

OBSERVATIONS ON THE HABITS OF *ANOPHELES FREEBORNI*  
IN NORTHERN UTAH AND SOUTHERN IDAHO  
(Diptera; Culcidae)

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*Anopheles freeborni* Aitken, has been discussed by Freeborn in two papers. His publication (1932) gives a detailed account of the seasonal life history of *freeborni* in the Sacramento Valley of California. The second paper (1945) gives a more comprehensive account of the ecology, distribution and seasonal life history of this mosquito. A brief discussion of the overwintering habits of *freeborni* in Utah was published by Rees (1942). The present paper concerns the seasonal behavior of *freeborni* in northern Utah and southern Idaho and is the result of a rather intensive study conducted by the junior author during the past two years, corroborated by annual notes on observations of this species made by the senior author since 1928.

It has been observed that female *freeborni* begin migrating from lower valley areas toward the warmer foothill regions of Utah and Idaho with the approach of cool, autumn weather. This so-called "prehibernation migration" usually commences when temperatures start going down during the fore part of September, and continues through October. As a result, large populations of female *freeborni* congregate in cellars, caves, barns, and similar situations along the foothill region by the fore part of November. During the summer breeding season *freeborni* are rarely encountered in shelters along the foothills especially where these shelters are three or four miles from the nearest larval habitat.

This movement of *freeborni* in the fall from the valley floor to the foothill region is apparently influenced by the mosquitoes

seeking an area of higher temperature, as available shelter, food, and other factors remain more or less constant. Adult populations have reached their peak at this period; however, there is no evidence of overcrowding in the shelters occupied by *freeborni* on the valley floor.

It has been established by Alter (1941), that the foothill regions in Utah remain several degrees higher in temperature than the valley floor during the fall and winter because of the mixing effect of the air currents from the mountain slopes. According to Alter a seasonal "difference of two weeks is often noted in the same valley between bottom lands and the adjacent farm lands at the foot of the mountains." The bottom lands show a fall seasonal advance of two weeks over the foothill region.

The mosquitoes remain active in the overwintering quarters as long as temperature conditions permit. During this period of late fall they usually are to be found resting in a typical anopheline-like position upon old, dusty spiderwebs in darker corners of the quarters. While temperature conditions are favorable the *freeborni* are restless and exhibit a pronounced tendency to feed upon anyone who enters the resting places. These overwintering females appear more eager to feed upon man than do those encountered in resting places during mid-season. Their attack is stealthy and will often be repeated if they are molested and fail at first to secure a complete blood meal. Those mosquitoes in the overwintering quarters which are provoked into flight usually choose a dark, secluded spot in

which to hide. It is interesting to note that many of these will walk about over the surface of the resting place while seeking a suitable place to hide, while during the summer season *freeborni* invariably remain "fixed" when they alight after being forced to fly about in a rest shelter.

With the onset of colder weather they seek more secluded or protective hiding places beneath spiderwebs, in crevices or under loose bark, where they assume a Culicine-like posture with the body pressed closely against the resting surface. Large numbers of overwintering *freeborni* have been observed literally "packed together" beneath torn wallpaper and other protective objects.

Mortality is high among female *freeborni* which enter hibernation in northern Utah. This is particularly true of those mosquitoes in quarters with a high prevailing humidity, where sufficient moisture may condense to permit ice formation over the body of the mosquito. In situations of this type, such as in some cellars and caves, no *freeborni* was observed to survive until spring despite the rather interesting fact that they appear to manifest a predilection for the more humid situations during the prehibernation season of autumn. This conclusion is based upon comparative populations in various types of overwintering quarters during, and immediately following, the prehibernation migrations.

In less humid quarters the rate of survival among hibernating females was found to be relatively high. It was estimated that approximately five per cent of the female *freeborni* overwintering in cow barns and other dry, well-insulated places under observation during the winter of 1944 survived until spring. Males were not encountered in resting places after the middle of November in the northern Utah areas during the winter of 1944, although a few were present in favorable resting places during the first week of December in the winter of 1945.

With the advent of warmer weather in spring, generally during the fore part of April, surviving females resume activity

and feed avidly upon domestic animals or men. At this time they are extremely wary so that considerable care must be exercised when making collections. They attack man in the same stealthy manner as do those encountered in the late fall.

It is believed that the female *freeborni* disperse to breeding areas for the purpose of oviposition soon after securing a blood meal. At any rate populations in overwintering stations decrease sharply after the fore part of May and most resting stations in the foothills region in the northern part of Utah are devoid of *freeborni* from this time until the prehibernation migration in the fall. In shelters near larval habitats the appearance of the first spring generation of adults takes place about the second week in June, as indicated by the appearance of the first males.

Concurrent with the rapid decrease in the number of overwintering females in hibernation quarters because of the spring exodus to breeding areas, is a gradual increase in the larval population. As a general rule a few small larvae are to be found by the middle of May and larger numbers are present in breeding areas by the fore part of June. There seems to be no mid-season slump in either the larval or adult population of *freeborni* in northern Utah or southern Idaho such as occurs in the Central Valley of California as reported by Freeborn (1945), but rather a steady increase in both larval and adult numbers from the beginning of the breeding season until the cool weather of fall. The active breeding season extends from about the middle of May until the late part of September, or October, depending upon weather conditions. The peak in adult densities generally occurs during the first part of September.

In Utah the favored *freeborni* breeding areas are pastures which are "flood irrigated" or those which are continuous watered as a result of seepage. However, larvae have been taken in nearly all types of breeding areas where the water is fresh and cool and sufficiently shaded by emergent vegetation or floatage. Flowing water

avoided but larvae have been taken along margins of the larger irrigation canals where the water is still and partly shaded by vegetation. Larvae have not been taken in the highly alkaline waters of Utah nor in water that has been polluted as the result of cannery or creamery wastes.

#### Summary

The "prehibernation migration" of *Anopheles freeborni* from the valley floor to the foothill shelters in northern Utah and southern Idaho may be explained on the basis of a difference in temperature between the two regions.

During the summer season, *freeborni* remain "fixed" in an anopheline-like position after they alight, but when seeking suitable shelter from the winter, they frequently walk about until a suitable location is found, after which they assume a culicine-like posture with the body close to the surface upon which they are resting.

Female *freeborni* are active in shelters in Utah and southern Idaho until about the middle of November or first part of December. They then remain in semi-hibernation from this date until about the middle of April when they leave the over-

wintering shelters along the foothills and return to breeding areas during the first part of May. Most of them perish in winter quarters where temperatures are below freezing and humidity is high. The first generation of adults appears in early June. The breeding season extends from the middle of May until the first part of October with a gradual increase in numbers until the peak in the adult population is reached during the first part of September. No mid-season slump in the larval or adult population has been observed in this area where larvae develop in nearly all types of mosquito breeding habitats where the water is fresh, cool and sufficiently shaded by emergent vegetation or floatage.

#### Literature Cited

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