

ECOLOGICAL AND BEHAVIORAL NOTES ON *HESPERIA*
METEA AND *ATRYTONOPSIS HIANNA* (HESPERIIDAE)

ARTHUR M. SHAPIRO

7636 Thouron Avenue, Philadelphia, Pennsylvania

The ecological associations of a number of the northeastern HesperIIDae have received relatively little attention in print. The lack of published information has handicapped many workers in their attempts to find the insects, and thus hampered the expansion of our knowledge of them. *Hesperia metea* Scudder and *Atrytonopsis hianna* (Scudder) have long been cases in point. Although both were described about a century ago, their life histories remain largely unknown, and their ecology and distribution but little illuminated. The present paper offers observations on the ecological associations, flight period, and behavior of these two species as observed in southeastern Pennsylvania and in New Jersey.

HESPERIA METEA Scudder

No records of this species have been published for Pennsylvania. Its occurrence there has generally been cited on the basis of a quotation in Tietz (1953) from Williams, who merely postulated its occurrence "within fifty miles of Philadelphia." Therefore it is noteworthy that recent records show *metea* is a resident in at least the following Pennsylvania counties: Philadelphia, Montgomery, Bucks, Chester, Delaware, and Lancaster (the last on the authority of George Ehle, personal communication). In New Jersey it occurs at least in Burlington and Ocean counties.

The ecology of *metea* in Pennsylvania may be taken as more typical than that in New Jersey, for most of its range. The writer has obtained a long series of *metea* from several colonies within the city limits of Philadelphia and in the surrounding counties. The physiognomy of these sites is uniform enough that it has been found possible to predict the occurrence of *metea* with considerable accuracy in a given site, even out of season.

In Pennsylvania, *metea* is very closely associated with the grass *Andropogon scoparius* Michx. This grass, commonly known as bunchgrass, bluestem beard grass, or fire grass, is a characteristic species of dry hillsides, woodland clearings, burn scars, and denuded or sterile sites. Its aerial method of distribution facilitates its occupying such situations rapidly. It reaches its greatest abundance on dry, open hillsides surrounded by woods; hills which open above the trees on at least one side.

This is the typical situation for *metea*. The butterfly is never found where the *Andropogon* is less than the dominant element of the herbaceous vegetation, nor where it is only a short-term component.

H. metea seems to occupy burned-over sites after the second year following the fire, *i.e.*, after *Andropogon* has thoroughly dominated the site. The skipper continues in residence until the grass is shaded out by tree growth or until other species of grasses become dominant, as sometimes occurs. In Pennsylvania, *Andropogon* is only locally a conspicuous element of oldfield vegetation, but on the rocky, poor soils of New England it is more important, and *metea* may occur in more open areas.

Aside from dry hillside clearings, *metea* in Pennsylvania also occurs in artificial clearings and on railroad tracks through woods, with the foodplant, but never in the abundance it reaches in hillside situations. It also occurs on the dry banks along the Pennsylvania Turnpike in wooded sections, but not commonly. Possible sites for *metea* may be recognized in autumn by the red-brown cast of the *Andropogon* stems forming a cover of dense clumps.

Andropogon, as earlier noted, is rarely in this area a permanent component of field vegetation, being only an occasional species on level, open terrain. One major exception is on the so-called "serpentine barrens" of Chester County, Pennsylvania, where the substrate is inhibitory to many herbaceous species and a peculiar grassland community results, of which *Andropogon* is a dominant species; *metea* is common here. I suspect it may also occur at Jennings Blazing Star Prairie in Butler County, another odd grassland where *Andropogon* is common.

Adults of *Hesperia metea* are very closely associated with the *Andropogon* plants and do not wander far from them. On hillsides, surrounded by woods, the *Andropogon* regularly occurs at the top and the upper half of the slope, with usually another grass, a species of *Panicum* of the *clandestinum* group, at the bottom and some *Triodia flava* in between. The *Panicum* is usually in partial shade, and the *T. flava* represents one of the most common grasses in the area, an important component of virtually every grassland type in eastern Pennsylvania but not a rapid spreader. In autumn of 1964 I examined two colonies of *metea* at the exact spots which had been noted on topo maps the previous spring. The density of *Andropogon* was measured by counting seed stems per square meter. It was found that in both colonies, over 80% of the specimens had been taken where the seed stem density exceeded 45/m², which is a good indication of the intimacy of the association. It may, of course, also reflect a reluctance on the part of *metea* to fly downslope.

On railroad tracks, the *Andropogon* is typically mixed with *Panicum*,

the relative abundance of the two on a given stretch being related to the amount of shade; in these places *metea* is always commonest where the *Andropogon* is thickest, but the butterflies fly all along the track.

Male *metea* are aggressive, but there seem to be surprisingly few contacts among them considering the density which the species may reach in a small area. Close observation has led me to believe that a definite, though transient, territoriality exists. The males feed in the early morning and extend their range in the late morning, each occupying a specific site and, normally, returning to it when disturbed. These resting sites are usually open spots of bare ground among the tufts of *Andropogon*, occasionally projecting clumps of low vegetation. Male chases are very brief, rarely over two or three minutes, and seldom more than eight feet above the ground, unlike, for example, *Poanes zabulon* (Bdv. & LeC.). If a male is removed, its place will not be taken for ten or 15 minutes, suggesting that the number of drifting males, without territories, is quite low. As for the apportionment of these territories, it would appear to be on a first come, first served basis; and when a male already occupying a territory is challenged, it is always the original occupant that returns after the chase. The area defended by a single male varies with the vegetation and the population size, ranging from two feet square or more to ten inches square under overcrowded conditions, but becomes considerably greater in the air. The territories are rarely adjacent, the intervening spaces being used by transient males and by females which tend to stay just above the ground, and thus avoid pursuit.

If a male is disturbed by the collector, it typically will take flight but normally remain about a foot above the ground, twisting through the grass and other vegetation in a fast but skipping way, and returning within ten minutes or so to its original resting place via a circuitous route. When greatly alarmed, males fly higher and faster.

Females generally fly low, and rest during the heat of the day. When a male pursues a female that has wandered into the territory, the female generally alights quickly on a grass blade. The male follows, flying about the female for a few seconds; it then alights and walks up behind the female, fluttering slightly. At this point the female occasionally takes flight again, the male pursuing, but more often she flutters slightly, then steps sideways, allowing the male to advance up the leaf to a position parallel and adjacent to her. The male now curves its abdomen in toward the female, so that its extruded genitalia make contact with the caudal tip of the female. One or two repetitions of this behavior result in acquiescence by the female, and exposure of her genitalia is instantly followed by copulation. The male then sidles around the leaf until he

faces in the opposite direction to the female. The process on the leaf, just described, requires about three minutes. I covered two mated pairs with glass bottles in the field and found both still in copula two hours later. I do not know the normal full duration of copulation. Mating generally occurs around the noon hour, and seems more frequent in cloudy and cool weather than in full sunshine.

Males at rest in their territories generally perch with the forewings opened to an angle of about 70° and the hindwings to about 45° , but close the wings in cloudy weather or when slightly disturbed. Both sexes when feeding, and females when at rest, keep the wings closed over the back. During copulation the wings are closed as a rule, but twice I have seen the male open them to the "territorial" angle. Mated pairs frequently settle downslope from the territorial area. They are occasionally disturbed by other males. If the pair is at rest and the intruder airborne, the former will not normally take flight; when both are in flight, the pair usually land.

Ovipositing females appear on casual inspection to be flying in the normal, skipping manner six inches or so above the ground. They alight repeatedly, however, and crawl down into tufts of *Andropogon*. Here, the female turns around so that her abdomen points into the center of the tuft, and deposits an egg singly down low on a leaf, on the upper surface. I have never seen a single female lay more than one egg on a clump of the grass, although under crowded conditions it is likely that a number of females may utilize each clump. Females while ovipositing, and mated pairs, are much less wary and thus easier to observe than under other conditions.

Both sexes will fly into shade, but only for short periods. Females are much more active in cloudy weather than males, and may continue to oviposit while the males are at rest with wings folded. Neither sex flies in conditions of persistent overcast, however.

As might be gathered from much of the preceding discussion, the population density in various sites is quite variable. The highest I have seen is about 120 observed in an area of slightly over half an acre. Of course, most of these were concentrated into parts of that area with highest *Andropogon* density. The species is quite common in most of its localities. The frequent failure to find it probably results in part from ignorance of its habits and in part from its very short flight period. In Pennsylvania, the first males appear about May 6, the first females about May 12, with the overall peak about May 18, and hardly any males by the 25th. The last females are still on the wing about June 1. To be sure of finding the species, it is virtually necessary to look between May

12th and 22nd. Because of the sedentary habits of the butterflies, a thorough search is necessary; one may miss a small colony completely by only a few feet.

In the New Jersey pine barrens, the ecology of *H. metea* is necessarily somewhat different. There it is associated with *Andropogon scoparius* var. *glomeratus*, a grass found locally in sandy barrens. In clearings in the pine forest *metea* exists in conditions not unlike those in Pennsylvania, although rarely in large numbers. The greatest populations seem to be in the so-called "plains" area near the Lebanon State Forest, in the Mount Misery vicinity. This is a high, wind-swept area characterized by a curiously stunted open growth of pine and blackjack oak (*Quercus marilandica*); it is subject to frequent burning. *H. metea* flies in and out of the scrub trees and low vegetation, behaving much as it does elsewhere. Territoriality does seem to exist in the more open parts, but principally at ground level since the vegetation is not conducive to pursuit at high levels. The largest numbers are found on the recent burn scars, but the quick-sprouting pine and oak make these areas much less stable than similar clearings in the oak-tulip, poplar-birch-maple forest of Pennsylvania, even when on projecting hillsides.

It is almost certain that proper investigation will uncover *H. metea* in most of Pennsylvania's counties, and perhaps extend its known range elsewhere as well.

ATRYTONOPSIS HIANNA (Scudder)

The situation concerning published records of this species for Pennsylvania is analogous to the preceding, the only citation other than Williams in Tietz (1953) being my own (Shapiro, 1963). So far *hianna* has been found in Philadelphia and Chester counties, Pa., and Burlington and Ocean counties, N. J. Further searching will undoubtedly extend its known range in the area considerably.

Forbes (1960) mentions that this and the preceding species occur together; Franklin H. Chermock and George Ehle have mentioned the same fact to me *in litt.*, referring to Maryland and Lancaster counties, Pa., respectively. Such indeed is the case. The association of *hianna* with *Andropogon* is quite clear, and generally one may find either where the other is known to occur. Generally, *hianna* is much rarer than *metea*, the numbers running in the ratio of from 1 : 5 to 1 : 20 in various colonies.

The general behavior of the two species is similar, but on the whole *hianna* is a much more active and aggressive insect. Males are especially fond of flying up and down exposed rock surfaces in the sunshine, and when such surfaces are available, will take up their territorial vigil on projecting tufts of grass or other vegetation extending from cracks in the

surface. Otherwise, they will perch on or near the ground like *metea*, darting up to chase one another with great vigor. Where the species is at all common, the males are occupied in chasing one another for much of the day; this behavior is relaxed only in the early morning and late afternoon, when both sexes are feeding. Males returning from chases are apt to be assaulted again before reaching their original perch, and other males may move in to occupy it, so that there is a constant competition for resting sites, much more intense than in *metea*, even though the species is less abundant. The chase flights are no more sustained than in *metea*, except as renewed by new challengers, but the combatants rise much higher, sometimes escaping from sight. All of this behavior is exactly similar to that of *A. vierecki* (Skinner) as I have observed it in the *Fallugia* arroyos of Bernalillo County, New Mexico.

Female *hianna* fly low, generally at six to eight inches above the ground; they have not been seen ovipositing, nor has the mating process been observed, but pairs in copula have been seen between 11:00 A.M. and 2:00 P.M., indicating that, as in *metea*, copulation probably occurs early in the territorial part of the day.

A. hianna is less active than *metea* in cool or cloudy weather, the females again flying much more than the males under such conditions. Both sexes visit flowers more consistently than *metea*, but like *metea* show a definite preference for *Rubus*, *Fragaria*, and *Trifolium pratense*. Unlike *metea*, it feeds regularly in the late afternoon as well as in the morning.

Male *hianna* at rest hold the wings closed, as a rule, but both sexes open them somewhat while feeding. Despite its pugnacity, the species is no more wary than *metea*, and although a startled male will depart with a fast flight high into the air, it will, if not engaged in chase by another individual, return to its original perch in a few minutes. Females never seem to become agitated to the degree that the males do, and even when alarmed make a steady and erratic flight only a foot or so above the ground.

A. hianna appears just as *metea* is disappearing, the first males about May 27, the first females about June 1, both sexes declining by June 10, with a few worn females still alive in early July. This flight period is about as limited as that of *metea*, and likewise contributes to its having remained unknown for over 100 years in a center of entomological activity like Philadelphia. The insects wander a good deal more than *metea*, but still are quite local, and could very easily be overlooked by anyone not specifically searching for them.

I have not had the time during the flight period of *hianna* to check all of the *metea* sites for this species, but those thus far examined have

demonstrated the association of the two insects, and it is to be expected that this will be the rule throughout most of the range. It certainly holds around Philadelphia, on the serpentine barrens, and in the New Jersey pine barrens.

I have not had the opportunity to investigate the early stages of either species. This may be possible in the future. Hopefully these preliminary notes will enable many more field workers to become acquainted with *metea* and *hianna* and extend our knowledge of them.

LITERATURE CITED

- FORBES, W. T. M., 1960. The Lepidoptera of New York and Neighboring States. Part IV. Ithaca, N. Y., 188 pp.
SHAPIRO, A. M., 1963. The Butterflies of the Morris Arboretum: 1963. Morris Arb. Bull., 14: 67-69.
TIETZ, H. M., 1953. The Lepidoptera of Pennsylvania. University Park, Pa., 194 pp.

A RECENT RANGE EXTENSION OF *PIERIS BECKERI* (PIERIDAE) IN WYOMING

DENNIS GROOTHUIS AND RICHARD HARDESTY
Douglas, Wyoming

The years 1963 and 1964 have yielded very many interesting specimens in our study of Wyoming Rhopalocera, but perhaps the most unusual record has been the capture of two *Pieris beckeri* Edwards, one of each sex, in Douglas, Wyoming.

Holland (1931) states that the range of *P. beckeri* is from "Oregon to central California and eastward to Colorado." In 1937, Cross in "Butterflies of Colorado," and in 1956, Brown in "Colorado Butterflies," said that *P. beckeri* was found west of the Continental Divide. However, in 1962, Hovanitz revised the eastern limits to be the "Rocky Mountain system in Montana, Wyoming, and Colorado." His map indicates three localities in Wyoming in which *P. beckeri* had been collected: (1) the vicinity of Highway 430, south of Rock Springs in Sweetwater County; (2) the vicinity of Mammoth Hot Springs in Yellowstone National Park, and; (3) the vicinity of Cody, Park County. The locality near Highway 430 is west of the Continental Divide. Cody and Mammoth Hot Springs are both east of the Continental Divide, and are in or near mountain ranges and are within Hovanitz' new eastern limits.