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A NOTE ON *LETHE ANTHEDON BOREALIS* (SATYRIDAE)

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In recent years the genus *Lethe* Hubner has inspired a good deal of new interest by North American Lepidopterists; Irwin (1970) has treated *Lethe creola* (Skinner); dosPassos (1969), Shapiro and Carde (1970) and Carde, Shapiro and Clench (1970) have treated the *Lethe eurydice* (Johansson)—*Lethe appalachia* Chermock complex while Heitzman and dosPassos (in preparation) are treating the *Lethe anthedon* Clark—*Lethe portlandia* (Fabricius) complex. As a result of these studies, the number of recognized species of *Lethe* in North America is increased from three (as given by dosPassos 1964) to five. Included are two sets of sibling species, *eurydice-appalachia* and *creola-portlandia-anthedon*, which show very little morphological divergence but exhibit strong physiological distinctions which warrant their current designations as separate species. In view of this, the physiological differences between *Lethe anthedon borealis* Clark, per my observations in Minnesota, Wisconsin, Ontario and Manitoba, and nominate *L. a. anthedon* seem quite pertinent. They should shed some light on the proper relationship of the two subspecific popu-

lations and indicate the value in retaining *borealis* as a subjectively valid name.

Lethe anthedon borealis was described from Hymers, Ontario by Clark (1936) as *Lethe portlandia borealis* in the same paper in which *Lethe portlandia anthedon* was described. *Borealis* has received but little interest, usually having been regarded as a "very weak" subspecies of *portlandia* (= *anthedon sensu stricto*) or as a subjective synonym for *anthedon*. The morphological differences, cited by Clark to separate the two subspecies, are indeed slight; they are as follows:

> Dark border on hind wings above narrow and tapering anteriorly; on the hind wings below the dark band, between the light line bordering the fourth and fifth spots and the submarginal light line, is little, if at all, broader than the distance between the submarginal light line and the margin of the wing ..... *anthedon* Clark
> Dark border on hind wings above broader and more uniform, not narrowing appreciably anteriorly; on the hind wings below the dark band between the light line bordering the fourth and fifth and the submarginal light line is broader, usually much broader, than the distance between the submarginal light line and the edge of the wing; ground color below browner and usually more uniform ..... *borealis* Clark

These distinctions are minor and difficult to use in keying out specimens and it is almost necessary to have both populations available for comparison; however, *borealis* is not often represented in collections. The character that I have found most useful in separating populations is the ground color of the hind wings below; in *borealis* it is a dull and uniform brown while in *anthedon* the background seems to be composed of several shades of brown and is much brighter. This distinction is especially evident in looking at the butterflies in series, which avoids comparing individual differences. I have also found that the morphological distinctions between the two populations occur on a sharp line between the Transition and Canadian Life Zones. Munroe (1969) stated that a number of butterflies exhibit sharply distinct subspecies on the two sides of a boundary between two major ecological formations. As examples he cited, among others, *Papilio glaucus canadensis* Rothschild & Jordan and *Limenitis arthemis arthemis* (Drury) for the Canadian Zone versus *Papilio glaucus glaucus* Linnaeus and *Limenitis arthemis astyanax* (Fabricius) for the Transition Zone.

After carefully examining the specimens of *Lethe anthedon* in my own collection and in the University of Minnesota collection, I placed them, subjectively, into subspecies *borealis* or *anthedon* and plotted their distribution (Fig. 1). The correlation between subspecies and life zones is

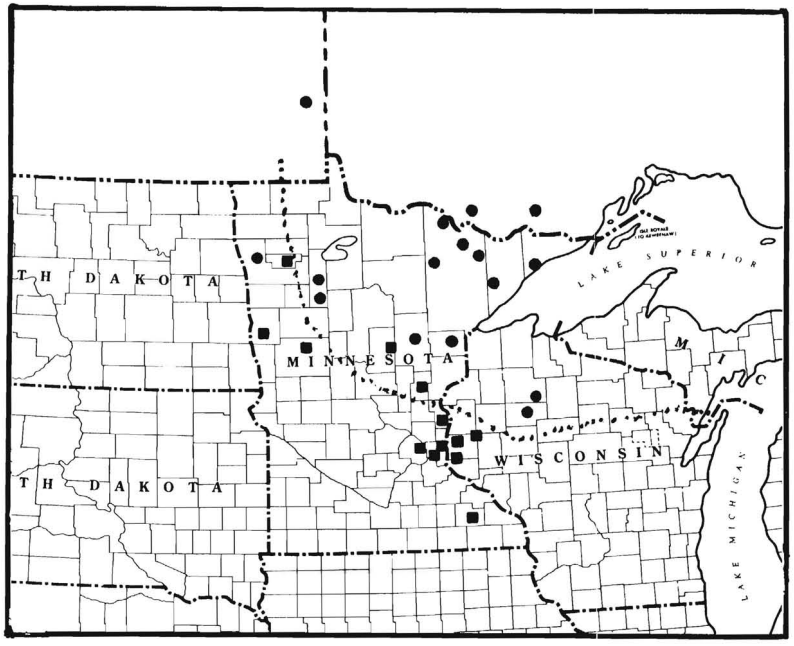

Fig. 1. Distribution of examined specimens of *Lethe anthedon* in Minnesota and neighboring areas. Circles: *Letha a. borealis* (Clark). Squares: *Lethe a. anthedon* (Clark). Dotted Line: approximate boundary between Canadian (Boreal Region) and Transition (Austral Region) life zones.

very good; as indicated by the dotted line on the map which traces the approximate boundary between the Canadian and Transition Zones (per Roberts, 1936). Nearly every specimen examined could be placed reliably into one subspecies or the other. Some degree of intergradation was noted in the character of the dark border on the dorsal hind wing, and to a lesser extent in the other characters, but in no case was more than one character involved in intergradation.

The differences in habitat and habits are much more conspicuous. My observations on *Lethe anthedon anthedon* have been principally in southern Minnesota, central Wisconsin, Missouri and Arkansas, but are in complete accord with Shapiro and Carde (1970) for New York and New Jersey, Klots (1951) and Edwards (1897). Nominate *anthedon* is a shade loving butterfly of deciduous forests. It's foodplants are grasses, *Brachyelytrum erectum* Schreb. (Shapiro & Carde, 1970), *Uniola latifolia* Michx. (Heitzman, 1970) and possibly others. The butterflies frequent small glades in the forest and exhibit strong preferences for flight in the late afternoon, often flying until dusk. They are infrequently taken at lights which may

indicate that they, like *Lethe creola,* are subject to occasional nocturnal flight. The males are very territorial in habit and each male will occupy a favorite perch at some distance from the perches of his nearest neighbor. The distance between perches is inversely proportional to the population density in the particular locality and, if the population density is extremely high, they may be very close together and, in some cases, even on the same tree. The perches are almost invariably on a tree trunk, two to four feet off of the ground, which allows a view of a small glade or opening in the forest. Territoriality very similar to this has been recorded for a number of other satyrid butterflies, e.g. *Oeneis macounii* (Edwards) and *Oeneis jutta* (Hubner) (Masters & Sorensen, 1969), and apparently serves the mating requirements of the butterflies.

Based on my observations, primarily in Rusk County, Wisconsin, Aitkin and Saint Louis Counties, Minnesota and Riding Mountain, Manitoba, *Lethe anthedon borealis* has distinctly different habits and habitats. It does not occupy the fully wooded environment but prefers a very "open" wooded environment with lush undergrowth, the mosaic habitat of Shapiro and Carde (1970). In some cases I have found colonies in localities where bogs or marshes are gradually giving way to forest and the plant associations are quite mixed. In other cases I have found them in young seral forests, composed of birch, aspen and hazelnut growing sparsely with heavy undergrowths. The foodplant of *Lethe anthedon borealis* is not known. One of the recorded foodplants for nominate *anthedon, Brachyelytrum erectum,* occurs at least in part of it's geographic range (Lakela, 1965), however *Uniola latifolia* does not. The actual foodplant may prove to be *B. erectum* or another grass, but I would not be suprised to learn that it was a sedge instead since several species of sedge are common in the *borealis* habitats.

Like the nominate subspecies, *L. a. borealis* exhibits a marked preference for late afternoon flight and may be taken until sunset on warm days. At Riding Mountain, Manitoba, it is always the last butterfly on the wing each day and can be taken on overcast days when few or no other butterflies are flying.

The greatest behavior difference between *borealis* and nominate *anthedon* is that *borealis* exhibits none of the territorial characteristics that are so pronounced with *anthedon* and is, in fact, quite gregarious in habit. Large numbers of *borealis* are frequently seen congregating together about a single bush or group of bushes, usually at the edge of a road or a forest opening. They seem to be quite "amiable" together and the aerial encounters of males, that are so common with nominate *anthedon* and territorial species never occur. Unlike nominate *anthedon,* they very seldom perch on tree trunks but prefer perches on low shrubbery, usually less than

a foot off the ground. When alarmed, their favorite tactic is to dodge deeper into the bush they are on, which makes pursuit by a larger predator very difficult. Dozens of *borealis* are sometimes encountered clumped together while feeding at carrion or excrement or at a shaded, damp spot in a road. Assemblies of nominate *anthedon* at damp spots or while feeding are not uncommon, but the tendencies are not as pronounced and the numbers involved are not as large.

The range of *Lethe anthedon borealis,* as far as known, includes: southern Manitoba, west to Riding Mountain; northeastern Minnesota, south to Aitkin and Carleton Counties; northwest Wisconsin, southeast at least to Rusk County; and the part of Ontario that is immediately north of Minnesota and Lake Superior. It probably occurs further east in Wisconsin and, quite likely, in the northern peninsula of Michigan. No attempt has been made to determine the eastern limit in Ontario.

One of the major criticisms leveled at the trinominal and it's usage in taxonomy is that the subspecies, as currently defined and used, fails to distinguish between weakly and strongly differentiated geographic subspecies and treats them all alike. Descriptions and identifications of populations are essentially based on visible morphological distinctions and consequently taxonomy has been strongly oriented in this direction and populations which show strong morphological divergence have attracted the most attention. However, we have in *Lethe anthedon borealis,* a very good example of very marked physiological (behavioral) differences along with very weakly developed morphological differences. Differences between species, subspecies, or any taxonomic category, may be physiological, morphological, or both, and they may be phenotypic or genotypic in each case. Fortunately physiological differences, which are far more important in the long run, are usually accompanied by at least minor morphological changes which allows the taxonomist to distinguish and name the populations exhibiting them. On the other hand, so far as we know, morphological differences are usually accompanied by at least minor physiological differences; if they weren't, there would be little point in pinning a name on them. Unfortunately, however, there is not always a correlation. Remington (1968), for instance, stated that he had under study three species of butterflies in Connecticut and four in Colorado, each of which he felt was a pair of widely sympatric and fully speciated entities. He had, however, delayed formal naming of these species because he had not yet found [morphological] recognition characters useful for determining museum specimens.

The North American *Lethe* constitute a good example of the problems in relying exclusively on morphological characters for species distinctions. Ehrlich (1961) cited *Lethe* as one of only fourteen North American genera

of butterflies that represented no problem to the taxonomist because speciation is quite distinct. Since that time field work and behavioral studies have forced us to increase the number of recognized species from three to five and we have become aware of classification problems in the populations of *borealis* and *fumosus* Leussler, both of which are still treated as infraspecific, but with reservations.

The physiological distinctions that I have observed between *Lethe anthedon anthedon* and *Lethe anthedon borealis* are of the same magnitude as Shapiro and Carde (1970) found between *Lethe eurydice* and *Lethe appalachia*, and which they used as justification for separating them into two distinct species. *Lethe eurydice* and *Lethe appalachia* are sympatric over a wide range, while, as far as is known, *Lethe a. anthedon* and *Lethe a. borealis* are allopatric or nearly so. Thus the retention of them as subspecific entities is justifiable.

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