Lancaster (boarders North Carolina) and Oconee (mountains) counties, South Carolina; I herein extend the range of *A. midea annickae* from New England south to at least the Sandhill counties of eastern Georgia.

REEXAMINATION OF TEXAS *MIDEA*

Concerning the *midea* populations in Texas, dos Passos and Klots stated on page 10, "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 very extensive [orange FW] 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-patched 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."

And on page 17, "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."

I have examined 50 Texas *midea* (40 ♂♂ & 10 ♀♀) from Freestone, Comal, and Smith counties. These range over a distance of 500 km. from northeast to south central Texas. These specimens confirm the observations of dos Passos and Klots in relation to the small size of the male apical orange patch. However, all 50 examples differ definitively from *A. m. annickae* in having much less black scaling at the base of the dorsal wings. I have also examined a small series of 10 specimens (7 ♂♂, 3 ♀♀) from Johnson and Douglas counties in eastern Kansas which match this Texas phenotype.

The amount of black scales at the base of the wings is a diagnostic subspecific character between *A. sara sara* Lucas and *A. sara flora* W. G. Wright (Layberry, Hall and Lafontaine 1998). It is also diagnostic for species in the related genus *Euchloe*. Accordingly, I therefore describe these Texas/prairie populations as a new subspecies.

Anthocharis midea texana Gatrelle, new subspecies

Description and diagnosis. *Male* (Fig. 1): In all phenotypic aspects as in subspecies *annickae* except that the black scaling at the base of the dorsal wings adjoining the abdomen is generally 50 % or less that of *annickae.* *Female* (Fig. 5) as in male but black basal dusting even more restricted sometimes almost immaculate white at base of wings.

Types. *Holotype* ♂ (Fig. 1): 16 March 1989, 6 mi. w. of Buffalo, Freestone Co., Texas. *Allotype* ♀ (Fig. 5): 16 March 1989, 6 mi. w. of Buffalo, Freestone Co., Texas. *Paratypes:* 39 ♂♂, 9 ♀♀: all TEXAS: FREESTONE COUNTY, 6 mi. w. of Buffalo, 1 ♂, 13 March 1986; 4 ♂♂, 3 ♀♀, 16 March 1989. SMITH COUNTY, Tyler St. Pk., 3 ♂♂, 14-15 March, 4 ♂♂, 18-19 March 1987. COMAL COUNTY, Landa Pk., New Braunfels, 2 ♀♀, 8 March, 4 ♂♂, 1 ♀, 20 March 1982; 20 ♂♂, 1 ♀, 14 March 1983; 3 ♂♂, 23 April 1988; 2 ♀♀, 3 April 1995. The Holotype, Allotype, and 6 ♂ paratypes are deposited in the Florida State Collection of Arthropods, Gainesville, Florida. 6 ♂ paratypes are deposited in the American Museum of Natural History, New York, with the remaining paratypes deposited in the author's collection.

Etymology. *Texana* is named for the great state of Texas.

Remarks. The range of *texana* needs to be worked out by local collectors/researchers in the region. It apparently does not occur in Missouri. However, Missouri specimens tend to have the restricted basal black scaling at the juncture of the wings with the abdomen, and thus resemble *texana* in this trait more then *annickae* or *midea. Texana* does occur in the Lawrence area of Kansas, then south and westward. Colonies in Louisiana should be closely documented and observed since they occupy the tension zone between the convergent phenotype in Mississippi and Texan *texana.*

BIOGEOGRAPHICAL EVOLUTION

The evolutionary cause for the odd geographical phenotypic dispersal of *midea* was a mystery dos Passos and Klots left unanswered. However, they were not far from answering this question. They stated on page 10, "The concentration of large-patched 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 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."

Now that adequate material has been examined from Georgia and South Carolina, the solution seems fairly clear. *Midea midea* and *annickae* are from different ancestors. While *annickae* and *texana* have the same ancestor.

First, we now know that *midea* and *annickae* exist subspecifically in nature only a few kilometers apart in the coastal areas of Georgia, South Carolina and south coastal North Carolina. In fact, they probably occur in adjacent counties in this region (i.e. Beaufort and Hampton counties SC). They parallel each other along the coast for several hundred kilometers.

Second, climate and environment play no part in the coloration of these subspecies because specimens from Burke County, Georgia look exactly like specimens from Connecticut. While specimens from Chatham County, Georgia are vividly distinct from both. These phenotypes are genetic not environmental.

I believe Klots was exactly correct in postulating that *midea midea* ascended from an isolated Florida population. He was also accurate in stating that at the same geological time (the Pleistocene) *texana* was an isolate in Mexico. What I believe occurred was that the western population colonized itself eastward along the then existent coast (today's Black Belt Prairies of Mississippi and Alabama, and the Sandhills of Georgia, South Carolina and North Carolina), while *midea* was still isolated in island Florida. This eastward movement is substantiated by the research of Dr. Richard L. Brown of Mississippi State University. He has documented the eastward movement, and subsequent influence, of western species of Lepidoptera into and on the Lepidoptera of the Black Belt region (personal communication).

After Florida was joined to the mainland, those large-patch *midea* which moved northwestward (unhindered by habitat barriers) met the *texana/annickae* phenotype which was already present in that area. This gave rise to the mixed phenotypes north and northwest of the Florida panhandle. Those *midea* which moved northeastward became isolated on the coastal islands while *annickae* was isolated in the Sandhills. Before colonial times, these two southeastern subspecies were kept apart in the region by thick maritime forest swamps which were the dominant feature of the mainland coast.

Today, *midea midea* and *midea annickae* are becoming accessible to each other as the result of 300 years of deforestation and human environmental alteration. The convergent evolution we see taking place in the mixed phenotype populations (which now occupies most of the species range in the south and lower

Midwest) will eventually cause the extinction of *midea midea*. Over the last 30 years I have observed *midea* further and further inland and *annickae* closer and closer to the coast. There may be undiscovered colonies in Jasper and Hampton Counties, SC, which are now only separated by 20 km or less.

Biogeographical evolution is a slow process. We seem to usually think in terms of divergence, but convergence is a product of evolution also. Without the intervention of unforeseen isolating factors, the day will surely come when *midea* will be one polytypic species.

LITERATURE CITED

DOS PASSOS, C.F. & A.B. KLOTS. 1969. The Systematics of *Anthocharis midea* Hübner (Lepidoptera: Pieridae). Entomologica America. Vol. 45: 34 pp.

LAYBERRY, ROSS A., PETER W. HALL & J. DONALD LAFONTAINE. 1998. The Butterflies of Canada. Univ. of Toronto Press, Toronto, Canada 279 pp.

The Taxonomic Report is a publication of ***The International Lepidoptera Survey (TILS).***
126 Wells Road, Goose Creek, SC 29445-3413

TILS Purpose. TILS is devoted to the worldwide collection of Lepidoptera for the purpose of scientific discovery, determination, and documentation, without which there can be no preservation of Lepidoptera.
TILS Motto. As a world community, we can not protect that which we do not know.

Everyday around the world, in jungles and urban areas alike, insect species and subspecies are becoming extinct. Every year scores of these taxa have not even been scientifically discovered and documented. Thus, their extinction is unnoticed because their existence is unknown. They are unknown simply because they have not been collected and systematically identified. Without systematic taxonomy there is nothing. Without the collection and exchange of specimens (i.e. information) there will be no systematic taxonomy. Without amateur collectors the majority of the undiscovered species/subspecies will die out before they are discovered.

Please support the environment, support collecting. Be it moon rocks, urine samples, or butterflies, collecting is the first step of access to all other scientific information – and protection.

_____

The Taxonomic Report is projected for initial publication at the rate of at least 10 issues a year. Subscription is $65 US annually. The subscription year begins in August. All issues are mailed 1st class. At the end of each year subscribers receive that year's volume on CD for permanent archiving. **Checks** should be made payable to **TILS,** and **mailed to:** Scott D. Massey, Editor, 126 Wells Road, Goose Creek SC USA 29445.

Articles for publication are sought. They may deal with any area of taxonomic research on Lepidoptera. Before sending a manuscript, simply write **TILS** at the above address to set up discussion with the head of our research dept. on how to best handle your research for publication.

TILS is working to establish the **Museum Of The Hemispheres (MOTH).** The MOTH collection will be a collection of collections. Each individual sponsor, upon their death or retirement, will have their personal collection housed in a personalized cubical. Thus, their personal collection (specimens, storage setup, library, desk, etc.) will forever be preserved intact and be available to researchers in this form. For information on this **write to:** Ronald R. Gatrelle, MOTH Curator, 126 Wells Road, Goose Creek SC USA 29445.