THE LEPIDOPTERISTS' NEWS

Volume 8 1954 Number 6

AN ACCOUNT OF THE UNUSUAL LIFE HISTORY OF A RARE YUCCA SKIPPER (MEGATHYMIDÆ)

by LUCIEN HARRIS, JR.

Collecting butterflies with a shovel! That sounds fantastic, but before the life history of the very rare skipper *Megathymus cofaqui* Strecker was solved, a shovel became standard equipment in addition to the usual butterfly net. The adult butterflies are so rare that in order to get a series it became necessary to use a shovel to dig up the caterpillars from the roots of the yucca plant.

Megathymus cofaqui was named by HERMAN STRECKER in 1876 from a single specimen collected in Georgia by H. K. MORRISON. STRECKER failed to record the locality or the date of capture. The lack of these two important data has added to the difficulty of this investigation, for it now appears that there are either two forms of this Skipper, one of which flies on the upper half or Piedmont region of Georgia in July and August, and the other one flying in Florida and perhaps on the Coastal Plain of Georgia in March and April, or else a new but closely allied species has been discovered.

A comparison of a recently captured northern Georgia specimen was made with the original type specimen at the Chicago Natural History Museum by the Curator, R. L. WENZEL. His report shows that the upper side of STRECKER'S type specimen is distinctly lighter brown than the northern Georgia specimen. The underside was lighter throughout in the type specimen (color distinctly brown), with the same distribution of blue gray scales that occurs in the northern Georgia specimen.

A photograph of the original type specimen was also supplied through the courtesy of the Chicago Natural History Museum (see Plate 1). When it was compared with a series of specimens from northern Georgia and Sarasota, Florida, the Florida specimens compared most closely. This would not be surprising if the type was collected on the Coastal Plain of Georgia. The Georgia Coastal Plain extends in a broad belt from Augusta to Savannah and thence to the Florida state line on the south, and westward to the Alabama state line taking in the territory between Columbus, Georgia, and the Florida state line.

In several other species of butterflies there is a Coastal Plain form that differs from the one that flies in the Piedmont region. MORRISON, like many other collectors, may have collected briefly in the Georgia Coastal Plain when he

traveled to or from Florida. Nearly every collector of North American butterflies cherishes the hope that someday he can make a special collecting trip to Florida, where a number of species abound that are not to be found elsewhere.

My special interest in *M. cofaqui* began on July 9, 1950, when my son, LUCIEN HARRIS, III, caught what appeared to be a fresh male in the edge of the woods at the base of Stone Mountain. This spectacular granite mountain is located 16 miles east of Atlanta, Georgia, on U.S. Highway #78. At the time of the capture we wondered why it seemed to be flying so late in the year, for the few references to this skipper in books usually gave March and April as the flight period. Our guess at that time was that this particular specimen had remained in its pupal case several months past its normal emergence time. Later developments proved how wrong we were!

A year later, when looking at the collection of Prof. J. P. KNUDSEN, then at Oglethorpe University, near Atlanta, I saw a female *M. cofaqui* which he had captured near Cleveland, Georgia, on August 16, 1942. This record and LUCIEN'S July record gave me the first real clue that July and August were the flight months of *M. cofaqui* or a closely related species in the Piedmont region instead of March and April. No wonder it was rare in collections!

KNUDSEN recalled having seen a few yucca plants on the roadside when he caught the skipper. The butterfly is not easy to catch, for it has a rapid, undulating, zig-zag flight. On July 9, 1952, almost ten years after KNUDSEN had caught his specimen, I visited the area and located the yucca plants. They were *Yucca filamentosa,* which is the same species that grows on Stone Mountain. The local name for this plant is Bear Grass. This plant also occurs in Florida in favorable localities where its local name is Adam's Needle, according to BAKER'S *Florida Wild Flowers.*

Bear Grass is a low-growing plant with no trunk. From the root-base on the ground its sharp, stiff leaves point upward and outward like green bayonets. At certain times of the year, especially in the summer, there are curly threads or filaments along the edge of the leaves, which give the plant its scientific name. In addition to being found in sandy soil it often occurs in the gravelly soil on large granite outcroppings in the Piedmont region. Also in recent years this yucca plant has become established in favorable places on the well drained shoulders of highways in most of the southeastern states.

When I first searched for the larva of *M. cofaqui* on the yucca plants near Cleveland, I looked for a silk cocoon-like pouch. It seemed likely that the larva would protect itself with a silk covering over its tunnel like other species of this group. I was familiar with the brown, cigar-shaped pouch which the larva of the other Yucca Skipper of Georgia, *Megathymus yuccæ,* constructs in the center of the plant, sticking up a few inches like the thumb of a brown glove. After a diligent search both in and around the plants I discovered the secret of *M. cofaqui.* Instead of constructing or creating the cocoon-like pouch in the center of the plant, it had erected one

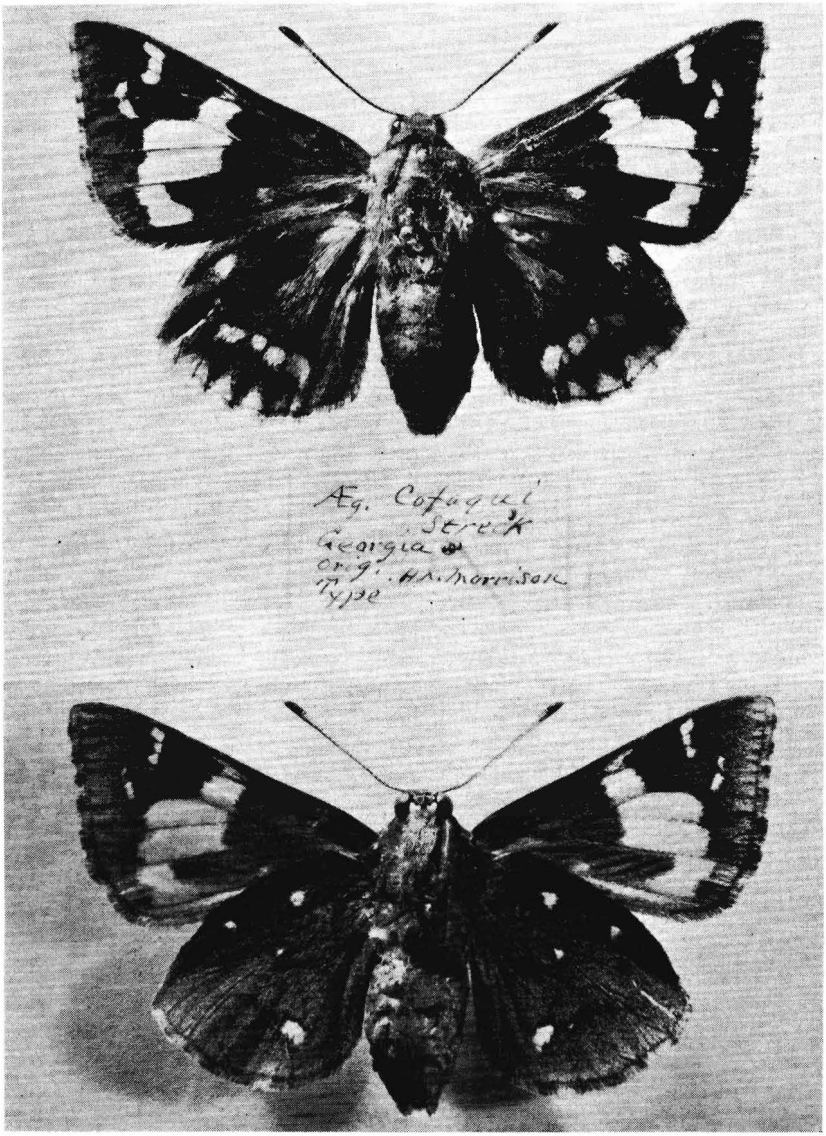
on the ground a few inches away from the base of the plant. It was hidden from view by the lower leaves of the plant (see Plate 3). A silk-lined underground tunnel connected the silk pouch with the yucca root where the larva had lived and fed for almost a year. This pouch was not constructed above the surface of the ground until the larva had become full grown and was almost ready to undergo the transformation to a pupa. When the larva is ready to pupate it crawls into the base of the pouch just below the surface of the ground and sheds its skin. The pouch now serves as a cocoon for the pupa. However, the pupa can be extremely active, and when the cocoon is disturbed the pupa will retreat down into the root tunnel (see Plate 3). After remaining as a pupa from two to six weeks, the butterfly emerges and crawls out through a hole made at the top of the pouch. This usually takes place between sunrise and 10 A.M. Its wings expand rapidly, and it is ready to fly in three hours.

The cocoon-like pouches are difficult to find because they blend so well with their surroundings. The silk is somewhat sticky when the pouch is first made by the larva, and it often becomes coated with soil, gravel, or leaves that effectively camouflage it. This gives the pouch of *M. cofaqui* an entirely different appearance from that of *M. yuccæ* (see Plate 3). The latter creates its pouch above the ground, up in the center of the plant, where it is out of contact with the soil. It is light brown when first constructed, usually turning dark brown with age.

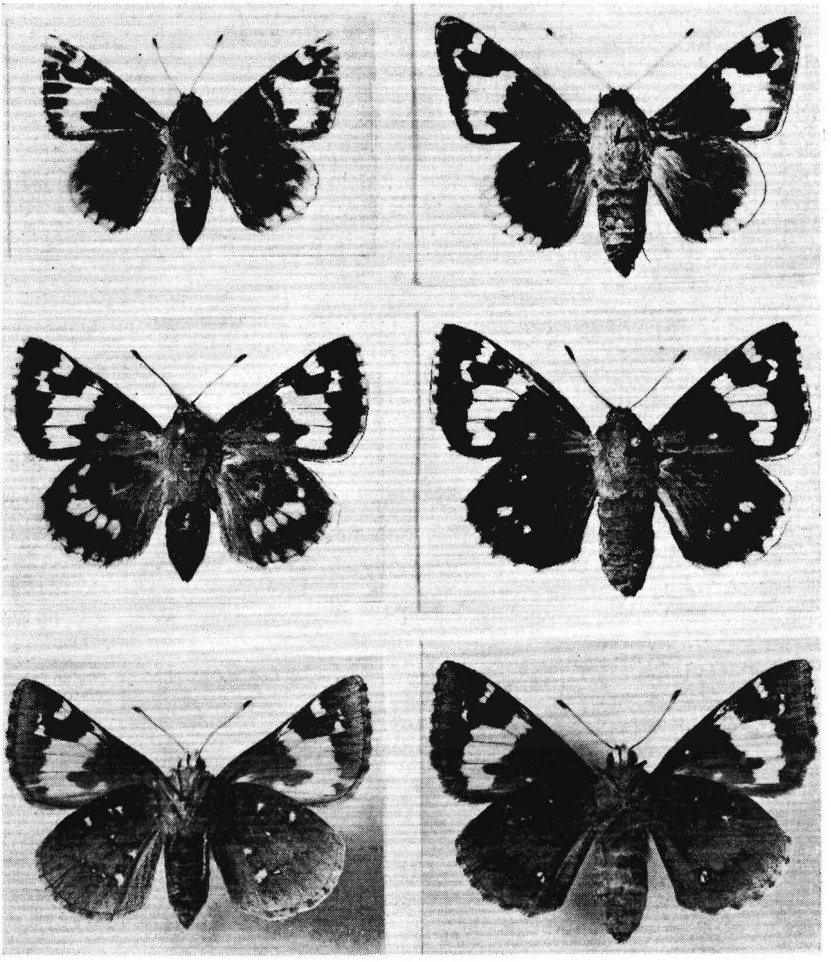
The trip to Cleveland, Georgia, on July 9, 1952, yielded six of the "tents", as these tubular silk pouches are sometimes called. Three of them contained one pupa each, one contained a larva, and two contained empty pupal skins from which the Skippers had already emerged. The first Skipper to emerge appeared on July 21, and the others followed in a few days, the last one emerging on August 10. A second trip was made on July 12, and two more "tents" were found. One contained a larva and one a pupa. The larva transformed into a pupa on July 15, and a female *M. cofaqui* emerged on August 6.

On August 20, the final trip in 1952 was made to the area, and one more "tent" was found. The larva was injured while being dug out with the shovel. It died a few days later. I dissected it and saw that it had been parasitized, having been infected with a multitude of minute grubs. Previously I had detected a similar parasite in the larva of *M. yuccæ.*

The first larva, collected July 9, was two inches long and cream colored. It had a small black head that could be withdrawn into the first segment. In general, it resembled the larva of *M. yuccæ* except that the *M. cofaqui* larva was somewhat smaller. This larva changed to a pupa on July 19. The pupa was one-and-three-fourths inches long and three-eighths of an inch in diameter. At first it was creamy white, but it soon began to darken at its head, and in a few days it was dark for three-fourths of its length. The pupa was very active and could wriggle up and down at will in its silk-lined tunnel. Usually it stayed up in the "tent" unless disturbed; then it would quickly wriggle down into the root tunnel.



Megathymus cofaqui Strecker, holotype female. Upperside above, underside below. (Photo courtesy of Chicago Natural History Museum)



Megathymus cofaqui: left row Sarasota, Florida, 15-17 March 1953; right row Stone Mountain, Georgia, 17-23 July 1953. Upper row males, upperside; middle row females, upperside; lower row same females, underside. (Photos by CAROLYN CARTER)

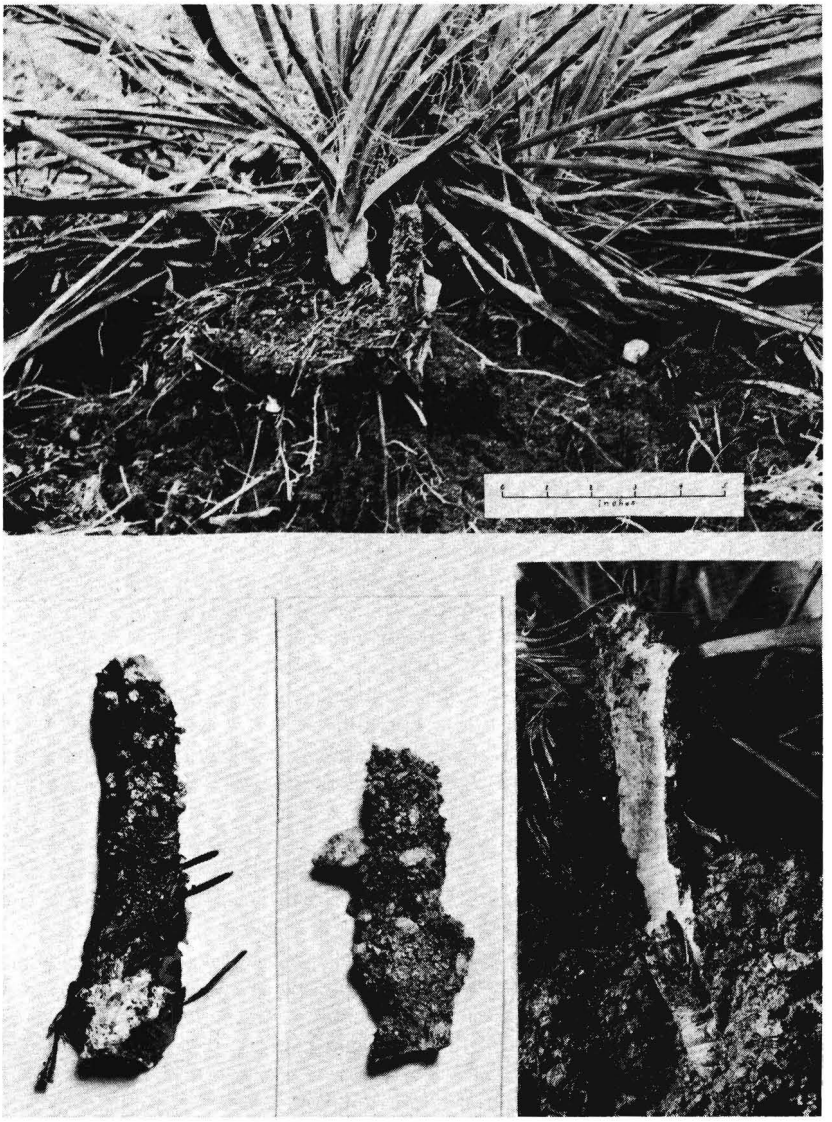
Since LUCIEN HARRIS, III, had collected a specimen of *M. cofaqui* at the base of Stone Mountain, a search was made on August 2, 1952, for "tents" on the ground among the yucca plants at the foot of the mountain. Three "tents" were found, but they contained empty pupal cases. Professor KNUDSEN examined the leaves of one plant under which we had found a "tent" and discovered an egg near the center of a leaf. Further search revealed three more eggs on other leaves. He took them home for further study. He later reported that the egg is smooth, nearly hemispherical and about as high as wide. At the time the egg was first collected its color was pale pink. One week before hatching, the egg is a pale rose purple, lightest at the base and shading to a deep tone at the apex. As hatching time approaches, the egg loses the purple cast and becomes white with a dark micropyle. The larval head can be seen through the shell as a gray area within the egg. The first larva emerged August 10, 1952.

At hatching time the larva leaves the egg through a roughly circular hole 1 mm. in diameter chewed at the apex of the egg. On emergence the larva is about 6 mm. long. The remainder of the shell is not eaten, and the young caterpillar crawls immediately to the base of the leaf where it conceals itself in the crown of the plant. A little later it gradually begins to eat its way into the main root of the plant.

The head is a deep brown, almost black, slightly clothed with short hairs. It is about 1 mm. in width. The first thoracic segment is dorsally armored with a shell of horny material against which the head can be tightly drawn. The larva's body is a warm orange brown, faintly flecked with black at the base of the short unbranched hairs with which the larva is sparsely clothed. From six to ten hairs are found on each segment, those segments toward the rear bearing the longest hairs.

On September 11, 1952, Professor KNUDSEN and I went to Macon, Georgia, to collect butterflies. While crossing a railroad embankment, covered with rather dense brush about knee-deep, the professor kicked a yucca plant, and an *M. cofaqui* fluttered out. His net was popped over it, but instead of flying upward into the net the butterfly dropped through the thick underbrush to the ground and eluded us. This late summer record is important, for Macon is on the "fall line" which marks the end of the Piedmont region and the beginning of the Coastal region. The "fall line" extends across Georgia from Augusta through Macon to Columbus. Macon is close to the geographic center of the State.

KNUDSEN'S record, together with a specimen captured in Macon by Dr. H. F. STROHECKER one summer, which is in my collection, establishes the fact that even in middle Georgia the *M. cofaqui* is on the wing during the summer months. The writer would like to receive information from anyone having specimens taken on the Coastal Plain of Georgia, as date and locality of captures in this area are greatly needed. At the present writing we do not have any records for this area. As pointed out earlier in this article the flight period in the Piedmont region of Georgia is quite different from the March and April flight period in Florida. The Coastal Plain of Georgia



Above, "tent" of *Megathymus cofaqui* (Mt. Arabia, DeKalb Co., Ga.) *in situ* beside *Yucca* plant. Below right, "tent" and upper burrow of *M. cofaqui* (Georgia) opened to show silk-lined tube and pupal shell. Below middle, "tent" of *M. cofaqui* (Georgia). Below left, "tent of *M. yuccae* (Georgia). (Upper photo by C. L. REMINGTON; others by CAROLYN CARTER)

may someday provide the answers that will bridge the gap between the two populations or show that they are distinct species.

My first bit of information about the life history of *M. cofaqui* in Florida came from Dr. AUBURN E. BROWER of Augusta, Maine. He wrote that there was very little information about *Megathymus cofaqui* but that an observer in Florida, J. G. BONIWELL, had referred to it in 1917 in an article in *Lepidoptera* (vol. 2: pp. 108-109). BONIWELL'S report dealt with *Megathymus yuccæ* (Boisduval) but referred to *M. cofaqui* briefly in three lines as follows: "Some experiments with the larvæ of *Megathymus cofaqui* the year before had convinced us that it had habits quite a lot different from its near kin *yuccæ*. This year we succeeded in determining without any doubt the fact that the *cofaqui* does not make a silken pouch in the summer or fall like the *yuccæ,* but remains entirely concealed until about two weeks prior to pupation, at which time it penetrates the surface and creates a short light-colored pouch, usually near the ground on rotten prostrate stems. We have yet to find a *cofaqui* in a strong healthy plant."

It should be pointed out that the *M. cofaqui* larvæ studied by BONIWELL were in Spanish Bayonet which is the tall yucca plant of the coastal sand dunes and is different from the low growing Bear Grass or Adam's Needle of the inland country and highlands. Spanish Bayonet (*Yucca aloifolia*) has a trunk two to ten feet tall with several branches, and the entire plant is covered with rigid, sharp-pointed leaves one to three feet in length. It is tree-like in comparison with Bear Grass (*Yucca filamentosa*) which has no trunk. Unfortunately, BONIWELL did not state the exact time of year that *M. cofaqui* larvæ under study penetrated the surface and created the pouch, but he did state that it did not make a silken pouch in the summer or fall. This leaves the winter and spring as possibilities which he further narrowed down with the statement, "but remains entirely concealed until about two weeks prior to pupation, at which time it penetrates the surface and creates a short light-colored pouch . . ."

Through the courtesy of Dr. A. B. KLOTS of the American Museum of Natural History, the dates of capture of their Florida specimens were given to me. They ranged from March 1 to May 11 with 9 specimens having been taken in March, 4 in April and 1 in May. These dates proved without a doubt that the Florida *M. cofaqui* flies in the early spring.

Dr. KLOTS also supplied me with the names of H. L. KING and CHARLES P. KIMBALL, both of whom had recently taken *M. cofaqui* near Sarasota. KIMBALL reported the interesting and unusual capture of a fresh female on November 22, 1952. While this date seems to be as out of season as the unexpected capture of a male on July 9, 1950, by LUCIEN III, or KNUDSEN'S capture of a female on August 10, 1942, it is likely that KIMBALL'S November 22 date will fit into its proper place, too, when the entire life cycle is known.

H. L. KING reported the capture of several specimens of *M. cofaqui* near Sarasota during the period from March 23 to March 30, 1952. On March 1, 1953, he caught a fresh specimen and invited me to visit him and look for "tents". The butterflies were still on the wing when I visited the lo-

cality with KING and KNUDSEN on March 15. KING had found this small colony in a group of Spanish Bayonets on the edge of the Gulf.

We were anxious to discover where and how *M. cofaqui* constructs its "tents" when the food plant is the tall Spanish Bayonet instead of the low growing Bear Grass. After we had all spent some time carefully searching for "tents", KNUDSEN found two on the ground at the base of a rather small plant. They would not have been visible to the casual observer, for they were completely hidden from view by the dead leaves hanging downward from the lower part of the stalk. These "tents" resembled the ones that we had found in northern Georgia in July but were shorter and lighter in color. Unlike the Georgia ones they were not coated on the outside with sand or other material. The "tent" was yellowish in color and stood out in contrast to the white sand on which it had been erected. The "tent" was connected with the root of the plant by a silk-lined tunnel. After a diligent search we each found two or three "tents" on the ground well-hidden at the base of yucca plants.

The second important discovery was made by KING. He was examining the dead leaves on a yucca stalk and found a "tent" on the stalk about six inches above the ground. This confirmed BONIWELL'S observation on this point. We concluded that the caterpillar usually erects its "tent" on the ground, but when circumstances are not favorable it will place it on the stalk as near the ground as possible. In February 1954 the area was again visited and several "tents" were found. They were located on the base of the plants at or slightly above ground level on the stalk.

The colony which we were studying was located on the edge of the Gulf of Mexico. Sometimes when the skippers were accidently flushed from their hiding places in the underbrush they would fly out over the water and then circle back to the land. Although the flight was fast and erratic it was sustained for only a brief time.

This colony flourished in an area about two acres in extent where the Spanish Bayonets were not as strong and vigorous as they were in nearby areas where no skippers were found. BONIWELL had previously noted that he had not found *M. cofaqui* larvæ in strong healthy plants. It would be difficult to decide whether the condition of the plants was due to the infestation by the *M. cofaqui* larvæ or to other causes. We noted that another type of larva apparently the grub of a large beetle, was also burrowing in the stalk of these plants. Other factors may have been involved that prevented these plants from being strong and vigorous.

The adult Skippers which we captured were smaller and browner than the ones taken in northern Georgia. The Florida specimens varied greatly in size. They compared with Georgia specimens (see Plate 2), as follows:

Florida males, wing expanse 1-3/4 inches to 2-1/4 inches
Georgia males, wing expanse 2-1/4 inches to 2-6/16 inches
Florida females, wing expanse 1-6/16 inches to 2-6/16 inches
Georgia females, wing expanse 2-1/4 inches to 2-6/16 inches
STRECKER'S original type female, wing expanse 2-3/16 inches.

Adult specimens collected in the field did not vary noticeably in size or color from the specimens that emerged from collected pupæ.

Another very noticeable difference between the northern Georgia and Florida specimens, in addition to the much lighter brown color of those from Florida, is the greater width of a band of yellow markings on the upper side of the hindwings of the Florida females. This band of spots varies from a fairly narrow row to a rather wide band, while on Georgia specimens there is a row of three or four rather small spots instead of a band. These spots are rather constant in size on all of the female Piedmont region specimens that I have examined. On the underside of the hindwings of the Florida females there are light spots which correspond with the ones on Strecker's female type, whereas northern Georgia females consistently have fewer spots (see Plate 2).

A trip to the spot on the highway near Cleveland, Georgia, was made on July 1, 1953. It proved disappointing, for the highway department had worked over the area, and many of the plants were buried or destroyed when the shoulder of the road was graded. Not a single "tent" could be found. A similar trip was made on July 28, 1954, with the same results.

A visit was made on July 3, 1953, to the Stone Mountain area. Nine "tents" were located. Each contained a pupa. It was difficult to dig the root tunnel and "tent" out of the rocky locations, but this was finally accomplished with a stout shovel. The first skipper emerged on July 5, and others followed at intervals of a few days. The last one emerged on July 26, 1953. Another visit was made to the Stone Mountain area on June 30, 1954. Three pupæ were dug up, but two died from injuries. A female skipper emerged on July 10, 1954, from the third pupa.

While I was searching the Stone Mountain area for "tents", a large female *M. cofaqui* flew out of a cluster of yucca plants. I swung my net but missed it and was glad that it escaped, for it represented generations yet to be born of a rare species that had given me the pleasure of exploring both mountains and seashore in an attempt to solve its life-history secrets.

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[Editor's note: Since this manuscript was accepted, it has been learned that there are in fact two species in Mr. HARRIS'S material, one of which is being described as new (in press) by H. A. FREEMAN.—C. L. R.]

ON MARKED AND RELEASED MONARCHS

Any individual who has marked Monarchs (*Danaus plexippus*) in North America this year is urged to communicate immediately with the *News* Editor. A clearly marked specimen was caught in Ohio in October. In addition to those released by C. A. ANDERSON of Dallas, Texas, we know of 36 marked near Washington, D. C., by JOHN H. FALES, from 1 to 17 October. Mr. FALES also marked one *Vanessa cardui* and one *Phœbis sennæ eubule* before releasing them.

C. L. REMINGTON