

THE LEAFHOPPERS OF WHITE CLOVER, *Trifolium repens* L.,  
IN NORTHERN NEW YORK AND IN THE  
MOUNTAINS OF HAITI

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A bountiful and never-failing spring of clear, sparkling water flowing out of the mountainside is largely responsible for the intensive agricultural development of the region around Kenscoff, Haiti. The abundance of water makes possible the production of such crops as watercress just below the springs, and of lettuce, onions, cabbage, potatoes, carrots and other temperate zone vegetables by irrigation at somewhat lower levels, and more especially of artichokes. Peach trees thrive at an elevation of around 4,000 feet, now producing an abundance of fruit since the apparently perfect natural control of the West Indian peach scale, *Pseudalacaspis pentagona* (Targioni), resulting from the introduction of the twice-stabbed ladybeetle, *Chilocorus cacti* L. The effectiveness of this ladybeetle, endemic in Texas and Cuba, whence it was brought to Puerto Rico and then sent to Hispaniola, is seriously lessened at lower elevations in the tropics by the abundance of predaceous lizards, but these are notably scarce so high in the mountains. Indeed, both flora and fauna are primarily temperate zone, the original forest being replaced by the first European settlers with the plants with which they were familiar in France, not only fruits and vegetables, but also the same grasses and clovers, and not excepting the weeds. The pastures of the steeper slopes not in irrigation to a large extent are composed of white clover, furnishing a rich forage for cows whose milk is the basis for a small butter and cheese industry.

Sweeping areas in white clover (*Trifolium repens* L.) mixed with European grasses in a field where sweet-peas had been grown for export last year, the largest, most abundant and by far the most conspicuous leafhopper present on the clover on February 1, 1948, was found to be *Hortensia similis* (Walker). Originally described from Central America as a *Tettigonia*, and for many years called a *Kolla*, this common neotropical leaf-

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hopper, opaquely light green above, with a distinctive and unvarying pattern in black on head and pronotum, was possibly most intensively studied at the time when mosaic disease of sugar-cane was invading Puerto Rico, for it seemed to be the most probable vector of the disease.<sup>(1)</sup> In fields of young cane, its abundance varies directly with rainfall. During drought, the adults retreat to moist meadows of "malojillo" or Pará grass (*Eriochloa subglabra* and *Panicum barbinode*), to stream margins, or to the grasses of mountain pastures and the margins of forest and coffee groves. Nymphs have been reared on young sugar-cane plants, and occur in abundance on grasses, but rarely are found on corn, beans, carrots and weeds, from which adults have been swept. The nymphs "feed nearly half the time. With their thick beak inserted in the cane plant, they let go with their legs, using them to get rid of the minute drop of colorless excreta which collects at the anus. With all their legs in motion at once and these little drops of moisture being hurled into the air at the rate of one every seven seconds, a colony of *Kolla similis* nymphs feeding is a most exciting spectacle." Among the numerous adults swept from white clover at Kenscoff were a few nymphs, which may of course have been feeding on the grass interspersed with the clover and not on the clover itself. It is hardly possible, however, that the numerous adults could have confined their feeding to the scanty grasses present in the dominantly white clover areas, and clover may be considered as a normal host for this leafhopper at the higher elevations in the tropics where clover can maintain itself.

Of the other less numerous, less conspicuous and much smaller leafhoppers swept from white clover at Kenscoff, Dr. John S. Caldwell identified and listed in order of abundance *Unerus colonus* (Uhler), previously known on carpet grass (*Axonopus compressus*) in mountain pastures in Puerto Rico; *Deltocephalus sonorus* Ball, abundant on malojillo; *Nesosteles incisa* (Matsumara) on seed-heads of malojillo; the cosmopolitan *Eritianus obscurinervis* (Stal), and a few individuals of the light green *Empoasca sativae* Poos and *Empoasca dilitara* Davidson and DeLong. Most of these are neotropical or West Indian leafhoppers, and that they should occur on white clover in tropical Haiti would appear to indicate its introduction from France, presumably as seed, without any of its specific leafhopper pests.

The completeness with which white clover may occupy the environments to which it is particularly well adapted, to a considerable extent depends on the specific insect pests attacking it. In a pasture in northern New York, so closely cropped by cows that the recumbent habit of this clover made it the dominant plant, but a single leafhopper, *Agallia quadripunctata* (Provancher), specifically fed upon it.<sup>(2)</sup> Of this leafhopper, approximately one hundred and fifty were counted in one hundred square feet of pasture; so few that their effect on the host was practically negligible. Much more abundant was what Dr. Herbert Osborn<sup>(3)</sup> calls the meadow leafhopper. *Acucephalus nervosus* (Schrank), of which approximately five hundred nymphs and adults were present in the same hundred square feet. Bluegrass, redtop, sweet-scented grass and some timothy were present in this pasture, and may have been the normal hosts, but adults were noted resting on white clover, and possibly feeding on it. The other leafhoppers present were the timothy crown leafhopper, *Aphrodes albifrons* (L.), and in smaller numbers: *Leavicephalus affinis* (Gillete & Baker), *Polymia inimica* (Say), *Amblysellus curtisii* (Fitch) and *Balclutha impictus* (Van Duzee), most of which were so scarce as possibly having nothing to do with the white clover. Indeed, its major pests in northern New York were introduced weevils and a cutworm, of which none was noted in Haiti, and from which it may be entirely free in the tropical environment.

The only Fulgorid certainly identified from the white clover pasture in northern New York was *Bruchomorpha oculata* Newman, which was so scarce that no observation on host relationships was possible. In Haiti, Dr. Caldwell identified the most common Delphacid as *Delphacodes propinqua* (Fieber); others were *Delphacodes teapae* (Fowler), *Sogata furcifera* (Horvath) and *Evidella weedi* Van Duzee. In numbers they exceed all of the smaller leafhoppers, and in bulk were more than the approximate equivalent. The first three are more or less common neotropical inhabitants of lowland pastures and meadows, and are sometimes to be found on young sugar-cane. Their occurrence on white clover in the mountains of Haiti is only one more instance of how readily endemic insects become adjusted to flourishing, newly-introduced plant hosts, which have escaped from the pests attacking them in their country of origin.

1. Wolcott, G. N., The Minor Sugar-Cane Insects of Porto Rico. Jour. Dept. Agr. P. R., 5 (2): 5-47, fig. 19. San Juan, April 1921.
2. Wolcott, G. N., An Animal Census of Two Pastures and a Meadow in Northern New York, Ecological Monographs, 7 (1): 1-90, ref. 42. Brooklyn, January 1937.
3. Osborn, Herbert, Meadow and Pasture Insects, pp. 288, fig. 103. The Educator's Press, Columbus, 1939.