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The Taxonomic Report

OF THE INTERNATIONAL LEPIDOPTERA SURVEY

AN EXAMINATION OF SOUTHEASTERN U.S. *SATYRIUM* (LYCAENIDAE: THECLINAE).
PART ONE:
AN OBSCURE NEW SUBSPECIES OF *SATYRIUM EDWARDSII*

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ABSTRACT. *Satyrium edwardsii meridionale* is described as a new subspecies from Aiken County, South Carolina. This scarce colony is the southeasternmost known population of this butterfly in the United States. It was discovered by the author in 1990 near Aiken State Park in Aiken County, South Carolina. This site is in South Carolina's upper Coastal Plain in the southern part of the state adjacent to Georgia. It is known from only one male and one female at the type locality. Because it was known from only one pair, the author thought it best to wait until more specimens became available before describing this as a new subspecies. In 2000 the author located a series of several very similar *edwardsii* from Cobb County, Georgia in the FSCA collection Gainesville, Florida. Also, in recent years populations of *S. edwardsii* have been discovered in the southern Sandhills (upper Coastal Plain) of North Carolina that may well prove to belong to this subspecies as well. This was seen as sufficient evidence to confirm the southernmost populations as a phenotypically distinct subspecies paralleling the normal subspecific pattern of all other eastern U.S. *Satyrium* of northern and southern clinal subspecies. Compared to the nominate subspecies, *meridionale* is much larger, has bolder marking on the ventral hindwing margins, much longer tails and the spots of the postmedian band tend to be less round. It is sympatric with *Satyrium calanus* nr. *falacer*, *Satyrium liparops liparops*, *Satyrium titus mopsus*, and two other undetermined and/or undescribed *Satyrium* species or subspecies at the type locality. The holotype is currently deposited in the *Museum of the Hemispheres* collection, Goose Creek, South Carolina, USA.

Additional key words: Ancient populations, relict refugium species, biogeographical evolution.

ORIGINAL DESCRIPTIONS

In 1867 Grote and Robinson published an article in the Transactions of the American Entomological Society titled *Descriptions of American Lepidoptera – No. 2.* In this they describe two new hairstreak butterflies under the names *Thecla lorata* and *Thecla henrici*. Their *henrici* is what we know today as *Deciduphagus henrici* (Grote and Robinson, 1867). Their *lorata* has always been placed in the synonymy of *Satyrium calanus* (Hübner, 1809). In their treatment of *lorata* they compare it against "*Thecla calanus"*. The problem here is that what they call *lorata* is actually what we know today as *Satyrium calanus falacer* (Godart, 1822*),* and what they call *calanus* is what we know today as *Satyrium edwardsii* – as traditionally attributed to Grote and Robinson per this 1867 paper.

There are serious problems with the Grote and Robinson article relative to the name *edwardsii,* primarily because *edwardsii* was not actually described in this paper. What they gave was clearly intended as a redescription of Hübner's *calanus,* which they misunderstood. The name *edwardsii* was mentioned only twice in this paper. First, in Grote & Robinson's list of *calanus* synonyms, and second as an anecdotal

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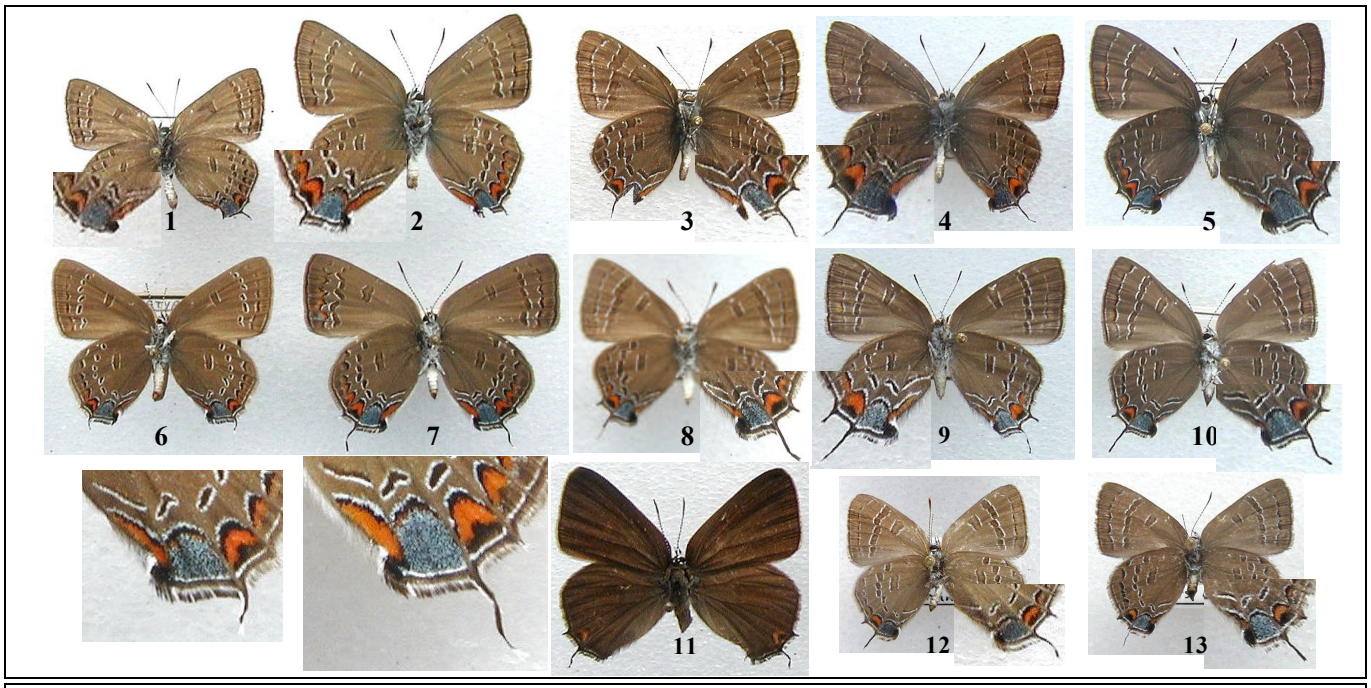
aside relative to an (at the time) unpublished manuscript name of Saunders. Two years later Saunders published this name himself in The Canadian Entomologist (1869) – where he likewise sank it as a *calanus*. In this paper, Grote and Robinson only give a semi-redescription of *calanus* (as compared to their *lorata*) based on two *nomen dubium* specimens from Mr. Saunders. These two specimens (at least the male) are likely what we have come to know as *edwardsii*. I say likely, as there are one or two other undescribed eastern U.S. *Satyrium* that Saunders may have had in hand. These have red antennal clubs in females (as did the Saunders' female) and/or expanded orange at the hindwing anal angle (Figs. 4 & 9).

Some of these problems were recognized by Michener and dos Passos, who, in 1942 reviewed this situation and designated a neotype which they deposited in the American Museum of Natural History, New York. (I have not had the opportunity to examine the neotype.) In their paper, Michener and dos Passos attribute the name *edwardsii* to Grote and Robinson. This, however, is contrary to the International Code of Zoological Nomenclature Articles 11, 12.2, 12.2.1 and 12.3. Michener and dos Passos' attribution of *edwardsii* is stated as follows.

The specific name *edwardsii* has usually been credited to Saunders. Apparently it was first used in print by Grote and Robinson (1867) who credited it to Saunders, saying that it was to their knowledge previously unpublished, and placing it as a synonym of *calanus*. As shown by Scudder (1870) the *calanus* of Grote and Robinson was the species now called *edwardsii*. Their placement of the name *edwardsii* under their *calanus* is as definite an indication of the species involved as a bibliographic citation, and hence the name *edwardsii* was nomenclatorially validated by and must be credited to Grote and Robinson, as stated by Barnes and Benjamin (1926, Bull. So. Calif. Acad. Sci., XXV, p. 94).

Saunders in 1869 was the next to use his name *edwardsii*, and he also placed it as a synonym of the *calanus* of Grote and Robinson.

Finally Scudder in 1870 realized that *calanus* Grote and Robinson was not *calanus* Hübner and proposed to call the former *edwardsii* Saunders. It was Scudder who first clearly stated the characters of *edwardsii*, and the species might reasonably be credited to him.



Figures 1-13. *Satyrium* species. **Fig. 1.** ♂ *S. e. edwardsii*: 7 July 1993, Jones Gap, Macon Co., NC. **Fig. 2.** Holotype ♂ *S. e. meridionale*: 1 June 1990, Aiken Co., SC**. Fig. 3.** ♂ *Satyrium* undescribed: 21 May 1977, Aiken Co., SC. **Fig. 4.** ♂ *Satyrium* undescribed: 19 June 1976, Aiken Co., SC. **Fig. 5.** ♂ *S. calanus falacer*: 17 May 1991, Aiken Co., SC. **Fig. 6.** ♀ *S. e. edwardsii*: 8 July 1973, Sherborn, MA. (leg. Winter). **Fig. 7.** Allotype ♀ *S. e. meridionale*: same data as fig. 2. **Fig. 8.** ♀ *Satyrium* undescribed: same data as fig. 3. **Fig. 9.** ♀ *Satyrium* undetermined/undescribed: 21 May 1977, Aiken Co., SC. **Fig. 10.** ♀ *S. calanus falacer*: same data as fig. 5. **Fig. 11.** Paratype ♀ *S. e. meridionale*: Cob Co., GA. (leg. Towers). **Fig. 12.** ♀ *S. caryaevorum*: 6 July 1993, Jones Gap, Macon Co., NC. **Fig. 13.** ♀ *Satyrium* undetermined: same data as fig. 12 except 7 July. All leg R. Gatrelle except 6 & 11. All specimens actual size. Photos by Joe Mueller. (The short tails on Fig. 11 are an optical illusion. They droop downward on the mounted specimen, and are as long as those of Fig. 7.)

The key phrase here by which they attribute the name is "…as definite an indication of the species involved as a bibliographic citation…" The error here is that there can be no "bibliographic citation" where there is no valid publication to cite (12.2.1). The fact that Grote and Robinson had an actual Saunders specimen in hand is disallowed by 12.3 as a mechanism of validation. *Edwardsii* Grote and Robinson is a *nomen nudum* and thus not an available name from either Saunders, or Grote and Robinson 1867.

In 1869 Saunders published this name himself. However, he gave no description, and established no type. He simply gave it as a Synonymic listing under *calanus* – this would not seem to meet the rules of availability (Articles 10-20). Scudder, as pointed out by Michener and dos Passos themselves, in 1870 was the first to actually fully describe and illustrate *edwardsii*. His action validated the name to his authorship and date (see ICZN Glossary under *nomen nudum*). Thus, the correct nomenclatorial citation is *Satyrium edwardsii* (Scudder, 1870).

NORTHERN NOMINATE *EDWARDSII*

The name *Satyrium edwardsii* was affixed by the Michener and dos Passos' neotype to populations in southeastern Canada, type locality Queenstown, Ontario. The male specimen Grote and Robinson had in hand was also listed as from Canada. The female in Grote and Robinson's possession in 1867 was from Philadelphia, Pennsylvania. I do not think this specimen was what we now call *edwardsii* because they stated that the underside of the antennal club was "fulvous beneath." I have not observed this feature in *edwardsii*. I have collected specimens of a "falacer" in Iowa with ventrally very orange clubs in the female.

Nominate *edwardsii* is a smallish, short tailed taxon. The nominate subspecies' range extends from Canada into the New England states and down the Appalachian Mountains, in this typical form, to extreme southwestern North Carolina (Fig. 1). I have personal experience with nominate *edwardsii* in Macon County, North Carolina at Jones Gap between 3800 to 4200 ft. elevation. Macon County abuts Rabun County, Georgia and Oconee County, South Carolina.

Layberry et al (1998) states that the larval hosts of nominate *edwardsii* in southeastern Canada are Black Oak (*Quercus velutina* Lam.), White Oak (*Q. alba* L.) and Red Oak (*Q. rubra* L.). Gochfeld and Burger (1997) list Scrub Oak (*Q. ilicifolia* Wang.) as the primary larval host in New Jersey with Black Oak as a possible host. Allen (1997) also lists *Q. ilicifolia* as the primary host for West Virginia, but adds that Black Jack Oak (*Q. marilandica* Muenchh.) is also used there. Of these known hosts, only *ilicifolia* is not known from the southern Appalachian Mountains of North Carolina, Georgia, and South Carolina. However, since Black, White, and Red oaks are not primary larval hosts in the northern Appalachians of West Virginia or the coastal state of New Jersey, *marilandica* is the only frequently utilized northern U.S. *edwardsii* host that also occurs in the southern Appalachian area.

SOUTHERN NON-MONTANE *EDWARDSII*

Specimens of *edwardsii* from the deep South have rarely been encountered. One of the main reasons for this is, undoubtedly, the historical lack of collectors in the South. Nevertheless, this species is probably truly rare in the coastal region of the South from South Carolina westward. Harris (1972) gives several records from throughout the Piedmont region of Georgia, with the southern most being in Bibb County on the edge of the upper coastal plain. While Harris lists *Q. ilicifolia* as a host, he was surely only repeating this as referenced in the literature to northern populations as this tree does not occur in Georgia. It is interesting that one of his locations is at Blackjack Mountain (Cobb County) which is very probably named after the Black Jack Oak – which is a known *edwardsii* host in West Virginia and coastal North Carolina.

On 1 June 1990, while collecting specimens of various *Satyrium* species near the southern boundary of Aiken State Park, in Aiken County, South Carolina, I was surprised to find a courting pair of *Satyrium edwardsii* (Figs. 2 & 7). This area is part of the Sandhills region of North Carolina, South Carolina and Georgia in the upper coastal plain of these states. This particular location is only 27 miles from the Georgia line at the Savannah River and 30 miles from the lower coastal plain region of South Carolina. The area where this pair was taken is at the junction of two habitats. They were collected in dry sandhill habitat but less than 100 yards from where there is a dramatic shift to the wet Edisto River basin. The sandhill area is dominated by Turkey Oak (*Quercus laevis* Walter). However, there is also a good bit of Black Jack Oak in this immediate area.

It was apparent immediately that this pair was very large and phenotypically distinct from northern nominate *Satyrium edwardsii*. I looked further that day and again the next year but located no further specimens in that general area. In 1999 this area began to be developed into residential acreage. Today, in 2001, the literal spot of collection is in tact but the surrounding immediate area is largely decimated.

With the increase in popularity of butterfly watching, several healthy populations of *S. edwardsii* have now been discovered in the North Carolina upper coastal plain (Scotland, Moore and Cumberland counties) adjacent to South Carolina. Unfortunately, I know of no specimens that have been collected from these taxonomically important populations. The prevailing attitude among many butterfly watchers (at least in the eastern US) is apparently that all butterfly species and subspecies have been discovered and thus there is no need for any more scientific (or recreational) collecting. This is not the true. These populations need to be collected in long enough series to determine their taxonomic status. They may be too far "north" to be the new subspecies described herein, however, they are definitely too far "south" to be nominate *edwardsii*. They are either the new subspecies (which is very likely) or a blend zone phenotype nr. the new subspecies.

In 2000 while researching other taxa, I came across a series of nine *edwardsii* collected in Cobb County, Georgia. These were obviously not nominate *edwardsii*. Most were identical to the Aiken phenotype, but a couple were somewhat atypical in size. I borrowed these and gave them, and this whole situation, a lot of thought.

DESCRIPTION OF A NEW *EDWARDSII* SUBSPECIES FROM THE DEEP SOUTH

Clinal subspecies are the most common but, generally, they are also the least evolutionarily distinct. *Satyrium calanus calanus* and *calanus falacer* (Godart, [1824]), *S. liparops liparops* (LeConte, 1833) and *liparops strigosum* (Harris, 1862), *S. titus titus* (Fabricius, 1793) and *titus mopsus* (Hübner, 1818), and *Fixsenia favonius favonius* (J.E. Smith, 1797) and *favonius ontario* (W.H. Edwards, 1868) are all well established, and almost universally accepted, north/south clinal hairstreak subspecies pairs in eastern North America. It is therefore not only not surprising but to be expected that *Satyrium edwardsii* follows this same pattern in eastern North America.

While no other records exist for *edwardsii* in coastal South Carolina, the several records from Georgia and coastal North Carolina leave no doubt that *edwardsii* is a breeding resident in the deep South. The lack of discovery of additional colonies in this area is just that – a lack of discovery due to few historical workers in this region. Now that this taxon is being recognized as a distinct subspecies, this will doubtless spur more interest in it, and inevitably, the discovery of more colonies in the South. My opinion is that it is an uncommon to rare component of the fauna of the deep South and should be considered as a candidate for special attention by wildlife agencies – though far from threatened or endangered. The type locality is already largely destroyed by housing and ranching development.

The Sandhills as a whole are massive and thus an enormous area of suitable habitat exists in which this taxon may very well occur. I have located one area in Orangeburg County, South Carolina in particular that looks promising in regard to the discovery of this new taxon there. Five other *Satyrium* have already

been found there plus a rare and unusually marked colony of *Fixsenia favonius* that is definitely not the nominate subspecies and may represent the southern most known colony of subspecies *ontario* (W.H. Edwards, 1868)

Kimble (1965) mentions three *edwardsii* specimens in the American Museum of Natural History labeled from Florida and collected by Palm. One is labeled "Kissimmee". This is in the Orlando area and is well into peninsular Florida. John Calhoun (1997) examined these specimens and has determined that they are typical of northern nominate *edwardsii* and that they are surely mislabeled. If *edwardsii* was to occur in Florida, the panhandle would be the most likely area. It would also be the new subspecies described herein.

Satyrium edwardsii meridionale Gatrelle, new subspecies

Diagnosis and description. The male (Fig. 2) and female (Fig. 7) of *meridionale* are marked much alike. **Dorsally**, most *Satyrium edwardsii edwardsii* and *S. edwardsii meridionale* are virtually identical. The only difference being the size and frequency of the red spot on the hindwing margin at the tail (Fig. 11). Two of the three known females of *meridionale* have this spot, but it is small and faint. All 8 male *meridionale* have this spot but it is likewise very small and faint. In nominate *edwardsii* this spot is not always present but is commonly very prominent, especially in females. **Ventrally**, nominate *edwardsii* has the postmedian band consistently formed of distinctly round or ovoid spots with prominent white outlines. In *meridionale* these spots are ovoid to connected bars and are not as prominently outlined with white, especially on the forewings. Typical of, and consistent with, southern *Satyrium* subspecies, the markings along the outer margin of the hindwings of *meridionale* are enlarged, elongated and thus have bolder red-orange marking in this area. The tails are nearly twice as long on *meridionale* as in *edwardsii* for both sexes (unfortunately the tails are missing on the holotype). The wing expanse of mounted specimens of nominate *edwardsii* varies from 20 to 30 mm. (small males to large females). In the *meridionale* type series the expanse ranges from 26 to 35 mm. (small male to largest female). *Meridionale* basically averages 5 mm. larger in each sex – which is quite a bit for a small species. Summation of *meridionale* characters: large size, frequent but faint marginal red spot on DHW, spots of ventral postmedian bands tending to become bars and less boldly outlined with white, very long tails, expanded red and larger spots on VHW margin, VHW blue spot tending to have prominent gray-blue inner cap. The male stigma of *edwardsii* (including *meridionale*) is much narrower than the stigma of either *calanus* or *caryaevorum* and serves as the best character to separate males of these taxa when their postmedian VHW bands are atypical.

Types. *Holotype* ♂ (Fig. 2): SOUTH CAROLINA: Aiken County, along south boundary of Aiken State Park, 1 June 1990 (leg. R. Gatrelle). *Allotype* ♀ (Fig. 7): SOUTH CAROLINA: Aiken County, along south boundary of Aiken State Park, 1 June 1990 (leg. R. Gatrelle). *Paratypes*: 7♂♂, 2♀♀: All GEORGIA: Cobb County, Pine Mountain various dates: 4♂♂, 1♀, 10 June 1973; 1♂, 30 May, 1977; 1♂, 2 June, 1♂, 1♀, 5 June 1979. All paratypes leg. A Towers. The holotype and allotype are currently deposited in the Museum of the Hemispheres, Goose Creek, SC. All paratypes are deposited in the Florida State Collection of Arthropods, Gainesville, Florida.

Etymology. *Meridionale* is a neuter latinization meaning characteristic of the south or southern. Its common name is Sandhill Hairstreak.

Remarks. It must be remembered that the further south one goes below New Jersey that the ranges of *edwardsii* and *meridionale* shift in opposition from north - south to west - east. I have examined all the *edwardsii* specimens in the FSCA Gainesville and the MOTH collection here in Goose Creek. Some of the more pertinent specimens are from Massachusetts, Missouri and New Jersey. Massachusetts specimens are typical *edwardsii* in size and markings. A series from Oak Ridge, New Jersey are beginning to show an inclination to *meridionale* in that some are larger – though not as large as *meridionale*. The postmedian spots on these New Jersey specimens are still very round and their tails on the short side. I would still refer to these as the nominate subspecies and not a blend zone population. The blend zone will be in Virginia and/or North Carolina east of the mountain region of those states. I also expect the blend zone in the coastal area of those states to be rather large. This remains to be determined and I would be happy to receive specimens (and return them) to help assess where this area is. It is my expectation that the populations in the North Carolina Sandhills near South Carolina will be referable to *meridionale* but this remains in question. Missouri specimens are typical of *edwardsii* in the western part of its range. They are larger than typical Canadian and Appalachian specimens, but are very characteristically marked and with shorter tails. True *meridionale* is strictly a taxon of the deep South. Intermediate populations should be referred to as nr. (near) *edwardsii* or nr. *meridionale* whichever is more appropriate for a given area. I am not entirely comfortable with the series from Cobb County. Both females paratypes from there are very large as are most of the males. But one male is atypically small. Specimens in this area are certainly near the northern edge of *meridionale's* range.

DISCUSSION

As stated earlier, clinal subspecies are usually the least evolutionarily distinct. While it is clear that *S. edwardsii meridionale* is a clinal subspecies, its geographical location in the Sandhills region indicates evolutionary significance as well. Twenty million years ago, this area was the coast of southeastern North America before the current lower coastal plain was geologically formed. The sands of the Sandhill region were once dune and beach deposits. While the area of central Florida is often referred to in lit as a refugium area from which various unique taxa arose during times of glacial retreat and advance, the Sandhills region is a much older area that provided the same type of evolutionary opportunity. Indeed there remain today a few butterflies that are still endemic to this region of origin. They are *Neonympha mitchellii francisi,* Parshall & Kral, 1989, *Neonympha helicta helicta* (Hübner, 1806), *Chlosyne ismeria ismeria* (Boisduval & LeConte, 1833), *Chlosyne gorgone gorgone* (Hübner, 1810), and *Poanes aaroni minimus* Gatrelle, 2000. In addition, the *Satyrium* that are sympatric with *meridionale* at its type locality exhibit morphological characters that seem to point to the possibility that this area was the evolutionary origin of the eastern North American Banded Hairstreak group of *Satyrium* species.

A coworker and I are in the process of working out just what these other entities at the *meridionale* type locality are. One is what we currently understand to be *calanus* nr. *falacer* (Figs. 5 & 10). The other two may be forms of one variable undescribed species – or, one an undescribed southern subspecies of *Satyrium caryaevorum* (McDunnough, 1942) (Figs. 3 & 8) and the other an undescribed species that is the (or a) link to the ancient ancestor of all three of these taxa (Figs. 4 & 9). It should also be mentioned that *S. titus mopsus* and *S. liparops liparops* are sympatric with these other *Satyrium* at the type locality and that *Satyrium kingi kingi* (Klots & Clench, 1952) has a colony one mile from the type locality in the Edisto River basin.

The undescribed species at this site is of special interest here as many specimens of it have the red bar at the anal angle expanded to almost as prominent as in species *edwardsii* (see enlarged insets on Figs. 4 & 9). Also, as mentioned in the description above, one of the distinguishing characters of *meridionale* is the tendency of the ventral postmedian band to be composed of dashes and away from spots as in nominate *edwardsii*. All of which points to the phenotypic evolutionary closeness of all the taxa at this site.

A few other unusual taxa occur here most notably: *Atrytone arogos arogos* (Boisduval & LeConte, 1852) (only known South Carolina colony), *Lycaena phlaeas americana* Harris, 1862, and the southern subspecies of *Mitoura hesseli* Rawson & Ziegler, 1950 (in press)(only known South Carolina colony). None of these occur in Aiken State Park but are all found immediately outside of it on private property. Thus, unless steps are taken to protect these unusual populations they are all at severe risk of destruction via development. It is also the type locality of *Neonympha helicta helicta* by way of neotype designation.

I think it is very likely that the range of *meridionale* will eventually be determined to extend from the southern sandhills of North Carolina south through this region in South Carolina and Georgia, then westward through the similar Black Belt region of Alabama and Mississippi to southeast coastal Texas. However, it may not extend westward beyond the Mississippi River valley.

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