# DISCUSSION

## A MAJOR CYCLE IN INSECT FLIGHTS

FROM June 1 to September 15, 1939, a period of unusually uniform and predominantly fair weather in northeast Georgia, a nightly record was kept of the insects which were attracted to a neon-mercury light trap in operation from dusk until 1:00 A.M. at Demorest, Habersham County. By an actual count of certain insect types representative of entire catches, a rather accurate estimate could be gained of the extent of insect aerial activity for each evening. These index forms, which waxed and waned independently throughout the season, included all moths, micro as well as macro, small scarabaeid beetles of the genera *Aphodius* and *Ataenius,* carabid beetles of the genus *Harpalus,* scolytid beetles of the genus *Xyleborus* and a minute, reddish brown cydnid bug, *Amnestus pusillus* Uhler.[1] The last two named often came in swarms during the early part of the evening and, over the four or five weeks of their dominance, constituted dependable indicators of general flight conditions.

During the course of these observations, several remarkable flights were recorded. The evenings on which they occurred stood out in marked contrast not only to the average night of fair yield but even to the less frequent occasions when yields were relatively large. On June 6, 7, 22, July 5, 22, August 18, 19 and September 4, from dusk until midnight, thousands of insects (on August 19, tens of thousands) came to light and were trapped, a phenomenon which was out of all proportion to the hundreds or even tens captured on other evenings. According to a solar-lunar gravitational table,[2] these dates coincide exactly with periods when the combined pull of the sun and moon acted tangentially on the earth at the appropriate meridian during the hours from 10:30 P.M. till 12:30 A.M. The only similar period included in this series of observations which was not characterized by insect flights of especially great magnitude was coincident with two successive evenings (August 5 and 6) featuring heavy thunderstorms followed by a pronounced drop in temperature. However, there was every indication, judging by the progressively increasing numbers of flyers on August 3 and 4, that conditions were building up for a major movement on the 5th and 6th, an event which most probably would have taken place had the weather remained congenial. As though in compensation for a thwarted impulse, the flights during the subsequent swarming period, August 18 and 19, were the heaviest of the entire season. Midway between the times of intense nocturnal activity was noted a much less clearly defined cycle of minor flights, while few or sometimes almost no insects came to light on intervening dates. Although cold or windy weather may noticeably restrain nocturnal insects, temperature seems not to be the primary factor in determining whether or not they will take to the air en masse. This is clearly indicated by the observation that, on several supposedly ideal flying evenings when the atmosphere was sultry and warm (70° F. or more at midnight), the turnouts were only fair or even poor; whereas it was somewhat cooler (68° F.) on the night of August 19 when the greatest flight among 76 consecutive recordings took place.

It therefore seems quite possible that nocturnal swarmings of insects, presumably essentially nuptial in character, are governed in some way by gravitational or related forces. At any rate, it appears fairly certain that such mass movements are cyclic and broadly predictable, recurring every 13 to 17 days so long as season and weather permit. Striking confirmation of this periodicity comes from data collected by the writer in Fiji. There, at an altitude of 2,600 feet, thousands of miscellaneous insects (mostly *Lepidoptera, Coleoptera* and *Hemiptera*) arrived at light on the evenings of October 6, 7, 21 and 22, 1937, despite low temperatures and showers, while at the identical spot on all other nights, mild or cool, from October 3 to the end of operations on the 28th, the collecting sheets were virtually empty; and in the lowlands, the first spectacular spring flights since collecting began in July were recorded on September 23 and 24 when the temperature (70° F.) was far from unusually high.

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[1] The writer is indebted for determinations to Dr. E. A. Chapin, Dr. M. W. Blackman and Mr. H. G. Barber of the U. S. National Museum.

[2] J. A. Knight's "Solunar Tables" for 1939.

## CALCIUM CARBONATE DEPOSITS MARGINAL TO GLACIERS

BLACKFEET GLACIER[1] is located on the north slopes between Mount Jackson and Blackfeet Mountain, members of the Livingston Range in the central part of Glacier National Park, Montana. The glacier rests upon limestone and dolomite of the pre-Cambrian Siyeh formation. The front of the glacier is now completely divorced from its immediate recessional moraine, which forms a striking and almost continuous ridge, interrupted where the main melt-water streams escape. Since its mapping in 1914 by the U. S. Geological Survey, the glacier has separated through ablation into two separate bodies of ice, a large one to the east and a smaller one to the west. A contoured map of the western ice body was com-

[1] W. C. Alden, "Glaciers of Glacier National Park," Department of the Interior, pp. 4–11, 1914.