



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

RONALD R. GATRELLE¹

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 *annickae* 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.

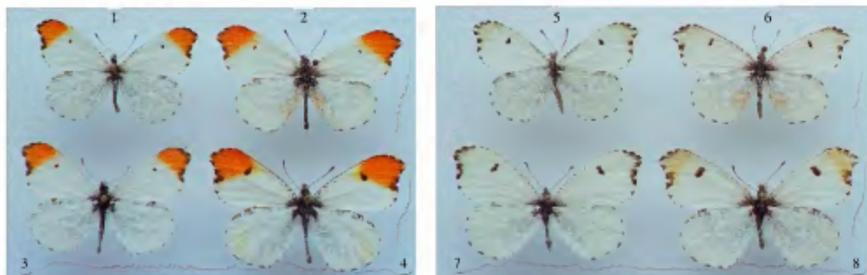
Additional key words: Biogeographical evolution, convergent evolution.

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 than *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 Americana. 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. Gatrell, MOTH Curator, 126 Wells Road, Goose Creek SC USA 29445.



The Taxonomic Report

OF THE INTERNATIONAL LEPIDOPTERA SURVEY



THE REDISCOVERY, TAXONOMY, AND BIOLOGY OF *CHLOSYSNE GORGONE GORGONE* AND *CHLOSYSNE ISMERIA* (NYMPHALIDAE) IN BURKE COUNTY, GEORGIA.

RONALD R. GATRELLE¹

126 Wells Road, Goose Creek, South Carolina 29445

ABSTRACT. On 24 April 1993 a colony of *Chlosyne gorgone gorgone* was found in Orangeburg County, South Carolina. This led to the rediscovery on 27 April 1993 of *C. g. gorgone* at its type locality in Burke County, Georgia. This species had not been seen or collected anywhere in east coastal Georgia or coastal South Carolina since its description in 1810. The type locality is xeric, scrub oak sandhill. This habitat is generally unsuitable for the survival of later broods. The larvae of nominate *gorgone* have only been found on *Helianthus divaricatus*. Topotypical *gorgone* differ slightly, but consistently, in phenotype from *C. gorgone carlota*. In biology, *gorgone gorgone* is strongly univoltine and thus markedly distinct from the multibrooded subspecies *carlota*. The range of nominate *gorgone* is restricted to these univoltine coastal populations. Upland/inland multivoltine populations in Georgia and South Carolina are best referred to subspecies *carlota*. A neotype of *Dryas reticulata gorgone* is designated and placed in the Allyn Museum of Entomology where the neotype of *C. g. carlota* is also located. On 20 August 1989, *Chlosyne nycteis* was also found to occur in Burke County along the Savannah River. The presence, both today and in John Abbot's day, of two *Chlosyne* species in Burke County necessitates the reopening of the *Melitaea ismeria* mystery. Enough evidence now exists to resurrect *ismeria* and define it correctly as the insect long known as *C. nycteis*. A neotype of *Melitaea ismeria* is designated and deposited in the Allyn Museum of Entomology. *Ismeria* (1833) becomes the binomial species name under *Chlosyne*. Due to lack of preserved specimens, *ismeria* is tentatively applied to only the coastal/sandhill populations in eastern Georgia and adjacent South Carolina having broader light areas above and ventral orange borders. *Chlosyne ismeria nycteis* [new combination] retained as the trinomial name through the remainder of *nycteis*' traditional range.

Additional key words: *Chlosyne harrisii*, Asters, convergent evolution, *Falcapica midea*.

TYPE LOCALITIES AND HISTORICAL INFORMATION

Chlosyne gorgone gorgone (Hübner) was described in 1810 from a John Abbot painting (Fig. 1) without any text. In the absence of a text, and because the figures of the type were produced by Abbot, it has traditionally been presumed that the Burke County area of Georgia is the type locality of *C. gorgone*. *Chlosyne ismeria* (Boisduval and LeConte) was described in 1833 from a poor copy of an Abbot painting (Fig. 4) and was accompanied by a brief textual annotation. The annotation established the range of *ismeria* as "Carolina and Georgia." The traditional assumption is that "coastal" Georgia and South Carolina is meant. The range of *ismeria* may actually be wider once its status in nature is better understood. Further, Burke County, Georgia has been established throughout the historical literature as the type locality of *ismeria*. I agree that this is the correct position.

¹Research Associate, Florida State Collection of Arthropods, Gainesville, Florida



FIGS. 1-7. 1, Hübner's ♂ *Dryas reticulata* Gorgone, dorsal and ventral surfaces from his plate 41. 2, Neotype ♂ *Dryas reticulata* Gorgone, 27 April 1993 Burke Co., GA, River Rd., dorsal and ventral surfaces. 3, Topotype ♀ *Chlosyne gorgone* gorgone, 21 April 1994 Burke Co., GA, River Road, dorsal and ventral surfaces. 4, Boisduval and LeConte's ♀ *Melitaea ismeria*, dorsal and ventral surfaces from their plate 46. 5, ♂ *C. g. carlota*, 22 April 1989 Oconee Co., SC, Brasstown Creek Rd., dorsal and ventral surfaces (leg. Watson). 6, ♀ *C. g. carlota*, 25 June 1988 Oconee Co., SC, Rt. 107 S. of Oconee St. Park, dorsal and ventral surfaces (leg. Watson). 7, Neotype ♂ *Melitaea ismeria*, 20 August 1989, Burke County, GA, at Savannah River, dorsal and ventral surfaces. All specimens collected by R. Gatrell unless otherwise noted.

I have not found any valid historical records for either of these species from or near their type locality since their discovery – a period of about 180 years. Harris (1972) lists several records of *C. gorgone* from various inland and upland Georgia counties. Burke County is 180 km from Harris' nearest record.

Forbes (1960) under *gorgone*, sites personal knowledge of "a few males in the British Museum [NH] from Abbot". His text structure is unclear, but the statement seems to refer to *ismeria*. Dr. Ian James Kitching of the British Museum (NH) kindly searched their holdings and found no Georgia specimens of *C. gorgone*, *C. ismeria* or *Chlosyne nycteis* (Doubleday and Hewitson). Nor did they find any Abbot specimens in the BMNH. Thus, Forbes statement is in error.

Opler (1984) has a dot on his range map for *C. gorgone* along the coast of South Carolina. After communicating with Dr. Opler on this matter, I contacted the individual from whom he received this record. This individual informed me that the record was in error, and he had not taken nor observed *C. gorgone* at any South Carolina location. Dr. Opler's record is also in error.

F. Martin Brown (1974) in number 16 of the *Bulletin of the Allyn Museum*, provides the singular most extensive historical and thorough taxonomic treatment of *C. gorgone*, *C. gorgone carlota* (Reakirt), and *C. ismeria*. He too found no existent coastal Georgia specimens of either *C. gorgone* or *C. ismeria*.

REDISCOVERY OF BURKE COUNTY *CHLOSYNE*

On 24 April 1993 I stopped to fix a flat tire on an Orangeburg County, South Carolina road. (Localities will remain vague due to the rarity of species concerned.) While fixing the tire, a non-lepidopterist friend, Scott Massey, who occasionally accompanies me and helps with collecting, caught a butterfly by the car and asked what it was. It was a *Chlosyne gorgone*! By chance we had stopped in the middle of a flourishing colony of *C. gorgone*. I had been actively collecting in South Carolina for 23 years, and this was my first encounter with this long sought after species.

Both sexes were numerous and fresh. A small series was collected. Adults were nectaring at the diminutive *Coreopsis auriculata* L. The habitat at the Orangeburg locality reminded me of an area I had collected a few years earlier in Burke County, Georgia.

On 27 April 1993, I made a trip to this location in Burke County, and upon finding a patch of *C. auriculata*, parked the car. Within a minute of exiting the vehicle, I had rediscovered this rare butterfly at its type locality. 200 years had passed since John Abbot had found this butterfly in this same general area and it was still there! While *C. gorgone* was not as numerous here as in Orangeburg County, the suitable habitat was more extensive and continuous. Consequently, *C. gorgone* was more dispersed at the Burke County site.

The rediscovery of the insect named *Melitaea ismeria* by Boisduval and LeConte was much less dramatic but more significant.

On 20 August 1989 at about 1800 h, while observing several species of butterflies gathered at mud along the banks of the Savannah River, I noted that among them were some fresh males of *Chlosyne nycteis*. Having found *nycteis* in many states over the years, I initially gave it no thought. In fact, earlier that day I had been collecting in the mountains of Georgia where *nycteis* had been a virtual pest. Remembering I was in Burke County, it occurred to me that this species may be unusual for that part of the state. So I netted three as vouchers. These *nycteis* were not only a new record for Burke County, but for southeastern Georgia, and over 140 km from the nearest record for this species in Harris (1972).

These sat unexamined (I only mounted one) in my collection from 1989 until 1997. By then I had rediscovered *gorgone* and was putting together a paper on it. One day while working on *gorgone*, I was struck by the obvious – Abbot had found two species of what we now call *Chlosyne* in Burke County. I had also found two. Could these two be Abbot's *gorgone* and *ismeria*? I herein propose that they are.

TAXONOMY OF THESE SPECIES

Brown's aforementioned paper is a detailed and definitive work on the literary history and taxonomy of the species which we are examining. While Brown's work is foundational to this present paper, I will only mention herein a few key quotations and points, and leave it to the reader to search out the full record.

Melitaea ismeria Boisduval and LeConte

Brown demonstrated that the modern misuse of *ismeria* being synonymous with *gorgone* was the result of an identification error by Scudder and A. G. Butler subsequently communicated to W. H. Edwards and others. On page 2 Brown states, "Scudder's concept [of *ismeria* = *gorgone*] is untenable." On page 3 he says, "Careful study of the use of the name *ismeria* indicates that its acceptance as the equivalent of *gorgone* male hinges on Scudder's statement about the [faulty] manuscript plate of Abbot in the British Museum (N. H.)." Then in Brown's concluding statements on page 10 he unequivocally states, "In conclusion, I believe that the name *ismeria* Blv. & LeC. cannot be used in association with *gorgone* Huebner."

Brown's determination was that while in much of the literature *ismeria* and *gorgone* have been associated as the same species, in nature they are not.

Brown's quandary was not in determining what *ismeria* wasn't, that is, not *gorgone*, but in what it was. To Brown, *ismeria* was most likely either *Chlosyne harrisii* (Scudder) or *C. nycteis*. His personal leaning was toward *harrisii*, chiefly because of his preoccupation with one feature, the orange margin of the ventral wings. Consider the following quotes from Brown in reference to the original painting of *ismeria*. On page 2, "On the underside the most striking feature is broad orange brown margins on both wings, much as on *harrisii* Scudder." On page 3, "It cannot be considered even a crude representation of either of the insects called *gorgone* by Huebner. It can be considered a crude representation of the butterfly called *harrisii* by Scudder, but this insect is not now found in Georgia. The larvae figured... does

not conform to the mature larva of *carlota* (*gorgone* male Huebner). It does suggest the mature larvae of *harrisii*... [or] early-stage larvae of... *nycteis*." On page 10, "Again the evidence, poor as it is, points toward *harrisii* (or *nycteis*) rather than *carlota* [= *gorgone*] being the closest known taxon to *ismeria*."

Brown's conclusion on *ismeria* was that he considered it a *nomen incognitum*.

However, now that it is **known** that two *Chlosyne* species are living today in Burke County, Georgia, two of Brown's statements stand out. On page 8, "Taxonomically there are two, possibly three, species involved." On page 3, "There is no way today to judge the accuracy of Abbot's representations in Boisduval and LeConte's book, except by comparison with **known** butterflies from [Georgian] America." (Emphasis mine.) The comparison can now be made.

The consideration of the following facts and comparison of species characters clearly reveals just what *ismeria* was and is.

1) Brown established *ismeria* as a valid (but unidentified) species separate from *gorgone* and postulated that it could well be *C. nycteis*.

2) Abbot found two species of *Chlosyne* in Burke County, Georgia. 200 years later there are still two (and only two) species of *Chlosyne* in Burke County.

3) One of these species has always been readily identifiable as *C. gorgone*. The logical probability is that the remaining species is the poorly depicted, but valid, *ismeria*.

4) The range of *C. harrisii* is hundreds of miles to the north of Burke County.

5) *C. nycteis*, as the only other *Chlosyne* in the eastern United States, is the only other species available for consideration as *ismeria*.

6) Abbot stated that his *ismeria* fed on sunflower, and depicted it on *Helianthus strumosus* L. (= *trachelifolius* Miller). This plant occurs in Burke county, and is a known host for *nycteis*.

7) The only known host (Opler 1984) of *harrisii*, *Aster umbellatus* Miller, is not known in eastern Georgia. *Aster umbellatus* is known from South Carolina only as variation *brevisquamis* Fernald and in only a few extreme northeast counties adjacent to North Carolina (Radford 1968). Thus, *harrisii* should be eliminated from consideration.

8) Abbot stated that his *ismeria* pupated on May 16 and eclosed on May 26. This coincides with the first brood records of *nycteis* in Georgia.

9) Burke County *gorgone* emerge from mid to late April, a full month before *ismeria*.

10) Lastly, Burke County specimens of *nycteis* possess all the major phenotypic characters of the original painting of *ismeria* and twice as many of these characters than does *harrisii*. They differ from northern specimens of *nycteis* and *C. harrisii* as detailed in Table I.

While characters F and G on the original *ismeria* painting match in size *harrisii* better than Burke County *nycteis* (= *ismeria*), it must be remembered that the painting is a copy and a very poor rendition. Which means we should first be looking for the presence of a character and secondarily at the accuracy of the size and shape of the character. What is important is that in nature, Burke County *nycteis* (= *ismeria*) do possess all characters A - G.

There is one other character on the Boisduval and LeConte plate of *ismeria* which is of interest. That is the complete row of silver spots along the margin of the hind wing. This picture is of a female. As yet we have no topotypical females for comparison. However, I do have a female *nycteis* from Spartanburg County, South Carolina with silver spots all along its hind wing margin. It is very probable that as we go further south and to the coast this character becomes more pronounced and more frequent, especially for females.

TABLE I

Character	<i>C. i. ismeria</i>	<i>C. i. nycteis</i>	<i>C. h. harrisii</i>
(A) Dorsal hindwing black postmedian line	Narrow across the entire area	Often wide to very wide	Usually only partial, but very variable
(B) Dorsal forewing submarginal spots	Well developed to ½ size of postmedian spots	Often just dots, usually less than ¼ size of postmedian spots	Variable, dots to well developed
(C) Eyespots on apex of ventral forewing	3 - 4 well defined pupiled eyespots on light to medium brown background	3 - 4 eyespots less defined on dark background.	Usually no eyespots, if so, only one or two and weak
(D) Inner three fourths of ventral forewing	Nearly solid light orange, light striations	Medium orange striated with brown lines.	Orange-red, well striated with black-brown lines
(E) Inner two thirds of ventral hindwing	Light buff dominant, somewhat silvered, usually with medium to dark brown striations near base	Same as <i>ismeria</i> , but tending to less silvered and brown striations lighter.	Dark, contrasting, orange-brown and white checkered
(F) Ventral hindwing submarginal black spots	Surrounded by some narrow orange in dark field.	Nearly always in dark field only.	In broad orange band in dark field
(G) Ventral margins	Orange, narrow, clearly defined	Mainly cream or buff, may have some orange.	Orange, wide, well defined

It should also be remembered that my Burke County specimens are from the fall brood. The spring brood (which we know Abbot reared and perhaps his figures were made from) should be expected to differ in appearance and may more fully fit the form painted.

Based on the above, *C. nycteis* is synonymous with *C. ismeria* in Burke County, Georgia. Accordingly, I have designated a male (Fig. 7) taken 20 August 1989 along the Savannah River, Burke County, Georgia as neotype of *Melitaea ismeria* Boisduval and LeConte (1833). This specimen is deposited in the Allyn Museum of Entomology, Sarasota Florida and is labeled: NEOTYPE, *Melitaea ismeria* Boisduval and LeConte, Det. R. R. Gatrell. One male topotype is also deposited in the Allyn Museum. The remaining male is in the authors collection.

The new nomenclature is:

Chlosyne ismeria (Boisduval and LeConte) *MELITAEA*. (1833)

a. *i. ismeria* (Boisduval and LeConte) *MELITAEA*. (1833)

b. *i. nycteis* (Doubleday and Hewitson) *MELITAEA*. (1847) [NEW COMBINATION]

c. *i. drususius* (W. H. Edwards) *PHYCIODES*. (1884) [NEW COMBINATION]

d. *i. reversa* (F. and R. Chermock) *MELITAEA*. (1940) [NEW COMBINATION]

Having made only one attempt to collect this insect, I am sure this subspecies, while virtually uncollected, is not that rare in nature. It should be looked for along watercourses in southern Georgia and South Carolina. Harris' record of *nycteis* from Laurens County, Georgia, is likely *C. ismeria* also. The *nycteis* I have from Spartanburg County tend to have well defined narrow orange boarders also. So the final decision as to the range of *Chlosyne ismeria ismeria* and *C. ismeria nycteis* remains to be worked out. For now, I think it best to limit the range of *C. ismeria ismeria* to the coastal plain of Georgia and southeastern South Carolina.

***Chlosyne gorgone* (Hübner)**

John Abbot's painting of *C. gorgone* published by Hübner is excellent. In it we see a dark, boldly marked *gorgone* phenotype. Its two most distinguishing characters are the lack of a white pupil in the dark submarginal spot in cell M_3 , both dorsally and ventrally, and the restricted white chevrons on the margin of

the ventral hind wing. We now know that this is in fact exactly what typical *gorgone gorgone* looks like in nature (Figs. 2, 3). I have designated a male (Fig. 2) taken 27 April 1993 Burke County, Georgia as neotype. It is labeled: NEOTYPE, *Dryas reticulata gorgone* Hübner, Det. R. R. Gatrell. It has been deposited in the Allyn Museum of Entomology, Sarasota, Florida.

C. gorgone carlota is a valid subspecies. Ventrally, *carlota* is generally lighter, nearly always has a white pupil in the submarginal black spot in cell M_2 , both dorsally and ventrally (especially in females), and bolder marginal chevrons. Its range is primarily Midwestern, northern and western. A number of *gorgone* have been collected in upland Georgia and South Carolina and most workers who have seen them have rightly concluded that in appearance they are so close to Midwestern *carlota* as to be the same subspecies (Figs. 5, 6). Thus the range of subspecies *carlota* extends into at least the upper piedmont of Georgia and South Carolina.

The existence of *carlota* in north Georgia has caused most modern workers to wrongly sink *carlota* into synonymy. Why is this the case?

In spite of the accuracy of the original depiction of *gorgone*, subsequent writers of popular butterfly literature have consistently transposed the *ismeria* phenotype (large pale washed out below more well marked above) onto the name *gorgone*. In other words, their term was "gorgone" but their concept was "ismeria." This false concept of *gorgone* has also affected the concept and taxonomic validity of *carlota*.

Two conceptual errors have become orthodoxy. 1) The name *gorgone* is used but the concept is *ismeria* and 2) the name *carlota* is no longer used because the concept is *gorgone*.

As pointed out by Brown, this conceptual confusion all began with the misidentification and misassociation of *C. ismeria* with the totally dissimilar species *C. gorgone* by Scudder and A. G. Butler who in turn relayed this error to W. H. Edwards, and he to others. Since Edwards, many have seemed to just "take the word" of the previous worker and perpetuated the error. The treatment of *C. gorgone* by Opler (1984) and Scott (1986) are examples of this continuing "hearsay" taxonomy. (It appears that neither Scott nor Opler were aware of Brown's 1974 paper.) Howe (1975) is one modern writer to have the taxonomy correct.

Opler defined *ismeria* as a large pale (dominant in coastal Georgia?) form of *gorgone*. Then, by not mentioning *carlota*, demonstrated that he considered *carlota* and *gorgone* to be phenotypically the same. He held both conceptual errors.

Scott took Scudder's error to its logical conclusion. He only mentioned *gorgone*, demonstrating that his concept of *carlota* was *gorgone* and his concept of *ismeria* was as a form of *gorgone*. He held both conceptual errors.

Howe correctly treated *C. gorgone* as a valid subspecies limited to the coast of Georgia and *C. g. carlota* as the inland and westward subspecies. He did this correctly, but probably for the wrong reason. Howe seemed under the impression that *ismeria* and *gorgone* were synonymous and did not mention *ismeria* for that reason. If this is correct, he also associated the painting of *ismeria* as being what coastal Georgia *gorgone* looked like. In other words, conceptually, his *gorgone* was still phenotype *ismeria*. He held only one of the conceptual errors. So he had the right taxonomy, but part of the old concept.

There may or may not be some avoidable errors here. But by far, the primary, most unavoidable and problematic factor has been that up until now there were no actual topotypes in existence of either *C. gorgone* or *C. ismeria*.

As mentioned above, *gorgone gorgone* varies slightly, but consistently, from *gorgone carlota* in phenotype. These differences alone are enough to validate subspecific status of both entities. However, my attempts to rear nominate *gorgone* revealed that it is strongly univoltine. I have attempted to rear approximately 800 larvae and have only kept two out of diapause. (Larvae were subjected to the usually very effective long photoperiod (continuous light) method of breaking diapause. Roughly 600 were from the Orangeburg sight. The two kept out of diapause were also from the Orangeburg site.) I also sent a few larvae to Dr. Tom Allen of the West Virginia DNR (in connection with his book on W.Va. butterflies) and

he too was unable to keep larvae out of diapause or break it. (All diapausing larvae were returned to their place of origin and securely released back into the population.)

Adults were found at both locations in April of 1993 and 1994. No adults were ever seen in repeated visits to these areas in those years at the appropriate time for subsequent flights of adults. And perhaps more importantly (since larvae are easier to find than adults) no other immatures were ever found later in those years.

C. g. carlota is multiple brooded throughout its range, including Canada (Catling and Layberry 1998), upstate Georgia (Harris) and Pickens County, South Carolina (Dr. Charles Watson, personal communication). Thus, one would expect the populations of *gorgone* at its southern extreme to be multibrooded – especially if we were dealing with clinal subspeciation. But it is only single brooded. I consider this difference in genetic biology to be the strongest reason to consider *gorgone* as a distinct subspecies.

It is also significant that in rearing Canadian *gorgone carlota*, Catling and Layberry found that *H. divaricatus* L. was rejected as a host. At both sites where *gorgone gorgone* was found, intensive searching located larvae and ova on *H. divaricatus* only.

***Gorgone* biogeographical evolution**

The habitat of *C. gorgone* in Burke County is xeric, turkey oak, rolling sandhill in the vicinity of the Georgia Power Nuclear Facility. These areas in Burke County change very little from year to year, and slowly decade to decade. Thus, species in this type of habitat have less of a need to continually be colonizing new areas. Multiple broods are obviously advantageous in species relocation dynamics. (Fire is a medium factor here in species survival strategy.)

The habitat at the Orangeburg County site is open mixed hardwood and some pine in hilly sandhill dispersed amid wetter areas and agricultural fields. This habitat may vary greatly decade to decade. Lepidoptera in these areas need to be more flexible for relocation purposes. (Fire is a major survival factor here.) However, larvae of *gorgone* from both sites were virtually impossible to keep out of diapause.

Thus, both colonies are genetically linked by a common ancestor. An ancestor which evolved into a univoltine subspecies to insure its survival due to hostile environmental conditions (lack of surface water?). Both of these locations are usually very hot and dry in June and July. While the larval host, *H. divaricatus*, is leafed out at that time, conditions are nearly always such that acceptable nectar sources for adults are virtually nonexistent.

I believe *C. gorgone gorgone* is a remnant of a biogeological relic whose univoltine reproductive cycle developed under the climatic pressure of an annual dry season in Florida when it was an island. It is pertinent to note that *Falcapica midea midea* (Hübner) which is endemic to the Georgia and South Carolina coastal islands, has gone as long as three years as pupae when kept inside in dry conditions and then emerged when exposed to high spring humidity (Gatrelle 1985). This genetic trait, though currently unnecessary in *midea's* present ecology, is still retained by *midea* from its Florida ancestor.

This theory would indicate that the multivoltine *carlota* populations in Georgia and South Carolina are descendent from ancestors from the west. Dr. Richard L. Brown has documented the eastward movement, and subsequent influence, of western species on the Lepidoptera of the Black Belt region (remnant prairies) of Mississippi and Alabama (personal communication). If the above is so, convergent evolution is taking place as these two formerly isolated taxa move toward each other. Something which is surely enhanced by human environmental alteration through deforestation and agriculture.

We see this same type of convergent evolution occurring between *F. m. midea* and *F. m. annickae* (dos Passos and Klots) in this same region (Gatrelle, 1998). *Midea midea* is from a Florida ancestor. *Annickae* is from a Mexican/Texas ancestor which moved eastward along the then coast into Georgia and then northeastward, while *midea midea* was still isolated in Island Florida. After Florida was rejoined to the mainland, those *midea* which moved northwestward (unhindered by habitat barriers) met the *annickae* phenotype and gave rise to the mixed phenotypes north and northwest of the Florida panhandle. Those *midea* which moved northeastward became isolated on the coastal islands. Before colonial times, these two subspecies were kept apart in that region by thick maritime forest swamps.

Today, *annickae* ranges from the upper coastal plain and Sandhills of east central Georgia into New England. *Midea* was once limited to the Islands of Georgia, South Carolina, and south coastal North Carolina. However, they may now be found within 60 km of each other in Chatham (*midea*) and Burke (*annickae*) counties, Georgia, and within 50 km in adjacent Jasper and Hampton counties of South Carolina. Three centuries of environmental alteration and destruction is allowing *midea* and *annickae* to move toward each other, and eventually genetically absorb each other in the region. Perhaps, this is also occurring with *gorgone* and *carlota*.

ACKNOWLEDGMENTS

Thanks go to: Mr. Scott Massey for capturing *gorgone* and computerization of photos, my son Ben Gatrelle for photographs and computer input, the late C. F. dos Passos for encouraging me in taxonomy and supplying hard to find publications, and SC DNR staff botanist Bert Pitman for assistance on plant identification.

LITERATURE CITED

- BROWN, F.M. 1974. The Butterfly Called *ismeria* by Boisduval and LeConte. Bull. of the Allyn Mus. Bull. No. 16. 12 pp.
- CATLING, P.M. & R.A. LAYBERRY. 1998. Distribution and Biology of *Chlosyne gorgone carlota* (Nymphalidae) at its Northeastern Limit. J. Lepid. Soc. 52:98-104.
- DOS PASSOS, C.F. & A.B. KLOTS. 1969. The Systematics of *Anthocharis midea* Hübner (Lepidoptera: Pieridae). Entomologica Americana. Vol. 45: 34 pp.
- FORBES, W.T.M. 1960. Lepidoptera of New York and Neighboring States. Memoir 371 part IV (188 pp.). Cornell Univ. Agric. Expt. Sta. New York St. Col. of Agric., Ithaca, NY
- HARRIS, L., Jr. 1972. Butterflies of Georgia. Univ. of Okla. press, Norman OK. 326 pp.
- HOWE, W.H. 1974. The Butterflies of North America. Doubleday & Co., Inc. New York, NY. 633 pp.
- GATRELLE, R.R. 1985. The Papilionoidea of the South Coastal Area of South Carolina. Bull. Southern Lepid. Soc. Bull. No. 2. 15 pp.
- 1998. An addendum to *Anthocharis midea* dosPassos and Klots 1969 (description of a new subspecies from Texas). The Taxonomic Report Vol. 1, No 1, TILS, Goose Creek, SC. 5 pp.
- OPLER, P.A. & G.O. KRIZEK. 1984. Butterflies East of the Great Plains, An Illustrated Natural History. Johns Hopkins Univ. Press, Baltimore, MD. 294 pp.
- RADFORD, A.E., H.E. AHLLES & C.R. BELL. 1968. Manual of the Vascular Flora of the Carolinas. Univ. of North Carolina Press, Chapel Hill, NC. 1183 pp.
- SCOTT, J.A. 1986. The Butterflies of North America, A Natural History and Field Guide. Stanford Univ. Press, Stanford, CA. 583 pp.

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.

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

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 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 a CD for permanent archiving and reproduction for personal use (i.e. a museum or university may make as many copies as needed in whatever format desired). Non-subscribers may receive individual issues on disc at any time at \$9 per issue post paid.. **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. Gatrell, **MOTH** Curator, 126 Wells Road, Goose Creek SC USA 29445.



The Taxonomic Report

OF THE INTERNATIONAL LEPIDOPTERA SURVEY



TWO NEW NYMPHALIDAE FROM WESTERN NORTH CAROLINA: NEW SUBSPECIES OF *SPEYERIA APHRODITE* AND *PHYCIODES BATESII*.

RONALD R. GATRELLE¹

126 Wells Road, Goose Creek, South Carolina 29445

ABSTRACT. Two new subspecies are described from Macon County, North Carolina. *Speyeria aphrodite cullasaja* is characterized by dorsal melanism, especially in females, by usually lacking the dorsal FW basal spots in cell Cu₁ and Cu₂, and by a narrowed buff marginal band on the ventral HW (sometimes absent in females). *Phyciodes batesii maconensis* males are characterized by wholly yellow ventral hind wings devoid of any dark marginal dusting or whitish crescents; and females occasionally possessing, lightly dusted, brown margins and rarely having a silvered marginal ventral HW spot. *P. batesii maconensis* larvae are gregarious *Aster* feeders. Females are known to oviposit only on *Aster undulatus*. Both subspecies are presently known only from the drainage of the Little Tennessee River in western North Carolina and northern Georgia at altitudes above 4,000 feet. Both are common in this area.

Additional key words: *batesii* syntypes, *Speyeria atlantis*, high altitude, Great Smoky Mountains National Park

A new subspecies of *Speyeria aphrodite* Fabricius

L. Paul Grey was North America's expert on *Speyeria*. In our correspondence over the years he had expressed his belief that the southernmost populations of both *Speyeria aphrodite* in north Georgia and western North Carolina (Figs. 1, 2) and *Speyeria atlantis* Edwards in West Virginia (Figs. 9, 10) were undescribed subspecies. Unfortunately, I never found the *aphrodite* he wanted from that area until after his health failed.

On 8 July 1988, I located a population of *S. aphrodite* in the area of Jones Knob, Macon County, North Carolina. This population was visited in 1988 through 1994 and in 1998 with *aphrodite* present all years. In 1990, another population was located in the vicinity of nearby Scaly Mountain, Macon County; and in 1994 *aphrodite* was discovered in the area of Rabun Bald in adjacent Rabun County, Georgia. All known colonies are resident at elevations above 4,000 feet.

A total of about 100 specimens have been collected from these sites. They confirm Dr. Grey's speculation and represent a new subspecies.

¹ Research Associate Florida State Collection of Arthropods, Gainesville, Florida

Speyeria aphrodite cullasaja Gatrell, new subspecies

Diagnosis. *Speyeria aphrodite cullasaja* is the largest of the nine known *aphrodite* subspecies. The average FW radius being 37 mm (expanse 66 mm) in males, and 44 mm (expanse 78 mm) in females. In appearance, *cullasaja* ♂♂ look like large ♂♂ of *Speyeria cybele novascotiae* (McDunnough) (Fig. 5); while *cullasaja* ♀♀ closely resemble ♀♀ of *S. atlantis capitaneus* R. Holland (Fig. 6), only larger. Two features distinguish *cullasaja* from all other *aphrodite*. First, the basal half of the dorsal surface in both sexes, but especially the female, is heavily suffused with dark brown scales. So much so, that this area in some females appears almost black. In flight, these dark females can be mistaken for slow flying males of *Speyeria diana* (Cramer). Secondly, 75 – 80% of specimens (both sexes) have the basal spots in cell Cu_1 and/or Cu_2 either absent or greatly reduced. The largest males, with broader than average ventral buff margins, are easily mistaken in flight, or at nectar, for males of *S. cybele* (Fabricius) with which it flies.

Description. *Male* (Fig. 1): *Head*: dark brown dorsally, light brown palpi ventrally, antennae with shaft dark brown, club black. *Thorax and abdomen*: concolorous dark brown dorsally, concolorous light brown ventrally. *Forewings*: black spots at base of cell Cu_1 and Cu_2 just below discal cell usually missing or greatly diminished; dorsally, with basal dark brown scaling usually extending to postmedian black spots in Cu_1 and Cu_2 ; frequently into base of cell M_1 , and to second black band in discal cell; ventrally, as in nominate *aphrodite* but all colors bolder, especially reddish brown at base, and brown markings at apex. *Hindwings*: dorsally, with brown scaling as in nominate *aphrodite*, but much darker; ventrally, with narrowed light buff marginal band usually 2 mm or less, ground color dark brown. *Female* (Fig. 2): *Head*: as in male. *Thorax and abdomen*: as in male. *Forewings*: black spots at base of cell Cu_1 and Cu_2 just below discal cell usually missing or greatly diminished; dorsally, with heavy dark brown to black basal scaling extending through discal cell and to postmedian black spots in Cu_1 , Cu_2 and M_1 ; ventrally, strong brownish red flush to area basad of postmedian black spots, tornus pale brownish yellow, apex dark brown with silver spots. *Hindwings*: dorsally, with heavy dark brown scaling extending to the postmedian black spots, except in cell M_2 ; ventrally, with narrowed light buff marginal band 2 mm or less, frequently obliterated by dark purplish brown as in subspecies *alcestis* (W. H. Edwards).

Types. *Holotype* ♂ (Fig. 1): trail to Scaly Mountain, 4200', Macon Co., North Carolina, 5 July 1990, Coll. Ronald R. Gatrell. *Allotype* ♀ (Fig. 2): meadow near Jones Knob, 4150', Macon Co., North Carolina, 15 July 1994, Coll. Ronald R. Gatrell. *Paratypes*: 58 ♂♂, 25 ♀♀: all MACON COUNTY, North Carolina: JONES KNOB: 1♂, 2 ♀♀, 8 July, 2♂♂, 4♀♀, 9 July 1988; 4♂♂, 7 July, 2♂♂, 1♀, 8 July 1989; 1♂, 1♀, 4 July 1990; 1♂, 5 July 1991; 1♂, 2♀♀, 6 July 1993; 2♂, 10 June, 10♂♂, 17 June, 2♂♂, 26 June, 4♂♂, 2♀♀, 2 July, 1♂, 9♀♀, 15 July 1994; 3♀♀, 12 July, 1♀, 13 July 1998. DENNY ORCHARD RD (below Jones Knob): 3♂♂, 17 June, 1♂, 26 June 1994. SCALY MOUNTAIN: 2♂♂, 5 July, 2♂♂, 6 July 1990; 1♂, 7 July 1993. HALE RIDGE ROAD (below Scaly Mt.): 2♂♂, 10 June, 10♂♂, 17 June, 1♂, 26 June 1994. All collected by Ronald R. Gatrell. The holotype, allotype, and 6 paratypes are deposited in the collection of the American Museum of Natural History, New York. Paratypes are deposited in: the Allyn Museum of Entomology, Sarasota, Florida (4), Florida State Collection of Arthropods, Gainesville, Florida (4), Dr. Jeff Slotten collection, Gainesville, Florida (2), Dr. George T. Austin collection, Las Vegas, Nevada (4), remainder in collection of Rev. Ronald R. Gatrell, Goose Creek, South Carolina.

Etymology. *Cullasaja* is Cherokee for "laughing water." The subspecies is named for the Cullasaja River Gorge, which is the outstanding geological feature of the area and is threatened by proposed hydroelectric development.

Remarks. An additional 12 males have been taken in Rabun County, Georgia, along Sky Valley Road (this becomes Hale Ridge Road where it crosses into North Carolina). Males wander away from breeding areas below 4000'. Females seem to stay in the higher elevation, in meadows and thinly wooded areas near balds. Peak flight is mid-June for males, and mid-to-late-July for females. The range of *cullasaja* is difficult to predict. However, it is not great. From Virginia south, *aphrodite* is clinal in appearance, with specimens becoming larger and females darker. Clark and Clark (1951) give a good presentation of *aphrodite* variation in the Appalachian region. I have examined numerous specimens from all states throughout this area. *Cullasaja* has not been found in any other location. Some of the more pertinent locations and specimens are as follows: 3♂♂ and 8♀♀ in the FSCA Gainesville, Florida from Great Smoky Mountains National Park, Cades Cove, Blount County, Tennessee: while larger and more heavily dusted than topotypical *aphrodite* (TL New York City, Figs. 3, 4), all specimens have the typical basal spots in Cu_1 & Cu_2 , and none of the females approach *cullasaja* in degree of basal darkness. They are not *cullasaja*. At the state line on Hwy. 23 Unicoi County, Tennessee / Madison County, North Carolina: I took a few in 1978 (the meadow is now gone due to road construction), none of which are *cullasaja*. Big Black Mountain, Harlan County, Kentucky: occasional specimens lack the spots in Cu_1 and Cu_2 , but are otherwise typical of the variation described by Clark and Clark. For now, *Speyeria aphrodite cullasaja* is known only from the Nantahala Mtns. and

acts as an island isolate in a cluster of peaks and connecting ridges above 4000 feet in the southern end of the Blue Ridge. I expect it to inhabit other Blue Ridge mountains between Highlands and Asheville, North Carolina. Since it has not been found in the western Appalachian Mtns., it may be a southern Blue Ridge endemic.

A new subspecies of *Phyciodes batesii* (Reakirt)

Scott (1994) presented a thorough study of the biology and taxonomy of the genus *Phyciodes*. In that work, he described three new subspecies of *Phyciodes batesii* (Reakirt), of which *P. b. lakota* Scott, TL Pine Ridge, Sioux County, Nebraska is one. Scott lumped *lakota* into his clinal concept of "eastern" *batesii* – which he sees extending from Alberta, Canada, across southern Canada and the northern United States to the Atlantic Ocean, and then down the Appalachian Mountains terminating in northern Georgia. A vast area overlapping many life zones, habitats, elevations, etcetera.

In this clinal concept, he correctly sees two phenotypic "extremes" (his term) and a variable intermediate. He correctly extends the range of his western extreme, *lakota* (Fig. 16), eastward into Michigan and **central Ontario**. He accurately limits his other extreme phenotype to the high mountains of the southern Appalachians in northeast Georgia and western North Carolina. He then incorrectly associated this second extreme with the intermediate variable phenotype, northeastern US nominate *batesii* (Figs. 17, 18, 19), which he extended into **eastern Ontario**.

His taxonomic verdict should have been based foremost on any existent type specimens and an accurate understanding of the type locality (location, habitat, altitude etc.). Then without prejudice, allow the facts to dictate the conclusions. He did not. His treatment of *P. batesii* in the eastern and southern US is prejudicially incorrect. His statements reveal his *lakota* taxonomy is based heavily on in his own predisposed personal agenda. "Because I wish to use only two names in this cline, I want to have the TLs [type localities] as near as possible to the ends of the cline." "I have used taxonomic license to force the [his] concept."

Type specimens

In his *batesii* research, he refers, directly or indirectly, to information supplied to him by myself no less than 7 times. His taking "taxonomic license" included not mentioning photos of the syntypes (one from Winchester, VA and one from Colorado) in the FMNH that I informed him of in a 17 Nov. 1993 letter. (photos provided by the Allyn Museum of Entomology.) The Winchester syntype clearly shows a *P. batesii batesii* **type specimen** (Fig. 14) with dark shading along the outer margin of the ventral HW. In his study, he did mention that I had informed him (in the same letter) that no Gloucester, New Jersey (type locality) specimens could be found. However, he neglected to mention that I had located and obtained the loan of Shipiro's Philadelphia, County, PA, *batesii* taken VI-23-65, Wissahickom. A specimen taken only 15 miles from Gloucester (and thus a virtual **topotype**) with quite a bit of shading along the ventral margin of the HW. (Specimen now housed in the Bohart Museum, University of California Davis.)

Since both the existent syntype and topotype possess brown scaling (and of equal importance, crescent spots) in their margins, Scott's attempt to present nominate *batesii* as a taxon that doesn't possess dark scaling along the ventral margin of the HW is false (Figs. 17, 19). Scott states, "My separation of ssp. *batesii* and *lakota* is based on this [brown] patch..." But, this patch in *lakota* isn't consistently prominent (Fig. 16). Scott, on page 51, mentions "families" (colonies? adults from larval groups?) of *lakota* that "in wing pattern resembles N Appalachians [= *batesii batesii*] adults."

In actuality, Scott's *lakota* is either an east-west clinal subspecies of *batesii* or should be considered a synonym of nominate *batesii*. The three major characters on the ventral HW mentioned by Scott (silver crescent, brown dusting, heavier marking) are shared by *lakota* and eastern *batesii* in classical clinal gradation. Further, there is no barrier or break (isolation) in his east-west cline. He has both subspecies in Ontario (*lakota* central and *batesii* eastern). The syntypes themselves connect the western (*lakota*) and eastern (*batesii*) population, as one is from Colorado (Fig. 15) and the other Virginia!

Conversely, none of those three characters, by Scott's own research, are found in northern Georgia and western North Carolina *batesii*. Furthermore, *batesii* in north Georgia and western North Carolina are isolated on elevational Islands above 4,000 feet in the southern section of the Appalachians. They are isolated broadly from northern populations by valleys at about 2,000 feet (followed by the routes of I-81 and I-75) in southwestern Virginia. They may be more narrowly isolated by elevation, as is *Speyeria aphrodite cullasaja* (described above), which occupies the same ecological niche.

Type locality

Scott continually refers to his restricted *P. b. batesii* type locality of Winchester, VA as being in the northern Appalachian "mountains." The elevation of Winchester is 714 feet – basically the same as Charlotte, North Carolina, and 100 feet lower than Spartanburg, South Carolina. Winchester is on the edge of the Virginia piedmont (see Clark and Clark, 1951). Winchester is only 38 miles south of Pennsylvania and 145 miles southwest from Gloucester, NJ.

Scott (1986) shows Winchester, VA, Gloucester, NJ, and Sioux County, Nebraska, to be in the Upper Austral faunal zone. Both *batesii* and *lakota* are inhabitants of primarily once glaciated and/or Upper Austral faunal areas. His same 1986 map shows his unique *batesii* extreme in North Carolina to be in the Canadian zone. In nature, *P. batesii batesii*, and *lakota*, are non-isolated, non-montane. The heretofore undescribed western North Carolina *batesii* is an isolated, high altitude, montane subspecies.

I see no reason to "restrict" the type locality to the immediate vicinity of either city mentioned in the original description (as did Klots (1951, Gloucester), or Scott (1994, Winchester)). Though to do so, in my opinion, would have no effect on the systematic taxonomy of *P. batesii batesii*. Thus, I consider the type locality to be the relatively small 145 mile Upper Austral geographical area from sea level (coastal plain) to 714 feet (piedmont) as stated in the original description. (State lines are artificial boundaries that have nothing to do with taxonomy.)

Phyciodes batesii maconensis Gatrell, new subspecies

Diagnosis. As described in Scott (1994), "In southern Appalachians the unh of males **always** lack a marginal brown patch and pale crescent, and the unh of females generally lacks a marginal brown patch (or it is very weak) and **usually** lacks the crescent." (Emphasis mine.) When a crescent is found on females, it is rarely silvered (I have seen only 2 silvered ♀♀ out of 90 examined). Nominate *batesii* from northeastern Virginia (TL) and the northeastern US differs from *maconensis* as per Scott (1994). "The brown unh marginal patch and pale unh marginal crescent **vary** esp. in males (females **often** have **both** patch and crescent)." (Emphasis mine.) Further, the crescent is often silvered in both males and females of *batesii* (Fig. 18). The theme throughout the literature is that *P. batesii batesii* may be distinguished by its diminished or absent VHW brown patch. Distinguished from what? From *P. tharos* (Drury). Regarding the brown patch, *maconensis* is to *batesii* as *batesii* is to *tharos*. In comparison to *maconensis*, many *batesii* may be said to have a prominent brown patch. These same *batesii* in comparison to *tharos* may be said to have a light patch. The average FW radius of male *maconensis* is 18 mm (expanse 35 mm), in females it is 21 mm (expanse 38.5 mm). My largest female has an expanse of 41 mm. In four pair of NY *batesii* I examined, the male FW radius averaged 16.5 mm (expanse 33.5), the female FW radius averaged 18 mm

(expanse 35 mm). The ventral FW black markings on *maconensis* are reduced in comparison to *batesii*, especially the apical black patch along the costal margin. Male and female *maconensis* look about the same, except for size; though the tendency is for *maconensis* females to be more lightly marked than males on the VFW and more heavily marked on the VHW. I have several *maconensis* females which are nearly devoid of any black on the VFW (Fig. 13). *Batesii* females are usually more heavily marked beneath than males on both the FW and HW. The ventral FW of *batesii* is redder and much more patterned.

Description. *Male* (Fig. 11): *Head*, appearance and appendages as in nominate *batesii*. *Thorax and abdomen*: as in nominate *batesii*. *Forewings*: dorsally, orange spotting of the postmedian and median bands and in discal cell more extensive than on *batesii*, with the median band usually a paler orange than the postmedian band and not as yellowish as in ♂ *batesii*; ventrally, yellowish orange ground with black markings crisp, and more restricted than on *batesii*, apical black patch along costal margin much smaller than on *batesii* and median black bar along costal margin often reduced to oval spots. No bold median light banding as often occurs on *batesii*. *Hindwings*: dorsally, broadly orange with postmedian spots usually at least partially fused to median orange patch, much as in *P. cocyta* (Cramer); ventrally, ground yellow with yellowish brown striations faint to very faint, no black markings except occasionally along costal margin and then not extending below vein SC+R₁, submarginal row of spots absent to light brown, never being prominent black dots as is frequently the case with *batesii*, rarely a faint light yellowish crescent along hindwing margin, but never prominent or white or silvered. *Female* (Fig. 12): as male, but larger and with following differences: contrast of median and postmedian bands on dorsal forewings more pronounced, ventral forewing with less black than ♂♂ (*batesii* ♀♀ usually have more black than their ♂♂), ventral hindwings with more brown striations and often a faint cream crescent (rarely whitish or silvered), occasionally some brown marginal dusting but never approaching a patch as is frequent in many *batesii* ♀♀.

Types. *Holotype* ♂ (Fig. 11): Jones Knob, 4100', Macon County, North Carolina, 4 June 1993, Coll. Ronald R. Gatrell. *Allotype* ♀ (Fig. 12): same data as male. *Paratypes*: 47 ♂♂, 45 ♀♀; all MACON COUNTY, North Carolina, area of Jones Knob; all Coll. Ronald R. Gatrell unless otherwise noted: 4 ♀♀ (2 leg. Jeff Slotten), 27 June, 1 ♀ (leg. Jeff Slotten), 28 June 1992; 17 ♂♂, 7 ♀♀, 4 June, 8 ♂♂, 9 June, 5 ♂♂, 7 ♀♀, 10 June 1993; 14 ♂♂ (3 leg. Scott Massey), 10 ♀♀ (5 leg. Scott Massey), 30 May, 3 ♂♂, 15 ♀♀, 10 June, 1 ♀, 17 June 1994. The holotype, allotype and 12 paratypes are deposited in the Florida State Collection of Arthropods, Gainesville, Florida. Paratypes are deposited as follows: private collection of Dr. Jeff Slotten, Gainesville, Florida (3), private collection of Dr. James Scott, Lakewood, Colorado (2), British Museum of Natural History, London, England (10), Allyn Museum of Entomology, Sarasota, Florida (14), University of California Davis, Davis, California (2), remainder of paratypes (49) in collection of Rev. Ronald R. Gatrell.

Etymology. *Maconensis* is named after Macon County, North Carolina.

Remarks. In addition to the type series, I have found *maconensis* on the trail to Scaly Mountain, Macon County, and have observed it in the area of Rabun Bald, Rabun County, Georgia. 1 ♂, 4 ♀♀ taken 30 May 1967 and 2 ♀♀ taken 2 June 1963 from Great Smoky Mountains National Park, Indian Creek area, Swain County, North Carolina, in the FSCA, Gainesville, appear to be *maconensis* also. I have found this new subspecies to be common. It inhabits the floor of open virgin hardwood forests around the tops of granite balds or ridges above 4000'. Specimens are often found along roads to these balds, which is as far as most collectors will go. However, if one will leave the road and traverse a hiking trail or forge one's way up to ridge crests (watch out for rattlesnakes), *maconensis* will be found flitting about the forest floor. This habitat differs markedly from the types of habitat described in Scott for *batesii* (fields, barrens, etc.) *P. batesii maconensis* is far from endangered; there are hundreds of high, inaccessible ridges and balds where *maconensis* surely thrives. I have found *maconensis* ova only on *Aster undulatus* L., and have only been able to get ♀♀ to oviposit on *A. undulatus* in captivity. In rearing *maconensis*, I have found the larvae to be gregarious *Aster* feeders. I think it has been so uncollected in the southern Appalachians because its flight period is in-between the flights of species that most collectors/watchers seek. Thus, the butterfly is out, but the collector is in. My own discovery of it was by "accident." The year 1992 was a very late season in the mountains. Jeff Slotten and I had gone to Jones Knob the end of June that year to look for *Speyeria aphrodite cullasaja*. We were too early for *cullasaja*, but found 4 worn (3 weeks out of season) females of *maconensis*. Returning 4 June 1993, it was fresh and common.

CONCLUSION

Speyeria aphrodite cullasaja and *Phyciodes batesii maconensis* occupy what seems to have been a relatively uncollected niche in the southern Blue Ridge and Appalachian Mountains. Both of these species have, until now, been considered rare in north Georgia and western North Carolina. They are actually

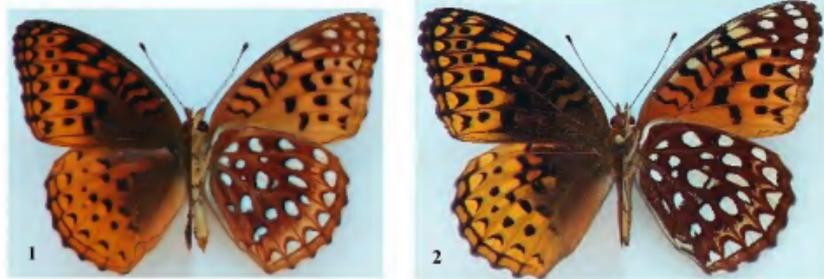
rather common. It is not surprising therefore, that other species which are generally considered uncommon or rare in that region (Harris 1972) also inhabit this same niche – with annual regularity. The following are resident at Scaly Mountain (S), Jones Knob (J), Rabun Bald (R): *Autochton cellus* (Boisduval and LeConte) (J); *Polites coras* (Cramer) (S,J,R); *Poanes hobomok* (Harris) (S,J,R); *Artogeia virginiensis* (below J); *Lycaena p. americana* Harris (J,R); *Parrhasius m-album* (Boisduval and Leconte) (S,J,R); *Erora laeta* (W. H. Edwards) (S,J); *Polygonia faunus smythi* A. H. Clark (R,J); *Clossiana bellona* (Fabricius) (R,S); *Ceryconis pegala carolina* (F. & R. Chermock) (status per Gatrell 1985) (S,J). Of these, *coras*, *hobomok* and *americana* are common; *laeta*, *smythi*, *bellona* and *carolina* generally present in small numbers; and *virginiensis*, *m-album* and *cellus*, infrequent.

ACKNOWLEDGMENTS

Thanks go to my son, Ben Gatrell, for photography of specimens and Scott Massey for computerization of said photos. To L. Paul Grey for pointing me in the right direction and putting me on the trail. Dr. James Scott for specimens and exchange of thought. To Dr. Lee Miller and the Allyn Museum for continued support of my research by the supply of information and photos of type specimens. And to Dr. Art Shapiro for the loan of his *Philadelphina batesii*.

LITERATURE CITED

- CLARK, A. H. & L. F. CLARK, 1951. The Butterflies of Virginia. Smithsonian Misc. Collect. 116 (7) 239 pp.
- GATRELLE, R.R. 1985. The Butterflies of the south coastal area of South Carolina. Bull. Southern Lepid. Soc. Bull. No. 2. 15 pp.
- HARRIS, L., Jr. 1972. Butterflies of Georgia. Univ. of Okla. Press, Norman, OK. 326 pp.
- KLOTS, A. B. 1951. A Field Guide to the Butterflies. Houghton Mifflin, Boston MA. 349 pp.
- SCOTT, J. A. 1986. The Butterflies of North America, a natural history and field guide. Stanford Univ. Press, Stanford, CA. 583 pp.
- 1994. Biology and Systematics of Phyciodes. *Papilio* (new series), by author, Lakewood, CO. 120 pp.



FIGS. 1-2. Type specimens of *Speyeria aphrodite callasaja*. 1, ♂ holotype, dorsal and ventral surfaces. 2, ♀ Allotype, dorsal and ventral surfaces. Data in text.



FIGS. 3-19. 3, Topotype ♂ *Speyeria aphrodite*, 3 July 1983 Long Island, NY, dorsal and ventral surfaces. 4, ♀ *S. aphrodite*, 3 July 1981 Ulster Co., NY, dorsal and ventral surfaces. 5, ♂ *S. cybele novascotiae*, 28 July 1990, Halifax Co., N.S. Canada, dorsal surface. 6, Topotype ♀ *S. atlantis capitaneusis*, 1 July 1989, 8000', Lincoln Co., NM, dorsal surface. 7, ♂ *S. atlantis*, 16 July 1983 Vilas Co., WI, dorsal surface. 8, ♀ *S. atlantis*, 15 July 1983 Florence Co., WI, dorsal surface. 9, ♂ *S. atlantis* ssp., 3 July 1987, 4200', Randolph Co., WV, dorsal surface. 10, ♀ *S. atlantis* ssp., 28 June 1987, 4200', Randolph Co., WV, dorsal surface. 11, ♂ **holotype** *Phycoides batesii maconensis*, dorsal and ventral surfaces, data in text. 12, ♀ **allotype** *Phycoides batesii maconensis*, dorsal and ventral surfaces, data in text. 13, ♀ **paratype** 077 *P. b. maconensis*, 10 June 1994 Macon Co., NC, ventral surface. 14, VA ♂ **syntype** of *P. batesii*. 15, CO ♂ **syntype** of *P. batesii*. 16, ♂ **paratype** *P. b. lakota*, ex pupa 10 August 1994, Sowbelly Cyn., Sioux Co., NE. 17-18, ♂♂ *P. batesii*. 19, ♀ *P. batesii*. 17-19, 10 June 1974 Jamesville, Onondaga Co., NY.

The Taxonomic Report is a publication of *The International Lepidoptera Survey (TILS)*.

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 vanish before they are discovered.

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

The Taxonomic Report is projected for 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 and reproduction for personal use (i.e. a museum or university may make as many copies as needed in whatever format desired). Non-subscribers may receive individual issues on 3½" disc at any time at \$9 per issue post paid. **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 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 **write to:** Ronald R. Gatrell, **MOTH** Curator, 126 Wells Road, Goose Creek SC USA 29445.



SUBSPECIFIC STATUS OF SOUTHEASTERN U.S. *MEGATHYMUS COFAQUI* AND *M. YUCCAE*: RENAMING OF THE FLORIDA SUBSPECIES OF *M. COFAQUI*.

RONALD R. GATRELLE¹

126 Wells Road, Goose Creek, South Carolina 29445

ABSTRACT. *Megathymus cofaqui* and *M. yuccae* are both represented in the southeastern U.S. by two subspecies. The type locality of both *M. y. yuccae* and *M. c. cofaqui* is the area of Burke/Screven counties Georgia. Each of their subspecies are primarily Floridian, with *M. y. buchholzi* extending along the immediate coast of Georgia into southern South Carolina. Topotypes of *M. cofaqui* from Burke County, Georgia, and Aiken County, South Carolina are phenotypically indistinguishable from both the holotype of *M. cofaqui* and topotypes of *M. c. harrisi*. Thus, *M. c. harrisi* is synonymous with *M. c. cofaqui*. This leaves the Florida subspecies of *M. cofaqui* without a valid name. *Megathymus cofaqui slotteni* is proposed as a new name for the Florida subspecies. The holotype of *M. c. slotteni* is deposited in the Florida State Collection of Arthropods, Gainesville, Florida.

Additional key words: type localities.

OVERVIEW AND DELINEATION OF TAXONOMIC PROBLEMS

At least 33 species of butterflies were originally described from east coastal Georgia or south coastal South Carolina. A broad taxonomic problem exists because most of these 33 taxa are not represented by any type or topotypical specimens in any of the world's institutional or private collections. A few of these are known in their nominate form from only a unique type specimen. *Megathymus cofaqui* (Strecker) is an example of the latter. Further, many of these 33 species/subspecies have been wrongly assumed to occur in their nymotypical form in their Floridian components. Unfortunately, this common erroneous assumption was applied to *M. cofaqui*.

Having personally collected nearly all of these 33 species in Burke or Screven counties over the last ten years, this researcher can attest to the fact that the only reason topotypes of these taxa are not represented in collections, and are thus unavailable to researchers, is simply because few lepidopterists have gone there to collect them. Most of them are not uncommon in that area. Over the decades, northern lepidopterists literally drove right past scientifically important specimens along highways 17 and 301 in Georgia on their way to collect the subtropical species of south Florida.

Lucian Harris, Jr. (1972) presents a concise historical overview of *Megathymus cofaqui* and *Megathymus yuccae* (Boisduval and LeConte). Both species were first discovered in and described from the area of Burke and Screven counties, Georgia. *M. yuccae* was described from a John Abbot painting. *M. cofaqui* was described from a female collected by Morrison. Harris was not enthused with H. A. Freeman's designation of Aiken County, South Carolina as the type locality for *Megathymus yuccae*; or

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

Freeman's affirmation of Grossbeck's 1917 assignment of Boca Grande, Lee County, Florida as the type locality of *M. cofaqui*. Harris' consternation is especially understandable in relation to *M. cofaqui*, for the ♀ holotype (fig. 5) is existent in the Field Museum in Chicago, and Strecker had clearly designated Georgia as the type locality in the original description.

COFAQUI

At the time of Harris' writing, it was not yet known that *Megathymus harrisi* H. A. Freeman was in fact only a *cofaqui* progeny and not a valid species. Up to the 1950's, the only known Georgian *cofaqui* was the type. About 85 years passed between the capture of the *cofaqui* type specimen and the next capture of a Georgian specimen (in the Atlanta area). During this time some supposed *cofaqui* were being collected in various locations in central/southern Florida. The assumption was that what was being collected in Florida was the same thing as what had originally been discovered in eastern Georgia. It was further assumed by some (Freeman) that since no other *cofaqui* had been found in Georgia in 85 years that perhaps the type really did not come from there. These two errors – viewing *harrisi* as a full species and the accepting of southwestern Florida as the type locality of *cofaqui* – have created an unallowable taxonomic situation.

Miller and Brown (1981) recognized the type locality error and reestablished Burke County, Georgia as the type locality of *M. cofaqui*, but left *cofaqui* and *harrisi* as distinct species in the Lepid. Soc. checklist. Ferris (1989) retained *harrisi* and *cofaqui* as separate species in the checklist revision. Hodges (1983) also retained these two as separate species in his checklist. This is unfortunate since Howe (1974), Pyle (1981), Opler and Krizek (1984), Scott (1986), and Gerberg and Arnett (1989), all correctly recognized that the northern and southern *cofaqui* phenotypes were but north/south clinal subspecies and not species.



Figs. 1-6. *Megathymus cofaqui* subspecies. Fig. 1, Paratype ♂ *M. cofaqui slotteni*, ex pupa 13 Aug. 1990 Interlocken, Putnam County, Florida (leg. Dr. Jeff Slotten). Fig. 2, Holotype ♀ *M. cofaqui slotteni*, 20 Sept. 1988 visc. of Williston, Levy County, Florida (leg. Dr. Jeff Slotten). Fig. 3, Topotype ♀ *M. cofaqui harrisi*, ex pupa 24 July 1977 Atlanta, Georgia. Fig. 4, Topotype ♂ *M. cofaqui*, ex pupa 20 Aug. 1998 Burke County, Georgia. Fig. 5, Holotype ♀ *Megathymus cofaqui*, Georgia (dorsal & ventral). Fig. 6, ♀ *M. cofaqui*, ex pupa 16 Aug. 1990 New Ellenton, Aiken County, South Carolina.

It has taken me 25 years to locate a few *Megathymus cofaqui* colonies in Columbia, Burke, and Screven counties, Georgia, and Aiken, Orangeburg, Sumter, and Lancaster counties, South Carolina. With several of these records based only on empty larval tents. All adult specimens from these localities are the same subspecies. Topotypes of *M. cofaqui* from Burke County are nearly identical to topotypical *harrisi*. Thus, there is only one subspecies of *M. cofaqui* that occurs in Georgia and South Carolina.

The holotype of *M. cofaqui* (fig. 5) has far too dark of a ground color to be from southern or central Florida. All of its markings are within the typical range of Burke County *cofaqui*, especially the marking of the dorsal forewings. The presence of yellow scales along its dorsal hindwing margin is a character more prevalent in females of the Florida subspecies (Freeman 1969). However, some Georgia females also exhibit this character. The Fulton County, Georgia *harrisi* female figured by Harris (plate 10 fig. 19) and the holotype of *cofaqui* could almost pass as the same specimen. It is documented in Harris (pg. 28) that Morrison was collecting in Burke/Screven counties at the proper time of year to have found his *cofaqui* there. Morrison stated that he found it there. We know, from specimens collected by myself, that *cofaqui* is still found there. There is absolutely no historical or phenotypic evidence to suggest that the type of *cofaqui* came from any other population than that in the area of Burke/Screven counties in Georgia.

Topotypes of *cofaqui* from Burke County, Georgia (fig. 4) and adjacent Aiken County, South Carolina (fig. 6), and topotypical specimens of *harrisi* from the Atlanta, Georgia area (fig. 3) reveal that *cofaqui* and *harrisi* are synonymous. This dictates that the taxon named after Harris (*M. c. harrisi*) must be dropped into the synonymy of *cofaqui*. It also necessitates that the name *cofaqui* applies only to the northern (Georgian) subspecies and can not be used for the long recognized southern (Floridian) subspecies. This in turn leaves the Florida *cofaqui* subspecies (figs. 1 & 2) without a name. Accordingly, I herein describe the southern race as a new subspecies, *Megathymus cofaqui slotteni* Gatrell.

YUCCAE

The problem concerning *Megathymus yuccae* is slight but should at least be mentioned. H. A. Freeman designated a neotype for *M. yuccae* from Aiken County, South Carolina simply because no Burke or Screven County, Georgia specimens were known at that time. There is no conflict in Freeman's designation of a **biological** neotype from adjoining Aiken County, South Carolina. The ecology of Burke County, Georgia has more in common with *adjoining* Aiken County, South Carolina than with most of *adjoining* Screven County, Georgia. This is because most of both Burke and Aiken counties are upper coastal sandhill habitats, while most of Screven County is lower coastal plain maritime forest.

I do not think that national, state, county, or any other subjective political boundary lines, have any bearing on systematic taxonomy. *If the environmental factors are the same*, a specimen caught one inch or one mile on one side or the other of such a line should not matter in **biologically defining** a type locality, or what constitutes a biological topotype. For example, I have a specimen of *Asterocampa celtis* (Boisduval and LeConte) which I caught as it landed on the Burke County, Georgia bank of the Savannah River after it appeared to have just flown 40 yards across the river from South Carolina! Is this a South Carolina or a Georgia specimen?

Humans divide up areas and affix names to places in order to establish their ownership and legal jurisdiction. (Where is Ceylon or the USSR today?) All type localities are geopolitical and geoeological. The latter is all that should matter scientifically, because the former is totally artificial. In practice, taxonomists use geopolitical names to easily reference a type locality. But scientifically, the *type-locality* can only be the geoeological area (which may be very small or quite large depending on the parameters set by the author — a colony, population, or phenotype) occupied by the single colony, population, or phenotype from which the representative type specimen(s) was/were taken. This is analogous to the use of

common and scientific names. Common names have absolutely no scientific standing (any person or organization can make up their own list or book of butterfly common names and it is just as valid as anyone else's.) Geopolitical type localities are like common names. They only serve as an easy and brief way to reference (in an inherently inaccurate manner) areas occupied by taxa which have a much more involved and scientific geocological type locality. I accept the **region** of Burke County, Georgia as the type locality of the nominate **population** of *Eudamus yuccae* Boisduval and LeConte and, conditionally, accept Freeman's designated neotype from that region and population (Aiken County, South Carolina) as a valid topotype.

The condition of my acceptance stems from the artificial environment from which the neotype came. I have a problem with the fact that Freeman's neotype came from an urbanized, artificially established, decorative stand, of *Yucca aloifolia* L. If Harris' determination is accurate, these plants were far from their natural range. *Y. aloifolia* is indigenous to South Carolina only in a few coastal counties (Radford et. al. 1968). Thus, we can not be sure that the *Megathymus yuccae* specimens found there were not from larvae or eggs imported into the area (from Florida?) with the plants.

I did not feel it necessary to figure specimens of typical *M. yuccae yuccae* or *M. y. buchholzi*. They do not differ a great deal and not always consistently. However, I feel that most specimens can be distinguished from each other without looking at locality labels. Further, *M. yuccae* becomes more distinct as one goes north and west from the Georgia coast. Unfortunately, the type locality is barely outside of what may be the blend zone of these subspecies. The Burke, Screven, and Aiken material I have from wild stands of *Y. filamentosa* L., have smaller, lighter, more yellowish median spots on the dorsal FW. Specimens from south coastal South Carolina have larger, richer, more orange spots. My coastal South Carolina specimens generally match individuals I have collected or examined in various personal and institutional series of Floridian *M. y. buchholzi* and are thus either referable to *buchholzi*, or represent an intermediate population at the northern end of the range of *buchholzi*.

A ♀ specimen of *M. y. buchholzi* I collected on Edisto Island, Charleston County, South Carolina is figured by Scott on plate 57, Figure 417 d. This specimen clearly shows the orange spotting that is characteristic of *buchholzi*. This specimen can be contrasted against the typical yellow spotted *M. y. yuccae* figured by Harris on plate 10, figures 14 & 15.

Megathymus cofaqui slotteni Gatrell, new subspecies

Diagnosis. *slotteni*, having passed for decades as typical *cofaqui*, is well depicted under that name throughout the popular and scientific literature. Figures of *slotteni* may be found under the name *cofaqui* in Holland (plate LIV, fig. 34 & 35), Klots (plate 40, figs. 3 & 4), Harris (plate 10, figs. 20 & 21), Howe (plate 82, figs. 7 & 8), and Scott (plate 57, fig. 420). Harris' figures perfectly depict and contrast these two subspecies as described below. The dorsal brown ground color is lighter in specimens further south (*slotteni*), and darker in specimens further to the north (*cofaqui*). The key distinguishing characters are the shape and relative size of the three spots in the postmedian spot band on the dorsal forewings of both males and females, and the size of the postmedian spot band on the dorsal hindwings of females. In *slotteni* the spot in cell Cu_2 is nearly always at least half the width of the spot in cell Cu_1 or larger. In *cofaqui* this spot is usually only one third the width (at the vein) and rarely over half (both sexes). In *cofaqui* the spots in M_3 and Cu_1 usually tend to be elongated and fused with the spot in the distal end of the forewing cell (both sexes). In *slotteni* this is not often the case, and when it is, the spot in Cu_2 is also expanded (esp. in females). The extent of the light yellow spotting on the ventral hindwings of females is so variable throughout the range that it should not be considered as a diagnostic character. Only at the extremes of the cline is this spotting consistently stronger in the south and nearly absent in the north. The tendency of females to have yellow dorsal hindwing margins is typical in *slotteni* and atypical, but occasional, in *cofaqui*. The dorsal hindwing spots on *cofaqui* females are usually smaller while on *slotteni* they are larger (heavily spotted *cofaqui* females look like lightly spotted *slotteni* females). In general, one could say that females of *cofaqui* have a greater size difference between their dorsal forewing and hindwing spots, while *slotteni* females have less of a size difference between their dorsal forewing and hindwing spots. These subspecies are clinal, and individual specimens within each subspecies are variable. They are not greatly distinct.

Description. *Male* (Fig. 1): Head, thorax, abdomen, and appendages with gray and brown scaling slightly lighter than in nominate subspecies. *Forewings:* dorsally, ground color dark to medium brown with golden brown scaling at base lighter than in nominate subspecies, postmedian spots light yellow, with spot in Cu_2 not strikingly smaller than those in Cu_1 and M_3 , spots in Cu_1 and M_3 not often fused with spot in discal cell; ventrally, as in dorsal except no light basal scaling. *Hindwings:* dorsally, dark to medium brown with golden brown scaling at base lighter than in nominate subspecies; ventrally, as in nominate subspecies, except that black postmedian spots often more pronounced. *Female* (Fig. 2): Head, thorax, abdomen, and appendages with gray and brown scaling slightly lighter than in nominate subspecies. *Forewings:* dorsally, ground color dark to medium light brown, lighter than in nominate subspecies (especially in southwestern Florida), golden brown scaling at base lighter than in nominate subspecies (especially in southwestern Florida), postmedian spots light orange yellow, with spot in Cu_2 not strikingly smaller than those in Cu_1 and M_3 , spots in Cu_1 and M_3 not usually fused with spot in discal cell; ventrally, as in dorsal except no light basal scaling. *Hindwings:* dorsally, dark to medium brown with golden brown scaling at base lighter than in nominate subspecies (especially in southwestern Florida), row of orange yellow postmedian spots often large, outer margins usually with extensive yellow; ventrally, with light yellow/whitish basal spots usually present and sometimes prominent, yellow/whitish spots and black spots of postmedian spot band often prominent.

Types. **Holotype** ♀ (Fig. 2): Vicinity of Williston, Levy County, Florida, 20 September 1988, leg. Dr. Jeff Slotten. **Paratypes:** 3 ♂♂, 2 ♀♀: all FLORIDA: 1 ♂ near Interlocken, Putnam County, 13 Aug. 1990; 1 ♂ Hernando County, 7 Sept. 1989; 1 ♂ near Williston, Levy County, 6 Sept. 1989; 1 ♀ Clay County, 1 March 1991; 1 ♀ near Williston, Levy County, 5 Sept. 1989. All were collected by Dr. Jeff Slotten. The holotype is deposited in the FSCA, Gainesville Florida. The paratypes are in the authors collection in Goose Creek, South Carolina.

Etymology. *Slotteni* is named after Dr. Jeff Slotten, a prominent amateur Florida lepidopterist.

Remarks. Because these two subspecies have been recognized for over 40 years, I see no need in designating a long type series. In fact, 5 paratypes might be considered excessive by some. I chose a female as the holotype of *slotteni* for two reasons. First, the type of *cofaqui* is female, and second, females of the two subspecies differ subspecifically more than their males. There is probably a broad blend zone between these subspecies roughly parallel to the Georgia/Florida state line. I feel the type locality of *slotteni* is sufficiently to the south of this blend zone. It is assumed here that no *M. c. cofaqui* occur in Florida. If it does, it would be expected only in the northwestern part of the state. *M. c. slotteni* does not occur north of Florida. I have examined all the *cofaqui* in the FSCA collection in Gainesville, and three private Floridian collections. I have not seen any of the *cofaqui* from the apparently large population that exists in the mountains of North Carolina. The one (and to my knowledge only) collector who has had a series of these, for years, has published nothing. With the known tendency of *Megathymus* to evolve into almost micro geographical subspecies, these North Carolina *cofaqui* (as well as the Tennessee population) need to be collected, in a large enough sample, so they can be examined by a competent taxonomist – and their status, whatever it may be, published.

ACKNOWLEDGMENTS

Thanks to my son Ben Gatrell for photographs and computer input, Dr. Lee Miller and the Allyn Museum for photo of type specimen, Jeff Slotten for specimens, and to the FSCA, Gainesville, for library support.

LITERATURE CITED

- FERRIS, C.D. ed. 1989. Supplement to: A Catalogue/Checklist of the Butterflies of America North of Mexico. Memoir No. 3, Lepid. Soc. 103 pp.
- FREEMAN, H.A. 1969. Systematic Review of the Megathymidae. Supplement 1, J. Lepid. Soc. 58 pp.
- GERBERG, E.J. & H.R. ARNETT, JR. 1989. Florida Butterflies. Natural Science Publications, Inc., Baltimore, MD. 90 pp.
- HARRIS, L., Jr. 1972. Butterflies of Georgia. Univ. of Okla. Press, Norman OK. 326 pp.
- HODGES, R.W., et al. 1983. Check List of the Lepidoptera of America North of Mexico. MONA series. E.W. Classey Ltd. & Wedge Ento. Research Foundation, Oxfordshire, England. 284 pp.
- HOLLAND, W.J. 1930. The Butterfly Book. Doubleday & Company, Inc., Garden City, NY. 424 pp.
- HOWE, W.H. 1974. The Butterflies of North America. Doubleday & Company, Inc. New York. 633 pp.
- KLOTS, A.B. 1951. A Field Guide to the Butterflies. Houghton Mifflin, Boston MA. 349 pp.

- MILLER, L.D. & F.M. BROWN. 1981. A Catalogue/Checklist of the Butterflies of America North of Mexico. Memoir No. 2, Lepid. Soc. Sarasota, FL. 280 pp.
- OPLER, P.A. & G.O. KRIZEK. 1984. Butterflies East of the Great Plains, An Illustrated Natural History. Johns Hopkins Univ. Press, Baltimore. 294 pp.
- PYLE, R.M. 1981. The Audubon Soc. Field Guide to North American Butterflies. Alfred A. Knopf, Inc., New York. 294 pp.
- RADFORD, A.E., H.E. AHLES & C.R. BELL. 1968. Manual of the Vascular Flora of the Carolinas. Univ. of North Carolina Press, Chapel Hill. 1183 pp.
- SCOTT, J.A. 1986. The Butterflies of North America, A Natural History and Field Guide. Stanford Univ. Press, Stanford, California. 583 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 or butterflies, collecting is the first step of access to all other scientific information – and protection.

The Taxonomic Report is projected for 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 and reproduction for personal use (i.e. a museum or university may make as many copies as needed in whatever format desired). Non-subscribers may receive individual issues on 3½ disc at any time at \$9 per issue post paid. **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 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 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 **write to:** Ronald R. Gatrell, MOTH Curator, 126 Wells Road, Goose Creek SC USA 29445.



The Taxonomic Report

OF THE INTERNATIONAL LEPIDOPTERA SURVEY



A COMMENT ON FRIEDLANDER'S *ASTEROCAMPA* (NYMPHALIDAE, APATURINAE): DESIGNATION OF NEOTYPES FOR *A. CELTIS* AND *A. CLYTON*.

RONALD R. GATRELLE¹

126 Wells Road, Goose Creek, South Carolina 29445

ABSTRACT. Friedlander's 1986 [1987] treatment of the southeastern U.S. taxa of *Asterocampa* is examined. Neotypes of *A. celtis* and *A. clyton* are designated from Burke County, Georgia to help stabilize the status of these taxa and aid in any future research. *A. celtis* is currently known to exist within at least 40 km of *A. c. reinthali* in Georgia. Their proximity, without integration, suggests evolutionary distance, perhaps even speciation. It is proposed that *A. celtis* is descended from *A. c. alicia*, and *alicia* from a Mexican refugium. *A. clyton* and *A. c. flora* intergrade in eastern Georgia and are subspecific.

Additional key words: cryptic subspecies.

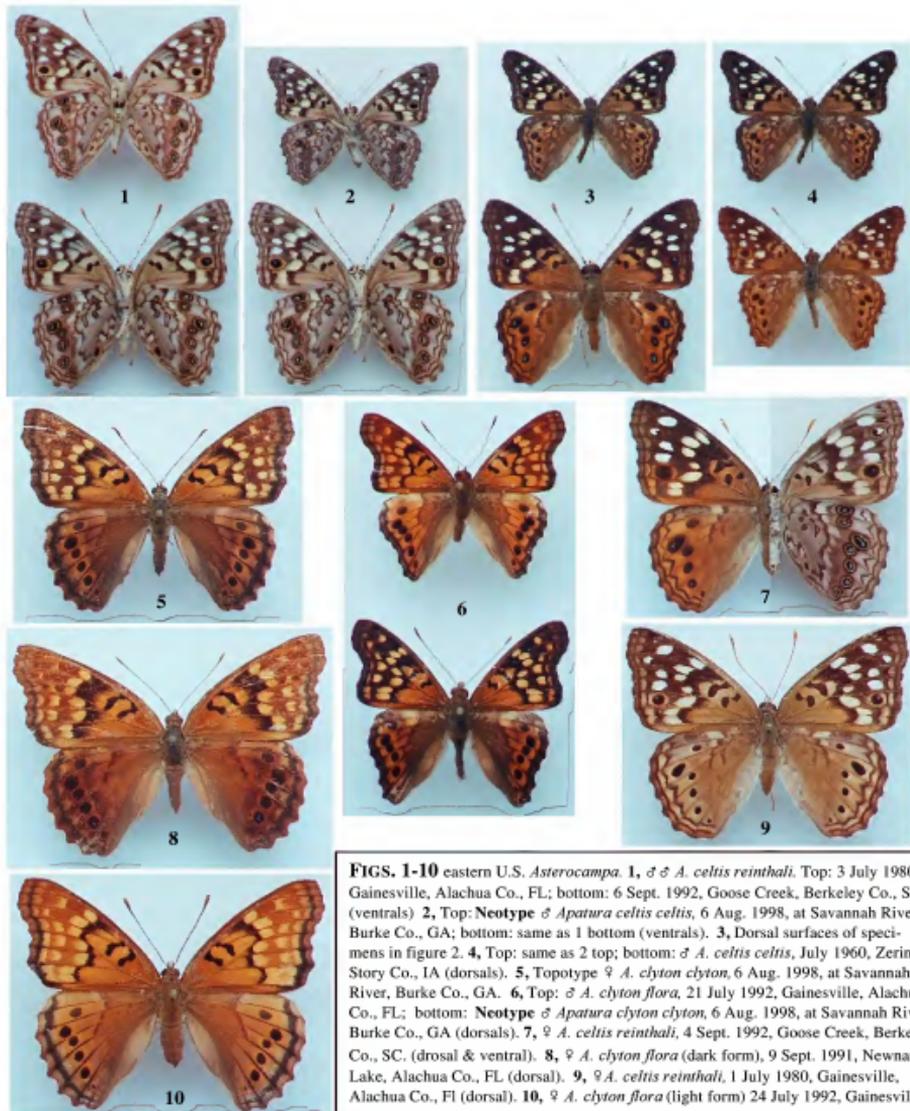
UNSTABLE TAXONOMY

Up to 1975, *Asterocampa* was usually thought of in North America as two or three species with five to seven subspecies. From 1975 (Howe *vide* Reinthal) until 1986 (Scott *vide* Friedlander) *Asterocampa* was presented in the literature as consisting of twelve North American species with only one subspecies. In 1987, Friedlander's revision of the genus left us with four species having six subspecies.

When I received number 25:4 of *The Journal of Research on Lepidoptera* in early 1988 (the date of publication is Dec. 31, 1987) devoted entirely to Friedlander's revision of *Asterocampa*, I immediately sat down to read it. I then spent the next several weeks comparing it against the literature and specimens in my collection. I, like many others, found his treatment much more acceptable than the hyper-splitting of everything into distinct species that had existed for a decade. However, it seemed to me, then and now, that his criteria for sinking taxa into subspecies or synonymy was not consistent and somewhat extreme in the opposite direction. Further, while he properly affirmed the type locality of *Asterocampa celtis* (Boisduval & Le Conte) to be Screven County in the lower coastal plain of Georgia, it seemed very risky to me that he did so without examining any topotypical specimens. Why?

All of the Georgia *A. celtis* he examined were from locations relatively far from the type locality. Four locations were in the Georgia piedmont, one was montane, and two (Decatur County in southwestern GA and Chattahoochee County which borders Alabama) were in the upper coastal plain. The closest specimens he had to the type locality were from Bibb and Clarke counties, which are both over 170 km away. All of the specimens he had seen from the counties just to the east of the type locality (in both Georgia and South Carolina) were his new subspecies, *A. celtis reinthali* Friedlander, and were only 40 km from the *celtis* type locality. Without specimens, how could Friedlander *know* that what occurred in nature in Screven County was not *reinthali* too? The answer is he couldn't.

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



FIGS. 1-10 eastern U.S. *Asterocampa*. 1, ♂ *A. celtis reinthali*. Top: 3 July 1980, Gainesville, Alachua Co., FL; bottom: 6 Sept. 1992, Goose Creek, Berkeley Co., SC (ventrals) 2, Top: Neotype ♂ *Apatura celtis celtis*, 6 Aug. 1998, at Savannah River, Burke Co., GA; bottom: same as 1 bottom (ventrals). 3, Dorsal surfaces of specimens in figure 2. 4, Top: same as 2 top; bottom: ♂ *A. celtis celtis*, July 1960, Zering, Story Co., IA (dorsals). 5, Topotype ♀ *A. clyton clyton*, 6 Aug. 1998, at Savannah River, Burke Co., GA. 6, Top: ♂ *A. clyton flora*, 21 July 1992, Gainesville, Alachua Co., FL; bottom: Neotype ♂ *Apatura clyton clyton*, 6 Aug. 1998, at Savannah River, Burke Co., GA (dorsals). 7, ♀ *A. celtis reinthali*, 4 Sept. 1992, Goose Creek, Berkeley Co., SC. (dorsal & ventral). 8, ♀ *A. clyton flora* (dark form), 9 Sept. 1991, Newnans Lake, Alachua Co., FL (dorsal). 9, ♀ *A. celtis reinthali*, 1 July 1980, Gainesville, Alachua Co., FL (dorsal). 10, ♀ *A. clyton flora* (light form) 24 July 1992, Gainesville, Alachua Co., FL (dorsal).

Friedlander accepted Abbot's paintings as being adequate to represent the type. However, Abbot's artistic renditions can not be trusted as being so accurate, either to phenotype or place of origin, as to be equivalent to actual specimens – especially type specimens. (To me, the elevation of the artistic products of the early workers on Lepidoptera as being definitive scientific types is equivalent to accepting prehistoric cave paintings as being on a par with the fossil record.)

If it could be demonstrated, through a series of specimens from Screven or Burke counties, that what occurred at the *celtis* type locality was the *reinthali* phenotype, then *reinthali* would have to be dropped into synonymy and *celtis* would become the name applied to his new south coastal South Carolina to southern Florida subspecies. This would also mean that *A. alicia* (W. H. Edwards), as the next oldest name, would have to be applied to the inland and northern subspecies long know as *celtis*. If Friedlander was wrong about what phenotype (subspecies) existed in Burke and Screven counties, he had created a taxonomic mess. As it turns out, he was correct.

LOCAL OBSERVATIONS

I had been collecting and observing *Asterocampa celtis* and *A. clyton* (Boisduval & LeConte) in south coastal South Carolina for 18 years when Friedlander's paper came out. All I had ever encountered in this area was his *reinthali* phenotype. Dr. Richard T. Arbogast had found only *reinthali* and an occasional *A. clyton* with a *flora* (W. H. Edwards) facies in his many years as a resident of Savannah, Georgia. Charleston was further north than Screven County. In Friedlander's study, the *reinthali* he examined from coastal Georgia were four times closer to *celtis*' type locality than any *celtis* he had seen from Georgia. Thus, I felt there was a strong possibility that what occurred in Burke and Screven counties was a nondescript blend zone population, or perhaps the coastal *reinthali* – but not *celtis celtis*. So I set out to collect and rear both *A. celtis* and *A. clyton* from the south coastal area of South Carolina, and to collect topotypical specimens of *A. celtis* and *A. clyton* to compare against Friedlander's position.

From 1988 to 1995, I netted hundreds of adults and reared about 3,000 specimens of both of these species from Berkeley and Charleston counties SC. (Nearly all netted and reared specimens were released.) All local *celtis* were *reinthali* (Figs. 1-3 bottoms, & 7) and all *clyton* were *clyton clyton*. Random *reinthali* larvae were checked for antler scoli AB5. All keyed out with this and the other *reinthali* larval characters set forth by Friedlander. *Celtis laevigata* Wild. was the local host of both *A. c. reinthali* and *A. clyton*.

Of anecdotal interest, *A. c. reinthali* eclosed after midnight and before dawn. If a light was on in the room, newly emerged adults (especially females) would often come to the light. Perhaps they were fooled into thinking it was dawn and moved into the light to make themselves more available to males (this may be an explanation for Friedlander's question at the bottom of page 240). For those who find wild *Asterocampa* at light, they should note if the females are usually fresh and the males old. If so, this could indicate early morning mate locating behavior.

In August of 1998 I located sizable populations of topotypical *A. celtis* (Figs. 2-4, tops) and *A. clyton* (Fig. 5 & Fig. 6 bottom) near the Savannah River in Burke County, Georgia and Allendale County, South Carolina. All the *clyton* were *clyton clyton* and, to my surprise, all the *celtis* were identical to specimens of *celtis celtis* I had collected as a teenager in my home state of Iowa (Fig. 4 bottom)! I had expected to find a *reinthali/celtis* intermediate at the type locality. And indeed, if we were dealing with a clinal subspecies, that is what **should** have been found in this area.

These *Asterocampa* were in association with *Celtis occidentalis* var. *georgiana* (Small) Ahles. Both males and females were found of *A. clyton* but only males of *A. celtis*. Both species were very common and about two dozen of each were netted and examined. (*C. occidentalis* var. *georgiana* does not occur along the coast where *A. c. reinthali* is found. I did not observe *C. laevigata* in the area of the *A. celtis* colonies, but it probably occurs in the vicinity. To this point in time, these plant associations only indicate occurrence and do not necessarily indicate, or eliminate, regional host specificity.)

POSTULATING A CONCLUSION

Specimens, adults and immatures, from southeastern Florida and south coastal South Carolina (700 km apart) are phenotypically (genetically?) the same – *reinthali*. Specimens, at least adults, from the warm climate of east coastal Georgia and the cold climate of Iowa (1,500 km apart) are phenotypically (genetically?) so similar as to be virtually the same – *celtis*. Yet, with only one county between them (40 km), these *celtis* and *reinthali* exist in nature in eastern Georgia as very distinct phenotypes, with no known intermediate populations or specimens from this area. Friedlander only “presumed hybridization” in this area (page 245.)

It is strikingly odd that specimens of a single species should be so subspecifically related on both a distant and proximate geographical basis. Add to this: the aspect that these *reinthali* populations along the coast may be host specific to *C. laevigata*, and the Burke/Allendale county *celtis* populations may be host specific with *C. occidentalis* var. *georgiana*; the morphological differences in larval characters; and enough circumstantial evidence is accumulated to reasonably indicate speciation rather than subspeciation. This would be considered weak evidence by some, perhaps many, but we are only postulating here. We are simply giving probable cause to keep this research open until the subspeciation question can be absolutely concluded one way or the other. It should be noted that *Anthocharis midea* (Hübner) and *A. m. annickae* dos Passos & Klots function as distinct subspecies in the exact same area.

I propose that the taxon closest to Georgian *A. celtis* is the Gulf Coast endemic *A. celtis alicia* and not *A. c. reinthali*. In noting the differences between *alicia* and the Floridian population, Friedlander not only named the Florida population (*reinthali*) but sank *alicia* into *celtis* synonymy. In my opinion, this is unfortunate. However, this is consistent with the rest of his revisional rationale (pg. 232). I consider *alicia* a valid subspecies with the same basic Gulf Coast range as *Basilarchia archippus watsoni* dos Passos. At first glance, *alicia* merely looks like a very large *celtis*. And indeed their markings are about the same, with one important exception. I have only seen a few topotypical *alicia*, but even in this small series they show a strong tendency to have an additional partial dorsal FW eyespot in cell M₅. This character was not mentioned by Friedlander.

The evolutionary significance of this tendency should not be minimized. This single feature in *alicia* would seem to tie southeastern *celtis* together with the western *A. c. antonia* (W. H. Edwards) and its many allies, which are double or partially double eyespotted entities. *Alicia* is positioned, both geographically and phenotypically, as the “link” connecting western and eastern *celtis*. I agree with Friedlander, that *A. c. reinthali* is a taxon ascended from the Florida refugium. However, I see *celtis*, by way of *alicia*, as descended from the Mexican/Texas refugium. (Friedlander, in his prepublication review of this paper, agrees that this hypothesis of the origin of *celtis* is plausible and warrants further investigation.)

The *celtis* – *reinthali* taxonomic question seems three fold. First, while the *celtis* and *reinthali* ancestors were separated in different refugium, did they evolve into close but separate species which may now be sympatric in some part of Georgia or South Carolina? Second, are *celtis* and *reinthali* just subspecies in unusually close proximity simply because *celtis*, at the terminus of its evolutionary tract, has now abutted a long disjunct relative? If so why are they not interbreeding? Third, are they subspecies that due to evolutionary distance, say by host specificity, now cryptically act as species in this area? Until one of these, or some other option, is proved correct by collecting and/or breeding experiments, *reinthali* and *celtis* may correctly be thought of as separate species – the status they had before Friedlander’s revision. The status Dr. Reinthal held to be correct. However, I am by no means embracing specific status. I am saying that the exact relationship of these two is still in question.

The situation with southeastern *A. clyton* is not complex. Occasional specimens from Savannah, Georgia I’ve seen in the collection of R. T. Arbogast tend to have features characteristic of both *flora* and *clyton*. Burke County *clyton* seem to be solidly *clyton*. All south coastal South Carolina *clyton* I’ve seen from Charleston, Colleton, Dorchester and Berkeley counties are true *clyton*. Thus, a blend zone between

clyton and *flora* can be observed in north coastal Georgia. Further, there is a dark female form of *flora* (Fig. 8) that is very similar to the light form of female *clyton* (Fig. 5).

Neotypes are definitely called for here. Accordingly I have designated a male of *A. celtis* and *A. clyton* each from Burke County, Georgia as neotypes. They have been deposited in the Carnegie Museum of Natural History, Pittsburgh, PA. They are labeled as follows: NEOTYPE *Apatura celtis*, 6 August 1998, at Savannah River, Burke County, Georgia (Figs. 2-4 top); NEOTYPE *Apatura clyton*, 6 August 1998, at Savannah River, Burke County, Georgia (Fig 6 bottom)

WESTERN SUBSPECIATION

A. leilia coeles (Lintner), *A. celtis montis* (W. H. Edwards), and *A. clyton subpallida* (Barnes & McDonough) were considered species by most writers in the 1970's and 80's. Today, via Friedlander, they are not even considered valid subspecies. I have all the western taxa in my collection and have reared *subpallida*. They seem to be perfectly good subspecies to me. I think this bears a second look. I would hope some western researchers would revisit this situation. Bailowitz and Brock (1991) had the best opportunity to reexamine *montis* and *subpallida* but chose to strictly follow Friedlander.

I am not sure if the criteria Friedlander used in defining his western subspecies (pg. 232) was applied in the same way to his eastern subspecies. However, based on his review comments of this paper, I think many may have read a finality into his *Asterocampa* revision that he absolutely did not intend.

He and I are certainly in agreement that, "very little is written in stone about *Asterocampa*." His lumping of western taxa was not an indication of a taxonomic simplicity or finality on his part. It was just the opposite. It was (is) the complex relationships of the western populations, coupled with his conservative approach, in the face of the unknown, that resulted in what he produced on paper. Let me relay a little of what he has written to me:

The rest of the iceberg is those western populations I sunk under the name of *A. celtis antonia*. There are dozens of distinctive, geographically isolated *antonia*-like *A. celtis* in the West, and I don't have a clue about their phylogeny. I can guess that *A. celtis celtis* arose from their ancestors, but how are the *antonia*-like *A. celtis* related one to another? Some may be on the line to *A. celtis celtis*, some may be persistent ancestors, some may be on entirely different lines of evolution. It will become useful to have separate names for them only when we have sufficient data to do the phylogeny work. For now we have no reason to believe that *A. celtis antonia* in New Mexico is a single entity, nor do we know how *A. c. antonia* from Arizona, Colorado, Texas, Oklahoma, Mexico, etc. relate to them – better to wait so the critical research can be done, and I think it will have to be molecular. So, if you need a name, the *A. celtis antonia* population from "X" will do, but be sure to voucher your material! In this sense, vouchering is as important as naming, maybe more so, for it's clear we need genetic material vouchered, whereas defining types is still largely morphological.

I sunk *subpallida* because it is the Arizona version(s) of *texana*, both of which probably are not single entities and require further investigation. I almost named subgenera for the two groupings, but of what use? They are distinctive enough to have come over from Asia separately, then separated into tropical/temperate pairs.

To sum up, I guess I'm emphatic that subspecific names not be raised or given until the critical research is done to explain the phylogeny of the populations. I'm not debating the distinctiveness or isolation of the western populations – they will all eventually need formal names, if they survive extinction. But there are many, many more such populations than *subpallida*, *montis*, *coeles*, and the one *A. celtis* I left unnamed in Mexico (and *A. clyton louisiana*). But if it helps to have a name [to provide protection to taxon], resurrect it now! I'd prefer to wait until the phylogeny is done right.

Two things are clear from Friedlander's remarks. First, much more research needs to be done. Second, the last word on *Asterocampa* subspeciation has not been spoken. My reason for writing this paper is to stimulate more research on the *Asterocampa*. I feel some of the named taxa were sunk prematurely. Why sink a subspecies we know will one day be validly resurrected just because it needs to be defined in a more accurate way? If some of the demoted taxa are not truly synonymous with (the same thing as) the subspecies they were placed under, then the only thing accomplished in sinking them was the replacement of an inaccurate subspeciation with an inaccurate synonymy.

If *Philotes sonorensis extinctis* Mattoni is a valid subspecies in half a canyon, and *Icaricia icariodes missionensis* (Hovanitz) on half a hill (with *I. i. pheres* (Boisduval) at the bottom of the hill), then *A. c. subpallada* and *A. c. montis* can be valid in half a state (this sentence contains hyperbole but it makes the point). As I stated, I hope someone from the area of these to-be or not-to-be Western *Asterocampa* subspecies will further research the question. It seems Tim Friedlander feels the same, though for different reasons.

ACKNOWLEDGMENTS

Thanks to Tim Friedlander for his review of this paper and input. To my son, Ben, for his usual excellent photos.

LITERATURE CITED

- BAILOWITZ, R.A. & J.P. BROCK. 1991. Butterflies of Southeastern Arizona. Sonoran Arthropod Studies, Inc., Tucson, AZ. 342 pp.
- FRIEDLANDER, T.P. 1987. Taxonomy, Phylogeny, and Biogeography of *Asterocampa* Rober 1916 (Lepidoptera, Nymphalidae, Apaturinae). *The Journal of Research on the Lepidoptera*, Santa Barbara, CA. 25:4, 119 pp.
- HOWE, W.H. 1974. The Butterflies of North America. Doubleday & Co., Inc. New York, NY. 633 pp.
- SCOTT, J.A. 1986. The Butterflies of North America, A Natural History and Field Guide. Stanford Univ. Press, Stanford, CA. 583 pp.

The Taxonomic Report is a publication of *The International Lepidoptera Survey (TILS)*.

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.

The Taxonomic Report is projected for 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 and reproduction for personal use (i.e. a museum or university may make as many copies as needed in whatever format desired). Non-subscribers may receive individual issues on 3½" disc at any time at \$9 per issue post paid. **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, write **TILS** at the above address to set up discussion on how to best handle your research for publication.



AN EVOLUTIONARY SUBSPECIFIC ASSESSMENT OF *DECIDUPHAGUS HENRICI* (LYCAENIDAE) BASED ON ITS UTILIZATION OF *ILEX* AND NON-*ILEX* HOSTS: DESCRIPTION OF A THIRD *ILEX* ASSOCIATED SUBSPECIES. DESIGNATION OF A NEOTYPE AND TYPE LOCALITY FOR *DECIDUPHAGUS IRUS*.

RONALD R. GATRELLE¹

126 Wells Road, Goose Creek, South Carolina 29445

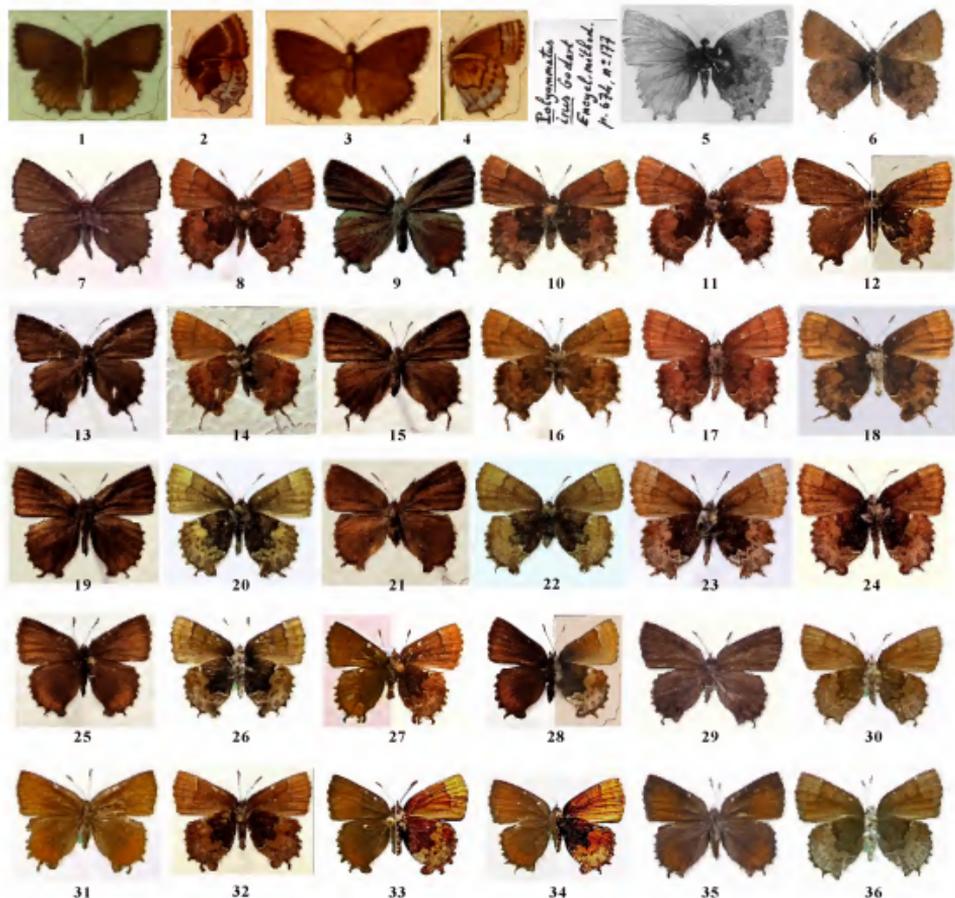
ABSTRACT. *Deciduphagus henrici* subsists as six subspecies which have evolved into two distinct larval host associated groups of three taxa each. **Group one** is composed of those taxa which utilize primarily *Ilex* (holly – various species) as their host. They inhabit the non-montane area of the southeastern United States and up the Atlantic coast to at least southern New Jersey. They are: *D. h. margaretae* (TL Deland, Volusia Co., FL) occupying east-coastal to south central Florida; *D. h. viridissima* (TL Nag's Head, Dare Co., NC) occupying the upper Outer Banks area of NC north through the Chesapeake and Delaware Bays to perhaps Rhode Island; and a new subspecies herein described as *D. h. yahwehus* (TL Orangeburg Co., SC) occupying the area from south central North Carolina south through Georgia then westward to perhaps Mississippi and the upper west coast of Florida. This *Ilex* host association is believed to be peri-Pleistocene and Floridian in origin. **Group two** consists of two subspecies which use primarily non-*Ilex* plants, and one taxon which is oligophagous (including *Ilex*). The primarily non-*Ilex* subspecies are: *D. h. solatus* (TL Blanco Co., TX) occupying south central Texas westward; *D. h. turneri* (TL Cowley Co., KS) occupying the area from north Texas northeast to at least Indiana; and (the oligophagous) *D. h. henrici* (TL Philadelphia, PA) occupying southeastern Canada south through the Appalachians. Nominate *D. h. henrici* is the most recently evolved of the six *henrici* subspecies. In parts of the northeastern U.S. *D. h. henrici* is in tension with *D. h. viridissima*, both phenotypically and biologically. *D. henrici* and *D. irus* were often confused. To stabilize the taxonomy, the false holotype of *D. irus* is designated as neotype. Its type locality is restricted to southern NJ.

Additional key words: sibling species, original descriptions.

EARLY HISTORICAL AND BIOLOGICAL INFORMATION

John Abbot found two species of *Deciduphagus* Johnson (1992) in coastal Georgia. Abbot sent his paintings and life history information regarding these taxa to Boisduval and Leconte who in 1833 published Abbot's renditions and information. Today, we know these species as *Deciduphagus henrici* (Grote & Robinson, 1867) and *Deciduphagus irus* (Godart, 1824) (see appendix). However, at the time of Boisduval and Leconte's publication, *henrici* had not yet been described, and Godart had only recently described *Polyommatus irus* from a single male specimen, of uncertain origin, which he had deposited in the Museum Nationale, Paris (see appendix). Thus, upon the receipt of Abbot's paintings and information, Boisduval and Leconte had to determine which of Abbot's depictions was Godart's *P. irus* and which was an undescribed species. After examining Godart's type (which they said was so "defected by dilapidation, it would not have been possible to recognize this type, if we had not seen it"), they determined one Abbot species to be Godart's *irus* (Figs. 1-2) and described the other as a new species, *Thecla arsace* Boisduval and Leconte (Figs. 3-4). However, they associated the wrong Abbot species with Godart's *irus*.

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



Figs. 1-36. 1-2 (d/v), ♂ *Thecla irus* (=henrici) reproduced from Boisduval & Leconte 1833. 3-4 (d/v), ♂ *Thecla arsace* from Boisduval & Leconte 1833. 5 (d/v), false ♂ holotype *Polyommatus irus* herein designated as neotype. 6 (v), ♂ topotype *D. irus*, 15 May 1971, Lakehurst, Ocean Co., NJ, leg. Stanford. 7-8 (d/v), ♂ holotype *D. h. yalwehus*, 10 March 1994, Nr. Bull Swamp, Orangeburg Co., SC. 9-10 (d/v), ♀ allotype *D. h. yalwehus*, same data as 7. 11 (v), ♂ *D. h. yalwehus*, 29 March 1986, Edisto Is., Colleton Co., SC. 12 (d/v), red HW ♂ *D. h. yalwehus*, 19 March 1977, Ft. Stewart, Bryan Co., GA. 13-14 (d/v), ♂ topotype *D. h. margaretae*, 7 March 1976, Deland, Volusia Co., FL. 15-16 (d/v), ♀ topotype *D. h. margaretae*, same data as 13. 17 (v), topotype ♂ *D. h. margaretae*, 9 March 1975, Deland, Volusia Co., FL. 18 (v), dark topotype ♀ *D. h. margaretae*, same data as 17. 19-20 (d/v), ♂ holotype *D. h. viridissima*, 3 April 1991, Bodie Is. lighthouse, Dare Co., NC, leg. Pavulaan. 21-22 (d/v), ♀ allotype *D. h. viridissima*, same data as 19. 23 (v), ♂ int. morph *D. h. viridissima*, 15 April 1992, Sussex Co., DE, leg. Pavulaan. 24 (v), ♂ brown morph *D. h. viridissima*, same data as 23. 25-26 (d/v), ♂ *D. h. turneri*, 21 April 1979, Ernie Miller Pk., Johnson Co., KS, leg. unknown. 27 (d/v), ♂ *D. h. henrici*, 10 April 1977, Lee Co., VA, leg. Hyatt. 28 (d/v), ♂ *D. h. henrici*, 29 April 1988, Great Swamp, Washington Co., RI, leg. Pavulaan. 29-30 (d/v), ♂ topotype *D. h. solatus*, 24 February 1976, 8 Mi. E. of Blanco, Blanco Co., TX, leg. unknown. 31-32 (d/v), ♀ *D. h. turneri*, 18 March 1973, Tyler, Smith Co., TX, leg. unknown. 33 (d/v), ♀ *D. h. turneri*, 8 March 1987, Nr. Dow, Pittsburg Co., OK, leg. unknown. 34 (d/v), ♀ *D. h. turneri*, 6 May 1975, Zaleski St. For., Vinton Co., OH, leg. Parshall. 35-36 (d/v), ♀ topotype *D. h. solatus*, same data as 29. Specimens leg. R. Gatreille unless otherwise noted; (d) = dorsal, (v) = ventral.

Abbot provided paintings and basic information to Boisduval and Leconte. Boisduval and Leconte made the determinations and wrote the descriptions. These authors saw no actual Abbot specimens. We know now that the Abbot painting to which Boisduval and Leconte assigned the name *irus* was in fact not Godart's *irus*, but the species Grote and Robinson would describe as *Thecla henrici* 34 years later. We know this because: 1) Abbot's adult figures depict *henrici* (no male scent patch), not *irus*; 2) his description of the larva fits *henrici*, not *irus*; 3) his larval hosts (*Ilex* L. and *Vaccinium* L.) are that of *henrici*, not *irus*; and 4) the verbal description (see appendix) is in all aspects, except one, *henrici* and not *irus*. Conversely, Boisduval and Leconte's *arsace* is an *irus* in these same four points (see appendix). Abbot's male figure of what Boisduval and Leconte called *arsace* has scent patches on the forewings.

Boisduval and Leconte's error of associating Godart's name *irus* with the as yet undescribed *henrici*, resulted in their describing the true coastal Georgian *irus* under the name *T. arsace*. Thus, *Thecla irus* Boisduval and Leconte 1833, should be listed under the synonymy of *Deciduphagus henrici* and noted as preoccupied by *Polyommatus irus* Godart, 1824.

To preclude the possibility that anyone might ever suggest that Godart's *irus* was a *henrici*, I wrote the Museum Nationale in 1975 and asked if Godart's *P. irus* type was extant. Dr. P. Viette not only confirmed that the holotype was there, but also sent me the specimen for taxonomic verification (Fig. 5). It is a *D. irus*. (See the appendix under *Polyommatus irus* for additional information.)

Boisduval and Leconte are not the only ones to have confused *D. henrici* with *D. irus*. Scudder (1889) lists both *T. henrici* and *T. arsace* in his synonymy of *D. irus*. He devotes seven pages of narrative to what is actually an *irus/henrici* composite. There is a wealth of information, but it is untrustworthy because he unknowingly goes back and forth between data relating to *henrici* and *irus*. However, for the reader who knows that Scudder was actually dealing with two species, this information is enlightening.

Scudder's comments under the heading "variations" manifests this confusion. He muses as to why some male *irus* nearly lack DFW scent spots (being *henrici*, they actually had none) and how these same males had noticeable HW tails "twice as long as usual [for *irus*]." He also notes that some of these same tailed (*irus* = *henrici*) specimens from Albany, NY were "decidedly olivaceous" in hue. This reference to **decidedly** olivaceous (greenish) specimens in upstate New York in 1889 is significant now that the often greenish *D. h. viridissima* Pavulaan has been described (1998).

Scudder quotes Abbot as stating that *irus* (actually *henrici* not *irus*) is often found in swampy areas. I too have found southeastern *henrici* in very wet areas. I have also found it curious that *henrici* in this area have the trait of firmly attaching their pupa to holly leaves or bark. I have wondered if this wetland habitat association might have caused these *henrici* to develop this trait – because the ground is often inundated with water. Or, is this characteristic of other populations in dryer environs also?

Holly (*Ilex*) and Lupine (*Lupinus perennis* L.) are the only plants Scudder confirmed as definite hosts for his "*irus*." We know now that the former only applies to *D. henrici* and the latter to *D. irus*. Scudder mentioned other plants, but stated he could not confirm any of them as being oviposited on by wild females. Scudder noted that larvae (of which species?) accepted wild plum fruit in captivity. He also documented that females (of which species?) refused to lay eggs when confined with *Vaccinium* (blueberry), *Quercus* L. (oak), or *Cyrilla racemifolia* L.

His comments on *Cercis canadensis* L. (redbud) are noteworthy. He records that Abbot only noted *C. canadensis* as an adult nectar source and not a larval aliment. I have often found local *henrici* adults around redbud (never *irus*). But I have never succeeded in getting *henrici* larvae from this area to eat, or females to oviposit on, *C. canadensis*. This plant is documented (in lit.) as a primary host of *D. h. henrici* and *D. h. turneri* Clench, in the Appalachian, northeastern, and western areas of the United States.

This confusing of *D. henrici* and *D. irus* adults, coupled with the unclear references to plants as either larval hosts or adult nectar sources by the early workers, should make the long list of *henrici* larval hosts as recorded in much of the modern literature suspect (i.e. Scott 1986). A lot of field work needs to be carried out throughout the range of *D. henrici* to accurately reassess and document its actual hosts.

BIOGEOGRAPHICAL EVOLUTION AND SUBSPECIATION

The six subspecies of *Deciduphagus henrici* can be divided into two groups of three subspecies each according to their known larval host associations. Three subspecies appear to be nearly monophagous toward *Ilex*. I call this group the *Ilex* group. The other group of subspecies is composed of two taxa which are primarily non-*Ilex* feeders and one which is oligophagous (including *Ilex*). I call this the non-*Ilex* group.

The *Ilex* group is found in the non-montane areas of the southern and eastern United States. The three taxa which comprise the *Ilex* group are: *D. h. margaretae* dos Passos, type locality Deland, Volusia County, Florida occupying east-coastal to south central Florida; *D. h. viridissima*, type locality Nag's Head, Dare County, North Carolina occupying the upper Outer Banks area of NC north through the Chesapeake and Delaware Bays and in scattered coastal colonies to perhaps Rhode Island; and a new subspecies herein described as *D. h. yahwehus* Gatrell (TL Orangeburg County, South Carolina) occupying the area from south central North Carolina south to north Florida then westward through Georgia to perhaps Mississippi and the upper west coast of Florida.

The non-*Ilex* subspecies are: *D. h. solatus* Cook & Watson, type locality Blanco County, Texas occupying south central Texas westward; *D. h. turneri* Clench, type locality Cowley County, Kansas occupying the area from north Texas northeast to at least Indiana; and the oligophagous (including holly) *D. h. henrici*, type locality Philadelphia, Pennsylvania and occupying the southeastern area of Canada south through the Appalachians.

Ilex Group

Ilex is the primary, perhaps exclusive, larval substrate of this group. After nearly 30 years of experience with *D. henrici* in Florida, coastal Georgia, and South Carolina I have only found it in association with *Ilex*. *Ilex opaca* Aiton, *I. cassine* L., and *I. vomitoria* Aiton are known larval aliments of *margaretae*, *yahwehus* and *viridissima*. Where more than one of these hollies grow in the same location, they are all utilized by the local *henrici* population. *I. opaca* and *I. vomitoria* are found from Virginia south to Florida and west to Mississippi, with *vomitoria* primarily along the coast. *I. cassine* is found from south coastal North Carolina south to Florida and west to Mississippi (includes var. *myrigloia* Aiton). This mutual host association and shared morphological characters of prominent tails and limited red scaling dorsally is consistent with a common ancestry of these three subspecies. This *Ilex* host association is therefore evidently peri-Pleistocene and Floridian in origin. Thus, they have arisen from a Floridian Pleistocene relict.

I. cassine prefers mesic, even paludal, habitats more than the other known hosts of this group. Thus, *I. cassine*'s range is restricted to the wet areas of the lower coastal plain. *I. cassine* is the primary host of *margaretae* in east coastal Florida. *I. opaca* is tolerant of both mesic and xeric habitats. Thus, *I. opaca* is by far the most upland of the known larval hosts. *I. opaca* is the primary host of the inland populations of *yahwehus*. *I. vomitoria* is the primary host of *yahwehus* on the coastal islands of South Carolina. *D. h. viridissima* utilizes *I. opaca* and *I. vomitoria* in the same fashion as *yahwehus* does.

In my evolutionary model, this group of subspecies arose from an ancestor adapted to lowland *Ilex* during the Pleistocene in island Florida with *margaretae* being the oldest most direct descendent. By this model, the species then followed the host(s) and invaded low wetlands northeastward and westward from Florida adapting to other hollies in the process. Those which followed *I. opaca*'s adaptation to xeric and upland environs moved inland with it and gave rise to *yahwehus*.

D. h. yahwehus is both phenotypically and geographically closest to *D. h. margaretae*. *D. h. viridissima* is equally distinct in phenotype from both of these. It is not possible to determine, without an involved study, if *viridissima* arose from *margaretae* or *yahwehus*. However, it is likely that *yahwehus*, based on its upland host adaptation, is the most recently evolved; and *viridissima*, by its continued lowland

coastal acclimation, is older than *yahwehus* and younger than *margaretae* having simply moved northward from Florida along the coast.

However, regardless of *viridissima*'s evolutionary ancestry, I disagree with Pavulaan's idea that *viridissima*'s green morph may have stemmed from environmental factors. If this were true, it would only be an ecotype (form) and not a subspecies. Further, if this were the case, why are not all coastal North and South Carolina populations predominantly greenish? All North and South Carolina maritime populations feed mostly on *I. vomitoria* and are subject to the same basic ecological conditions. It is far more likely that the great frequency of the green morph arose over thousands of years as the direct result of green gene selection and its eventual genetic dominance within the isolated population on the upper Outer Banks of North Carolina. I see *viridissima* as a genetically distinct *Ilex* group subspecies, with green, brown, and intermediate morphs, which now extends along the northeast coast from the upper Outer Banks of North Carolina to perhaps the Great Swamp of Rhode Island.

Regardless of what evolutionary models are eventually demonstrated to be the most likely, these three biologically similar *Ilex* associated *henrici* subspecies 1) form a group most probably evolved from a Floridian ancestor, and as such are 2) separated by thousands of years from the non-*Ilex* associated taxa.

Non-*Ilex* Group

I am by no means as familiar with this group as I am with the *Ilex* group. However, it seems fairly probable that the non-*Ilex* group is 1) from a common ancestor, and 2) from a different refugium than the *Ilex* group. The range of the three subspecies in this group, their host associations, and phenotypic similarities indicate that their ancestor is from a Texan or Mexican population.

Cercis canadensis seems to be the primary larval host of *D. h. turneri* and *D. h. henrici* (Pavulaan, 1998) from Texas northeastward to southeastern Canada and eastward to the southern Appalachians. This includes the northern glaciated and southern non-glaciated areas within this range. This dictates that *C. canadensis* became the primary host of this group before it came to occupy the formerly glaciated regions. Hypothetically then, there should be two biological situations in place in the Midwest, eastern US, and in southeast Canada which need to be investigated through careful field observations.

Bio-situation A. The older (more biologically conformed) populations in the **non-glaciated** areas would be expected to be monoalimentary in larval host selection. One plant genus, or species, would be the dominant larval aliment (i.e. *Cercis*). However, occasional colonies within this large geographic primary host area might utilize plants of one or two other genera (including *Ilex*) as secondary hosts; or even as a primary host in certain micro populations within the non-*Ilex* group's total range. *D. h. turneri* is the expected taxon of bio-situation A (Figs. 25-26, 31-34).

Bio-situation B. The newer (more biologically unstable) populations in formerly **glaciated** areas would be expected to be largely polyalimentary in larval host selection. They would equally utilize plants of multiple genera as larval hosts. *D. henrici*'s recent adaptation to *Rhamnus frangula* (Layberry et al., 1998), is indicative of this type of ongoing host adaptation by populations still in ecological and geographic advance. Situation B populations should be endemic to Remington's (1968) suture zone one. *D. h. henrici* is the expected taxon of bio-situation B (Figs. 27-28). *D. h. henrici* was the first taxon of *henrici* to be named; however, by my model, it is the most recently evolved and is the eastern extension of *turneri*.

Nevertheless, this does not mean that *D. h. turneri* is not also present in some situation B areas. I agree with Pavulaan (1998) that *D. h. turneri* extends from Texas well into the eastern United States and is probably the best name for *henrici* in much of Ontario, Canada. *D. h. turneri* was determined as the subspecies in Missouri by Heitzman (1987), and in Indiana by Shull (1987). Specimens I have from Vinton, Co., Ohio (Fig. 34) also fit best with *turneri*. It is the frequently extensive amount of red scaling on the dorsal surface of *turneri* that differentiates it from *henrici*. Ventrally, they are very similar. The name *henrici* should be limited to the oligophagous, dorsally dark (compared to *turneri*) populations of the northeast and Appalachians. Nominate *henrici* has more red dorsally than any of the *Ilex* group subspecies.

Diospyros texana (persimmon) is apparently the exclusive foodplant of *D. h. solatus* in Texas. This host association and *solatus*' distinct phenotype (Figs. 29-30, 35-36), indicates that it is either from a third ancestor (further to the west), or is an early subspecific split from the Texan ancestor of it and the other two taxa in the non-*Ilex* group. A breeding experiment between *solatus* and *viridissima* would be of interest to test if these two, by evolutionary distance, act as sibling species.

The *Ilex* and non-*Ilex* groups already act as sibling species in some aspects stemming from their host association. For example, Pavulaan was not able to get females of *viridissima* to oviposit on *Cercis*. And his *viridissima* larvae also exhibited difficulty in accepting *Cercis*. The *viridissima* larvae he was able to rear through to pupae on *Cercis* had extremely high pupal mortality. I have found this same condition to exist in nature here in South Carolina. The possibility exists that the taxa in these groups do not just act in some ways as sibling species, but are in fact such.

Subspecies In Tension

Mr. Harry Pavulaan and Dr. Dale Schweitzer have provided me with a great deal of information and offered their personal opinions and interpretations regarding *henrici/viridissima* in the northeastern United States. Dr. Schweitzer's input was specifically offered relative to his review of this paper. These two workers agree on the relevant biological and ecological data. However, they differ, sometimes dramatically, in their interpretation of these data. The facts and advice provided by Schweitzer and Pavulaan constitutes virtually all of the specific information in this section. Accordingly, they deserve special acknowledgment here. The subspecific theory is mine.

Cryptic species look exactly alike, but the factors of reproductive isolation and biological diversity distinguish them. Subspecifically, because there is no reproductive isolation, many butterfly taxonomists have come to rely almost entirely on morphological wing differences to determine subspeciation. I believe this is incorrect. As with species, **major** biological differences are of greater subspecific importance than wing coloration.

Pavulaan, in his description of *viridissima*, documented many populations which contained various percentages of green morph *viridissima* and/or intermediate *viridissima* like individuals meshed with predominately brown populations (which he called *henrici*) ranging through the entire Chesapeake Bay area and reaching as far west as West Virginia and northeast to New Jersey. According to both Schweitzer and Pavulaan, all Chesapeake Bay populations are *Ilex* feeders be they green, brown, or intermediate. They also agree that virtually all populations along the east coast from the Outer Banks through southern New Jersey and then in scattered colonies north to the Great Swamp of Rhode Island, are holly feeders.

However, Pavulaan limited the range of his *viridissima* to only that area of the upper Outer Banks of North Carolina containing the highest frequency of green individuals. I understand why he did this; however, I feel his approach is too narrow and simplistic. In actuality, his delineation of *viridissima* nearly renders *viridissima* as little more than a form. The situation in the northeast is about much more than green versus non-green specimens or even populations.

According to Pavulaan's original description, *viridissima* specimens vary in the degree to which the subspecies' three ventral green scaling characters are manifest – including brown topotypical individuals with **no** green scaling. While the green characters are the most **visible** *viridissima* attribute, subspeciation is primarily about evolutionary factors and not just how something appears to the human eye. Thus, Pavulaan errs throughout his article by using the subspecific **name** *viridissima* in relation to reported "greenish" individual specimens (**forms**) in the Midwestern populations of *turneri* and other areas. The term *viridissima* is a subspecific name, not a tag for a variation or form.

He misuses the subspecific **name** *henrici* in the same way for the "brownish" **form** within the topotypical *viridissima* population. The all-brown individuals at the type locality of *viridissima* are just as much *viridissima* as the green ones. I embrace *viridissima* as being subspecifically distinct from *henrici*

because of their different evolutionary ancestry, larval host associations, and morphological characters. *Viridissima* also differs phenotypically from its nearest relatives – *margaretae* and *yahwehus*.

Mr. Pavulaan did not figure or describe the brown *viridissima* morph. The following is a brief comparison of brown *viridissima* (Figs. 23-24) with *yahwehus* and *henrici*, and *yahwehus* and *margaretae*.

Dorsally, all *viridissima* (males and females) are typical of the *Ilex* group in that they have **very little**, if any, red on their forewings; on their hindwings, they frequently have red patches along the outer margin at the tails (especially females). Thus, in the dorsal aspect, *viridissima* is marked much like *yahwehus*. *Henrici* often have **much more** dorsal red scaling than *viridissima*, especially on the forewings of males (Fig. 27). Ventrally, the apical area of the forewing in *viridissima* is usually a much lighter brown than, and in strong **contrast** with, the dark brown of the basal two thirds of the wing inward of the postmedian line. On the hindwings, the area between the dark basal area and the marginal gray scaling is **also light** brown.

Viridissima's overall ventral appearance is light brown in the limbal areas **contrasted** against dark warm brown basally (sometimes washed or peppered with green). The brown morph of *viridissima* differs from the green morph only in its lack of green scaling. *Viridissima's* tails are true tails – they are narrow, have length, and a pointed terminus.

Yahwehus' overall ventral forewing appearance is medium rust brown in the limbal area with the area basad of the postmedian line **only slightly** darker rust brown; on the hindwing *yahwehus* is dark brown to black brown basally with dark rust brown in the limbal area and sometimes glazed (in fresh specimens) over the entire ventral surface with a wine color.

Henrici's overall ventral hindwing appearance is typically **black** basally with the limbal areas either (northeastern US westward to *turneri*) a very contrasting light brown, or (in Appalachians) a contrasting medium brown. The forewing contrasts in the same manner except that the area basad of the postmedian line in brown not black. *Henrici* does not have true tails – they have broad extended lobes with a rounded terminus.

Margaretae, *yahwehus*, and *viridissima* all have restricted red dorsally. *Henrici* and *turneri* may have a great deal of red dorsally. All individuals of the three *Ilex* group subspecies have true tails. Most non-*Ilex* group specimens do not (there are individual exceptions). *Henrici* and *turneri* are usually noticeably smaller than the three *Ilex* group subspecies. Ventrally, *margaretae* usually appears concolorous light to medium brown, *yahwehus* appears more contrasting but in dark dirty brown shades, while *viridissima* usually appears brighter and more contrasting in pleasing shades of brown and green.

The relationship of the populations in the northeastern area of the United States is very complex because two very distinct and evolutionarily distant subspecies are now in direct contact. One is *D. h. viridissima* of the Floridian parented *Ilex* group, and the other is *D. h. henrici* of the western parented non-*Ilex* only group. These two subspecies while in contact geographically, are separated evolutionally by thousands of years. The morphological and biological characteristics of each of these subspecies, which have taken tens of thousands of years to evolve, have doubtlessly been clashing in this tension zone² for a long time. A great deal of detailed field work needs to be done in this tension zone area.

The correct understanding of *viridissima*, based on the information supplied to me by Schweitzer and Pavulaan, seems to be that all of the monophagous *Ilex* populations along the east coast from about New York City south to the upper coastal area of North Carolina should be considered *viridissima*. These populations vary greatly in the percentage of green and brown morphs. However, this is the only *henrici* subspecies to have any significant amount of green specimens. Thus, the green morph remains as the most distinctive phenotypic character of this subspecies.

The limit of *viridissima's* inland range, and where it meets and is in tension with *henrici*, is beyond my knowledge and remains for others to work out. Dos Passos' lectotype of *henrici* is from Philadelphia, PA. According to Schweitzer, the shift to holly is east of the type locality in New Jersey. The fact that *D. h. henrici* includes *Ilex* as a host in some of its oligophagous populations (i.e. in Rhode Island) complicates this situation. In the tension zone, non-*Ilex* associated green *henrici* specimens may occur on occasion due to the interbreeding of these two subspecies.

² A "blend zone" is where two subspecies, one having arisen from the other, blend (a phenomena of divergent evolution). A "tension zone" is where two subspecies, of different refugia ancestors, meet and clash (a phenomena of convergent evolution).

DESCRIPTION OF A THIRD *ILEX* ASSOCIATED SUBSPECIES.

I have been collecting butterflies extensively throughout the southeastern United States for 31 years. Occasionally, I have come in contact with colonies of *D. henrici* in this region. It became apparent to me about 1973 that two *henrici* subspecies were present in this area. In 1975 I submitted an article to the *Bulletin of the Allyn Museum* describing the South Carolina population as a new subspecies. This paper was accepted and an initial time frame was set for publication. However, several factors unrelated to the research itself, resulted in that and several other projects, being put on hold – until now.

D. h. margaretae

Dos Passos described *Incisalia henrici margaretae* in 1943 from only four Florida specimens: two males taken at Deland, Volusia County, in the central coastal region, and two females collected near Auburndale, Polk County, in the south central part of the state. The holotype was a male from Deland, so that has become the type locality, though dos Passos did not specify it as such. His subspecies was based on four characters as contrasted against nominate *D. henrici*. His description is as follows. I have highlighted these characters in **bold**. In his comments section, dos Passos stated that the AMNH had no specimens from Georgia or South Carolina. The AMNH did have two specimens from Southern Pines, North Carolina, which he considered intermediate in dorsal color (more HW red) and length of tails.

“In Florida a very distinct race occurs, which, while having certain characters of *henrici*, is easily differentiated by the **length** of its tails. These are more than twice as long as in typical *henrici*. It is also somewhat **larger**, especially the females, and is **uniformly** dark grayish brown on the upperside. The underside is a more **uniform** color because the basal area is lighter and the limbal area darker than in *henrici*.”

From 1973 to 1988 I made several excursions to the type locality of *D. h. margaretae* on Hwy. 44 just east of Deland. The habitat is usually very wet, almost marshy, in the spring. Depending on the arrival of warmer weather, topotypical *margaretae* could be on the wing as early as the end of January or be found as late as the first of April. The topotypical population is very homogeneous in appearance.

During this time, I accumulated a large number of specimens of topotypical *margaretae* which was usually abundant about its larval host, *I. cassine*. *I. cassine* grows profusely in this forested area of Florida. *D. h. margaretae* fly high in the trees and only occasionally drop to within 10 feet of the ground, which is usually to nectar at low *I. cassine* or *Salix* L. (willow) flowers. I employed a series of pole extensions that enabled me to net specimens up to 30 feet high. Even with this method, the majority of observed individuals were too high and could not be caught. Specimens could often be seen about the tops of the highest pines. In this respect, collecting *margaretae* is very similar to collecting *Mitoura hesseli*. A good idea of its abundance is illustrated by the fact that even with this general unobtainability, 50 specimens could be captured in just 3 - 4 hours. This abundance was normal and did not represent a “population explosion” as hairstreaks are occasionally known to have.

The only other Florida *henrici* I have personal experience with is an *I. cassine* associated population I came across in March of 1988 near the Jct. of roads 337 and 326 in Levy County. I collected 17 specimens which all have the ventral basal area markedly darker than topotypical *margaretae*.

In addition to my own specimens, I have seen Florida *henrici* in the collections of Rick Gillmore, Jeff Slotten, Dave Baggett, and the Florida State Collection of Arthropods, Gainesville.

There is one striking observation to be made about these Florida *henrici* – only specimens from the central east coast to the south central area of Florida seem to possess all four of dos Passos characters and are thus true *D. h. margaretae*. I consider the range of *margaretae* to be limited to this basic area. Exactly how far inland this subspecies may be found is not known by me. I do know that specimens from Nassau and

Duval counties (Jacksonville) are atypical of *margaretae* and are probably best considered a blend zone population near the new subspecies, or the new subspecies described herein.

A New Subspecies

To lepidopterists who are only familiar with *henrici* from outside the deep south, the first thing noticed about specimens from central North Carolina south are their very long tails. (These tails may often be six mm long on some Floridian males.) This striking character is undoubtedly why some popular butterfly book authors have extended the range of *margaretae* well north of central Florida into southern Georgia (Harris, 1972 & Scott, 1986), and South Carolina (Howe, 1975). However, there are three other characters which typify *margaretae*, and these seem to have been largely ignored by those observing southern specimens. Even many Florida lepidopterists are apparently only assessing *margaretae* by the length of their tails.

A comparison of Southern and Floridian specimens against the four characters dos Passos listed as being definitive of *margaretae*, reveals that two phenotypes are present in this region. One is *margaretae*, from within the previously restricted range. The other extends from central North Carolina south through Georgia to Jacksonville and apparently down the west coast of Florida to Levy County and (evidently) west to Mississippi. Specimens from throughout this broad area are quite similar, are very different from *margaretae* in two characters, and moderately different in one. The moderately different character is that specimens from this area are noticeably larger (character noted by Pavulaan, 1998). They differ markedly in that they have more red at the margin of the dorsal HW (as noted by dos Passos), and most noticeably, have very contrasting ventral basal and limbal areas which are often partially delineated by a white line (as pictured by Abbot). The tails are about the same, reducing as one goes northward.

I first encountered this undescribed subspecies in Givhans Ferry State Park, Dorchester County, South Carolina in 1971. Since then I have collected it from the following locations. GEORGIA: Bryan County, about 30 specimens nr. Fort Steward, 1976 (mid March); SOUTH CAROLINA: Aiken, Barnwell, Berkeley, Charleston, Colleton, Dorchester, and Orangeburg counties, about 90 specimens accumulated from 1971 to 1998 (mid February - late April); NORTH CAROLINA: Hoke County, 1 worn specimen near Raeford, 1974 (early April).

I have also seen additional specimens from Bryan County, Georgia in the collection of R. T. Arbogast, and a long series collected by the late R. B. Dominick at the Wedge Plantation, Charleston County, South Carolina (now at the University of South Carolina).

Biologically, this new subspecies differs from *margaretae* in that it is the result of larval host adaptation to *Ilex opaca* which, in turn, allowed the species to expand its range, both environmentally and geographically, into dryer and upland environs. It is distinct morphologically, as noted above and in its description as follows. It should be remembered that this new subspecies, as a part of the *Ilex*-group, has never been directly related to the nominotypical *D. henrici*, and as such, can have no clinal or blend zone relation with *henrici*. At any place where these two may be found to be in contact (and thus producing phenotypically intermediate offspring), these populations should technically be referred to as tension zone populations, not blend zone populations.

Deciduphagus henrici yahwehus Gattrelle, new subspecies

Diagnosis. There is very little variation in *margaretae* (Figs. 13-18). The overall general appearance of both sexes of *margaretae* is about the same. They are a warm gray brown dorsally. Females occasionally have a few red scales on the DHW margin at the tails, males rarely do. The ventral HW basal and limbal browns of *margaretae* are much less contrasting than in the other subspecies (especially in males). Specimens of *margaretae* are often encountered with a good bit of rusty red-brown suffusion over the ventral forewings. The anterior portion of the submarginal line of basally pointed chevrons that borders the gray marginal area on *margaretae*'s ventral HW may also contain patches of rusty red. The tails are quite long, as can be seen from the figures. *Yahwehus* differs in that the ventral HW basal and limbal areas are much darker and more contrasting. The basal area in *yahwehus* is blackish and the limbal area brown. As pointed out by

Pavulaan, fresh specimens of *yahwehus* sometimes have a purplish wine tint to the ventral surface. Dorsally, *yahwehus* is a darker brown than *margaretae* and have browner, less checkered margins. Specimens of *yahwehus* often have a small patch of red along the outer margin of the hindwings at the tails (both sexes). The tails are not as long as in *margaretae*, varying from 2 to 4 mm throughout its range. Generally, these tails are always twice as long as in *henrici*. The average forewing radius (from base of wing to apex, right FW) of the 49 specimens comprising the type series is 14 mm (same for both sexes) – nearly all specimens are 13 to 15 mm.

Description. *Male* (Figs. 7-8): *Head*: face, eyes, palpi, and antennae slightly darker than *margaretae*. *Thorax and abdomen*: dark blackish brown dorsally, dark gray ventrally, with legs and ventral thoracic hairs dark charcoal gray (in *margaretae*, the ventral thoracic hairs are light gray and the legs are a markedly lighter gray.) *Forewings*: dorsally, uniform, dark brown, slightly grayish, with restricted white checkering along the fringe of wing and usually limited to the apical margin; ventrally, rusty brown with some specimens very lightly dusted with green scales, postmedian line prominent often black inwardly and highlighted with white outwardly, with the fringe more checkered looking on this surface. *Hindwings*: dorsally, same color as forewing, with about 30% of specimens having a small amount of red scaling along the outer margin in cells Cu_1 and Cu_2 in the area of the tail, average tail length 2.8 mm; ventrally, basal area dark blackish brown to black, often edged with white except at the middle of wing, fringe not checkered, marginal bluish gray area outlined by a row of occasionally prominent basally pointing black chevrons. *Female* (Figs. 9-10): *Head*: as male. *Thorax and abdomen*: ventral slightly lighter gray than male. *Forewings*: dorsally, ground color as in male, may have a very small amount of red scaling in postmedian area; ventrally, as in male. *Hindwings*: dorsally, color as in male except that about 75% of specimens have red scaling along the outer margin in cells Cu_1 and Cu_2 in the area of the tail, average tail length 2.5 mm; ventrally, as in male.

Types. *Holotype* ♂ (Figs. 7-8): vicinity of Bull Swamp, Orangeburg County, South Carolina, 10 March 1994, coll. Ronald R. Gatrell. *Allotype* ♀ (Figs. 9-10): vicinity of Bull Swamp, Orangeburg County, South Carolina, 10 March 1994, coll. Ronald R. Gatrell. *Paratypes*: 33 ♂♂, 14 ♀♀, all coll. R. R. Gatrell unless otherwise noted: SOUTH CAROLINA: AIKEN COUNTY: White Cedar bog north of Aiken State Park, 1 ♀ (worn), 21 April 1984; CHARLESTON COUNTY: Wedge Plantation, 1 ♂, 1 April 1971; 1 ♀, 30 March 1968 (both leg. R. B. Dominick); COLLETON COUNTY: Edisto Island on *I. vomitoria*, 1 ♂, 1 ♀ (worn), 4 April 1980; 4 ♂♂, 29 March 1986; DORCHESTER COUNTY: Givhans Ferry State Park, 1 ♂, ex pupa 10 February, 1 ♀, ex pupa 1 March, 3 ♀♀, 21 March 1976; on Hwy. 61 3 mi. east of Givhans, 1 ♂, 27 March 1986; ORANGEBURG COUNTY: Hwy. 172 1 mi. east of Hwy. 672, 1 ♂, 5 March, 1 ♂, 27 March 1992; Bull Swamp 2 mi. north of North off Hwy. 178, 3 ♂♂, 2 ♀♀, 10 March 1994, 1 ♂, 4 March 1997; GEORGIA: BRYAN COUNTY: Hwy. 204 nr Ogeechee River, 1 ♂, 1 ♀, 20 March 1976, 8 ♂♂, 19 March 1977; Hwy. 204 3 mi. north of Morgans Bridge, 1 ♂, 17 March 1980 (leg. R. T. Arbogast); 3.3 miles south of Ellabelle, 3 ♂♂, 17 March 1982 (leg. R. T. Arbogast); Pine Barrens Rd. 1 ♂, 2 ♀♀, 29 February 1992 (leg. R. T. Arbogast); 5 ♂♂, 2 ♀♀, 2 March 1992 (leg. R.T. Arbogast). The holotype, allotype, and 2 paratypes are deposited in the American Museum of Natural History (AMNH), New York, where the type series of *D. h. margaretae* is located. 2 ♂♂ and 2 ♀♀ paratypes are deposited in the Carnegie Museum (CMNH), Pittsburgh, where the bulk of the paratypes of *D. h. viridissima* are located. The remaining type specimens are in the Museum Of The Hemispheres (MOTH), Goose Creek, South Carolina.

Geocological type locality. *I. opaca* groves in 50 mile radius of Bull Swamp, Orangeburg County, South Carolina.

Etymology. YHWH (translated as Jehovah in English) is an ancient Hebrew name for God as Creator. This is the mono-Deity of the world's Jews, Moslems, and Christians. From this perspective, *yahwehus* is named for The Architect of the natural world. Its common name can be "The Architect," or "Architect's Elf." Johnson established *Deciduphagus* as masculine. The *us* ending is correspondingly masculine in *yahwehus*.

Remarks. The parameters of *D. h. yahwehus*' range are not known. According to Pavulaan, it evidently extends westward to Mississippi. The populations in the panhandle of Florida are *yahwehus*. In 1969, while living in Pensacola, Florida, I observed (but did not net) what was probably *yahwehus* flying about some *Ilex opaca* trees near Cantonment in Escambia County. When I moved a year later, the area was being considered for development as a park and zoo. That same year, I also observed (but was unable to net) two tailed elfins flying about a large planted *I. opaca* in a cemetery just east of Foley, Baldwin County, Alabama. How far down the west coast of Florida *yahwehus* extends is unknown. My specimens from Levy County (except for tail length) are certainly closer to topotypes of *yahwehus* than topotypes of *margaretae*. Likewise, specimens I have seen from Jacksonville, Florida seem to be closer to *yahwehus* than *margaretae*. Florida lepidopterists need to correctly define the range of *margaretae* subject to dos Passos characters, specifically the lightly contrasting ventral HW. Too much emphasis has been placed on tail length. The northern limit of *yahwehus*' range is probably north central North Carolina. However, too much attention can be placed upon the length of tails of *yahwehus* also. All biological and morphological characters must be considered together in accessing populations at the outskirts of its range. *Yahwehus* will undoubtedly prove to be the primary subspecies throughout the non-montane southern and southeastern US.

The Original Descriptions and Key Notations

Polyommatus irus Godart, 1824. Here translated from the original French into English (Fig. 5).

It has around 15 lines [in its] wing spread. The upper part of the male is a brownish-blackish iridescent with a small oblong opaque spot [male sex patch] near the middle on the side of the upper wings.

The underside of its first wings [primaries] is nearly the color of the [whole] upperside, with two small rust-colored lines transversal and wavy, on the middle of the surface.

The underside of the second wings [secondaries] is rust-colored at the base, with two darker flexuous [winding] lines; it is sprinkled with gray around the extremity with a point of brown placed near the angle of the anus. We have not seen the female. Is it in America?

Designation of a type and type locality for *Polyommatus irus irus*

In 1975 I received Godart's type of *Polyommatus irus* (Fig. 5) from the Paris Museum for examination. I found it to be in very good condition. I sent this specimen to the Allyn Museum, Sarasota, Florida, where it was photographed and examined by F. Martin Brown and affirmed, by the labels and insect pin, to be a specimen of some antiquity. The obvious problem is that Boisduval and Leconte described the type as "very defected and dilapidated" (see *Thecla irus* below). Thus, I believe this type specimen, by its excellent condition, is almost certainly not the original which Boisduval and Leconte viewed. I let this go unchallenged in 1975 and placed a label on it affirming it as the holotype (specimen also figured and additional information provided by Dr. Kurt Johnson in J. Lepid. Soc., vol. 45, pg. 147, fig. 18). Because the validity of this type is so highly suspect, and to further stabilize the nomenclature, I now designate this same specimen also as neotype for *Polyommatus irus* Godart 1824.

The *irus* type locality should also be addressed. Not only did Godart not designate a type locality, he put a question mark after America. There needs to be a type locality established. Accordingly, I herein point out that the *irus* type specimen certainly does not match any southern population. It does line up reasonably with the *Baptisia* feeding *irus* adjacent to Philadelphia in New Jersey. Godart's *Polyommatus falacer*, TL Philadelphia, PA, was described in the same publication with *P. irus*. I believe it is reasonable to assume that the true *irus* type may have come from this same area via the same source. Therefore, to further stabilize the nomenclature, I herein restrict Godart's *Polyommatus irus* to the geocological type locality of the *Baptisia* feeding *irus* populations (Fig. 6) in the southern area of New Jersey east of Philadelphia. My definition of "area," in this case, extends out 50 miles.

Thecla arsace Boisduval & Leconte, 1833. As translated from the original French into English (Figs. 3-4).

This *Thecla* is the size of the *irus* to which it resembles a lot by the facies and by its actions, and forms with this species and the following, a small neat group just to the present to North America and to the Antilles.

The dorsal of the wings of the male is a blackish-brown with a small dull oval spot near the side of the primaries; on the female it is more brown, with the extremity a fawn-red, forming on the primaries a large spot a little mellow by its contours with a general tint, and on the secondaries a spot (more small) situated fairly near the anal angle. Beyond that, the four wings are indented, with fringe absolutely like the *irus*.

The ventral of the wings is brown, with the middle crossed by a common line, sinuated with a brown black; the extremity of the primaries is more pale, divided by two small crossing rays more obscure and little distinguishable; the extremity of the secondaries is sprinkled with cinder gray like the *irus*, divided by a row of brownish spots little marked, lined up [aligned], and forming almost a curved ray uninterrupted.

The caterpillar is a reddish [rosy] flesh color, with the dorsal of the white back from the second ring to the ninth segments, and divided by two parallel lines, brought together and interrupted, an obscure green color. Near the base of the feet, one sees a marginal ray of the same color, bordered with white on the bottom, and between this and the dorsal rays there is like many similar species a series of seven or eight angled traits.

The pupa is reddish, with the anterior part and envelops it with wings of a greenish tint.

The *Thecla arsace* is rare. It lives in Virginia and Georgia on several scrubs of the family *Vaccinieae*.

Thecla irus Boisduval & Leconte, 1833 (= *henrici*). Here translated from the original French into English (Figs. 1-2).

Godart is the first author who made the acquaintance [or made known] this Lepidoptera; but the description he gives of it having been made on an individual male very defected by dilapidation, it would not have been possible to recognize this type if we had not seen it in the collection of the National Museum the only example that served him in his work.

It has about 15 lines of scales, that is it has [is] about the size of *Quercus* of Europe. The dorsal of the wings of the male is (of) a blackish-brown, with a small oval spot, flat grayish (color), near the side of the primaries, as in many of the species of the same kind; on the female it is more brown, with the rear section a reddish color more or less visible, which blends in with the general tint. Beyond that, the four wings are indented, with the fringe (cut between) with a whitish color.

The ventral of the wings is brown, with a crossing white line situated a little upwards of the middle and fades and is sinuate. The primaries have in the cell an obscure trait. Their extremity is a little reddish, divided by a ray little visible and interrupted by nervules. The secondaries have an extremity strongly sprinkling of a cinder gray, and divided by a crossing line interrupted by a purplish [wine] brown, little marked, often followed by one or two small brown spots. The base is lightly sprinkled with gray, and separated from the tint of the middle by a crossing, waving line.

The caterpillar is much like (resembles) the *liparops* (probably *favonius*). It is a yellowish green, with two dorsal rays interrupted by a lateral ray, and eight oblique lines of a light obscure green. The pupa is rust colored, garnished with little hairs, with two longitudinal rays more obscure. This species is found, but pretty rarely, in Georgia on several species of *Vaccinium*. It also lives in the Antilles.

Note: Their description of the male is based on the holotype which they saw and documented as having a male scent patch (*irus*). The male they figured was produced by Abbot and clearly lacks a scent patch (*henrici*). The rest of their description apart from that of the male, is based on Abbot's information and likewise applies to *henrici*.

Note: Scudder (1889) on page 839 reports that Abbot recorded rearing *irus* (= *henrici*) on *Ilex* (holly). *Ilex* is the only confirmed larval host of *henrici* in the non-montane southeastern US. The above statement that Abbot found the butterfly on several species of *Vaccinium*, most likely refers to adults at nectar. *D. irus* larvae feed only on *Baptisia*, not *Vaccinium* (blueberry). The false association of *irus* with blueberry throughout the old literature stems from Boisduval and Leconte's confusion of Godart's *P. irus* with the then unknown *D. henrici*.

Thecla henrici Grote and Robinson, 1867.

Male and Female – size and form of *Thecla angustus*, Kirby. Above, of a uniform dark brown shaded diffusely over the nervules of primaries (♀), and on secondaries before anal angle (♂ ♀) with brighter rusty brown; in the male these latter show a light brassy reflection. The fringes on the primaries are white, interrupted and entirely and very narrowly tipped with blackish. On the secondaries, the fringes are much as on the primaries, but more prominently interrupted with black at the extremity of the nervules, where also they are somewhat extended, especially inferiorly, and most prominently so before anal angle, the latter twisted inwardly, and prominent owing to the excavation of the internal margin within it; the white color is for the most part reduced to a narrow basal line. Beneath the primaries are of a brighter brown from the base outwardly to the single transverse line at apical third running over the nervules. The “veins” are here obsoletely marked with blackish. The single transverse line is straight, once inwardly and slightly notched opposite the disc and, not attaining internal margin, is discontinued at the last branch of median nervule. The internal margin, below median nervule, is of a duller and fainter more obscure brown. Outside of the transverse line, the wing is paler, being of an obscure ochre's, divided centrally by a faint light brown shade, and of a similar hue along internal margin inferiorly, leaving the lighter color to appear as interspatial blotches; fringes as on upper surface. Secondaries with the base of an intense blackish-brown, paler along the costa, and limited outwardly by the median line; this portion of the wing is sparsely clothed with pale and longer hairs, except on costal region outwardly. The median line is shaped as in *T. angustus*, but is succeeded by white scales. These are very prominent at the inception of the line on costa, before the first outward inflection, are obsolete centrally, but again appear, edging the line externally, before internal margin. Outside the line, the wing is ochreous brown, (nearly as on primaries outside of the transverse line); this color is most evident superiorly, inferiorly it is obscured by the hoary appearance of the wing and obtains here more narrowly. It is succeeded by an undulating series of semilunate, black, interspace points edged obsoletely inwardly by white scales. Beyond these marks, the terminal space is apically bright intense brown; below this, the wing is entirely hoary, somewhat of a lilac hue. There is a narrow, terminal, interrupted, blackish line, outside of which the extreme external margin is again entirely clear brownish; fringes much as on upper surface some white scales linearly arranged within the extra anal angle on the margin.

Head and body, above blackish, with longer and sparsely scattered pale hairs. Antennae, black, prominently annulated with white; club, black, tipped with fulvous. Palpi, black, with some longer whitish hairs beneath. Eyes, very narrowly

margined with white behind. Under thoracic surface and legs at base, clothed with long whitish hair. Tarsi, testaceous, with lateral white scales; tibiae marked within with whitish. Abdomen, beneath, obscure whitish.

Expanse, 1.10 inch. Length of body, 0.40 inch. Habitat. – Atlantic District. (Maine! To Pennsylvania!)

This species is intermediate between *Thecla augustus*, Kirby, (*T. augustinus*, West.) and *Thecla irus*, as illustrated by Boisduval and Le Conte, and is apparently associated geographically with the former. It differs from *T. augustus*, in the ornamentation of the wings beneath and the brighter colored antennal tips. It is smaller than *T. irus* and, while resembling it in the ornamentation of the wings beneath, is at once distinguishable by the absence of the inner purplish basal space circumscribed by arcuate white line. From *Thecla arsaec*, Bdv. and Lec., it differs by the markings of both wings beneath; the shape of the transverse line is very different, and these are not followed by white scales in Le Conte's figures, which *Thecla henrici* has nor the brown discal patch and the series of interspatial, subterminal, brown blotches in the secondaries beneath.

To the kindness of Mr. Scudder we owe a specimen of this species, ticketed as from "Maine" (Smith), which does not differ from a number of specimens from the vicinity of Philadelphia, except in that the secondaries show a very few white scales, very narrowly arranged, edging the secondaries linearly along external margin. There is a variation in the extent of the brown apical space on the secondaries beneath. In some specimens this encroached on by the hoary shading so that it is nearly lost. On the under surface of the primaries the veins margining the cell are most prominently discolored with blackish. In the males the brighter shadings of the primaries above are obsolete. With reference to *Thecla augustinus*, West., (*Thecla augustus*, W. Kirby), it may be remarked that Fabricius' *Hesperia augustus*, Ent. Syst., 3 p 275, will very probably be irrecoznizable. The description: – "H. R. alis caudatis albis; limbo fusco, subtus ferrugineo flavoquo variis, posticis strigis duabus cineris" – refers to a **tailed species**, and a reference is made to "*Papilio augustus*, Jon., fig. Pict. 6 tab. 3, fig. 1.," while the habitat is given of "America" on Drury's authority. The work cited is of very old date and unknown to us; until the species intended is identified, there can be no impropriety in retaining Kirby's name for our common species.

[N.B. I suspect the "unknown work" may be Jones' "Icenes" - R.R.I.]

Note: This OD of *T. henrici* was sent to me as a hand written copy of the OD. The odd spellings are clearly in the original as the handwriting is very good. However, there are a couple places in the Latin, at the end, where I had trouble reading the script. Unfortunately, I failed to make a notation on this copy sent me as to whom I received it from (nearly 30 years ago)! It may have been from the late Dr. J. F. Gates Clarke (USNM) (as I have some other hand written notations from him on this project in similar handwriting), or the late C. F. dos Passos.

I find Fabricius' mention of "a tailed species" of great interest because both southeastern subspecies of *D. henrici* have long tails. One is further lured by the fact that both Fabricius' *Papilio* (= *Cercyonis*) *pegala*, and *Papilio* (= *Phoebis*) *drya* (= *eubule*) were described from Charleston, South Carolina – an area where the tailed *D. h. yahwehus* (? = Fabricius' and Jones' *augustus* ?) is not uncommon. I have never seen Jones Icenes. Someone with access to these publications should investigate this further and resolve this indeterminate taxonomy. Are these names valid, but long dormant, and in need of resurrection and proper application. Or are they, as Scudder states, unrecognizable, and thus potentially disruptive, and in need of formal suppression. Has this already been done? To this point, both *Hesperia augustus* and *Papilio augustus* are *nomen incognitum*. If they are clearly recognizable as tailed *henrici*, they would be available to supplant *D. henrici* as the nominotypical taxa (specifically subspecies *yahwehus*) and negate the species name *D. augustus*.

ACKNOWLEDGMENTS

Thanks to Harry Pavulaan for information and loan of specimens, inc. the *viridissima* types, Dr. Dale Schweitzer for critical textual review and life history information, Dr. Kurt Johnson for technical review, Ms Anne Latimore for translation of the original descriptions, and Ben Gatrell for photographs.

LITERATURE CITED

- BOISDUVAL, J.A., & J.E. LECONTE. 1833. *Historie générale et iconographie des Lépidoptères et des chenilles de l'Amérique Septentrionalis*. Vol. 1. Paris 228 pp.
- CLENCH, H.K. 1943. Two New Subspecies of *Incisalia* (Lepidoptera: Lycaenidae). *Canadian Ent. 75*(10): 182-185.
- COOK, J.H., & F.E. WATSON. 1909. *Incisalia* (Lepidoptera) from Texas. *Canadian Ent.* 41(6): 181-182.
- DOS PASSOS, C.F. 1943. Some New Subspecies of *Incisalia* from North America. (Lepidoptera, Lycaenidae) *American Museum Novit.* No. 1230: 5 pp.

- GODART, J.B. 1824. Encyclopédie Méthodique Paris. 9: 674 pp.
- GROTE, A.R., & C.T. ROBINSON. 1867. Descriptions of American Lepidoptera, No. 2. Trans. of the Amer. Ent. Soc. 1 (2): 171-192.
- HARRIS, L., Jr. 1972. Butterflies of Georgia. Univ. of Okla. press, Norman OK. 326 pp.
- HEITZMAN, J.R., & J.E. HEITZMAN. 1987. Butterflies and Moths of Missouri. Missouri Dept. of Conserv., Jefferson City, MO. 385 pp.
- HOWE, W.H. 1974. The Butterflies of North America. Doubleday & Co., Inc. New York, NY. 633 pp.
- JOHNSON, K. 1992. The Palaearctic 'elfin' butterflies (Lycaenidae, Theclinae). Neue Ent. Naschr. 29:1-141, ill.
- LAYBERRY, ROSS A., PETER W. HALL & J. DONALD LAFONTAINE. 1998. The Butterflies of Canada. Univ. of Toronto Press, Toronto, Canada 279 pp.
- PAVULAAN, H. 1998. A New Subspecies of *Incisalia henrici* (Grote & Robinson) (Lepidoptera: Lycaenidae) from the Outer Banks of North Carolina. Maryland Ent. Vol. 4 (2) 1-16.
- RADFORD, A.E., H.E. AHLES & C.R. BELL. 1968. Manual of the Vascular Flora of the Carolinas. Univ. of North Carolina Press, Chapel Hill. 1183 pp.
- REMINGTON, C.L. 1968. Suture-zones of Hybrid Interaction Between Recently Joined Biotas. Evol. Biology, Vol. 2 (8) 325-413.
- SCOTT, J.A. 1986. The Butterflies of North America, A Natural History and Field Guide. Stanford Univ. Press, Stanford, CA. 583 pp.
- SCUDDER, S.H. 1889. The Butterflies of the Eastern United States and Canada with special reference to New England. Publ. by author. Cambridge, MA. Pages 834-841.
- SHULL, E.M. 1987. The Butterflies of Indiana. Indiana Academy of Science, U. of Indiana Press, Indianapolis, IN. 262 pp.

The Taxonomic Report is a publication of
The International Lepidoptera Survey (TILS).

(A Non-Profit Scientific Organization)

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.

The Taxonomic Report is projected for 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 and reproduction for personal use (i.e. a museum or university may make as many copies as needed in whatever format desired). Non-subscribers may receive individual issues on 3½" disc at any time at \$9 per issue post paid. **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 on how to best handle your research for publication.

TILS has established 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 **write to:** Ronald R. Gatrell, MOTH Curator, 126 Wells Road, Goose Creek SC USA 29445.



The Taxonomic Report

OF THE INTERNATIONAL LEPIDOPTERA SURVEY



A NEW SUBSPECIES OF *BREPHIDIUM ISOPHTHALMA* (LYCAENIDAE: POLYOMMATINAE) FROM COASTAL SOUTH CAROLINA.

HARRY PAVULAAN

494 Fillmore Street, Herndon, Virginia 22070

AND

RONALD R. GATRELLE¹

126 Wells Road, Goose Creek, South Carolina 29445

ABSTRACT. *Brephidium isophthalma pseudofoea* was described in 1873 from the Florida Keys. The ventral ground color of the wings in topotypical *pseudofoea* is a yellowish brown. The antennal clubs of *pseudofoea* have prominent orange red tips. The ventral surface of the abdomen of *pseudofoea* is broadly white to very light gray and usually extends halfway around the sides of the light to medium brown abdomen. Specimens of *Brephidium isophthalma* from coastal South Carolina differ greatly from topotypical *pseudofoea*. Accordingly, *Brephidium isophthalma insularis* is described as a new subspecies from coastal South Carolina. The antennal clubs of *insularis* are only slightly tipped in red, with many specimens having the antennae completely black. The light area on the ventral abdomen of *insularis* is medium to dark gray and does not extend up the dark brown sides of the abdomen, giving it a very dark appearance. The ventral surface of the wings of *insularis* are medium chocolate brown with prominent white markings. The spring brood of *insularis* is especially unique and was given the name *carolina* (Pavulaan, 1993). The northern and southern limits of *insularis*' range is undetermined. However, we expect *insularis* to be the resident subspecies in at least South Carolina, Georgia, and northern Florida. Its common name is Island Pigmy Blue. It is possible that *insularis* is a distinct species. It is likely that *pseudofoea* is conspecific with *B. exilis*.

Additional key words: subtropical species, resident species.

SUBSPECIFIC STATUS OF THE EASTERN PIGMY BLUE

Lycaena pseudofoea was described by Morrison in 1873 (without figures) from three specimens collected at Key West, Florida. The Pigmy Blue is a local, but common, butterfly. However, its proper taxonomic status is unsettled. It is in need of a definitive study to determine its true specific/subspecific relationships. Scott (1986) treats *pseudofoea* as a subspecies of *Brephidium exilis* (Boisduval). Calhoun (1997) treats *pseudofoea* as a subspecies of *isophthalma* Herrich-Schaffer, but states that it may be a subspecies of *exilis*. Opler (1984) treats *B. i. pseudofoea* and *B. exilis* as separate species. Our opinion is that all these taxa are probably part of the same species – *exilis*.

One of us, Gatrell, was a resident of San Diego, California from 1967 - 1969 and is very familiar with *exilis* (Figs. 3-4) in southern California. Occasional specimens of California *exilis* (Fig. 5, collected by David Hawks in Riverside, California) are similar to topotypical *pseudofoea*. Morrison referred to the ventral ground of *pseudofoea* as being concolorous. However, some specimens of typical *pseudofoea* from the Florida Keys tend to have light suffusion at the base of the ventral wings. Specimens like these lend credence to Scott's taxonomic alignment. However, the environmental, biological, and morphological

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

differences of the eastern and western US taxa are so great that genetic analysis and/or breeding studies are needed before a nomenclatural shift should be formally adopted.

We have not examined the genitalia of our new subspecies or *pseudofea*, but significant differences in their antennal clubs (shape and color), adult size, and morphological characters indicates that they very well may be different species. Thus, not only may the subspecific alignment of our new taxon eventually need to be changed, its specific status may need reconsideration also. We have followed the most conservative course and have placed our new taxon under *isophthalma*.

NORTHERN RESIDENCY AND RANGE OF THE PIGMY BLUE

Populations of *Brephidium* are common along Florida's coasts. In southern Florida *B. i. pseudofea* flies year round (Gerberg, 1989). Up to 1986, specimens of *B. isophthalma* ssp. from the northern area of its range in coastal South Carolina had been collected only sporadically and only in the summer and fall (Harris, 1972 & Gatrell, 1985). These flight dates had led Gatrell to assume that *isophthalma*, regardless of its tiny size and weak flight, was only a nonresident summer migrant in south coastal South Carolina.

In March of 1986 Pavulaan found the Pigmy Blue fresh and common on Hunting Island, Beaufort County, South Carolina. The presence of a large number of fresh specimens that early in the year is strong evidence that *isophthalma* is a resident species in coastal South Carolina. This is further supported by log notations (as follows) made by Gatrell regarding the winter of 1985. These notations indicate that the winter of 1985 was earlier and colder than normal. We also see that the spring of 1986 was only slightly early and was otherwise normal.

Entry of December 20, 1985: "Dec. has been very cold - freezing most nights." This is unusually cold for Charleston at that time of year. Spring appears to have arrived about two weeks early as the entry on February 7, 1986 reads: "has been warm for about a week 60 - 70." The entry on February 23 reads: "weather has been very warm for about a week 70's and 80's." It was also noted that temperatures dipped to freezing the nights of March 20 and 21, then warmed up again. It is typical in Charleston to have extended periods of warm weather from mid-February to mid-March, then one last freeze in March before spring completely sets in. (The freezes of March 20 and 21 are especially significant as Pavulaan found specimens of the Pigmy Blue common and fresh just six days later on March 27th.) Prolonged freezing temperatures in South Carolina are usually threatening to most subtropical wildlife like the Pigmy Blue.



Figures 1-12, *Brephidium* subspecies. Fig. 1 (d/v), ♂ *B. i. pseudofea*, 15 May 1978, Big Pine Key, Monroe Co., FL Fig. 2 (d/v), ♀ *B. i. pseudofea*, same data as 1. Fig. 3 (d/v), ♂ *B. exilis*, 11 May 1968, Balboa Park, San Diego Co., CA (leg. Gatrell). Fig. 4 (d/v), ♀ *B. exilis*, same data as 3. Fig. 5 (v), ♂ *B. exilis*, 25 June 1975, Santa Ana River, Riverside Co., CA (leg. Hawks). Fig. 6 (v), ♂ *B. i. insularis*, 9 June 1988, Cedar Key, Levy Co., FL (leg. Gatrell). Fig. 7 (v/d), ♂ holotype *B. i. insularis*, 3 Oct. 1993, Rt. 21 Nr. Beaufort, Beaufort Co., SC. Fig. 8 (d/v), ♀ allotype, *B. i. insularis*, 27 March 1986, Rt. 21 Nr. Beaufort, Beaufort Co., SC. Fig. 9 (v), ♂ paratype *B. i. insularis*, same data as 8. Fig. 10 (v), ♂ paratype *B. i. insularis*, same data as 7. Fig. 11 (v), light ♀ paratype, *B. i. insularis*, 24 Sept. 1972, Hunting Island, Beaufort Co., SC (leg. Gatrell). Fig. 12 (v), ♀ *B. i. insularis*, same data as 6. All specimens leg. Pavulaan except where otherwise noted. (d) = dorsal. (v) = ventral.

Snow, which would help insulate delicate wildlife on the ground, is very unusual in coastal South Carolina. (The most recent snow was ten years ago in 1989.) The climate, flora, and fauna of south coastal South Carolina and Pensacola, Florida is about the same. The authors thus state with certainty that *B. isophthalma* is confirmed to be resident along the immediate coast of South Carolina at least as far north as Fort Johnson in the Charleston harbor and probably up to at least south Myrtle Beach.

B. isophthalma has only been found around salt and brackish marshes on the Islands and immediate coastal mainland in coastal South Carolina. Several other butterfly species inhabit this narrow coastal area which are also primarily subtropical in their range and habitat associations. *Papilio Palamedes* (Drury), *Phoebis sennae eubule* (Linnaeus) (TL Charleston), *Eurema daira* (Godart), *Heliconius charitonius tuckeri* Comstock & Brown, *Agraulis vanillae nigrior* (Riley), *Phyciodes phaon* (W.H. Edwards), *Danaus gillipus* (Cramer), *Heriargus ceramus antibubastus* (Hübner), *Leptotes cassius theomus* (Lucas), *Anartia j. guantanamo* Munroe, *Calpododes ethilus* (Stoll), and *Urbanus dorantes* (Stoll) are common residents or usual summer transients on these coastal islands.

RECOGNITION AND DESCRIPTION OF A NEW SUBSPECIES

The *Brephidium* species/subspecies seem to have been largely ignored taxonomically. Perhaps this is because of their small size. We have placed them under magnification and determined that they deserve much more study. Pavulaan (1993) was the first to note the phenotypic differences between the island population in South Carolina and typical *pseudofea* from the Florida keys. The spring brood from South Carolina is especially distinct and he gave these the form name *carolina*. Further comparison and consideration has now led the authors to conclude that two subspecies, if not two species, exist in the southeastern US.

B. i. pseudofea was described from the Florida Keys (Figs. 1-2). We have examined 6♂ and 3♀ topotypes collected by Richard Anderson from Key West, and 6 specimens from Big Pine Key collected by Pavulaan. The ventral ground color of the wings in *pseudofea* is decidedly yellow brown. *Pseudofea* also exhibits lighter basal shading ventrally and a diminishing of the ventral forewing spots toward the outer margin. The short spoon shaped antennal clubs of *pseudofea* have prominent orange red tips (Morrison mentioned this as a major diagnostic character in his original description). The ventral surface of the abdomen of *pseudofea* is broadly white to very light gray and usually extends halfway around the sides of the light to medium abdomen. We have found the *Brephidium* from coastal South Carolina (Figs. 7-11) to differ significantly from topotypical *pseudofea*. Accordingly, *Brephidium isophthalma insularis* Pavulaan and Gatrell is herein described as a new subspecies from coastal South Carolina.

We do not know how far south the new taxon ranges, but specimens we have from Levy County in northwestern Florida (Figs. 6 & 12) seem to be good *insularis*. They differ from *insularis* only in tending to have the ventral white FW spotting more faded toward the outer margins. It is very possible that the name *pseudofea* properly applies to only the populations in the Florida keys or extreme southern Florida. Populations in the remainder of Florida need to be studied to determine their proper taxonomic status. Lepidopterists need to check their series of Florida Pigmy Blues for sympatric populations.

Brephidium isophthalma insularis Pavulaan & Gatrell, new subspecies

Diagnosis and Description. The male (Fig. 7) and female (Fig. 8) of *insularis* are marked alike. *B. i. pseudofea* and *B. i. insularis* are similar dorsally except that *insularis* averages a darker shade of reddish brown. Ventrally, they are quite distinct. The ventral ground color of *pseudofea* is distinctly yellowish brown and occasionally has the basal third of the wings lightly washed with white. In *insularis*, the ground color is a rich concolorous medium or dark brown in all broods with the basal area always uniformly brown. The white lines which give a spotted appearance to this species are usually faint, and sometimes absent, toward the outer margin of the forewings of *pseudofea*; while in *insularis* they are usually present all the way to the forewing margin. This white marginal spotting is especially strong in the *insularis* spring form *carolina*. In the early brood(s) of *insularis* there is also a considerable amount of whitish clouding in the submarginal band of the ventral HW. The light band along the outer margin of the HW of *insularis* is more orangeish and is more extensive than in *pseudofea*. The antennal clubs of *insularis* are elongate and completely black (most specimens) or only slightly tipped in

orange-red. In *pseudofea* the antennae are shorter and spoon shaped with prominent orange-yellow tips (Fig. 1). The light area running the length of the ventral abdomen of *insularis* is usually medium gray, narrow, and does not extend up the side of the dark brown abdomen, giving it a very dark appearance. We describe the South Carolina population as a new subspecies based on these characters. The geocological type locality is: coastal tidal flats in Beaufort County, South Carolina.

Types. *Holotype* ♂ (Fig. 7): Rt. 21 near Beaufort, Beaufort County, South Carolina, 3 October 1993, leg. H. Pavulaan. *Allotype* ♀ (Fig. 8): Rt. 21 near Beaufort, Beaufort County, South Carolina, 27 March 1986, leg. H. Pavulaan. *Paratypes*: 12 ♂♂, 5 ♀♀; all SOUTH CAROLINA: BEAUFORT COUNTY: Rt. 21 nr. Beaufort, 8 ♂♂, 2 ♀♀, 27 March 1986, leg. Pavulaan; 2 ♂♂, 1 ♀, 3 October 1993, leg. Pavulaan; Hunting Island, 1 ♂, 1 ♀, 24 September 1972, leg. Gatrell; COLLETON COUNTY: Edisto Island, 1 ♂, 1 ♀, 9 April 1988, leg. Gatrell. The holotype and allotype are deposited in the Carnegie MNH, Pittsburgh, PA. Paratypes are in the MOTH, Goose Creek, SC, and Harry Pavulaan, Herndon, Virginia.

Etymology. The name *insularis* means, of the island. Its common name is Island Pigmy Blue.

Remarks. The striking differences in the antennae of *insularis* and *pseudofea* necessitates that their specific status eventually be reevaluated. In *pseudofea* the $\frac{1}{4}$ to $\frac{1}{5}$ orange tipped clubs are short stemmed and spoon shaped. In *insularis* the dark clubs are elongate, narrow, and tapering toward the shaft. These differences can be seen on the CD figures when "zoomed." Glassberg's (1999) figure 1 on plate 22 from Black River, Savannah, GA is of *insularis* not *pseudofea*. Pavulaan has examined 12 specimens of *insularis* in the Robert Gardner collection taken 24 March 1994 on Tybee Island, Chatham Co., GA. Topotypes of *pseudofea* collected in the winter months (December - February) tend to be less yellow brown than those from the summer broods but are still noticeably lighter than *insularis*. Specimens figured are about twice their natural size but are proportionate to each other. All TILS photos are taken outside in natural light which often brings out different hues than one sees in the same specimens viewed indoors in artificial lighting.

ACKNOWLEDGMENTS

Thanks to: Dr. John Rawlins and the Carnegie Museum for the copy of the OD of *L. pseudofea*; Richard Anderson, the loan of topotypical Key West specimens; Ben Gatrell, photographs.

LITERATURE CITED

- CALHOUN, J.V. 1997. Updated List of the Butterflies and Skippers of Florida (Lepidoptera: Papilionoidea and Hesperioidea), Holo. Lepid. 4(2): 39-50.
- GATRELLE, R.R. 1985. The Papilionoidea of the South Coastal Area of South Carolina. Bull. Southern Lepid. Soc. Bull. No. 2. 15 pp.
- GERBERG, E.J. & H.R. ARNETT, JR. 1989. Florida Butterflies. Natural Science Publications, Inc., Baltimore, MD. 90 pp.
- GLASSBERG, J. 1999. Butterflies Through Binoculars - The East: A Field Guide to the Butterflies of Eastern North America. Oxford: Oxford Univ. Press. 242 pp. + 71 color plates.
- HARRIS, L., Jr. 1972. Butterflies of Georgia. Univ. of Okla. press, Norman OK. 326 pp.
- MORRISON, H.K. 1873. Notes on North American Lepidoptera. Bull. Buffalo Soc. Nat. Sci., 1: 186-187.
- OPLER, P.A. & G.O. KRIZEK. 1984. Butterflies East of the Great Plains, An Illustrated Natural History. Johns Hopkins Univ. Press, Baltimore, MD. 294 pp.
- PAVULAAN, H. 1993. Some Observations on South Carolina Butterflies and Description of a New Form of *Brephidium isophthalma pseudofea*. S. Lep. News Vol. 15 (4): 34-39.
- SCOTT, J.A. 1986. The Butterflies of North America, A Natural History and Field Guide. Stanford Univ. Press, Stanford, CA. 583 pp.

The Taxonomic Report is a publication of *The International Lepidoptera Survey (TILS)*.

The Taxonomic Report is published at the rate of about 10 - 12 issues a year. Subscription for vol. 1 is \$65 US. 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 and reproduction for personal use. 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.



The Taxonomic Report

OF THE INTERNATIONAL LEPIDOPTERA SURVEY



HÜBNER'S *HELICTA*: THE FORGOTTEN *NEONYMPHA*.

THE RECOGNITION AND ELEVATION OF *NEONYMPHA HELICTA*
(NYMPHALIDAE: SATYRINAE) TO SPECIFIC STATUS.

THE DESIGNATION OF NEOTYPES FOR *N. HELICTA* AND *N. AREOLATUS*.
THE SUBSPECIFIC TRANSFER OF *SEPTENTRIONALIS* TO *HELICTA* AND THE
DESCRIPTION OF A THIRD *HELICTA* SUBSPECIES FROM SOUTH FLORIDA.

RONALD R. GATRELLE^{1,2}

126 Wells Road, Goose Creek, South Carolina 29445

ABSTRACT. Hübner (1806) based the name *Oreas fimbriata helicta* on a John Abbot painting of a southeastern US satyr without a written description. Subsequent lepidopterists have nearly ignored this taxon. *Helicta* is herein recognized as a valid species – *Neonympha helicta*. A neotype is designated for *helicta* from Aiken County, SC and deposited in the AME Sarasota, FL. A neotype is also designated for *Papilio areolata* J.E. Smith, 1797 from Chatham County, GA and deposited in the AME. *Septentrionalis* Davis, 1924 is recognized as the northern US subspecies of *helicta* not *areolatus*. An apparently isolated relict population of *helicta* south of Miami, FL is described as new subspecies *Neonympha helicta dadeensis*.

Additional key words: Genitalia, habitat association, disjunct distribution.

HÜBNER'S *HELICTA*

In 1806 Hübner established the name *Oreas fimbriata helicta* by affixing it to an Abbot painting of a southeastern US butterfly in *Sammlung exotischer Schmetterlinge* (Figs. 2 & 3). There was no written description. However, by 1816 Hübner had apparently come to regard his *helicta* as synonymous with *Neonympha areolatus* (J.E. Smith, 1797), stating under number 622 in his 1816 *Verzeichniss bekannter Schmettlinge*: “*Neonympha Helicta. Areolatus* Abbot. Lepid. 13 Hubn. *Oreas fimb. Helicta.*”

In dos Passos' 1964 checklist, Hübner's *helicta* is listed in the synonymy of both *N. areolata areolata* and *N. areolata septentrionalis* Davis, 1924. In their 1981 revision of the Lepidopterists' Society checklist, Miller and Brown list *helicta* in the synonymy of *areolatus*. However, they noted that *helicta* might be more correctly associated with *N. areolatus septentrionalis*. Miller and Brown also suggested that the type specimen of *helicta* might be in the Natural History Museum, Vienna, Austria – or lost. The potential problem here is obvious. Since *helicta* is the older name, it would replace *septentrionalis* if these two were in fact the same taxon.

Dr. Gerhard Tarmann of Innsbruck, Austria, has graciously relayed the following information:

“The type of *Neonympha helicta* (Hübner) is not in the collection of the NHMW in Vienna. There is some Hübner material there although most of Hübner's material is destroyed. There was a man called Mazzola who bought some of Hübner's original material. As this man has taken away all of Hübner's labels and replaced them with his

¹ Curator, Museum of the Hemispheres, Goose Creek, South Carolina.

² Research Associate, Florida State Collection of Arthropods, Gainesville, Florida.

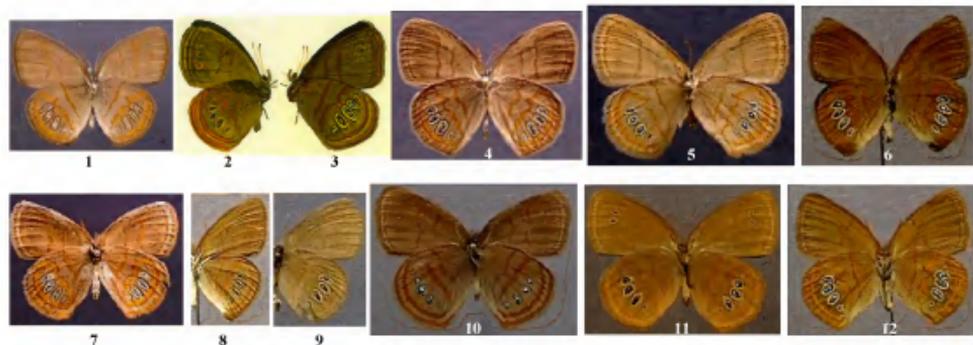
own printed labels, it took years to find out that some of the material in Mazzola's collection is in fact original Hübner material. However, although the Mazzola collection is in Vienna, there is only European material involved. **There are no possible Hübner types of American butterflies existing.** I got this information from Dr. Sabina Gaal, Naturhistorisches Museum Wien (NHMW)." (Emphasis mine.)

This situation calls for the designation and deposition of an appropriate neotype. Accordingly, I have designated a male specimen (Fig. 4) taken 1 June 1990 in the vicinity of Aiken State Park, Aiken County, South Carolina as neotype of *Oreas fimbriata helicta* Hübner, 1806. It has been appropriately labeled and deposited in the Allyn Museum of Entomology (AME), Sarasota, Florida. This specimen becomes the type for *Neonympha helicta*. I restrict the geocological type locality of *Oreas fimbriata helicta* to the upland sandhill habitats of Aiken County, South Carolina and Burke County, Georgia.

DAVIS' SEPTENTRIONALIS, AN HELICTA

In Davis' 1924 description of *septentrionalis* he briefly mentions *helicta* on page 106 and figures a specimen from Southern Pines, Moore County, NC which he correctly determined as *helicta*. However, he regarded this specimen as "a rather uncommon variation" since it was the only specimen of this phenotype he had seen. The specimen has its VHW eyespots rounded and the two VHW central brown lines rather close together, which indeed correlates well to the original figures of *helicta* (Fig. 2).

However, it should have been obvious to Davis that his New Jersey *septentrionalis* specimens were also close to Hübner's figures of *helicta*. They were certainly much closer to Hübner's plate than to any *areolatus* Davis had at his disposal. Davis expected *septentrionalis* to be variable and made the following statement at the end of his paper: "The writer does not mean to imply that specimens of *areolatus* from New Jersey and vicinity may not occasionally show spots resembling those from Florida and Georgia. He simply wishes to point out that there is a rather constant difference between those from the north and south." *Helicta* certainly falls well within Davis' expected degree of variation.



Figs. 1-12. *Neonympha* subspecies (ventral surfaces). 1, **Neotype** ♂ *Papilio areolata*, 2 Sept. 1989, Pine Barrens Road, Chatham Co., GA. 2, ♂ *O. f. helicta* from Hübner, 1806. 3, ♀ *O. f. helicta* from Hübner, 1806. 4, **Neotype** ♂ *Oreas fimbriata helicta*, 1 June 1990, nr. Aiken State Park, Aiken Co., SC. 5, toptype ♀ *N. h. helicta*, 8 June 1980, nr. Aiken State Park, Aiken Co., SC. 6, **Holotype** ♂ *Neonympha helicta dadeensis*, 22 Nov. 1989, Carde Sound Road, Dade Co., FL (leg. Koehn). 7, ♀ *N. areolatus*, 13 May 1973, Nr. Jct. I-26/17-A, Berkeley Co., SC. 8, ♂ *N. areolatus*, 27 March 1989, Collier Co., FL (leg. Koehn). 9, ♂ *N. h. helicta*, 23 June 1968, Foley, Baldwin Co., AL. 10, toptype ♂ *N. h. septentrionalis*, 29 June 1970, Lakehurst, Ocean Co., NJ (leg. ?). 11, ♀ *N. h. septentrionalis*, 2 July 1989, Lebanon St. For., Burlington Co., NJ (leg. ?). 12, **Allotype** ♀ *Neonympha helicta dadeensis*, 24 Nov. 1989, Carde Sound Road, Dade Co., FL (leg. Koehn). All specimens leg. R.R. Gatrell unless otherwise noted. All figs. natural size.

Given the very limited understanding of the inland fauna of the Carolinas and Georgia in Davis' time, it is perhaps understandable why Davis gave his northern specimens a new name. However, given the closeness of his New Jersey specimens to the original Hübner figures, one is left to wonder why he made absolutely no connection between *helicta* and his new taxon, *septentrionalis*.

Because *helicta* and *areolatus* were both described from specimens collected by John Abbot in the southeastern US (and thus assumed to be consubspecific), and because *septentrionalis* was described from the northeastern US, it is understandable, but unfortunate, that taxonomists have mostly associated the name *helicta* with *areolatus* and given little consideration to the idea that *helicta* and *septentrionalis* were the close relatives. Two things should have led taxonomists to conclude that *septentrionalis* and *helicta* were the "same thing." First, the Abbot depiction of the species named *helicta* by Hübner is a more accurate depiction of *septentrionalis* than *areolatus* (especially in the male). Second, workers should have placed more confidence in Abbot's skills as a naturalist.

Abbot was a keen observer who knew what he was doing. While we today have had difficulty, in some cases, figuring out what Abbot had, he surely knew that his *helicta* and *areolatus* were two species – just as he knew that his *Chlosyne gorgone* (Hübner, 1810) and *C. ismeria* (Boisduval & Leconte, 1833) were two species (Gatrelle, 1998); and that his "*irus*" in Boisduval & Leconte, 1833 (= *Deciduphagus henrici* (Grote & Robinson, 1867)) and *D. arsace* (Boisduval & Leconte, 1833) (= *D. irus* (Godart, 1824)) were two species (Gatrelle, 1999); and his two Azure Blues (*TTR* 1:9, in press).

Davis' lone specimen of *helicta* came from the south central North Carolina sandhills. Today, we know that the Sandhills region from North Carolina south through Georgia and west through Mississippi is the stronghold of Hübner's *helicta*. Further, by their shared wing patterns and genitalia, we now know that *septentrionalis* and *helicta* are two subspecies of the same species – *helicta*. We also know now that differences in genitalia, wing pattern, habitat association, and flight characteristics demonstrate that *areolatus* and *helicta* are distinct species.

Assimilating *helicta* and *septentrionalis*

While living in Pensacola, Florida I collected four *septentrionalis*-like specimens on 23 June 1968 east of Foley, Alabama along the Gulf coast. I loaned three of these to the Allyn Museum for comment in the late 1970's, but they subsequently lost the specimens. Fortunately, I still have one worn male (Fig. 9).

In 1976 I found a *Neonympha* phenotype that was widely distributed in the upland sandhills around Aiken State Park in Aiken County, South Carolina. I have visited this area sporadically over the last twenty three years to collect and observe this species. In wing pattern and genitalia these *Neonympha* are very close to topotypes of *septentrionalis* I have from New Jersey. The only meaningful taxonomic difference between the New Jersey and South Carolina populations is that those from New Jersey are much darker in their ventral ground color and the orange brown lines on the ventral HW are usually more brown than orange. (In both populations the two ventral forewing bands are nearly always brown.) When I first encountered this population, I thought they were just a very disjunct, lightly colored colony of what I then understood to be *N. areolatus septentrionalis*.

Later in the 1970's while visiting Irvin Finkelstein at his home in Atlanta, Georgia, I learned that he had taken a few *septentrionalis*-like specimens in central Georgia. I remember how struck I was with one specimen in particular because it so closely matched New Jersey *septentrionalis*. In the 1980's I became aware of a population of "*areolatus*" south of Miami, Florida with large rounded eyespots (Fig 13). Then in the early 1990's I became aware of *septentrionalis*-like specimens from Mississippi. I have now seen specimens in series from both of these areas.

By the early 1980's I had concluded that the southeastern populations were at least subspecifically distinct from both New Jersey *septentrionalis* and typical *areolatus*, and deserved recognition as such. At this point the Miller and Brown notation regarding *helicta* became a central issue to this research.

Unfortunately at that same time, certain personal matters necessitated that all of my taxonomic research be placed on hold. Well over a decade passed with little collecting, and less research, being done. However, in June of 1990 I did have the time to collect and dissect several fresh males of these taxa. The differences in the genitalia of Berkeley County, SC *areolatus* and topotypical Aiken County, SC *helicta* were found to be significant and consistent (see below). The differences in genitalia confirm that the two distinct phenotypes which occur throughout the southern and eastern US are two sibling species.

Early in 1998 I again picked up my research on these taxa. In late December of 1998, Dr. Gerhard Tarmann of Innsbruck, Austria supplied me with the long sought after copy of the color plate of Hübner's *helicta* and the above quoted statement regarding the absence of a type for that taxon. This original *helicta* plate clearly portrays what we have come to know, in the broad sense, as the *septentrionalis* phenotype and not that of *areolatus*.

The occurrence of colonies of *septentrionalis*-like specimens from New Jersey south through Georgia to Mississippi, and disjunctly in extreme south Florida, certainly demonstrates that this taxon is what John Abbot had based his *helicta* paintings upon. (Note the exactly similar shape of the V median bands in Figs. 2 & 4 and 3 & 12.) As the senior name, *helicta* has priority over *septentrionalis* and becomes the proper specific name for all allied populations that comprise *Neonympha helicta*.

All of the populations of *helicta* south and west from North Carolina are of the same basic phenotype (except in the Miami, Florida area). They differ significantly from *N. h. septentrionalis* in the New Jersey vicinity only in having the ventral ground color a much lighter brown; and secondarily in a tendency to have the VHW eyespots larger (more elongate) and the lines on the VHW more orange than the New Jersey subspecies. The yellow rings around the eyespots are also bolder in *helicta helicta*.

NEONYMPHA AREOLATUS AND NEONYMPHA HELICTA

Separating *helicta* and *areolatus*

Helicta (all subspecies) and *areolatus* remain consistently distinct in size, wing pattern, and overall habitat preference throughout their respective ranges. These differences, coupled with their differences in genitalia, lend strongly toward defining these taxa as distinct species. The following will serve as a basic guide to help lepidopterists properly distinguish and separate these two species. However, it should be noted that some phenotypically extreme *N. helicta helicta* individuals can only be positively separated by their genitalia. Also, the *septentrionalis* figured by Howe (1975) is *areolatus*-like in the shape of its spots.

Flight pattern. Dr. Richard Arbogast was the first to make the observation that the flight patterns of *areolatus* and *helicta* differed. Dr. Arbogast, as a long time resident of Savannah, Georgia, has collected/observed hundreds of *areolatus* about the marshes and swamps in the Savannah area over the years. After accompanying me on a collecting trip to Aiken County, he pointed out that the Aiken County *helicta* flew higher, faster, and straighter than *areolatus*. Being familiar with *areolatus* in coastal South Carolina, I acknowledged that this was indeed true.

Areolatus flies either just above the sedges and grasses or down in them. It also has a rather slow, but darting flight pattern. Female *areolatus* are reclusive and often have to be stirred up to be found. Conversely, *helicta* often fly up to three feet above the grass. Their flight is swift for a satyr, and tends to be much less darting. Female *helicta* are encountered about as often as males.

Habitat. I have found *areolatus* only around wet marshy (at least soggy) areas in South Carolina, North Carolina, Georgia, Florida, and Alabama. Ricky Patterson has informed me that this is also his observation for *areolatus* in Mississippi. Leroy Koehn has written that this is the situation in south Florida also. I have found *helicta* only in open, dry, upland sandhill in South Carolina. My Alabama *helicta* were taken in fairly dry, open pine flat woods. Ricky Patterson has also usually found *helicta* in dryer upland habitats in Mississippi. Whereas *areolatus* seems to be limited to wet areas, *helicta* does not seem to be limited to dry areas. In New Jersey, in particular, *helicta*

is directly associated with bogs (Gochfeld, 1998). Dr. Richard Boscoe, who has a great deal of experience in rearing many species of Lepidoptera, has informed me that he considers all *areolatus* and *helicta* to be solely sedge feeders.

In Aiken County, South Carolina *helicta* and *areolatus* are allopatric. I have taken two *areolatus* and observed a few others in the low marshes along the Edisto River at Aiken State Park. *Areolatus* is the only phenotype within this marshy valley habitat. *Helicta* is the only phenotype that occurs in the scrub oak sandhill surrounding the valley. I have found the two species within 2,000 yards of each other at this site. Scott (1986) lists *septentrionalis*, *areolatus*, and *mitchellii* (French, 1889) as sympatric in Hoke County, North Carolina. The data presented by Mather (1965) can be taken to indicate that these two may be sympatric at some Mississippi sites.

Adult size and wing shape. In his description of *septentrionalis*, Davis mentions that his new subspecies is markedly larger than Floridian *areolatus*. This is an indicator of speciation. I know of no species of eastern US butterfly that has markedly larger specimens in the northeast than in Florida. The reverse is the rule. This size difference holds true throughout the range of these two species. It is not uncommon to find female *N. h. helicta* and *N. h. septentrionalis* which measure 40 mm or more from outer FW margin to margin when spread. 35 mm is large for *areolatus* females. As a rule, males of the *helicta* subspecies are as large as *areolatus* females. Davis pointed out that the FW margins of *areolatus* are straighter and their FW apex more angulate, while the margins and FW apical area of *septentrionalis*' wings are rounder. I agree that this is the case with *areolatus*. However, not all *helicta* have markedly rounded forewings. I have noted that the HW anal angle is more angulate in *helicta* than *areolatus*.

Wing color and pattern. In *areolatus*, the color of the two bands on the VFW is nearly always orange and may often be faint or absent. In the subspecies of *helicta*, these lines are nearly always brown and may often be very prominent. All of the VHW lines are more brownish in *septentrionalis* than in *helicta* or *areolatus*. These HW lines are usually a brighter orange in *areolatus* than in *helicta*. The VHW and VFW median lines are closer together and more parallel on the *helicta* subspecies than on *areolatus*. One of the best distinguishing characters is that on *areolatus* the VHW marginal and median orange lines usually meet at vein M_1 or in the cell just above it (Figs. 1 & 7). In the *helicta* subspecies, these lines very rarely meet at vein M_1 and either remain separate all the way to the costal margin (Fig. 3), or meet about vein Rs. (Fig. 5). The best pattern character is the size and shape of the VHW eye spots. In *areolatus* these spots are elongate, irregularly narrow, and tend to have prominent yellow areas in the center on at least one or two spots. In the *helicta* subspecies, they are round (especially in males) or ovate (especially in females). These spots are smoothly rounded and usually have little, if any, yellow pupling in *helicta*. Occasional *helicta helicta* specimens have somewhat elongated eyespots. When this is the case other characters need to be considered. It is quite possible that *areolatus* and *helicta* hybridize in areas where they are sympatric. The antenna of SC *helicta* tend to be more orange (Fig. 2). Coastal SC & GA *areolatus* tend to have dark tipped antenna.

Genitalia³. The genitalia of both taxa are similar in that they are fairly symmetrical with rather long gnathos. The major differences are: In *areolatus* the terminus of the aedeagus is beveled. In *helicta* it is rounded and blunt at the terminus. In *areolatus* the gnathos is slightly bulbous at the center, then tapers to a long slender point. In *helicta* the gnathos is robust before tapering to a point. On the interior surface of the valva both species have a lateral projecting, backward pointing barb that looks like a rose thorn just before the distal terminus. In *areolatus* this barb is smooth. In *helicta* it is toothed on the outer edge. There is also a bulbous area on the inner surface of the valva of both species. In *areolatus* this area is rough. In *helicta* it is smooth. Genitalia were examined at 100X.

As there is no type for *Papilio areolata*, I have designated a male I collected 2 September 1989 at Pine Barrens Road, Chatham County, Georgia as neotype of *Papilio areolata* J.E. Smith, 1797 (Fig. 1). It has been appropriately labeled as neotype and deposited in the Allyn Museum of Entomology (AME), Sarasota, Florida. This specimen becomes the type for *Neonympha areolatus*. I restrict the geocological type locality of *Papilio areolata* to the marshy sedge forests of coastal Georgia.

³ In their recent book on New Jersey butterflies, Gochfeld and Burger (1998) accurately state that the genitalia of *areolatus* and *septentrionalis* (= *helicta*) differ and that the two are probably distinct species. Unfortunately, they unscientifically list the entity as *Neonympha septentrionalis* and then give it the inappropriate common name of Lakehurst Satyr (see under etymology below for the correct common names).

A NEW *HELICTA* SUBSPECIES FROM DADE COUNTY, FLORIDA.

There are two populations of *Neonympha* in southern Florida of uncertain taxonomic standing. Both of these populations have the anal angle of the HW angulate to the degree of tending to be lobed. They also tend to have the anal margin of the VHW moderately to heavily covered with whitish scales (especially the southwest FL *areolatus* segregate). The lobed HWs of these *Neonympha* are reminiscent of tropical Satyrinae in the genera *Cissia* Doubleday, 1848 and *Cyllopsis* Felder, 1869.

The *helicta* isolate in the southeast corner of Florida south of Miami is mentioned by Scott (1986). He refers to this "strangely" disjunct population in his discussion of the range of *septentrionalis* on page 238. This population is phenotypically distinct from neighboring populations of typical *N. areolatus* just to the north, but less so from the atypical *areolatus* west of it. In its morphological features, it appears to be a subspecies of *helicta* with large "blind" eyespots (Fig. 13) reminiscent of *Enodia portlandia floralae* (J.R. Heitzman & dos Passos, 1974). Its ventral ground color is much darker than in *helicta helicta*. Occasional specimens vary toward *areolatus* – VHW orange bands meeting at M_1 (Fig. 13).

The variation in this population leads me to wonder if it is either a relict link between, or actual ancestor of, both *areolatus* and *helicta*. Further, in its distinction from, or connection with, both *helicta* and *areolatus* it may not have followed the same evolutionary path as the populations that moved north. This *helicta* population solicits a great deal of evolutionary study. It is entirely possible that while *helicta* and *areolatus* have clearly evolved into distinct species in the non-Floridian part of their range, they may not have evolved far beyond a subspecific relationship in extreme south Florida. If this is the case, it will be problematic to those taxonomists who approach their craft with fossilized rigidity rather than living fluidity.

The *N. areolatus* populations of southwest Florida may also represent a weak, but evolutionarily definable, subspecies (Fig. 8). They differ from topotypical *areolatus* primarily by having the anal margin of the VHW strongly and broadly overlaid with whitish scaling; and are *helicta*-like in that the bands of the VHW tend to meet at vein Rs and not M_1 . The light anal margins are a striking trait. Because these *areolatus* are not isolated from the other *areolatus* in the rest of the Florida peninsula, their possible subspecific status will need to be evaluated against the examination of a large sample of specimens from throughout the state. I do not see a problem in the identifiability of the southwest Florida *areolatus*. The problem is in determining the boundaries of this likely clinal entity. I hope someone will undertake this in the near future.

Like *Papilio aristodemus ponceanus* Schaus, the southeast Florida *helicta* isolate's range is very restricted. It is definitely known only from the vicinity of Florida City, specifically the area of Carde Sound Road. Leroy Koehn has seen one specimen from north Key Largo, but considers this a stray. However, and hopefully, it may also occur sympatrically with *areolatus* across extreme south Florida to the Fakahatchee Strand, Collier County. I have seen only about 20 specimens from this area, but a couple of them look like good *helicta* to me. I have not examined the genitalia of any of these.

Koehn and Jeff Slotten have both informed me that its numbers appear to be in decline in the Carde Sound area. Its greatest threat is from urban development and agricultural encroachment – not butterfly collectors. It is amateur butterfly collectors that discovered it and are trying to protect it!

It may be premature to describe this isolate as a subspecies now. However, I feel this population needs official scientific recognition (to help qualify it for environmental protection) more than it needs additional study (which could take years). One of the primary goals of *The International Lepidoptera Survey* is to discover, determine, and document taxa before they become extinct. We would hate to see this become another *Philotes sonorensis extinctis* Mattoni, 1991 (a well known, but very geographically restricted, Sonora Blue subspecies which was described only after becoming extinct as a result of governmental land mismanagement). If in time it is determined that this population is not subspecifically distinct from *helicta helicta* someone can always sink it later. Thus, for the above stated reasons, I now describe this population as *Neonympha helicta dadeensis*.

Neonympha helicta dadeensis Gatrell, new subspecies.

Diagnosis and description. *Male* (Fig. 6): All appendages and markings as in *helicta helicta* except as follows. *Ventral forewing*: brown ground color much darker than in *helicta*, but not quite as dark as in *septentrionalis*, darker than in *areolatus*; transverse median bands similar to *areolatus* – tending to orange and not prominent. *Ventral hindwings*: marginal and median bands tending to *areolatus* – more orange, seldom open at the costal margin, and usually meeting at vein Rs; eyespots ranging from as in *helicta* to very broad and often touching each other at the veins, never with yellow pupils; the anal margin always with more white scaling than in nymotypical *helicta*, but rarely as heavy as in southwestern Florida *areolatus*; anal angle quite angular, pronounced, and often slightly lobed. *Female* (Fig. 12): As in the *dadeensis* male except as follows. *Ventral forewing*: brown ground color lighter with the transverse bands a little more prominent; may have one or two tiny eyespots in the submarginal area. *Ventral hindwings*: marginal and median bands more orange, occasionally open at the costal margin, usually meeting at vein Rs, and rarely at M₁; whitish scaling along the anal margin not as pronounced; the anal angle angulate but not as lobed.

Types. *Holotype* ♂ (Fig. 6): Carde Sound Road, Dade County, Florida, 22 November 1989. *Allotype* ♀ (Fig. 12): Carde Sound Road, Dade County, Florida, 24 Nov. 1989. *Paratypes*: 27 ♂♂, 11 ♀♀: all FLORIDA, Dade County, Carde Sound Road: 4 ♂♂, 2 ♀♀, 10 May 1991; 11 ♂♂, 4 ♀♀, 18 Nov., 5 ♂♂, 1 ♀, 22 Nov., 1 ♂, 3 ♀♀, 24 Nov. 1989; 3 ♂♂, 1 ♀, 10 May 1990 (leg. Slotten); 3 ♂♂, 9-11 March 1987 (leg. ?). The *Holotype* and *Allotype* are deposited in the Allyn Museum of Entomology, Sarasota, Florida. *Paratypes* are distributed as follows: Jeff Slotten, Gainesville, FL (4); MOTH, Goose Creek, SC (3); Leroy Koehn, Lake Worth, FL (31). All type specimens were collected by Leroy Koehn unless otherwise noted.

Etymology. *Dadeensis* is named for Dade County, Florida – the only area from which it is currently known. I suggest *Miami Helicta* as its common name. *Helicta Satyr* is the common name of *Neonympha helicta*. **Northern Helicta** is the proper common name of *Neonympha helicta septentrionalis* (*septentrionalis* means northern).

Remarks. The holotype is somewhat atypical in that its VHW eyespots are slightly smaller than average. I utilized it because of its excellent condition. **Figure 13** is a male paratype with larger fused eyespots. The type locality of *N. h. dadeensis* is Dade County, FL. At present, the ranges of the three *helicta* subspecies are not known to come into contact. There are no known blend zone populations. Leroy Koehn first found *dadeensis* on 9 May 1972. The two males he collected then, plus four pair he took in 1982, are now in the Carnegie Museum NH, Pittsburgh. I emphasize again that the taxonomic relationship of the south Florida *dadeensis* and *areolatus* populations is unsure and needs more study. All photos were taken outside in full sunlight which brings out the natural colors and highlights of butterflies.



Fig. 13

ACKNOWLEDGMENTS

Special thanks to: Dr. Gerhard Tarmann for supplying a color copy of the original *helicta* plate; Leroy Koehn, Jeff Slotten, and Ricky Patterson for their field observations and loan of specimens; Ben Gatrell for photography and computerization of photos.

LITERATURE CITED

- DAVIS, W.T. 1924. Northern Form of the Butterfly *Neonympha areolatus*. J. New York Ent. Soc., 105.
- DOS PASSOS, C.F. 1964. A Synonymic List of the Nearctic Rhopalocera. Memoir No. 1, Lepid. Soc., Yale University, New Haven, CT. 146 pp.
- GATRELLE, R.R. 1998. The Rediscovery, Taxonomy, and Biology of *Chlosyne gorgone* and *Chlosyne ismeria* (Nymphalidae) in Burke County, Georgia. TTR, Vol. 1:2, 9 pp. TILS, Goose Creek, SC.
- _____. 1999. An Evolutionary Subspecific Assessment of *Deciduphagus henrici* (Lycaenidae) Based On Its Utilization of *Ilex* and Non-*Ilex* Hosts: Description of a Third *Ilex* Associated Subspecies. Designation of a Neotype and Type Locality for *Deciduphagus irus*. TTR, Vol. 1:6, 14 pp. The Int. Lepid. Survey, Goose Creek, SC.
- GOCHFELD, M. & J. BURGER. 1998. Butterflies of New Jersey. Rutgers Univ. Press, New Brunswick, NJ. 329 pp.
- HOWE, W.H. 1975. The Butterflies of North America. Doubleday & Co., Inc. New York, NY. 633 pp.
- HÜBNER, J. 1806. Sammlung exotischer Schmetterlinge. Augsburg.

- MATHER, B. 1965. *Euptychia Areolata*: Distribution and Variation, with Special Reference to Mississippi (Satyridae). J. Lepid. Soc., Vol. 19:3, pp. 139-160.
- MILLER, L.D. & F.M. BROWN. 1981. A Catalogue/Checklist of the Butterflies of America North of Mexico. Memoir No. 2, Lepid. Soc., Sarasota, FL. 280 pp.
- SCOTT, J.A. 1986. The Butterflies of North America, A Natural History and Field Guide. Stanford Univ. Press, Stanford, CA. 583 pp.
- SMITH, J.E. 1797. The Natural History of the Rarer Lepidopterous Insects of Georgia. London. 2 Vols.

***The Taxonomic Report* is a publication of *The International Lepidoptera Survey (TILS)*.**

(A Tax Exempt Non-Profit Scientific Organization)

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.

The Taxonomic Report is projected for publication at the rate of at least 10 issues a year. Subscription/dues for volume 1 is \$65 US. The subscription year for volume 1 began in August of 1998 and will run to December 31 of 1999. Beginning with volume 2 (January 2000), all volumes will follow the calendar year. All issues are mailed 1st class. At the end of each year, subscribers receive that year's volume on CD for permanent archiving and reproduction for personal use (i.e. a museum or university may make as many copies as needed in whatever format desired). Non-members may receive individual issues any time for \$10 per issue. Individual issues on CD or disc to non-members are \$15 per issue post paid. **Subscriptions** 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 on how to best handle your research for publication.

TILS has established the **Museum Of The Hemispheres (MOTH)**. The **MOTH** collection will be a collection of collections. Each individual research 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 **write to:** Ronald R. Gatrell, **MOTH** Curator, 126 Wells Road, Goose Creek, SC USA 29445-3413.

Everyday around the world, in jungles and urban areas alike, insect species and subspecies are becoming extinct. Every year scores of 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 (information) there will be no systematic taxonomy. Without amateur collectors the majority of the undiscovered species/subspecies will vanish before they are discovered. Be it butterflies or moon rocks, collecting is the first step of access to all other scientific information – and protection.

Donations are needed to support and further our efforts to discover and protect butterflies worldwide. All donations are US tax deductible. Please help generously.

Donations should be mailed to: **Scott D. Massey, Treasurer, 126 Wells Rd., Goose Creek, SC 29445.**

Checks should be made payable to: **TILS**. Please indicate if you need an individual receipt.



The Taxonomic Report

OF THE INTERNATIONAL LEPIDOPTERA SURVEY



CELASTRINA IDELLA (LYCAENIDAE: POLYOMMATINAE): A NEW BUTTERFLY SPECIES FROM THE ATLANTIC COASTAL PLAIN.

DAVID M. WRIGHT

100 Medical Campus Drive, Lansdale, PA 19446

AND

HARRY PAVULAAN¹

494 Fillmore Street, Herndon, VA 22070

ABSTRACT. A new species of Polyommatinae, *Celastrina idella*, is described from the sandy Atlantic coastal plain of the eastern US. It is presently known to occur from southern New Jersey through Georgia. *C. idella* larvae have been recorded from four species of *Ilex* (holly). *C. idella* is distinguished from sympatric *C. ladon* and *C. neglecta* by differences in larval host, flight period, pupal diapause, and adult size and wing characters. In the New Jersey pine barrens the butterfly is univoltine and flies in the spring between the flights of its sympatric congeners.

CONCEPTS OF *CELASTRINA* SYSTEMATICS

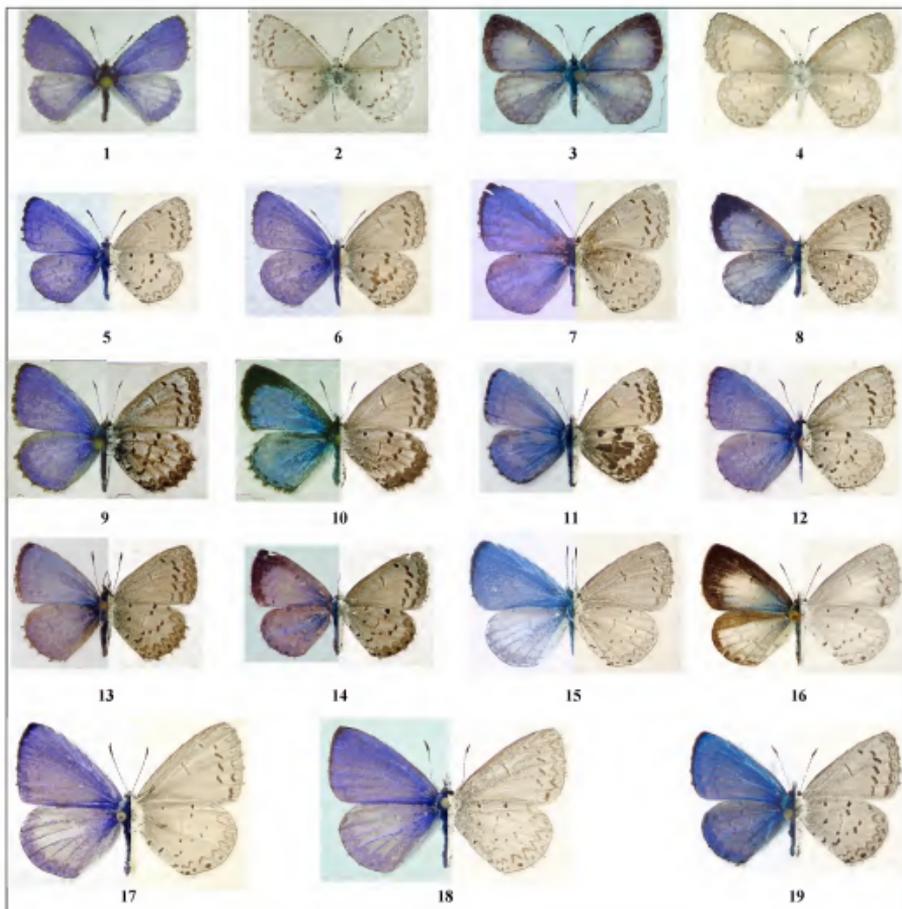
Two hundred years ago John Abbot, the famous Georgian naturalist, found larvae of a species of *Celastrina* Tutt, 1906 on *Ilex* L. (holly). He reared these to adults and in 1792 wrote: "The butterfly is not common, but is more frequent in Hammocks and near swamps... tied itself up 30th April, changed into chrysalis 2 May, bred March 12 following [year]." Abbot's historical description is remarkable on several accounts. We believe it to be the first reference to a heretofore undescribed species of *Celastrina* which we now describe in this paper. It is also one of the earliest insect life histories from the New World.

The above quote was not included with Abbot's plate in Smith (1797). It was uncovered later by Scudder (1872, 1876) who examined the original plates and unpublished manuscript in London. In Smith (1797), Abbot described a different *Celastrina* caterpillar found in June. This taxon fed on a wild legume and gave rise to a second brood without diapausing.

Unfortunately, Abbot's differing life history accounts have been largely overlooked taxonomically. Abbot's two very different life history descriptions indicated that at least two species of *Celastrina* were present in the eastern US. Specifically, an earlier flying univoltine species whose larvae feed on holly, and a later flying multivoltine species whose larvae feed on a different host(s).

Concepts of *Celastrina* systematics have emerged gradually. Prominent 19th century worker, W.H. Edwards of Coalburgh, WV, provided the first systematic study of American taxa. He reared many of them and correctly recognized them as distinct from Old World *C. argiolus* (Linnaeus, 1758). Edwards (1883) discovered that pupae derived from eggs of the spring generation hibernated, and accurately concluded the first generation was single-brooded. He then arbitrarily, and incorrectly, reasoned that all generations were interrelated and lumped them together as "one polymorphic species" – *pseudargiolus*. Again, accurate life history information was taxonomically overlooked. This view prevailed for nearly a century.

¹ Staff member, The International Lepidoptera Survey, Goose Creek, SC.



Figs. 1-2 (d/v), ♂ holotype *Celastrina idella*, 11 May 1987, nr. Chatsworth, Burlington Co., NJ. Figs. 3-4 (d/v), ♀ Allotype *Celastrina idella*, 19 May 1990, nr. Chatsworth, Burlington Co., NJ. Fig. 5 (d/v), ♂ paratype *C. idella*, 16 April 1995, Bevan WMA, Cumberland Co., NJ. Fig. 6 (d/v), ♂ *C. idella* f. *lucia*, 6 May 1987, Chatsworth, Burlington Co., NJ. Fig. 7 (d/v), ♂ *C. idella*, 24 March 1989, Green Swamp, Brunswick Co., NC. Fig. 8 (d/v), ♀ *C. idella*, same data as Fig. 7. Fig. 9 (d/v), ♂ *C. ladon lucia*, f. *marginata*, 10 April 1992, Chatsworth, Burlington Co., NJ. Fig. 10 (d/v), ♀ *C. l. lucia*, f. *marginata*, same data as Fig. 9. Fig. 11 (d/v), ♂ *C. l. lucia*, f. *lucia*, same data as Fig. 9. Fig. 12 (d/v), ♂ *Celastrina* undescribed sp., 24 May 1997, Pocono Pines, Monroe Co., PA. Fig. 13. (d/v), ♂ *C. ladon ladon*, 22 April 1988, near Rancocas State Park, Burlington Co., NJ. Fig. 14 (d/v), ♀ *C. l. ladon*, 16 April 1995, Alloway, Salem Co., NJ. Fig. 15 (d/v), ♂ *C. neglecta*, 23 July 1988, Red Lion, Burlington Co., NJ. Fig. 16 (d/v), ♀ *C. neglecta*, 20 June 1992, nr. Chatsworth, Burlington Co., NJ. Fig. 17 (d/v), ♂ *C. neglectamajor*, 15 May 1990, Fork Creek PHA, Boone Co., WV. Fig. 18 (d/v), ♂ *C. neglectamajor*, 4 June 1997, Mt. Joy, Hunterdon Co., NJ. Fig. 19 (d/v), ♂ *C. neglecta*, spring form, 21 April 1999, Sunnyside, Montgomery Co., PA.

All figures are enlarged to 1.5 natural size.

(d) = dorsal, (v) = ventral.

Twentieth century advancements in evolutionary theory have propelled the idea of sympatric speciation and have offered a new context in which to view co-occurring entities. Re-examination of many of Edwards' forms and "generations" have proven them to be isolated breeding populations. Several have been resurrected to species level or redescribed as new species.

Host plant adaptation plays a key role in the evolution of phytophagous insects, especially *Celastrina* (Pratt et al. 1994). Their larvae are adapted to feed almost exclusively on flowering parts of their hosts, a short-lived ephemeral resource. By necessity, adult flights are phenologically coupled to their host's flowering period in order that eggs may be laid on the seasonally limited provision. Because host plants often bloom at different periods, host specialization can result in asynchrony of adult flights and isolated mating periods.

Further, genetic isolation through seasonal isolation is believed to be an important mechanism in the evolution of species in sympatry (Smith 1988; Wood and Keese 1990; Pratt 1994). In eastern North America, *Celastrina* have diversified through host specialization. Local populations in nature often occur asynchronously to one another and gene flow between them appears limited to non-existent. Morphologic markers characterize several of these populations and formal description is needed to delineate them for future studies in molecular systematics, phylogenetics, and possible conservation.

In the late 1970's it became apparent to us that two separate entities flew in the spring in the New Jersey pine barrens. Given the changing status of *Celastrina* systematics and the recognition of new sympatric species in the Appalachians, we suspected a sibling species pair occurred in the springtime in southern New Jersey. The first flight, consisting of larger dark individuals (f. "lucia" and "marginata"), flew in April when its blueberry host was in bud; the second flight, consisting of smaller brighter individuals (f. "violacea"), followed in May.

The host of the latter was unknown until one of us (DW) witnessed "violacea" females ovipositing on unopened buds of inkberry holly *Ilex glabra* (L.) near cedar bogs in mid-late May, 1989. Viable larvae were eventually found on inkberry and other *Ilex* species in the pine barrens. After two decades of field studies we were convinced of the distinctness of the two spring taxa. The major distinguishing features between them are contrasting adult phenotypes, asynchronous flights, different larval hosts with staggered flowering periods, and experimental evidence of segregated pupal eclosion times. (A third species, the summer flying *C. neglecta* (W.H. Edwards, 1862) is extremely rare and absent from much of the pine barrens. When present, it occurs well after the spring siblings.) We felt these differences merited sibling species status and formal description of the *Ilex* feeding taxon.

A NEW *CELASTRINA* SPECIES

The Holarctic genus *Celastrina* consists of small polyommata (blue) butterflies whose larvae feed on the flowering parts of a diverse variety of plants. Adult flights vary from early spring to late summer and fall. Their biology and systematics have been the subject of recent investigation (Pratt et al. 1994; Pavulaan and Wright 1994; Wright 1995; Scott and Wright 1998). To this point in time, the *Celastrina* complex in eastern North America consists of four recognized sympatric species; *C. ladon* (Cramer, 1780), *C. neglecta*, *C. nigra* (Forbes, 1960), and *C. neglectamajor* Opler & Krizek, 1984. Additional distinct biological races have been described, from other areas, for which species level designations have been suggested (Wright 1995; Gochfeld and Burger 1997; Allen 1997; Layberry et al. 1998; Glassberg 1999).

Common species *ladon* and *neglecta* are polyphagous and occur in widespread overlapping ranges. Once thought to be different seasonal forms of the same insect (Edwards 1883), *ladon* is now known to be a univoltine spring species and *neglecta* a multivoltine summer species. Recently discovered spring species *nigra* and *neglectamajor* are uncommon monophagous species that fly in restrictive ranges in the Appalachians and Ozarks. Their ranges match those of their unique hosts.

We divide the common eastern spring species, *C. ladon*, into two broad subspecies. Northern ssp. *C. ladon lucia* (Kirby, 1837) occurs from the Canadian subarctic southward through New England to the pine barrens of coastal southern New Jersey (Figs. 9-11), where its larvae feed on highbush blueberry *Vaccinium corymbosum* L. A high percentage of heavily melanized adults (forms "lucia" and "marginata") appear in *lucia* populations. Males have androconia and lack long transparent scales. Southern ssp. *C. ladon ladon* occurs from eastern Texas to northern Florida, northward through the central Appalachian Mts. to the Piedmont of Pennsylvania and north central New Jersey (Figs. 13-14). Throughout its range, flowering dogwood *Cornus florida* L. is the principal host. Subspecies *ladon* adults normally are lightly marked on the venter and lack excessive melanization (form "violacea"). Males lack androconia and have long transparent scales overlaying the blue scales of the forewing (Pratt et al. 1994; Wright 1995; Wright 1998). Interestingly, ssp. *ladon* is often completely absent or rare on the outer coastal plain, presumably due to competitive exclusion by a different spring *Celastrina* species.

We describe here *Celastrina idella* n. sp., a distinctive spring univoltine *Ilex*-feeding species from the middle Atlantic seaboard (Figs. 1-8). It is distinguished from other *Celastrina* by its smaller size, wing color, flight period, pupal diapause, and larval host. At the northern extent of its range, in the pine barrens of southern New Jersey, it is sympatric with *C. ladon lucia*. There, it comprises the second of two easily recognizable allochronic spring flights. From Delaware southward to Savannah, Georgia, it is virtually parapatric to inland *C. ladon ladon*, and serves as the sole spring flight near the coast. *C. idella* flights are completed before the flights of the ubiquitous sympatric summer species, *C. neglecta* (Figs. 15-16).

Celastrina idella Wright and Pavulaan, new species

Description. *Male* (Figs. 1-2, 5-7). Forewing length 10-15 mm (n=167). Southern NJ males average smaller (12.2 mm, n=68) than those from coastal North Carolina (13.2 mm, n=54). Dorsal color uniform light blue; some individuals with distinct purplish-blue tint (especially NJ pine barrens). White insuffusion between veins on DHW common. Androconia present. Wing fringes white; black checkering minimal to absent. Ventral color uniform light gray to white. Black maculations greatly reduced. All are lightly marked, similar to form "violacea", except in southern NJ where a few (3-6%) have partially fused maculations on the VHW disc (near form "lucia"). *Female* (Figs. 3-4, 8). Forewing length 11-14.5 mm (n=36). NJ females average smaller (12.2 mm, n=19) than those from North Carolina (13.5 mm, n=11). Dorsal color lustrous metallic light blue; many NJ individuals (pine barrens) with purplish tint. Black on DFW costa and outer margin. DHW with series of submarginal black dots. White insuffusion on DHW common; occasionally also on DFW. Wing fringes white; black checkering minimal to absent. Ventral color and pattern as in male.

Types. *Holotype* ♂ (Figs. 1-2): 2.2 km. s. of Chatsworth, Burlington Co., NJ, 11 May 1987, cedar bog in Risley Branch of Wading River, leg. D.M. Wright. *Allotype* ♀ (Figs. 3-4): 8 km. e. of Chatsworth, Burlington Co., NJ, 19 May 1990, cedar bog in Pope Branch of Wading River, ovipositing on *I. laevigata* (Pursh) Gray, leg. D.M. Wright. Holotype and allotype deposited in The Academy of Natural Sciences of Philadelphia (ANSP), Philadelphia, PA. *Paratypes*: 101 ♂♂ and 35 ♀♀: GROUP I (in pine barrens from 26 April - 28 May, 1987-1995): 50 ♂♂ and 20 ♀♀ from Chatsworth, NJ, and vicinity; GROUP II (from outside the pine barrens 15 March - 20 May, 1979 - 1997): 45 ♂♂ and 13 ♀♀ from Bevan WMA and Bear Swamp East, Cumberland Co., NJ; 1 ♂, 2 ♀♀ from N. Dennis and Eldora, Cape May Co., NJ; 5 ♂♂ nr. Pleasant Mills and Egg Harbor Twp., Atlantic Co., NJ. Paratypes deposited in ANSP, United States National Museum (Washington, D.C.), American Museum of Natural History (New York, NY), and collections of authors and contributors (DS, DL, JP).

Etymology. *Idella* is a feminine name derived from several possible Latin roots (id, ide, idea). We interpret it as a corrupted form of Latin *idealitas*, meaning "model embodying perfection." Its common name should be **Holly Azure**.

Synonymy. *Papilio argiolus* L. in Abbot (1792), "Caterpillar feeds on...Holly &c. [F]requent in Hammocks and near swamps." [GEORGIA]; *Cyaniris pseudargiolus* (Bsd. & L. C.) in Scudder (1876, 1889), "...*Ilex*, on which Abbot found it." [GEORGIA]; *Lycaena ladon* (Cramer), form "violacea" Edw. in Smith (1910), "occurs in April and May... foodplants...are *Ilex*." [NEW JERSEY]; *Lycaenopsis argiolus pseudargiolus*, form vern. *pseudargiolus* in Comstock (1940), "...spring forms *lucia* and *marginata* occur with *pseudargiolus*...Lakewood [pine barrens]...May 18" [NEW JERSEY]; *L. a. pseudargiolus*, form vern. *neglecta-major* (Tutt) in Comstock (1940), "This form follows the early spring forms and is intermediate in occurrence between them and the first summer brood...Jamesburg [pine barrens] May 30." [NEW JERSEY]; *Lycaenopsis argiolus*, form *violacea*, in Shapiro (1966), "...majority of spring specimens are form *marginata*...[V]iolacea increases in frequency as the spring emergence progresses." [NEW JERSEY, in part]; *Celastrina ladon* (Cramer), form "violacea" in Gatrell (1986), "from all south coastal counties...form *violacea* emerges at end of February and flies throughout March." [SOUTH CAROLINA]; *Celastrina ladon*, "violacea" in Glassberg (1993) "In our area there may be at least three species -[including] a 'violacea' type Azure appearing in the pine barrens in early May." [NEW

JERSEY; *Celastrina ladon*, "Pine Azure" in Walter (1993), "Pine Azure...is associated with pine barren habitats." [NEW JERSEY]; *Celastrina ladon*, "Late Spring Azure" in Pavulaan and Wright (1994), "especially common in New Jersey white cedar swamps...also very common in New Jersey deciduous swamps, Cape May County." [NEW JERSEY]; *Celastrina ladon ladon* (Cramer), race "violacea" III in Pratt et al. (1994), "type III feeds on male flowers of *Ilex* species...on coastal plain" [NEW JERSEY to GEORGIA]; *Celastrina* sp., "Cherry Gall Azure" and "Eastern Spring Azure" in Wright (1995), "...sizable populations of Cherry Gall Azures can be found in cedar swamps of the New Jersey pine barrens, where...[they feed] on male flowers of Inkberry (*Ilex glabra*)," and "...along outer coastal plain from Cape May, New Jersey to Georgia, there occurs a brightly-colored, holly-feeding, 'violacea' variety of the Eastern Spring Azure." [NEW JERSEY to GEORGIA]; *Celastrina* n. sp., "Late Spring Azure" in Itfner and Wright (1996), as "Holly Spring Azure" [Fig. 1] [NEW JERSEY]; *Celastrina* sp., "Pine Barren Azure" in Gochfeld and Burger (1997), "...this distinct entity may be either a small race...or a distinct species. Forested Coastal Plain including the Pine Barrens...[feeds on Inkberry...and American Holly." [NEW JERSEY]; "Coastal Holly Azure" in Williams (1998), "...coastal holly azures have been discovered so recently that they have yet to be assigned scientific name." [NEW JERSEY]; *Celastrina ladon*, "Pine Barrens Spring Azure" in Glassberg (1999), "...may eventually merit full species status" [EAST]; "Celastrina sp." Holly [Spring] Azure in LeGrand and Howard (1999)... "This species found in a wide variety of wooded or semi-wooded sites, in the vicinity of hollies...Coastal Plain only" [NORTH CAROLINA].

Biology. Flight period: In the north (type locality), a four-week flight from end of April to end of May and following the flight of *C. ladon lucia* (extreme dates: 25 April - 4 June). To the south (inc. Delaware Bay counties of southern New Jersey), flight is correspondingly earlier (extreme dates: 26 February - 20 May). **Adult Nectar Sources:** Open flowers of highbush blueberry *Vaccinium corymbosum* L., sand myrtle *Leiophyllum buxifolium* (Berg.) Ell., chokeberries *Aronia arbutifolia* (L.) L.F. and *A. melanocarpa* (Michx.) Willd., black cherry *Prunus serotina* Ehrh., red maple *Acer rubrum* L., and rock cress (*Arabis* sp.) **Hosts:** Male flowers of dioecious *Ilex* species (Aquifoliaceae). Eggs and larvae recorded on American holly *I. opaca* Ait., inkberry *I. glabra* (L.) Gray, and smooth winterberry *I. laevigata* (Pursh) Gray in southern New Jersey. Recorded from yaupon holly *I. vomitoria* Ait. in the outer banks of North Carolina and *I. opaca* Ait. in coastal southern Virginia. Possibly tall gallberry holly *I. coriacea* (Pursh) Chapm. in North Carolina. [Note: Wild larvae reared from flowers of Virginia Willow *Itea virginica* L. at Virginia Beach, VA, in May, diapaused and produced *idella* adults. This may be an alternative host, especially near the end of the adult flight when unopened *Ilex* buds are dwindling.]

Immature Stages. Egg white, similar to other *Celastrina*; placed on floral buds of *Ilex* hosts. First instar light green; bores into floral buds. Mature larva (4th instar) variable, light green to creamy white; some lightly contrasted with dorsal white chevrons, maroon prothoracic shield, or rarely with faint rosy mid-dorsal stripe. (Lighter and less boldly marked than larvae of *C. ladon lucia*.) Myrmecophilous larvae on *Ilex glabra* (L.) Gray attended by worker ants of *Camponotus ferrugineus* (F.), *C. nearcticus* Emery, and *Lastus alienus* (Foerster). Hymenopterous parasitoids recovered during rearing include *Trichogramma* sp. from eggs and a small wasp *Cotesia cyaniridis* (Riley) from mature larvae. Pupa light brown (7.2-8.2 mm, n=10), obtect. Pupation dates, June 14-July 3 in New Jersey. Pupa diapause.

Habitat. Wet areas (cedar swamps, cypress swamps, pocosins, bottomlands, wet thickets) and upland dry maritime forests of sandy coastal plain and barrier islands, with holly (*Ilex*).

Frequency Associates. *Mitoura hesseli* Rawson & Ziegler, 1950, in Atlantic white cedar bogs and the *Ilex* associated subspecies (Gatrelle, 1999) of *Deciduphagus henrici* (Grote & Robinson, 1867) in coastal holly woodlands.

Range (Fig. 22). Known localities include: **NEW JERSEY:** ATLANTIC CO.: Atlantic City International Airport, Brigantine, Folsom, Forge Pond, Hammonton, Mays Landing, Mizpah, Pleasant Mills, Pomona, Weekstown; BURLINGTON CO.: Batsto, 2.2 km. s. Chatsworth, 8 km. e. Chatsworth, Duke's Bridge, High Bridge, Jenkins, 6 km. e. Medford, Ong, Oswego Lake, Penn SF, Quaker Bridge, Red Lion, Speedwell, West Plains; CAMDEN CO.: Atco, Gibbstown, Kirkwood Lake; CAPE MAY CO.: Belleplaine SF, Cape May Point, Dennisville, Eldora, Five Mile Beach, Goshen, Hidden Valley, Higbee Beach, Jake's Landing, North Dennis, Petersburg, Seaville, Woodbine (Great Cedar Swamp); CUMBERLAND CO.: Bevan WMA, Bear Swamp, Center Grove, Dividing Creek, Hanesy Creek, Millville, Manumuskinn, N. Port Norris; GLOUCESTER CO.: Iona; MONMOUTH CO.: Allaire SP; OCEAN CO.: Lakehurst, Lakewood, Manahawkin, Ridgeway, Waretown, Warren Grove; SALEM CO.: Alloway, Quinton. **DELAWARE:** KENT CO.: w. Milford (Mispillion River); SUSSEX CO.: nr. Bethel, nr. Lincoln, Nanticoke WMA. **MARYLAND:** ANNE ARUNDEL CO.: Annapolis, Riva; CALVERT CO.: Lusby; CAROLINE CO.: nr. Templeville; CHARLES CO.: Cedarville SF; PRINCE CHARLES CO.: Cedarville; WICOMICO CO.: n. Salisbury (white cedar swamp); WORCESTER CO.: Wango (John's Tract). **VIRGINIA:** CHESAPEAKE: Northwest River Park; FAIRFAX CO.: Mason Neck SP; JAMES CITY CO.: Lakewood (nr. Jamestown); NEW KENT CO.: New Kent; PRINCE WILLIAM CO.: Triangle (Prince William Forest); SUFFOLK: Dismal Swamp, nr. Corapeake, NC; VIRGINIA BEACH: Seashore SP. **NORTH CAROLINA:** BEAUFORT CO.: Locality not given; BLADEN CO.: Bladen Lakes SF (nr. Elizabethtown), Jones Lake SP (nr. Elizabethtown); BRUNSWICK CO.: Green Swamp; CAMDEN CO.: Great Dismal Swamp; CATERET CO.: Moorhead City; COLUMBUS CO.: Green Swamp; CRAVEN CO.: Croatan NF (nr. Croatan); DARE CO.: Kill Devil Hills (Outer Banks), Nag's Head (Outer Banks), Whalebone (Outer Banks); DUPLIN CO.: Kenansville; GATES CO.: nr. Sunbury (Great Dismal Swamp); JONES CO.: Croatan NF (nr. Maysville); NEW HANOVER CO.: Locality not given; ONSLOW CO.: Locality not given; PASQUOTANK CO.: Elizabeth City; PENDER CO.: Angola Swamp; PITT CO.: Locality not given; ROBESON CO.: Locality not given; SAMPSON CO.: Turkey; WAYNE CO.: Locality not given. **SOUTH**

CAROLINA: AIKEN CO.: Aiken SP; BARNWELL CO.: Barnwell SP; BEAUFORT CO.: Locality not given; BERKELEY CO.: Locality not given; CHARLESTON CO.: Charleston; COLLETON CO.: Locality not given; DORCHESTER CO.: Givhans Ferry SP; GEORGETOWN CO.: Georgetown; HORRY CO.: Nixons Crossroads; JASPER CO.: Locality not given. **GEORGIA:** CHATHAM CO.: Ossabaw Island; LIBERTY CO.: St. Catherines Island; TATTNALL CO.: Ohoopce Dunes.

Diagnosis: In southern NJ, *C. idella* flies immediately following the flight of sympatric *C. ladon lucia* with minor overlap of flights in certain years. Mean peak flights of *lucina* (April 16) and *idella* (May 13) are nearly a month apart in the pine barrens at Chatsworth, NJ, as calculated from field and museum data (*lucina* n=511, *idella* n=435). South of the NJ pine barrens in the Delaware Bay counties (Cape May Co., Cumberland Co., Salem Co.) mean peak flights of *lucina* and *idella* are fully two weeks earlier. *C. idella* (Figs. 1-2) is distinctly smaller and lighter in color than *lucina*. The wings of both sexes of *lucina* (Figs. 9-10) are larger (FW 13.1 mm, n=42), solid blue in color with no white suffusion, and strongly outlined in black (often checkered). The *lucina* venter is dark ashen gray and is strikingly contrasted with heavy brown to black maculations and borders (74% form "marginata"; 24% form "lucina"). The sole *lucina* host in southern NJ is highbush blueberry *Vaccinium corymbosum* L. which blooms earlier than *Ilex* species. Larvae of *lucina* are generally bolder in markings; red, green, and brown contrasting morphs are common. *Lucina* pupae (7.5-8.6 mm, n=28) are slightly larger and pupate earlier (May 24-June 8). Under experimental conditions (4 C for four months, then 20 C until eclosion), the mean eclosion time of *lucina* pupae (4.2 days, n=48) is significantly earlier than *idella* (n=13.8 days, n=57, S.E.=0.2) and indicates a genetic basis for the separate *lucina* and *idella* flights in southern NJ. Southward along the coast and westward toward the Piedmont, *idella* is distinguished from nominate *C. ladon ladon* (Figs. 13-14) by bearing androconia and lacking the long overlay scales unique to this subspecies². *C. l. ladon* males often have a satiny matte appearance (not seen in *idella*) because of these scales. A dissecting scope or hand lens is often needed to diagnose this scale pattern. The ultrastructure (SEM) of *C. l. ladon* male scales (Fig. 21) contrasts dramatically with males of other eastern *Celastrina* taxa (e.g. *C. neglecta* in Fig. 20).

Phenotypically, three white-vented species (*neglecta*, *neglectamajor*, and species undescribed) are most similar to *idella*. However, their larvae do not survive on *Ilex*. The sympatric summer species, *C. neglecta*, nearly always lacks temporal contact with *idella*. *Neglecta* individuals are slightly larger and have more white insuffusion dorsally and ventrally (some near immaculate) (Figs. 15-16). In the NJ pine barrens *neglecta* is virtually absent due to a paucity of suitable summer host plants. In the surrounding Delaware Bay counties of southern NJ *neglecta* is present in early summer (June), but uncommon in late summer. Elsewhere *neglecta* is common throughout the summer (Fig. 25). [A phenomenon of unknown significance is the occasional appearance in early spring (April) of *neglecta*-like individuals in habitats where summer *neglecta* is known to occur. These individuals are never common and we believe they are *neglecta*. We encounter them more frequently inland in wooded and urbanized habitats. On the middle Atlantic coastal plain south of the NJ pine barrens they can be confused with *idella* due to similar appearance. A combination of features help separate these rare spring *neglecta* individuals from *idella*. In general, they are not found in holly habitats, but are closely associated with black cherry *Prunus serotina* and will oviposit on floral buds of this host. The great majority of larvae reared on black cherry do not diapause and eclose to join the bulk of the *neglecta* population which begins flight in late May/June. (Curiously, a few larvae reared on black cherry diapause. We believe this is facultative univoltinism.) When transferred to *Ilex* species, spring *neglecta* larvae die. The venter of the spring *neglecta* individuals (Fig. 19) is slightly grayer than *idella*; ventral maculations are more prominent, but never fused into a "lucina" patch as found in 3-6% of NJ *idella*. Spring *neglecta* males perch near black cherries with wings held vertically over the body. Most *idella* males perch near hollies with wings partially spread at 30-45° to vertical. See Williams (1998) for photo by author (DW) of this phenomenon.] Both *C. neglectamajor* and the undescribed cherry gall species fly between *C. l. ladon* and *neglecta* flights in their respective ranges, neither of which overlaps the range of *idella*. *Neglectamajor* is much larger (Figs. 17-18) and is found only in Appalachian deciduous woodlands (Fig. 27). It feeds solely on black cohosh *Cimicifuga racemosa* (L.) Nutt. The species (Fig. 12) associated with mite-induced leaf galls of cherry trees *Prunus serotina* Ehrh. and *P. virginiana* L. occurs further north from n. NJ to s. Canada. *C. nigra* is separated from all other *Celastrina* species by its black males, Appalachian range (Fig. 26), and unique monophagy. *Nigra*'s foodplant is goat's beard *Aranthus dioicus* (Walt.) Fern. Despite phenotypic and biological differences, there are no major differences in male genitalia among all the *Celastrina* species in eastern North America. As a group they diverge from the genitalic characteristics of Eurasian *C. argiolus* and are easily separated from that taxon. However, they can not be reliably distinguished from one another. The sclerotized male valva terminates in a narrow apical process with small subsidiary teeth. In most southern NJ *idella* males the upper surface of the apical process, medial to the subsidiary teeth, displays very fine sparse cuticular spinosity (not sensory setae) under high-power magnification (Fig. 28 on CD). This feature is absent in the other eastern *Celastrina* species; it may prove to be most useful in solving the identity of puzzling museum specimens (for instance *idella* versus spring *neglecta*). Lastly, the inner margin of the uncus lobe spine is considerably smoother in *idella* than in the other taxa (Fig. 29).

² The *C. ladon* (Cramer, 1780) neotype designated by Clench and Miller (1980) has this unique scale pattern. The spring taxon *violacea* (W.H. Edwards, 1866), defined in lectotype designated by Brown (1970), also has this scale pattern. Thus, *violacea* (W.H. Edwards) is a junior synonym of *ladon* (Cramer). The taxon described/figured by Boisduval and Le Conte (1833) as *pseudargiolus* has phenotypic features of *ladon* (Cramer) and is properly synonymized under that name.

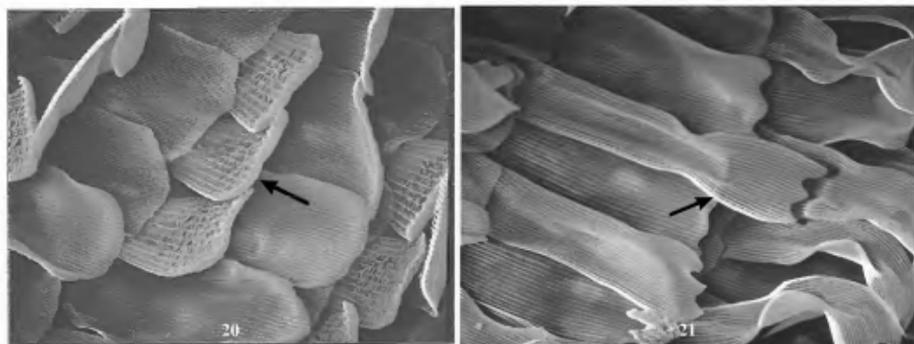
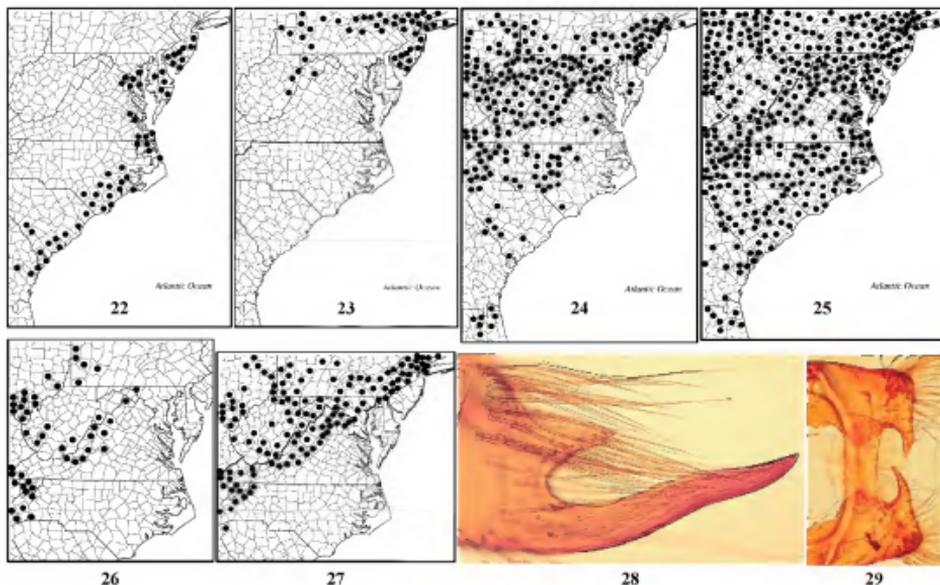


Fig. 20, Scanning electron micrograph (SEM 640X) of dorsal forewing of δ *C. neglecta* showing androconia between blue scales. Specimen taken 17 September 1987, Harleysville, Montgomery Co., PA. Fig. 21, (SEM 640X) of dorsal forewing of δ *C. l. ladon* showing long overlapping scales and lack of androconia. Specimen taken 23 April 1992, Green Ridge State Forest, Allegany Co., MD.



Figs. 22-27. *Celastrina* distribution in the mid-Atlantic region. 22, distribution of *C. idella*. 23, distribution of *C. l. ladon lucia*. 24, distribution of *C. l. ladon*. 25, distribution of *C. neglecta*. 26, distribution of *C. nigra*. 27, distribution of *C. neglectamajor*.

Figs. 28-29. Genitalia³ of δ *C. idella* from nr. Chatsworth, Burlington Co., NJ, 13 May 1987. 28, dorsal view of valva with apical terminal process (100X). 29, ventral view of upper half of ring; uncal lobes with spines (100X).

³ ED. NOTE: Subscribers may "zoom" Fig. 28 on CD to full page size to see detailed features, including cuticular surface of terminal process of valva (400X).

DISCUSSION

Celastrina idella becomes the fifth North American lycaenid described from the New Jersey pine barrens⁴. The region is a natural community with distinctive flora and a rich history of scientific study (Forman 1979). Located on the unglaciated outer coastal plain, the barrens is an "island" of highly acidic, sandy soil which supports large stands of undisturbed pine forests, heathlands, and bogs. Its close proximity to major metropolitan centers and easy access to exploration account for its popularity with naturalists for nearly two centuries. Part of the uniqueness of the pine barrens is its mixed flora. Many plant species of both northern and southern affinity reach their range extremes in the pine barrens where they overlap (McCormick 1970).

In similar fashion, the sibling pair of spring *Celastrina* in the pine barrens represent insects of differing affinities whose ranges overlap only in southern New Jersey. The first taxon, *C. ladon lucia*, is most common in northern woodlands and peatlands of Canada and New England where it feeds on many plant families. Its southernmost coastal population occurs in the New Jersey pine barrens (Fig. 23). This coastal *lucia* population is unique in that it utilizes a single host, flies very early, and is darker blue than northern populations. It may be a remnant of a much larger *lucia* population that once flourished on expanded heathlands of the exposed continental shelf. Physiological constraints prevent *lucia* from extending further south despite the presence of acceptable hosts.

The second taxon, *C. idella*, is a denizen of southeastern coastal swamps and holly forests. It occurs from Georgia to southern New Jersey with its northernmost population in the New Jersey pine barrens. Similarly, physiologic constraints must prevent *idella* from occurring further north even though holly still remains common along the coast. (For instance, *C. idella* is absent from the American holly forest on the dunes at Sandy Hook, Monmouth Co., NJ, just north of the New Jersey pine barrens, and is also absent from the Long Island pine barrens of eastern Suffolk Co., NY, where inkberry is locally common.) Even though these two siblings are adapted to single hosts, it should be stressed that they are also restricted by habitat preferences. Their ranges are smaller than their respective hosts.

How often sympatric speciation creates new species is still a matter of dispute. Once thought impossible, the concept has gained respect among evolutionary biologists (Gibbons 1996). Charles Darwin's ideas of the formation of species through ecological specialization have been revived (Morell, 1999). Most organisms require geographic isolation (allopatry) to form new species. However, some plant-feeding insects seem to be particularly adept at finding empty niches, exploiting opportunities, and diverging from others sympatrically. Divergence is spurred by strong selection and rapid adaptation.

Specialization on host floral buds is the niche of *Celastrina* and each separate host represents a potentially different niche. Wherever *C. l. lucia* and *idella* co-occur, host specialization prevents their contact. Adults of the two species fly at different times coupled to the bud stage of their respective hosts. The degree of interbreeding (if any) between these two taxa is unknown. Population genetics models have shown that it takes very little interbreeding to erase differences. The small percent (3-6%) of New Jersey *idella* individuals with imperfect "lucia" disc on VHW (Fig. 6) could be taken as evidence of interbreeding between *C. l. lucia* and *idella*. However, all other phenotypic and biologic characteristics of the taxa remain distinct with no introgression. The "lucia" disc is most likely genetically controlled, but instead of acquisition through recent interbreeding it can be equally explained as an expression of an ancestral gene induced or unmasked by local cold temperatures (especially soil temperatures where pupae rest).

We are not aware of any evidence of interbreeding between *C. l. lucia* and *C. idella* in New Jersey. Further south within its range, *idella* flies parapatrically to inland *C. l. ladon*. *C. l. ladon* is common in the Piedmont and reaches the inner coastal plain (Fig. 24) where there is evidence of partial hybridization with *idella*. The flights of the two taxa overlap chronologically in Virginia and the Carolinas, and contact is inevitable. The width of the hybridizing suture zone is presently unknown, but is suspected to be small.

⁴ Others are: *Epidemia eptanthe* (Boisduval & Le Conte, 1833), *Decisphagus polstor* (Cook & Watson, 1907), *Mitovora hesseli* Rawson & Ziegler, 1950, and *Decisphagus trux* (Godart, 1824) by designation of neotype in Gutreille (1999).

On the outer coastal plain and barrier islands *C. idella* is the exclusive spring *Celastrina* taxon and *C. l. ladon* is absent. Should the hybridization zone on the inner coastal plain prove to be substantially large, then the two taxa are not separated at the species level in the south. In that case, southern New Jersey would harbor endemic populations of *C. idella*.

The origins of *C. idella* are unknown. We suspect that it originated in the Pleistocene during glacial stages of low sea level when the Atlantic coastal plain was enormously widened and constituted a significantly larger belt of land. During these intervals the exposed outer coastal plain extended 100-200 km eastward from today's shoreline and was covered with similar vegetation (Emery *et al.* 1967). Given the abundance of *Ilex* and the relative sparsity of flowering dogwood *Cornus florida* on today's outer coastal plain, *idella* was most likely the only spring *Celastrina* flying in this expanded biome during low sea levels from Delaware Bay southward. It may have evolved quickly by a host shift from a closely related ancestor. The hypothetical ancestor presumably had a light venter phenotype similar to present day *neglecta*, *neglectamajor*, or the undescribed cherry gall species. Curiously, *Ilex* flowers are toxic to the larvae of these three species in the lab – they generally do not survive beyond the first instar stage. Selection would have favored a founder with larval resistance to *Ilex* toxins. Allozyme studies are underway to investigate the closest relative(s) of *idella* and its systematic relationship with other taxa.

ACKNOWLEDGMENTS

We acknowledge our deep gratitude to David Ifner, Gordon Pratt, and Dale Schweitzer who provided many stimulating discussions regarding this new taxon and *Celastrina* biology. These individuals also reviewed the manuscript draft and offered valuable critical comments. We greatly appreciate the unselfish assistance given by F. Martin Brown and John Eliot regarding nomenclatural issues. We also acknowledge and extend our warmest thanks to the following individuals and their respective institutions for providing access to reference collections: The Academy of Natural Sciences of Philadelphia (Don Azuma, Jon Gelhaus, and Jason Weintraub), Allyn Museum of Entomology (Jackie and Lee Miller), American Museum of Natural History (Fred Rindge and Eric Quinter), Carnegie Museum (John Rawlins), Cleveland Museum of Natural History (Sonja Teraguchi), Dayton Museum of Natural History (Reed Watkins), Delaware County Institute of Science (John Hallahan), Eastern College (David Unander), Field Museum (Phil Parillo), Florida State Collection of Arthropods (John Heppner), Illinois Natural History Survey (Kathleen Zieders), Los Angeles County Museum of Natural History (Julian Donahue), Michigan State University (Mo Nielsen), Museum of Comparative Zoology (David Furth and Stephan Cover), New Jersey State Museum (David Parris), Newark Museum (John Michalski), The Ohio State University Museum of Biological Diversity (Eric Metzler), Pennsylvania Department of Agriculture (Karl Valley), Pennsylvania Department of Forestry (John Quimby), Pennsylvania Natural Diversity Inventory (Barbara Barton), Purdue University (Arvin Provonsha), Reading Museum (Michael Feyers), Royal Ontario Museum (Chris Darling), Rutgers University (Timothy Casey), Staten Island Institute of Arts & Sciences (Edward Johnson), United States National Museum (Robert Robbins), University of California Riverside (Greg Ballmer and Gordon Pratt), University of Delaware (Dale Bray and Tom Wood), University of Guelph (Steve Marshall), University of Louisville (Charles V. Covell), University of Michigan Museum of Zoology (Mark O'Brien), University of Pennsylvania (Andrew Binns), Wagner Institute (Eugene Bolt and Susan Glassman), Yale Peabody Museum (Charles Remington). We also sincerely thank the following individuals for allowing us the opportunity to examine their private collections and/or forward specimens to us: Chris Adams, Tom Allen, George Balogh, Andrew Beck, Richard Boscoe, John Bove, John Calhoun, Tom Carr, Charles V. Covell, Harry N. Darow, Jim Dowdell, David Eiler, Karl Gardner, Robert Gardner, Ron Gatrell, William Grooms, David Ifner, Phil Kean, Ron King, Marc Minno, Mo Nielsen, David Parshall, John Peacock, Jim Popelka, Joe Riddlebarger, Frank Rutkowski, Dale Schweitzer, John Shuey, Ernest Shull, Don Simonds, Richard Smith, Reed Watkins, William Wright, Joe Zeligs, Ben Ziegler, and Harry Zirlin. A special thanks is extended to Carol Spawn (Chief Librarian of The Academy of Natural Sciences of Philadelphia) and Pamela Gilbert (Entomology Librarian, British Museum of Natural History) for aiding in retrieval of the Abbot references;

also to Phil Ackery and Pamela Gilbert (BMNH) for obtaining color transparencies of the original Cramer and Abbot paintings. We are grateful to Jim Springer (North Jersey Butterfly Club) and Steve Walter (New York City Butterfly Club) who kindly shared their databases. Steve Walter also supplied helpful information regarding the Long Island pine barrens. We sincerely appreciate the expertise and efforts of Paul Marsh and Richard D. Smith, Research Entomologists (USDA), who identified the larval parasitoids and ant attendants.

LITERATURE CITED

- ABBOT, J. (1792-1804). Drawings of the Insects of Georgia, &c. [Original water-colour drawings with MS. descriptions.] vol. 16, no. 212, British Museum (Natural History), London.
- ALLEN, T.J. 1997. The Butterflies of West Virginia and their Caterpillars. Univ. of Pittsburgh Press, Pittsburgh. 388 pp.
- BOISDUVAL, J.A.B.D., and J.E. LE CONTE. 1833. Historie Generale et Iconographie des Lepidopteres et des Chenilles de l'Amerique Septentrionale. Roret, Paris. 228 pp.
- BROWN, F.M. 1970. The Types of Lycaenid Butterflies Named by William Henry Edwards Part III. Plebejinae. Trans. American Ent. Soc. 96: 423-431.
- EDWARDS, W.H. 1883. On the Polymorphism of *Lycaena Pseudargiolus*. Papilio 3:85-97.
- CLENCH, H.K., and L.D. MILLER. 1980. *Papilio ladon* Cramer vs. *Argus pseudargiolus* Boisduval and Le Conte (Lycaenidae): A Nomenclatorial Nightmare. J. Lepid. Soc. 34(2):103-119.
- COMSTOCK, W.P. 1940. Butterflies of New Jersey. J. New York Ent. Soc. 48: 47-84.
- EMERY, K.O. *et al.* 1967. Freshwater Peat on the Continental Shelf. Science 158:1301-1307.
- FORMAN, R.T.T. 1979. Pine Barrens: Ecosystem and Landscape. Academic Press, New York. 601 pp.
- GATRELLE, R.R. 1986. The Papilionoidea of South Coastal Area of South Carolina. Southern. Lepid. Bull. no. 2. 16 pp.
- _____. 1999. An Evolutionary Subspecific Assessment of *Deciduphagus henrici* (Lycaenidae) Based On Its Utilization of *Ilex* and Non-*Ilex* Hosts: Description of a Third *Ilex* Associated Subspecies. Designation of a Neotype and Type Locality for *Deciduphagus irus*. The Taxonomic Report, Vol. 1:6, 14 pp. The Int. Lepid. Survey, Goose Creek, SC.
- GIBBONS, A. 1996. On the Many Origins of Species. Special News Report: Speciation. Science 273: 1496-1498.
- GLASSBERG, J. 1993. Butterflies Through Binoculars. A Field Guide to Butterflies in the Boston-New York-Washington Region. Oxford Univ. Press, New York. 160 pp.
- _____. 1999. Butterflies Through Binoculars. The East. A Field Guide to the Butterflies of Eastern North America. Oxford Univ. Press, New York. 242 pp.
- GOCHFELD, M. and J. BURGER. 1997. Butterflies of New Jersey. Rutgers Univ. Press, New Brunswick, NJ. 327 pp.
- IFTNER, D. C., and D. M. WRIGHT. 1996. Atlas of New Jersey Butterflies. Special Private Publication, Sparta, NJ. 28 pp.
- LAYBERRY, R.A., P.W. Hall, and J.D. Lafontaine. 1998. The Butterflies of Canada. Univ. of Toronto Press, Toronto. 280 pp.
- LEGRAND, H.E., Jr., and T.E. Howard, Jr. 1999. Notes on the Butterflies of North Carolina. Sixth Approximation. 183 pp. [Online] Available: <http://www.ncsparks.net/butterfly/nbnc.html>
- MCCORMICK, J. 1970. The Pine Barrens. A Preliminary Ecological Inventory. NJ St. Mus., Res. Report no.2. 103 pp.
- MORELL, V. 1999. Ecology Returns to Speciation Studies. Science 284: 2106-2108.
- PAVULAAN, H., and D.M. Wright. 1994. Out of the Azure and Into the Lab: The Current State of *Celastrina* research. The Mulberry Wing 10 (1): 406.
- PRATT, G.F. 1994. Evolution of *Euphilotes* (Lepidoptera: Lycaenidae) by Seasonal and Host Shifts. Bio. J. Linnean Soc. 51: 387-416.

- PRATT, G.F., D.M. WRIGHT, and H. PAVULAAN. 1994. The Various Taxa and Hosts of the North American *Celastrina* (Lepidoptera: Lycaenidae). Proc. Entomol. Soc. Wash. 96(3): 566-578.
- SCOTT, J.A., and D.M. WRIGHT. 1998. A New *Celastrina* From the Eastern Slope of Colorado. Papilio new series, no. 9. 15 pp.
- SCUDDER, S.H. 1872. Abbott's Notes on Georgian Butterflies. Canad. Ent. 4(4): 73-77 and 84-87.
- _____. 1876. The Relationship of the Early Spring Blues. Canad. Ent. 8(4): 61-66.
- _____. 1889. The Butterflies of the Eastern United States and Canada with Special Reference to New England. 3 vols., pub. by author, Cambridge, Mass. 1958 pp.
- SHAPIRO, A.M. 1966. Butterflies of the Delaware Valley. Amer. Ent. Soc., Philadelphia, PA. 79 pp.
- SMITH, D.S. 1988. Heritable Divergence of *Rhagoletis pomonella* Host Races by Seasonal Asynchrony. Nature 336: 66-67.
- SMITH, J.B. 1910. The Insects of New Jersey. Ann. Report of the NJ St. Mus. 1909. MacCrellish and Quigley, Trenton. 888 pp.
- SMITH, J.E. 1797. A Natural History of the Rarer Lepidopterous Insects of Georgia. 2 vols., London.
- WALTER, S. 1993. Out of the Blue (?) and Into the Azure. Mulberry Wing 9(1): 5-6.
- WILLIAMS, T. 1998. Reports. Earth Calendar. Audubon 100 (3): 20.
- WOOD, T.K., and M.C. KEESE. 1990. Host Induced Assortative Mating in *Enchenopa* Treehoppers. Evolution 44: 619-628.
- WRIGHT, D.M. 1995. The American Azures: Our Blue Heaven. American Butterflies 3(1): 20-28 & 30.
- _____. 1998. Update on *Celastrina* Including Notes on Ohio Species. The Ohio Lepid. 20 (2): 18-21.

The Taxonomic Report is a publication of *The International Lepidoptera Survey (TILS)*.
(A Tax Exempt Non-Profit Scientific Organization)

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.

The Taxonomic Report is projected for publication at the rate of at least 10 issues a year. Subscription/dues for volume 1 is \$65. US. The subscription year for volume 1 began in August of 1998 and will run to December 31 of 1999. Beginning with volume 2 (January 2000), all volumes will follow the calendar year. All issues are mailed 1st class. At the end of each year, subscribers receive that year's volume on CD for permanent archiving and reproduction for personal use (i.e. a museum or university may make as many copies as needed in whatever format desired). Non-members may receive individual issues any time for \$10 per issue. Individual issues on CD or disc to non-members are \$15 per issue post paid. **Subscriptions** 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 on how to best handle your research for publication.

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 (information) there will be no systematic taxonomy. Without amateur collectors the majority of the undiscovered species/subspecies will vanish before they are discovered. Be it butterflies or moon rocks, collecting is the first step of access to all other scientific information – and protection.

Donations are needed to support and further our efforts to discover and protect butterflies worldwide.

All donations are US tax deductible. Please help generously.

Donations should be mailed to: **Scott D. Massey, Treasurer, 126 Wells Rd., Goose Creek, SC 29445.**

Checks should be made payable to: **TILS.** Please indicate if you need an individual receipt.



The Taxonomic Report

OF THE INTERNATIONAL LEPIDOPTERA SURVEY



THREE NEW HESPERIOIDAE (HESPERIINAE) FROM SOUTH CAROLINA: NEW SUBSPECIES OF *EUPHYES BIMACULA*, *POANES AARONI*, AND *HESPERIA ATTALUS*

RONALD R. GATRELLE^{1, 2}
126 Wells Road, Goose Creek, South Carolina 29445

ABSTRACT. *Euphyes bimacula arbogasti* is described as a new subspecies from Berkeley County, South Carolina. It is known from only a few widely scattered colonies in the coastal swamp forests of the southeastern United States from Georgia to southeastern North Carolina. It is darker than *E. b. bimacula* and *E. b. illinois*. *Poanes aaroni minimus* is described as a new subspecies from Bull Swamp, Orangeburg County, South Carolina. This unique inland subspecies is presently known only from the type locality. It is darker than *P. a. aaroni* and *P. a. howardi*. *Hesperia attalus nigrescens* is described as a new subspecies from the relict dunes of Sandy Island National Wildlife Sanctuary, Horry County, South Carolina. This isolated subspecies is much darker than *H. a. attalus* and *H. a. slossonae*. The Sandy Island colony of *H. a. nigrescens* is believed to be the only remaining colony of this subspecies. All three subspecies are similarly melanic.

Additional key words: Threatened species, original descriptions.

INTRODUCTION

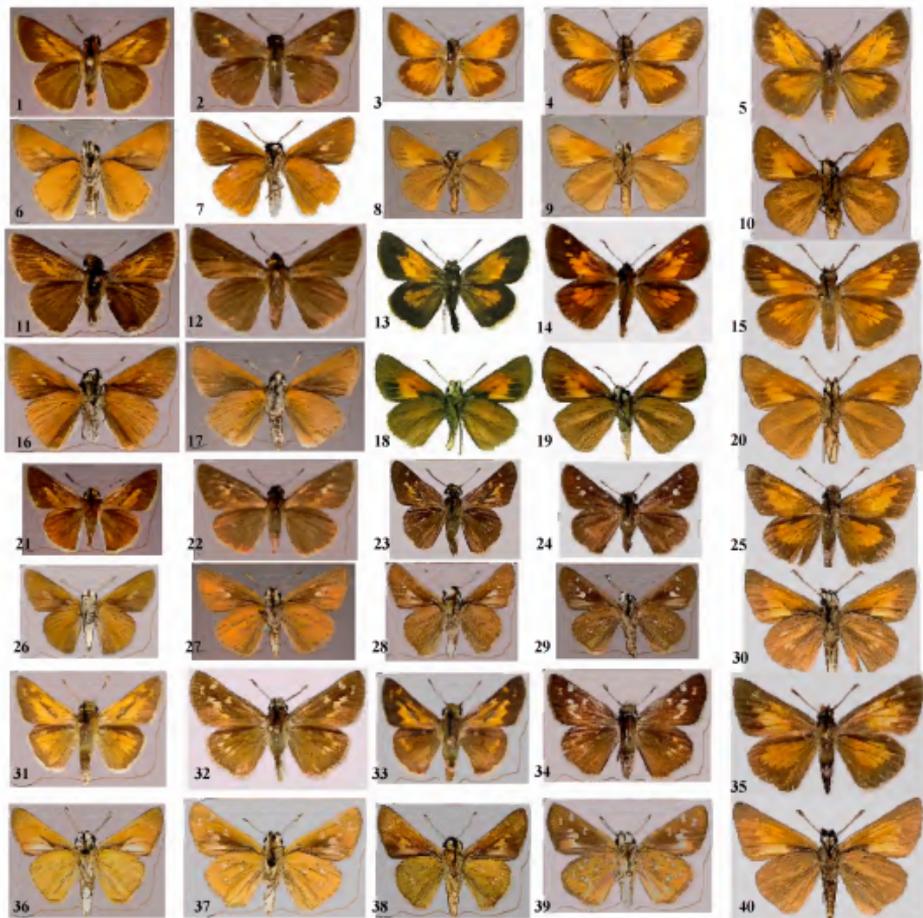
At least 33 species/subspecies of butterflies were originally described from populations inhabiting east coastal Georgia or south coastal South Carolina by the earliest workers on American Lepidoptera in the 1700's and early 1800's. Since then however, very little taxonomic attention has been given to the Lepidopteran fauna of the mid-Atlantic area of the United States between Florida and New Jersey. This has been especially true for the last half of the 1900's when very few lepidopterists, and even fewer butterfly taxonomists, have been residents of the mid-Atlantic area.

A result of this long term scarcity of collectors is that few specimens from this region are available for study. This informational void has given rise to taxonomic oversimplification and misrepresentation in the popular literature of the taxa occupying the area between Florida and New York and from the Atlantic coast to the Mississippi River. Most modern butterfly books recognize few species as occurring in more than one subspecies throughout this vast area of the United States.

This is in stark contrast with the west coastal region of the United States with its abundance of lepidopterists and subspecies. In this western area it is generally *expected* that each mountain range and valley system will harbor different subspecies – and indeed they often do. In California, for example, some (supposed) subspecies are separated by only a few hundred yards. Yet, the consistent impression given in the popular literature is that the species of South Carolina (from its coast to its mountains) are *not expected* to differ subspecifically from those of New Jersey, Missouri, or Louisiana.

¹ Curator, Museum of the Hemispheres, Goose Creek, South Carolina.

² Research Associate, Florida State Collection of Arthropods, Gainesville, Florida.



All figures actual size.

Figs. 1-40. 1/6 (d/v), ♂ *E. b. bimaculata*, 29 June 1986, Passadumkeag, Penobscot Co., ME, leg. Grey. 2/7 (d/v), ♀ *E. b. bimaculata*, 29 June 1986, and same as 1. 3/8 (d/v), ♂ *P. a. aaroni*, 20 August 1976, nr. New Gretna, Burlington Co., NJ, leg. Adelberg. 4/9 (d/v), ♀ *P. a. aaroni*, same data as 3. 5/10 (d/v), ♂ *P. a. howardi*, 24 April 1971, 10 mi. w. Daytona, Volusia Co., FL, leg. Roman. 11/16 (d/v), ♂ neotype *E. b. illinois*, 22 June 1968, Denine Crossing, Grundy Co., IL, leg. N.G. Seaberg. 12/17 (d/v), ♀ *E. b. illinois*, 28 June 1975, William's Prairie, Johnson Co., IA, leg. Gatrell. 13/18 (d/v), ♂ holotype *P. a. minimus*, 1 June 1992, Bull Swamp, Orangeburg Co., SC, leg. Gatrell. 14/19 (d/v), ♀ allotype *P. a. minimus*, 6 June 1992, and same as 13. 15/20 (d/v), ♀ *P. a. howardi*, 25 July 1976, 5 mi. w. of I-95 on Hwy. 92, Volusia Co., FL, leg. Gatrell. 21/26 (d/v), ♂ holotype *E. b. arbogastii*, 12 July 1970, nr. jct. of I-26 and 17-A, Berkeley Co., SC, leg. Gatrell. 22/27 (d/v), ♀ allotype *E. b. arbogastii*, 21 May 1962, nr. Blichton, Bryan Co., GA. 23/28 (d/v), ♂ holotype *H. a. nigrescens*, 10 October 1995, Horry Co., SC, leg. Gatrell. 24/29 (d/v), ♀ allotype *H. a. nigrescens*, 3 October 1995, and same as 23. 25/30 (d/v), ♂ *P. aaroni* sp., 27 May 1995, Sabine Pass, Jefferson Co., TX, leg. Slotten. 31/36 (d/v), ♂ *H. a. attalus*, 2 June 1974, 8 mi. west of Medicine Lodge on 160, Barber Co., KS, leg. Heitzman. 32/37 (d/v), ♀ *H. a. attalus*, 28 May 1974, and same as 31. 33/38 (d/v), ♂ *H. a. sloxsonae*, 21 June 1994, Chesterfield Co., SC, leg. Gatrell. 34/39 (d/v), ♀ *H. a. sloxsonae*, 5 September 1994, Hwy. 19, Marion Co., FL, leg. Gatrell. 35/40 (d/v), ♀ *P. aaroni* sp., same data as 25

The states of Georgia, South Carolina, and North Carolina compose the most ecologically diverse area in the eastern United States. This diversity occurs in all points of the compass, but is delineated most notably from the coastline to the mountains. South Carolina, being in the heart of this area, has five very definitive life zones: 1) semi-subtropical south coastal islands, 2) maritime swamp forests, 3) arid sandhills, 4) piedmont, and 5) the edge of the Appalachian Mountains. As one traverses these zones, from the south-east to the northwest, South Carolina's species changes greatly. On a given fall morning one could observe/collect such locally common tropical taxa as *Heliconius charitonius tuckeri* W. P. Comstock and F. M. Brown, 1950; *Danaus gilippus berenice* (Cramer, [1775]); *Hemiargus ceranus antibubastus* Hübner, [1818]; *Pterourus palamedes* (Drury, [1773]); *Urbanus dorantes* (Stoll, [1790]); and *Calpodus ethlius* (Stoll, [1782]) on Hunting Island in Beaufort County, then drive just five hours to Oconee County and in the afternoon observe/collect such locally common temperate species as *Boloria bellona* (Fabricius, 1775); *Speyeria cybele* (Fabricius, 1775); *Lycaena phlaeas americana* Harris, 1862; *Polites peckius* (W. Kirby, 1837); and *Enodia anhedon* A. H. Clark, 1936.

As with its species, South Carolina's subspecific diversity is more pronounced from east to west (southeast to northwest) than from south to north. In this respect, South Carolina is similar to southern California where the basic life zones and their accompanying subspecies are encountered east/west as they correspond to the mountain ranges and valleys. This similar geographical subspecific pattern should be *expected* because the subspecific distribution of the taxa in both South Carolina and California arose in concert with the geological evolution of these states coastal areas, mountains, valleys, and arid regions.

Some of South Carolina's species are represented in the state by one subspecies which is endemic to the coastal area and another which is endemic from the midlands to the mountains: *Anthocharis midea midea* (Hübner, 1809) (coastal islands) and *A. m. annickae* dos Passos and Klots, 1969 (remainder of state); *Asterocampa celtis reinthali* Friedlander, 1988 (south coast) and *A. c. celtis* (Boisduval and Leconte, [1834]) (remainder of state). Some do not occur in the coastal area but are represented by one subspecies in the sandhills and another in the mountains: *Satyrium edwardsii edwardsii* (Grote and Robinson, 1867) (mountains) and *S. edwardsii* undescribed (southern sandhills); *Chlosyne gorgone gorgone* (Hübner, 1810) (sandhills) and *C. g. carlota* (Reakirt, 1866) (upper piedmont and mountain foothills). Occasionally a species may have three subspecies within the state: *Satyrium calanus calanus* (Hübner, 1809) (south coastal), *S. c. falacer* (Godart, 1824) (mountains), and *S. calanus* undescribed (sandhills).

There are at least three undescribed butterfly species in South Carolina and several undescribed subspecies. Three of these heretofore undescribed subspecies are described as new Hesperinae in this paper. Two of these are apparently geographically unique and are thus limited to single populations (one is in the Sandhills region and the other in a coastal dune area). The third is widely distributed from Georgia to North Carolina, but is rare within this range. Each of these subspecies should be considered as a taxon in need of special environmental protection. One, *Hesperia attalus nigrescens* Gatrell, 1999 n. ssp., is already protected because most of its population is expected to be found within the Sandy Island National Wildlife Sanctuary in Horry County, SC.

A NEW SUBSPECIES OF *EUPHYES BIMACULA*

Review of *bimacula* subspecies.

Euphyes bimacula bimacula (Grote and Robinson, 1867) was described from the female – the male being unknown at the time. There was no figure. The original description makes no mention of how many specimens were involved. I believe it is most probable that this species was described from a single specimen. Miller and Brown (1981) were unaware of the location of the type, but suggested that it might be in the AMHN or NY State Museum. I have not tried to locate the type. (Any information regarding the

existence of the female holotype would be greatly appreciated.) It is possible that the type is no longer extant. Further, if *bimacula* was described from a single specimen, then there are no syntypes. In which case, a neotype should be designated from the vicinity of Philadelphia, Pennsylvania.

The *Annals of the Lyceum of the New York Natural History Society* is a rather rare work. It was only published in 10 volumes from 1860 to 1869. Because the original description is so rare, and also very detailed and accurate, I think it a good idea to reproduce it here:

Hesperia bimacula, n. s. Female. Head, above, and prothorax, covered with dark brassy yellow scales; the tips of the palpi are stained with the same shade. Thorax and abdomen, above, blackish, clothed with lateral, longer, mixed olivaceous and aeneous hair. Beneath, the palpi are white; the eyes are also margined narrowly with white. Thoracic parts, beneath, clothed with longer, mixed griseous and whitish hair. Abdomen, beneath, whitish, with longitudinal darker streaks, laterally clothed with mixed griseous scales. Legs, obscure aeneous; femora with white scales inwardly. Antennae, rather short and stout; above, sub-annulate; "club," blackish; beneath, more plainly annulate with yellowish white, the apices tinged with dark fulvous.

Wings, broad, somewhat longitudinally wrinkled; above, lustrous olivaceous brown, with dark olivaceous longer scales. Anterior wings, above, without markings, except two, unequal, pale yellowish, obliquely placed maculations at the base of the interspaces between the upper median nervules. Of these, the upper is much the smaller, and is brought nearer the external margin than the lower; beneath this latter there are faint indications of a third, paler spot, above the internal nervure. Base of the wing costal region, sparsely clothed with obscure aeneous-yellow scales; fringes, prominent, *whitish*, with a faint darker basal shade. Posterior wings, immaculate, with longer, aeneous olivaceous and yellowish hairs spreading over the disc and along internal margin, this latter as long as the abdomen, anal angle slightly and rather broadly exserted; fringes as on anterior wings. Beneath, the anterior wings are evenly covered with obscure aeneous or golden yellow scales, which are very prominent along costa, leaving the lower portion of the wings, above internal margin, free; the two yellow maculations of the upper surface are here repeated. The posterior wings are immaculate, concolorous with anterior pair, being almost everywhere evenly covered with golden yellow scales, least prominently so before internal margin.

Expanse, 1.50 inches. *Length of body*, 0.70 inches.

Habitat. – Atlantic District. (Philadelphia!)

A little larger than *Hesperia pochontas*, *Scudder*, and resembling this species in the shape of the wings. It will be readily recognized by the whitish fringes and the simplicity of its markings.

Because we are dealing with *bimacula* subspecies in this paper, the primary character to be noted in the original description is the repeated reference to "yellow" or "golden yellow" scaling (or hairs) on both the fore and hind wings (both dorsally and ventrally). Nominotypical *bimacula* is bright Dijon mustard orange (with slightly lighter veins) on the ventral hind wings (Figs. 6 & 7). The dorsal forewings of male *E. b. bimacula* are broadly fulvous in the cell and distal of the stigma (Fig. 1).

This subspecies ranges from the Atlantic coast (between Virginia and New Brunswick, Canada) west to Ontario, in Canada and to Indiana in the US where it transitions to *E. b. illinois* (Dodge).

I have examined 102 examples of this subspecies. The following is a summary listing of sites (by county) from which I have seen specimens. PENNSYLVANIA: Clinton, Huntingdon, Centre, Tioga, Montgomery; MAINE: Penobscot; MASSACHUSETTS: Middlesex; NEW JERSEY: Burlington, Ocean; WEST VIRGINIA: Hampshire; MICHIGAN: Crawford, Newaygo, Jackson (this southeastern Mich. population is near *illinois*).

***Euphyes bimacula illinois* (Dodge, 1872)** was described from Bureau Co., Illinois where Dodge recorded it as being "...quite abundant upon grassy slopes on the high rolling prairie that forms the divide between the Illinois and Rock Rivers." He took a series of over forty specimens, nine of which were females. None of these were designated as types. In fact, he offered them in exchange to anyone who could provide him with specimens of "...North American butterflies not of common occurrence in Northern Illinois." He gave no illustration of his new skipper.

Ray Stanford (in Ferris and Brown, 1981) recognized *illinois* as a valid subspecies. I concur with this position based on my personal experience with this subspecies during the 1960's and 70's in my home state of Iowa. It differs from nominate *bimaculata* in that it is larger, more fulvous on the dorsal forewings (especially in females), and most significantly, grayish (or olive) orange rather than yellowish orange on the ventral hind wings (Figs. 16 & 17).

This prairie subspecies was once abundant from Colorado to Indiana. Today it is found only in a few remnant prairies of that region. I encountered it in such prairies in Iowa. Its range is very similar to that of *Boloria selene nebraskensis* (Holland, 1928). *Nebraskensis* and *Oarisma poweshiek* (Parker, 1870) are often found with it.

I have examined 63 specimens of *E. b. illinois* from the following states (by county). ILLINOIS: Cook, Grundy; IOWA: Johnson, Howard, Guthrie; MINNESOTA: Pine; WISCONSIN: Jackson; COLORADO: Yuma.

I have not been able to locate any of Dodge's syntypes. The best lead I had was that some of these specimens may have been deposited in the Field Museum in Chicago and from there to the Allyn Museum. I received no reply from my inquiry to the Allyn Museum about the possibility of any of Dodge's specimens being there. In the apparent absence of a type, I herein designate a male (Figs. 11 & 16) taken 22 June 1968, Denine Crossing, Grundy County, Illinois, leg. N. G. Seaborg as NEOTYPE of *Hesperia illinois* Dodge, 1872. This location is only 45 km east of Bureau County. This specimen is deposited in the Florida State Collection of Arthropods, Gainesville, Florida. If any syntypes are found, I withdraw this specimen as neotype only on condition that such syntype is designated as lectotype. I here redefine the type locality more scientifically as a geocological type locality as follows: high prairies of north-central Illinois.

E. bimaculata bimaculata is a descendant of *E. b. illinois* and not the southeastern population. This is evidenced by the continuous range and similar size and phenotype of these two subspecies. If we had to recognize only two subspecies, they would be the smaller and much darker southeastern subspecies I describe below and a northern one, *bimaculata*, which would range from New England to Colorado.

One of the most erroneous assumptions that persists among many taxonomists is the general idea that the primary line of evolution for the taxa in the northeastern US ascends from the Florida refugium. The fact is that nearly all the northeastern taxa which now inhabit the formerly glaciated areas of the northeast are derived from western sources. This is especially true for species whose larvae feed on grasses and sedges.

Undescribed Southeastern *bimaculata* subspecies. I have seldom encountered *Euphyes bimaculata* here in the Southeast, and when I have, it has never been in any numbers. I have collected it in Chatham County, Georgia with Dr. R. T. Arbogast and in Berkeley County, South Carolina near Summerville. I believe it to be extinct at the Summerville location. It appears this extinction was caused by drainage of the area by Westvaco (lumber/paper) for the purpose of municipal/industrial development and pine tree farming. Hopefully, this taxon is still extant in as yet undiscovered populations in Berkeley County.

It has long been the general opinion of skipper collectors that the small, dark southeastern populations of *E. bimaculata* from the Green Swamp of southeastern North Carolina southward represent an undescribed subspecies (Figs. 21,22,26 & 27). Throughout this region, specimens are markedly darker above and below in comparison to the two northern subspecies and average smaller. Evolutionarily, it has long been separated from the northern/western subspecies.

The most probable reason for this taxon having remained undescribed for so long is that few people have very many of them and usually from only one location. Its scarcity is evidenced by the *bimaculata* distribution map on page 254 in Opler and Krizek (1984). I know of no one familiar with it who has ever questioned its subspecific distinctness. Mr. Harry Pavulaan was also interested in describing this taxon, but has graciously deferred to me because I have been working on it longer. I appreciate his input and encouragement to proceed.

Euphyes bimacula arbogasti Gatrell, new subspecies.

Diagnosis. Males. Both *E. b. bimacula* and *E. b. illinois* are broadly fulvous on the dorsal forewings from the costal margin to distad of the stigma, and have the discal area of the dorsal hindwings lightly (but noticeably) dusted with fulvous scales and overlaid with long fulvous hairs. Males of *E. b. arbogasti* have the fulvous of the dorsal wings greatly reduced: on the forewings, the fulvous in the cell is usually confined to a small streak next to the upper segment of the stigma, there is rarely any fulvous in the FW costal area, and the fulvous distad of the stigma is significantly narrowed. Ventrally: *arbogasti* males are rusty brownish orange with prominent veining on the VHW; *bimacula* males are bright concolorous yellow-orange with only slightly lighter veins; *illinois* males are gray to olive-gray orange with very prominent VHW veining. The hairs on the head and prothoracic area of male *bimacula* and *illinois* are distinctly fulvous, while in *arbogasti* they are only slightly fulvous. **Females.** Females of *illinois* often have only one (and occasionally no) cream spots on their dorsal forewings while the females of both *arbogasti* and *bimacula* usually have both FW spots. Female *E. b. bimacula* often have orange fulvous scaling along the costa of the FW as delineated in the original description; *E. b. illinois* usually have little to some costal fulvous; *E. b. arbogasti* females usually have none to slight costal fulvous scaling. Ventrally: the hindwings of the females are like their males except that the light veining is correspondingly more pronounced. **Size.** *Illinois* is the largest and *arbogasti* the smallest subspecies. Average right FW radius from thorax to tip of apex (millimeters): σ *illinois* (16.3), σ *illinois* (17.5); σ *bimacula* (15), σ *bimacula* (16); σ *arbogasti* (14), σ *arbogasti* (15).

Description. Male (Figs. 21/26): *Head, thorax, abdomen and legs* as in *bimacula* except the hairs on top of the head and patagium are brown to slightly fulvous (these are distinctly fulvous on the other subspecies). *Forewings:* dorsally, dark brown with fulvous primarily restricted to one tiny spot at the apical tip of the stigma, two narrow spots distad of the stigma, and a small streak in the cell adjacent to the upper segment of the stigma; ventrally, with yellow fulvous prominent only along the costal margin, brown along the inner margin intruding up along the outer margin toward the apex (in the other subspecies the fulvous dusting in the apical area intrudes down along the margin into the inner marginal area). *Hindwings:* dorsally, dark brown with white fringe on the outer and inner margins, very little to no fulvous dusting in the discal area; ventrally, rusty brownish orange often with prominent light veins. **Female** (Figs. 22/27): *Head, thorax, abdomen and legs* as in male. *Forewings:* dorsally, unmarked dark brown except for two cream spots distad of the cell; ventrally, as in the male but darker. *Hindwings:* dorsally, as in male; ventrally, as in male except darker and the veins more contrasting.

Types. Holotype σ (Figs. 21/26): SOUTH CAROLINA: Berkeley County, nr. jct. of I-26 and hwy. 17-A, 12 July 1970, R. Gatrell collector. **Allotype** σ (Figs. 22/27): GEORGIA: Bryan County, Blythe, 21 May 1962, collector unknown. **Paratypes:** 13 σ σ , 4 σ σ (collector: R. Gatrell unless otherwise noted); SOUTH CAROLINA: Berkeley County, nr. jct. of Interstate 26 & hwy. 17-A, 1 σ , 11 July, 1 σ , 14 July, 1 σ , 1 σ , 17 July, 1 σ , 24 July, 1 σ , 31 July 1971; 1 σ , 21 July (leg. R.T. Arbogast), 1 σ , 23 July, 1 σ , 5 August 1973; NORTH CAROLINA: Brunswick County, Green Swamp, 1 σ , 29 July 1983 (leg. Kral); GEORGIA: Bryan County, Blythe, 1 σ , 12 July 1962 (leg. Unknown); Chatham County, Pine Barrens Rd. (all leg. R.T. & T.S. Arbogast), 1 σ , 1 σ , 2 May, 1 σ , 10 May 1976; 3 σ σ , 14 May 1978. The holotype, allotype, and 2 paratypes are deposited in the FSCA collection, Gainesville, FL. The remainder of the paratypes are distributed as follows: Dr. Jeff Slotten, Gainesville, FL (1), R. Gatrell, Goose Creek, SC (6), R. T. Arbogast, Gainesville, FL (8).

Geocological type locality. Sedge wetlands nr. Summerville, Berkeley County, South Carolina.

Etymology. It is my privilege to name this new subspecies after my long time friend Dr. Richard (Terry) Arbogast. Its common name should be Arbogast's skipper.

Remarks. The type locality was once a classic location as evidenced by its former biodiversity. The following are just a few of the many, and often rare, lepidopteran species that no longer occur at this site. *Euphyes berryi* (Bell), *E. bimacula arbogasti*, *Atrytonopsis loammi* (Whitney), *Satyrion kingi* (Klots and Clench), *Decidophagus irus arsaec* (Boisduval and LeConte), *Heraclides crespontes* (Cramer), and *Callosamia securifera* (Maassen). While there are a couple of amateur butterfly collectors/watchers associated with the South Carolina Dept. of Natural Resources, that department has no real knowledge as to the condition of South Carolina's Lepidoptera or what to do about or with them. I moved to South Carolina 30 years ago. I have watched, and continue to watch, the destruction of vital lepidopteran habitat – nearly always by various state and local government agencies, including state and county parks. Eco-tourism is becoming big business everywhere, and the South Carolina "Low Country" is no exception. The building of paved roads (which function as dams in that they affect both the surface and subsurface hydromatrixes), park offices, campsites, and other facilities (which are built on the same higher ground most utilized by many Lepidoptera) are planned and implemented with no real knowledge of their effect upon the area's Lepidoptera. New industrial parks are coming into being on Daniel Island and inland from Charleston in Berkeley and Dorchester counties faster than any Lepidoptera related environmental studies could be adequately made. Why this fuss? As South Carolina's only butterfly expert, if I don't sound the alarm who will and when? If the known lepidopteran species/subspecies of South Carolina are not receiving adequate attention in the area of habitat preservation, there is absolutely no future for the rare undescribed taxa of this state! Lastly, in defense of the SC DNR, it all comes down to funding and personnel. Thus, I hope the US Dept. of Interior will budget much more funding to help the invertebrates of South Carolina. Remember: We cannot protect that which we do not know.

A NEW SUBSPECIES OF *POANES AARONI*

Review of *aaroni* subspecies.

Poanes aaroni aaroni (Skinner, 1890) was described from seven males and one female collected by Mr. Samuel Aaron at Cape May, New Jersey. The species was not figured and no type was designated. However, Holland (1931) gives a figure of a male "paratype" on PL. XLVI, fig.37. This specimen is in the Carnegie Museum NH, Pittsburgh and is probably actually the type. It is a typical *aaroni* male.

P. a. aaroni is the smallest and most brightly colored (especially females) of the *aaroni* subspecies (Figs. 3,4,8 & 9). Unfortunately, some researchers continue to follow Clark and Clark (1951) who introduced the idea that all populations from New Jersey to Miami, Florida are but one subspecies. The Clark's clearly acknowledged that the populations in New Jersey were recognizable, then offhandedly dismissed this by attributing the differences of *aaroni* to "nothing more than a depauperate light and somewhat undersized variety of the species." New Jersey *aaroni* are not undernourished faded dwarfs. They are an easily recognizable, valid subspecific taxon.

Both *P. a. aaroni* and *P. a. howardi* (Skinner, 1896) are broadly fulvous dorsally. However, the fulvous is more extensive and lighter in nominotypical *aaroni* – especially in females. When atypically large dark males of *aaroni* and atypically small light males of *howardi* are encountered they indeed look very much alike dorsally. However, New Jersey *aaroni* and Floridian *howardi* are quite different ventrally (as attested to by Holland, page 391). On the ventral hindwing, the vast majority of *howardi* are marked like *Poanes viator zizanae* Shapiro (1971) – with a long light central dash and three to four small light spots (see the description of *howardi* below). The ventral hindwings of nearly all *aaroni* are marked more like those of *Euphyes dion* (W.H. Edwards, 1867) with a faint central light streak and no spots.

I consider true *P. a. aaroni* to be confined to New Jersey and Delaware. However, it is possible that it ranges westward to the eastern and western shores of the upper Chesapeake Bay in Maryland (Fales, 1974). It is not found in Virginia by the Clark's own determination. (They state that many VA specimens are noticeably darker than either Floridian or New Jersey specimens. We will examine this more later.)

I have examined 81 *P. a. aaroni* summarized as follows by state and county. DELAWARE: Kent; NEW JERSEY: Burlington, Ocean, Cape May.

Poanes aaroni howardi (Skinner, 1896) was described from 12 specimens. All but two of these were simply labeled as being from Florida. The two with site specific labels are stated as being from Georgiana on the Indian River. This is the eastern coastal area of Florida. The taxon was not figured and no specific specimen was designated as the type. However, Holland (1931) figures the male type on PL. XLVI, fig.38. This specimen is absolutely typical of this subspecies and thus represents it well. The original description is as follows (key elements differentiating *aaroni*, *howardi*, and *minimus* are in bold):

Pamphila howardi, n. sp. Male. – Expands 1.50 inches. *Upper side*: Superiors tawny with a fuscous border a little more than one-eighth inch in width; there are from one to four small subapical tawny spots in the fuscous border; at end of cell a dark spot which may or may not be connected with the stigma; stigma rather more than an eighth inch in length, very narrow and unbroken, and extending to inner margin. Inferiors have the same fuscous border and tawny central area. *Under side*: Superiors with tawny central area and border same as upper side; there is a large triangular spot extending into the wing from the base. The tawny colour above this spot is of a darker hue than that below and outside of it. Inferiors very light brown, generally with four or five very faint tawny spots in the central area.

The females are larger, without the stigma and have the underside of the inferiors immaculate. Described from eight specimens in my own collection and four in that of the U.S. National Museum, through the courtesy of Prof. L.O. Howard. They are all from Florida; two being from Georgiana, on the Indian River; exact locality of others unknown. This species belongs to the *arpa*, *palatka*, *Aaroni*, *viator* group. It is a much larger species than *Aaroni*; it has not the bright immaculate inferiors below like *arpa* and differs from *palatka* in the stigma, which in that species is in two short sections. The superiors in *viator* above are fuscous, covered with tawny spots.

I have examined over 300 spread *howardi* and observed hundreds more in the field over the last 30 years. The mounted specimens I have examined are from the following states (by county). FLORIDA: Baker, Dade, Duval, Levy, Putnam, Seminole, Volusia; GEORGIA: Bryan, Chatham, Glynn; SOUTH CAROLINA: Beaufort, Colleton, Charleston, Jasper; NORTH CAROLINA: Currituck; VIRGINIA: Princess Ann.

The populations from Miami, Florida to Beaufort, South Carolina are very similar in size and markings, dorsally and ventrally. The populations in this area are broadly fulvous above and the vast majority of specimens (especially males) have the *viator*-like streak and spots on the ventral hindwings (as highlighted in the original description).

From Beaufort, South Carolina through Virginia most specimens are still broadly fulvous above but many specimens are encountered without the *viator*-spotting of the ventral hindwings. In some areas the ventrally unspotted phenotype dominates. These are the darker specimens mentioned by the Clarks in the *Butterflies of Virginia* on page 170. Despite the somewhat atypical appearance of some of these mid-Atlantic populations, they are still part of subspecies *howardi* and should be referred to as such. I believe the tendency for specimens in this area to be darker and to lose the ventral HW spots is due to past genetic contact with the freshwater inland subspecies *P. aaroni minimus* described below.

Undescribed Texas *P. aaroni* subspecies. It is my opinion that the *aaroni* population in east coastal Texas is most likely an undescribed subspecies (Figs. 25,30,35 & 40). I only have four worn specimens of this in my collection but they are unlike anything I have seen from the eastern US. I would want to examine several more before describing it. They are very large and orange fulvous rather than yellow fulvous. Their wings are quite rectangularly elongate and pointed at the apex (the wings of the three eastern subspecies are more square). The *viator*-spotting on the ventral hindwings is also very prominent. I strongly encourage someone in Texas who has a good series of these to describe it.

Undescribed inland South Carolina *P. aaroni* subspecies. On 17 May 1991 I was amazed to discover an inland fresh water population of *Poanes aaroni* at Bull Swamp in Orangeburg County, South Carolina. I found it common and by far, the dominant skipper at this site in May, June and September of 1991, 1992, and 1993. (I have not visited the site since.)

North of Florida, *aaroni* is only known from coastal salt or brackish marshes. According to Opler and Krizek (1984), this skipper is "...restricted to coastal salt marshes, usually in association with smooth cordgrass (*Spartina alternifolia*).” Gochfeld and Burger (1997) state that *P. aaroni aaroni* is restricted to salt marshes on both coasts of southern New Jersey. The fresh water South Carolina colony is surrounded by dry sandhill habitat and is located 120 km. inland and at least 100 km. from the nearest populations in Charleston and Colleton counties, South Carolina.

I know of only one other fresh water record from this region. This is found in Harris (1972) and is by H. W. Eustis for Richmond County, Georgia in the late 1940's. Harris figures a male from that population on plate 10. This specimen looks like a good *P. aaroni howardi* as it is brightly colored and quite unlike the dark Bull Swamp population. It is likely that Eustis' specimens were transients from the sizable *howardi* population that inhabits the vast swamps along the Savannah River from the coast inland into at least Screven County.

The Bull Swamp population is distinctive in several aspects. First, its sandhills location, fresh water ecology, and dark phenotype indicates that it is evolutionally distant from all coastal populations from Florida to New Jersey, and as such, has long been isolated from the other subspecies in time and space. Second, its phenotype is consistently distinct from both *aaroni* and *howardi*.

Therefore, I describe this population as a new subspecies, *Poanes aaroni minimus*.

Poanes aaroni minimus Gatrell, new subspecies.

Diagnosis. Phenotypically, *Poanes aaroni minimus* differs from *aaroni* and *howardi* in having all dorsal fulvous markings reduced, or minimized. This is especially noticeable between the females. The ventral markings of *minimus* are similar to *aaroni* in that both lack prominent *viator*-spots and have all markings softened. It differs ventrally from *aaroni* only in being much darker. In *howardi* the ventral is often boldly marked with prominent *viator*-spots and central streak. Ecologically, it differs from all other populations from New Jersey to northern Florida in that it is endemic to fresh water marshes whereas the populations in those states are endemic to coastal salt and brackish marshlands (there are freshwater populations in peninsular Florida). Further, as a component of the Sandhills region, its biogeographical evolutionary origins are very different from those on the Atlantic coast. It is very possible that what we have here is the only remaining population of an *aaroni* that inhabited this area thousands of years ago when the region was the shoreline. Its life history is unknown.

Description. Male (Figs. 13/18). *Head:* the coloration of the hair and palpi is the same as in *howardi* and slightly darker than in *aaroni*; the antennal shaft and club are often so dark dorsally that the shaft is dorsally unringed, in *aaroni* and *howardi* the rings go all the way around the antennal shaft. *Thorax* (inc. legs) and *abdomen:* colored as in *howardi* and slightly darker than in *aaroni*. *Forewings:* dorsally, with wide blackish brown border occupying the outer 35-38% of the wing (measured from wing base to margin at vein CU₂) (medium brown at 23-27% in *aaroni*, brown at 27-32% in *howardi* and undescribed Texas) and extending from the apex to the distal end of the cell, about 25% of males will have one or two apical spots but in most specimens the apex is solid blackish brown (in *aaroni* the fulvous usually extends well beyond the cell into the subapical area; in *howardi* there are often two to five fulvous spots in the apical area – as I highlighted in the *howardi* original description), the inner fulvous area is sharply defined and not sinuate where it meets the dark outer border (the junction of the inner fulvous patch and outer border is usually sinuate at the veins and blended in the other subspecies), the lower part of the stigma is slightly shorter than in *howardi* and has less overall microandroconial mass making it appear smaller, darker, and more broken in many males; ventrally, with contrasting black (postmedian) and yellow (median) areas, no subapical light spotting. *Hindwings:* dorsally, dark border, broad and well defined as on the primaries, this affects the size of the fulvous spots in cells Rs, M₁, and CU₁ making them smaller and less elongate, from vein CU₂ to the anal margin the fulvous scaling is much diminished with many specimens having no spot in cell CU₂, this is a significant distinguishing character as I have never seen a *howardi* or *aaroni* specimen that lacked a spot in CU₂; ventrally, nearly concolorous subdued medium brown, usually with a faint tawny streak in cell and occasionally with two faint median *viator*-spots (one above and one beneath the streak) (*howardi* males usually have several, occasionally prominent, *viator*-spots – as highlighted in the *howardi* original description). **Female** (Figs. 14/19). *Head, thorax, and abdomen:* as in male; *Forewings:* without stigma, dark border as in male except for usually having two or three light apical spots, the basal half of the cell is usually brown and not fulvous, though this is variable; *Hindwings:* dorsally and ventrally, as in male.

Types. Holotype ♂ (Figs. 13/18): SOUTH CAROLINA: Orangeburg County, Bull Swamp, 1 June 1992, R. Gatrell collector. **Allotype** ♀ (Figs. 14/19): SOUTH CAROLINA: Orangeburg County, Bull Swamp, 6 June 1992, R. Gatrell collector. **Paratypes:** 27♂♂, 17♀♀; all SOUTH CAROLINA: Orangeburg County, Bull Swamp, R. Gatrell collector; specimens and dates: 1♂, 17 May, 1♂, 1♀, 25 May, 1♀, 9 September 1991; 10♂♂, 5♀♀, 1 June, 4♀♀, 6 June, 5♂♂, 4♀♀, 1 September 1992; 3♂♂, 1♀, 1 June, 7♂♂, 1♀, 3 June 1993. (I also netted, examined, and released 45 additional specimens in 1993.) The holotype, allotype and two paratypes are deposited in the Carnegie Museum NH, Pittsburgh, PA because the types of *aaroni* and *howardi* are there also. The remainder of the paratypes are in the MOTh, Goose Creek, SC.

Geocological type locality. Bull Swamp (freshwater), Orangeburg County, South Carolina

Etymology. *Minimus*, refers to the reduced fulvous area of this taxon as compared to the other subspecies.

Remarks. Many specimens I have seen from coastal South Carolina, North Carolina, and Virginia are atypical of Floridian *howardi* (as noted in the discussion under *howardi*). In fact, in a long series of coastal SC specimens, individuals occur which are phenotypically very close to *minimus* (except for the lack of a DHW spot in CU₂). This can be taken as possible evidence of genetic contact, at some time in the distant past in the mid-Atlantic area, between *howardi* and *minimus*. Further, because *minimus* is marked on the venter more like *aaroni* (though darker) and has the same color fulvous on the dorsum as *howardi* (though reduced in size), I think this is indicative of *minimus* being older, and thus a link to or is, the ancestor of both. It must be remembered however, that these similarly looking individuals are from very different ecological and biological populations. The phenotypic exceptions expressed in certain individual specimens that turn up in populations of *aaroni*, *howardi*, or *minimus* do not disprove the rule – evolutionary subspecificity.

P. a. minimus becomes the third known relict taxon endemic to the Sandhills region of Georgia, South Carolina, and North Carolina. The other two are *Chlosyne gorgone gorgone* (Hübner, 1810) and *Neonympha michelli francisci* Parshall and Kral, 1989. The geologic development, and correlating subspecific evolution of the biota, of the southeastern United States is old and "stable." As pointed out by Remington (1968), in recent millennia the evolutionary norm in this area has been one of convergence. Therefore it is always surprising to find a new taxon in this region, but expected that such taxa be found in only mono or widely scattered colonies. The Sandhills region is the most logical area to harbor such taxa and indeed that is the case. All of the taxa described in this paper are examples of old relict entities.

A NEW SUBSPECIES OF *HESPERIA ATTALUS*

Review of *attalus* subspecies.

Hesperia attalus attalus (W.H. Edwards, 1871) was described from two females collected by G.W. Belfrage near Waco, Texas. One of these specimens was figured (ventral aspect) by Holland (1931), Pl. LII, fig. 24. This same specimen was designated as lectotype by F.M. Brown and L.D. Miller (1977).

H. a. attalus is a bright, colorful *Hesperia* as can be seen from figs. 31,32,36 & 37. This western prairie subspecies averages slightly larger than the Eastern US populations. This western subspecies has been widely isolated from its eastern counterparts for thousands of years. There are no blend zone populations between western and eastern *attalus*.

I have no personal experience with this subspecies. However I have examined 47 specimens from the following states (by county). OKLAHOMA: Cleveland; KANSAS: Barber; TEXAS: Smith. The majority of these are from the J.R. Heitzman collection which is now housed in the FSCA, Gainesville.

Hesperia attalus slossonae (Skinner, 1890) was described from one male and one female collected by Mrs. A.T. Slosson. The origin of the specimens is simply given as Florida. The original description is as follows (I have highlighted key phrases in bold):

***Pamphila slossonae* n. sp.** – In size and markings this species comes nearest to *P. leonardus* Harris. The male expands rather less than an inch and a half. Ground color of inferior [superior] wings dark brown, with **basal half of wing thickly covered with tawny** scales which, beyond the stigma, form three spots, and just above these are two small square ones. The three subcostal spots are represented as in *leonardus*. Stigma narrow, black, and concave posteriorly. Inferior wings same color as superior, with **tawny scales scattered over the basal half**. There are four small, square, tawny spots close together, with a fifth elongated one at right angles with the four, on outer half of wing running nearly parallel with the outer margin, only the angle made by the spots is more acute. **Fringes of all wings dingy white**. The maculation on underside of superiors is nearly the same as in *leonardus*, but in color very different, the ground color in this species being made up of **yellowish and greenish scales**; underside of inferiors **olive-green**, with the spots of the upperside repeated, except there is a sixth one near the centre of the wing, and all are dingy white. Fringes on underside same as above. Head and thorax above covered with **greenish hair**, beneath grayish yellow. Palpi almost white.

The female expands a little more than an inch and a half. Superior wings very dark brown, with a broken band of **yellow** consisting of five spots commencing at the first nerve above the interior margin and extending to within one-eighth inch of apex. The subcostal spots are present, as in the male, with spots fainter; **underside of wings also same as in male**, but white spots on inferiors smaller. Fringes in female dark on superiors, but gradually getting lighter on inferiors as the anal angle is approached.

Over the last 30 years, I have encountered this subspecies at several locations throughout the southeast. My personal records are from (by county): FLORIDA: Escambia, Levy, Marion; GEORGIA: Burke; SOUTH CAROLINA: Aiken, Orangeburg, Chesterfield; NORTH CAROLINA: Hoke. The great majority of the several hundred individuals I have observed or collected from these widely separated areas are of the same well marked phenotype described in the original description (Figs. 33,34,38 & 39). In females there is moderate ventral variation toward brownish, non-greenish-yellow individuals.

I have also examined 73 *slossonae* in institutional and private collections from the following states (by county): FLORIDA: Levy, St. Johns, Bradford, Putnam; NEW JERSEY: Ocean; GEORGIA: Crawford.

Throughout their range, all *slossonae* males, and most females, exhibit at least some golden tawny scaling on the ventral hindwings. The ventral hindwings of most males have a great deal of golden over-scaling (unless they are worn) and a prominent row of cream spots in the upper postmedian area. The ventral hindwing varies quite a bit in female *slossonae*, but possesses at least some cream spotting in the postmedian area – with many females having a well developed contrasting row of creamy white spots. The dorsal forewings of males are usually brightly tawny immediately distad of the stigma with conspicuous tawny scaling in the upper part of the cell and prominent apical spots. On their dorsal hindwings, male

slossonae usually have a conspicuous amount of golden fulvous hairs, especially near the inner angle, and a well developed row of upper postmedian spots. The dorsal forewings of female *slossonae* are variable. Some have a well developed row of postmedian spots, including the apical area, while others only have a few spots in the postmedian area. The dorsal hindwings of females are also variable with the postmedian spotting ranging from prominent to faint. However, almost all females have some dorsal hindwing spotting. All of these key traits are mentioned in the original description.

MacNeill (1964), in his classic work on the western American *Hesperia*, briefly delves into the origins of the eastern species of this genus. His position is that the eastern species, and particularly the southeastern taxa, represent the oldest and thus most phylogenetically stable assemblage of species in the genus (which originated in the Nearctic). In other words, the southeastern taxa are all very old and highly evolved. On page 10 he states: "In [the] eastern United States, and particularly the southeast, a small group of relatively unrelated species occurs, none of which shows close relationships to any other known species. Apparently little geographic diversity is expressed by any of these."

I concur with MacNeill. This is evidenced by the great stability of the *slossonae* phenotype from central Florida to New Jersey – where the only difference is that individuals become smaller northward. This homogeneity is the backdrop that manifests the evolutionary importance of a newly discovered, isolated, phenotypically unique population of *Hesperia attalus*.

Undescribed coastal South Carolina *H. attalus* subspecies. On 3 October 1995 I discovered a population of *Hesperia attalus* near the South Carolina Coast at the southern tip of Horry County. This site is on private property near the newly designated Sandy Island National Wildlife Sanctuary. The elevation at the site is about 100 ft and is part of the Sandy Island remnant dune uplift. Prior to the advent of Europeans and deforestation, this population was separated and isolated from the inland sandhill populations of *slossonae* (Figs. 33 & 36) by approximately 50 to 80 km of (often swampy) forest. Even today, it remains separated from the inland subspecies by at least 35 km.

This population is distinctive on two levels.

First, MacNeill's determination that **all** southeastern *Hesperia* are evolutionarily old, phenotypically stable taxa, requires that this uniquely distinct and isolated segregate has 1) been in existence a very long time, and 2) is evolutionarily distant (subspecifically distinct) from *slossonae*. Second, it is just as distinct phenotypically from *H. attalus slossonae* as *H. attalus slossonae* is from *H. attalus attalus*. It is very dark and melanistic, especially in the male.

Its geographic location dictates that it most likely came into being in only one of two ways. It most likely is a relict of an *attalus* that once inhabited the coastal area when ocean levels were much lower. Its range then extending out, many miles in some areas onto what is now the Continental Shelf, up and down the mid-Atlantic coast in semi-barren sandy habitats (Emery et. al., 1967; Remington, 1968). Thousands of years of shore line compression have pinned this taxon between the Atlantic Ocean and the Maritime Forests of the eastern seaboard. If this is so, it is an isolated taxon in the process of geologically induced extinction. This may be the only population still extant.

The only other plausible course of evolution is that it is a descendent of inland ancestors whose range was once connected to the coastal area. When this connection was severed by increased forestation, this subspecies evolved *in situ*. This scenario, on the surface, seems supported by the presence of other species at this site which are also natural parts of the inland sandhill community – most notably *Hesperia meskei straton* (W.H. Edwards). However, this course is not the most likely because the other members of the biota at this site, which are common to the sandhills, remain subspecifically the same. The uniqueness of the *attalus* at this site indicates that it had already evolved to its present taxonomic state before it arrived (from an area now offshore). MacNeill concluded that the evolution of **all** southeastern *Hesperia* was settled millennia ago. For these reasons, I now describe this population as a new subspecies.

Hesperia attalus nigrescens Gatrell, new subspecies.

Diagnosis. In every aspect, much darker than *H. a. slossonae*, especially in the male. Never with extensive, or even moderate, golden-olive tawny ventral over-scaling in either sex. The ventral hindwings are dark brown and may occasionally be lightly peppered with some tawny. The ventral hindwings of females are very variable in the degree of white spotting, but are frequently concolorous unspotted dark brown. When these females also possess only one or two light dorsal spots, they can be easily mistaken for *Euphyes vestris metacomet* (Harris, 1862) in the field.

Description. Male (Figs. 23/28). *Head*: dark brown above, palpi dingy grayish white, antennae brown except for lower surface being slightly grayish white (in *slossonae*, the light areas are more extensive and definite creamy white); *Thorax and abdomen*: dark brown above, ventrally (inc. legs.) mottled brown and dingy gray (in *slossonae*, the sides and underside are heavily dusted with golden tawny and white). Simply put, *nigrescens* looks dingy and *slossonae* bright. *Forewings*: dorsally, ground color solidly dark brown with black line along the outer margin at base of fringe which is a gray brown, none of the 10 males in the type series have any tawny at the base of their forewings and all but one has the tawny in the cell limited to a tiny patch at the distal end, in the one exception the tawny is in the form of two streaks in the upper half of the cell, there are two to three tiny tawny apical spots and there may be one or two tiny submarginal spots near the apices, distad of the stigma the three usual greenish tawny spots are much reduced; ventrally, ground color black at base, elsewhere dark brown, very little to no orange fulvous along costa or in cell, light spots more restricted than above. *Hindwings*: dorsally, ground color dark brown, the macular band composed of two to four faint spots, basal hairs medium brown not tawny; ventrally, dark brown ground with macular band absent to complete, and then small and subdued, never bold as in *slossonae*, some individuals may be peppered with medium tawny scales. **Female** (Figs. 24/29). *Head, thorax and abdomen*: as in male but darker; *Forewings*: dorsally, ground blackish brown, spotting varies from only two to all spots present, these spots whitish never yellowish as in many *slossonae* (*slossonae* also vary greatly, but heavily spotted *slossonae* far exceed heavily spotted *nigrescens* and the darkest *slossonae* are far less dark than the darkest *nigrescens*); ventrally, dark brown with spotting restricted as above; *Hindwings*: dorsally, unmarked dark blackish brown to all spots present in same relation to *slossonae* as on dorsal forewing; ventrally, varying from solidly dark brown to all spots present in same relation to *slossonae* as on the dorsal hindwing.

Types. Holotype ♂ (Figs. 23/28): SOUTH CAROLINA: Horry County (specific site withheld), 10 October 1995, R. Gatrell collector. **Allotype** ♀ (Figs. 24/29): Same data as male except 3 October 1995. **Paratypes**: 9♂♂, 9♀♀: all SOUTH CAROLINA: Horry County (specific site withheld); specimens and dates: 5♂♂, 8♀♀, 3 October 1995; 4♂♂, 1♀, 10 October 1995. The holotype and allotype are deposited in the Carnegie Museum NH, Pittsburgh, PA where the types of *attalus* and *slossonae* are also located. Paratypes are all in the MOH, Goose Creek, South Carolina. (I saw approximately 20 more specimens in the field in addition to the few I collected. They were all dark.)

Geocological type locality. Coastal dune grasslands in southern Horry County, South Carolina.

Etymology. *Hesperia attalus nigrescens* is so named to emphasize its dark melanistic coloration.

Remarks. The known range of *slossonae* as figured by Opler and Krizek (1984) on page 230 is very interesting. The gap between Peninsular Florida and Georgia only reflects a lack of collecting and is thus artificial. The range connection from southern North Carolina to the sandhills may also be artificial, if it is assumed. Though there may be records from near the coast, it does not follow that there is a continuous *subspecific* population in-between these areas.

I expect this subspecies' range to be limited to the vicinity of the Sandy Island National Wildlife Refuge. However, it is possible that this subspecies may extend south into Georgetown County in suitable habitat areas along the narrow strip of land between the intracoastal waterway and the Atlantic south to North Island – but this should not be assumed. The Green Swamp in southeastern coastal North Carolina would seem to limit its range into that area. However, if an *attalus* is in coastal North Carolina, it should not be assumed as this subspecies – though it may be.

Hesperia attalus nigrescens should be listed as at least threatened. The Department of Interior's Fish and Wildlife Service should immediately require that any environmental alteration (current or proposed) along the Atlantic Coast east of the intracoastal waterway between Georgetown and Myrtle Beach be subject to a survey for the presence of this new subspecies before any further alteration is permitted.

Is more research needed on the range of this subspecies and its relation to *slossonae*? Absolutely. A primary goal of *The International Lepidoptera Survey*, in light of the rapid destruction of the world's living things and environment, is to affix names to valid scientific taxa and afford them legal status before it is too late! There is no longer time to dot every i and cross every t. Lepidopterists no longer have the luxury of taking 10 to 30 years to decide to publish on a species/subspecies and then take another 1 to 3 years from article submission to publication. Taxonomists need to get out of the laid-back, typewriter-slow 19th century and into the computerized speed of the 21st – the Bulldozer certainly has. Environmental regress seeks no wisdom and waits for no one.

ACKNOWLEDGEMENTS

My thanks go to the following persons. To Dr. J.D. Lafontaine (Canada), FSCA library, and the U. of Florida Science Library, for reprints of original descriptions; my son Ben Gatrell for photography of specimens, Dr. John Heppner FSCA for access to the FSCA collections, and to the congregation of my church for affording their pastor (me) *the time* to research bugs.

LITERATURE CITED

- BROWN, F.M. & L.D. MILLER. 1977. Trans. Amer. Ent. Soc., 103:281-282. (In Part. Series on the Types Named by W.H. Edwards)
- CLARK, A.H. & L.F. CLARK, 1951. Butterflies of Virginia. Smithsonian Misc. Collect. 116 (7) 239 pp.
- DODGE, G.M. 1872. A New Hesperian. Canadian Ent. 4:217.
- EDWARDS, W.H., 1871. Descriptions of New Species of Diurnal Lepidoptera Found Within the United States. Trans. American Ent. Soc., 3:276.
- EMERY, K.O. *et al.* 1967. Freshwater Peat on the Continental Shelf. Science 158:1301-1307.
- FALES, J.H. 1974. Checklist of the Skippers and Butterflies of Maryland. Chesapeake Sci., 15:4, 222-229.
- GOCHFELD, M. & J. BURGER. 1997. Butterflies of New Jersey. Rutgers Univ. Press, New Brunswick, NJ. 327 pp.
- GROTE, A.R., & C.T. ROBINSON. 1867. Notes on the Lepidoptera of America. Ann. Lyceum of the New York Nat. Hist. Soc., 8:433.
- HARRIS, L., Jr. 1972. Butterflies of Georgia. Univ. of Okla. Press, Norman, OK. 326 pp.
- HOLLAND, W.J. 1931. The Butterfly Book. Doubleday & Company, Inc., Garden City, NY. 424 pp.
- HOWE, W.H. 1974. The Butterflies of North America. Doubleday & Co., Inc., New York, NY. 633 pp.
- MacNEILL, C.D. 1964. The Skippers of the Genus *Hesperia* in Western North America, With Special Reference to California. Univ. of Cal. Press, Berkeley/Los Angeles, CA. 230 pp.
- MILLER, L.D. & F.M. BROWN. 1981. A Catalogue/Checklist of the Butterflies of America North of Mexico. Memoir No. 2, Lepid. Soc., Sarasota, FL. 280 pp.
- OPLER, P.A. & G.O. KRIZEK. 1984. Butterflies East of the Great Plains, An Illustrated Natural History. Johns Hopkins Univ. Press, Baltimore, MD. 294 pp.
- REMBINGTON, C.L. 1968. Suture-zones of Hybrid Interaction Between Recently Joined Biotas. *Evol. Biology*, Vol. 2 (8) 325- 413.
- SKINNER, H. 1890. A New Pamphila. *Ent. Americana*, 6:138.
- _____. 1890. Notes on Butterflies Found at Cape May, N.J., With Description of a New Species of Pamphila. *Ent. News*, 1:6.
- _____. 1896. Two New Hesperids. *Canadian Ent.* 28:187.
- STANFORD, R.E. 1981. In: Ferris & Brown: Butterflies of the Rocky Mountain States. Univ. of Okla. Press, Norman, OK. Pg. 101

The Taxonomic Report is a publication of ***The International Lepidoptera Survey (TILS)***.

(A Tax Exempt Non-Profit Scientific Organization)

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.

The Taxonomic Report is projected for publication at the rate of at least 10 issues a year. Subscription/dues for Volume Two are \$50 US for domestic and \$65 US for overseas subscribers. The subscription year follows the calendar year. All issues are mailed 1st class. At the end of each year, subscribers receive that year's volume on a CDR for permanent archiving and reproduction for personal use (i.e. a museum or university may make as many copies as needed in whatever format desired). Non-members may receive individual issues in print any time for \$10 per issue. Individual issues on CDR to non-members are \$25 per issue post paid. **Subscriptions and individual issue** orders should be made payable to **TILS** and **mailed to:** Scott D. Massey, Editor, 126 Wells Road, Goose Creek, SC USA 29445-3413.