ENTOMOLOGICAL PROBLEMS IN THE EVERGLADES

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In this discussion of the Entomological problems of the Everglades it may be well to first consider briefly the geology of the area. Most of you are at least casually acquainted with the area around Lake Okeechobee, but probably many of you know of this part of the state only from hearsay.

The Floridian plateau,[1] as described by geologists, has been in existence since very ancient time. It was probably dry land during the Triassic and Jurassic periods and the Lower Cretaceous epoch, but it was covered by the sea during part of the Upper Cretaceous time. During the Cenozoic era its shore underwent many shiftings, but it was never very deep under water nor has it been lifted very high above sea level. Since Florida is far from the Piedmont Plateau, the origin of all sand and gravel, the original sedimentary deposits contained more limestone than sand or clay.

The mica schists, quartzites and other rocks that form the foundation of the Floridian plateau are about 4100 feet below the surface and are only slightly known.

One class of lakes in Florida are those that fill original depressions in the floor of the sea. Lake Okeechobee, 35 miles across, and next to Lake Michigan, the largest body of fresh water wholly within the United States, is the most conspicuous example of this class. The Everglades form a level, grassy plain that slopes gently southward from an altitude of about 18 feet above sea level near Lake Okeechobee, and merges into the mangrove-covered keys in Florida Bay. This plain is underlain with Pliocene shell marl and limestone, which is generally covered by six to eight feet of peaty muck. Before their artificial drainage the Everglades was usually flooded, but now so much of the water is carried off by canals that the higher parts stand above normal water level.

For convenience in this paper I have arbitrarily divided the subject into two parts, problems of management and problems of entomology. All of us are quick to admit that climate, soil, plant diseases, etc., interact and react upon the insect populations. As a result there should be the fullest cooperation be-

[1]Cook, C. Wythe, and Stuart Mossom, Geology of Florida, Twentieth Ann. Rept. Fla. State Geology Survey, pp. 37-43, 1929.

tween the entomologist, soil chemist, horticulturist and plant pathologist. It is readily admitted that with cooperation between the various branches of agricultural research experiments can be designed that would give more reliable information on all the factors involved. This information could be obtained more quickly and cheaply, and would be more accurate than results so far obtained. It is ridiculous for the entomologist to ignore the problems of soil management, plant pathology or horticulture. He could not grow his crops for experimentation. It is then even more ridiculous to publish entomological findings when the same crops could be treated more effectively in a joint publication giving the results of the work of the several men concerned, where the experiments have been designed and carried out in a spirit of true cooperation. The practical farmer is forced to consider soil management, plant pathology, horticulture and entomology all at the same time. It is, therefore, somewhat confusing for him to have to read publications which discuss his problems from only one angle. We sometimes complain that the farmer does not readily put into practice our recommendations. I feel that this lack of cooperation between the various research fields may be largely to blame. What is the farmer to do when he gathers the horticultural, plant pathological, and entomological publications and finds glaring contradictions or recommedations impossible to follow because of conflicts with other necessary farm operations? We are expected to be leaders and if we are to lead we must first learn to cooperate among ourselves.

An example showing the benefits of interdepartmental cooperation can well be personally illustrated as follows: After testing several insecticides for the control of the corn budworm, *Laphygma frugiperda* S. and A., and finding effective sprays too costly for commercial corn production, the agronomist and myself designed an experiment to compare various spray materials with different spacings of corn. The results showed that far more effective control of the budworm was obtained by simply making closer plantings than by the use of any of the insecticides tested. This control was probably due to the same number of insects attacking a greater number of plants with proportionately less damage. This example illustrates the benefits resulting from cooperation and shows the possible effectiveness of experiments designed to cover all phases of a problem.

Other problems of management which the entomologist should consider are those of climate, drainage and irrigation. Time does not permit a full discussion of these subjects. Another important problem of entomological research is the financial problem. I expect that the research man never existed who was completely satisfied with his research conditions. His budget is too limited (which is too frequently the case), his surroundings are not satisfactory, or a number of other minor dissatisfactions may be present. However, the problems of a limited budget are the most common source of irritation. We love to dream of what we would do if our budget were unlimited, but fortunately this is not a dream world. We are forced to do the best we can with what we have and that best can be excellent if we really exert ourselves to the utmost.

Now let us take up the special entomological problems of the Everglades. I have listed first the effect of climate on insect populations and insect research. In the Everglades the bean leaf hopper, *Empoasca fabae* Harr., is present in destructive numbers usually only in the spring, while in the central part of the state it is present only in the fall. I have done some speculation as to why this is true; but to the present time speculation is as far as the problem has progressed.

Our crops are grown from September to June because of the climate. As a result aphids on pepper, tomatoes and English peas are particularly difficult to control. These insects are most abundant during December and January. These are periods when comparatively low temperatures, and high winds prevail. The insecticides we now have are most effective during periods of calm weather when the temperatures are 80° F. or above.

Another problem resulting from climatic effect is the periodic outbreak of such insects as the onion thrips, *Frankliniella tabaci* Lindm., on beans. During the spring of 1937 tobacco thrips became so abundant that it was economically impossible to control this insect.

In the Everglades such large areas are planted to single crops that most growers have turned to the practice of applying insecticides and fungicides by airplane. It is not necessary to discuss these problems as they have already been ably presented to this society by Dr. Ralph Miller in his presidential address in December, 1937.

Other special problems which I shall take time to only mention are the sugarcane borer, wireworms, mole crickets, cut-

worms and army worms. Heretofore, the principal means of control for the sugarcane borer, *Diatraea saccharalis* Fab., has been the introduction of parasites. These are no doubt beneficial but the borer population is steadily increasing. One peculiar phenomena that has not been explained is the fact that the Eastern Division of the U. S. Sugar Corporation has approximately five times the borer infestation of the Western Division. Dusting with cryolite is being investigated and shows much promise. Wireworms, *Melanotus communis* (Gyll.) and *Aiolus dorsalis* Say, are causing increasing damage to both cane and truck crops. It has been shown that these insects can be controlled with several soil fumigants, but these materials are not economically feasible. The only practical solution of the problem appears to be flooding during the peak of adult emergence or clean cultivation. Mole crickets are now causing great losses in the Plant City and other areas. The species present on the Experiment Station land, recently identified as *Grylotalpa hexadactyla,* is increasing in abundance. Cutworms and armyworms of several species occasionally cause severe damage. Their periodic abundance is probably due to climatic factors which have not been studied in the Everglades. The bean leaf roller, *Goniuras proteus* L., is frequently a serious menace to the production of snap beans during the fall.

There are a number of other problems which need attention. Now we have gotten back to the problems of finance and it is time to close. However, I would like to emphasize again the need for more money to work with and above all the need for more cooperation in the future between the various workers.

FLORIDA ENTOMOLOGICAL CONFERENCE

The next Florida Entomological Conference sponsored by the Newell Entomological Society will be held in Gainesville, March 27, 28, 1941. The Conference will feature the Silver Anniversary of the Plant Quarantine Service in the State of Florida as conducted by the State Plant Board. Dr. Lee A. Strong, Chief of the Bureau of Entomology and Plant Quarantine will be honor guest. Quarantine officials from all parts of the United States, Canada, and South America are invited to attend.

Any member of the Florida Entomological Society may obtain the Constitution and By-Laws, adopted at the 1939 annual meeting, by requesting a copy from the Secretary or the Editor of the FLORIDA ENTOMOLOGIST.