

REMARKS ON THE STUDY OF LEAF-HOPPERS.

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Although the Leaf-hoppers (Jassidae) are among the most abundant of our insects and present many problems of scientific and economic importance, they have received very meagre attention from American students. But very few localities in the United States have been collected with sufficient care to determine what the native species may be, and while we know that many of the species have a wide distribution, the limits of most are but very vaguely determined.

The object of this note is to call attention to the group; to show how easily the species may be collected and preserved and give some hints as to the means of identification.

In general the insects of the group are of small size, scarcely any exceeding half an inch in length and many are extremely minute. As a result they are very inconspicuous and readily escape notice except when specially sought for. They frequent all kinds of vegetation, though in the majority of cases each species has its particular kind of food plant and generally whole genera will be limited to some particular group of plants, certain ones affecting grasses, others willows, others grape, thorn, etc.

The methods of collecting must be adapted to the plants on which they occur, those living on trees being caught with an umbrella which is held inverted under branches, which are jarred by striking with a stick, or by use of a beating net of strong muslin. The beating net may also be used for brushing over shrubs and rough herbage, but the most generally useful net for these insects is a sweeping net made of cheese cloth. If caught in the umbrella the cyanide bottle must be in readiness to at once capture those that may be detected, as some of the species take flight very quickly. Others are more sluggish and may be picked up more at leisure. The sweep net after being brushed over the tops of the plants a few times is examined with the cyanide bottle held in readiness in one hand, the mouth closed with the thumb, the hoppers being taken in by slipping the bottle over them as they crawl up the sides of the net or jump from one side to the other. A little practice will enable one to judge of their movements, which vary somewhat with different species, so as to hold the net in the best shape to prevent loss of desired specimens. One soon learns to recognize different forms so as to capture only so many as are wanted of each kind. Many of the species, however, look very much alike to the uninitiated and it is not safe to rely on general appearance till characters are known.

It is better to have two or three small cyanide bottles while collecting (tubes with a mouth just large enough to be covered

easily by the thumb are most convenient), and captures from different plants may then be kept separate, or in case of a large catch, one bottle may be put aside for the insects to quiet down while others are caught in another bottle. When certainly dead it is well to transfer them to small pill boxes, noting plant from which they are taken on the box. If the bottle becomes moist it should be kept from wetting the insects by inserting a little blotting paper or absorbent material, as the delicate species will be ruined by too much moisture. To keep separate all the species that may be collected on a large number of plants may require many tubes and boxes, but the data thus secured is worth the effort and the memory should not be trusted for such data, at least until the species are well known.

As soon as convenient after the insects are dead they should be sorted over, separating, if desired, the various species, and if to be packed for examination at some later date or for transmission by mail, they should be put in pill boxes in thin layers separated by soft paper, the box being filled so that no rattling is possible. The papers may be cut to just fit the box and in this form data may be recorded on each slip to apply to the insects beneath it. Care should be taken that specimens of the different layers may not possibly become mixed. If the specimens are to be studied or mounted they may be spread out on white paper and protected temporarily by covering with a bell jar.

Some of the largest species may be pinned after the usual manner, but the most satisfactory method of mounting is to glue the insect on a paper "point," which is supported on an ordinary insect pin. The head of the insect should be directed forward when the point stands to the left of the pin and the label or labels with locality, date, collector's name and the food plant, when known, placed beneath. The best effect is gained by pinning through the right hand edge of the label and pushing it up to near the point when the left hand edge should be about equal to the point or project very slightly beyond it. I use points about 8 or 9 mm. long, just wide enough at base to hold the pin, and place them uniformly about ten millimeters from the head of the pin. When arranged in series of four abreast comparison is easy and points of difference are quickly noted.

The parts most used in classification may be illustrated in the accompanying figure. On the dorsal part of the head, shown at *c*, the space within occiput, eyes and anterior margin is the vertex, the part shown back of the head is the pronotum the dorsum of prothorax. The front of the head or "face," *b*, includes a large central portion, the front, and below this is a squarish piece, the clypeus, below which is the minute labrum resting on the beak. At each side of the clypeus is a well defined area, oval or semi-elliptical in shape, the lora, between which and the eye is the

gena, or cheek. The fore wing or elytron, *f*, has a triangular clavus extending along the inner or hinder part and separated from the rest of the wing by the claval suture. It includes two claval veins. From the base of the wing two principal veins run toward the apex. They are called the first and second sectors, or sometimes the radial and ulnar sectors. The first is usually

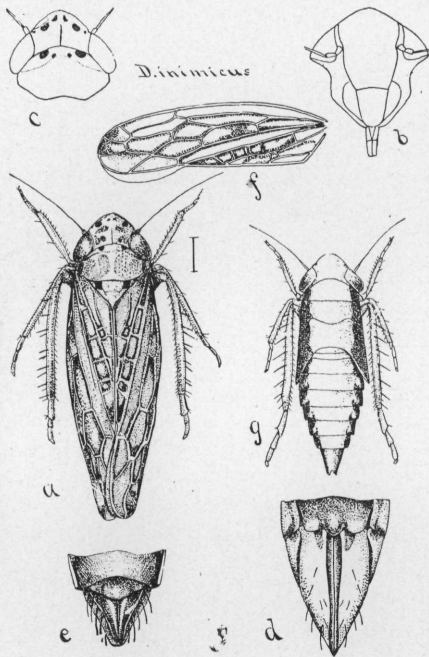


Fig. 1. *Deltocephalus inimicus*. a, adult, natural size shown by line at right; b, face; c, vertex and pronotum; d, female genitalia; e, male genitalia; f, wing; g, larva. (After Osborn and Ball.)

sector by one or two transverse veins. The cells at tip of wing are the apical and those next to them the ante-apical, while those next the costal margin are costal cells. The genitalia are of great importance for separating species in some of the genera. The female ventral segments, *d*, show a terminal ventral segment beyond which are two side pieces, including the ovipositor. The side pieces are termed pygofer, though more properly they are the ventral margins of the pygofer or terminal segment. The male, *e*, has following the last complete segment a variously shaped partial segment, the valve, following which are two plates that are usually triangular in outline and dorsal to these, usually hidden by them, are the margins of the pygofer. The larva is shown at *g*. The species

figured, *Deltocephalus inimicus* Say, is one of our most abundant species and occurs in blue grass over a very wide range of territory in the United States.

For systematic study of these insects, Van Duzee's "Synoptical Arrangement of North American Jassidae" and "Catalogue of the Described North American Jassoidea" are indispensable. Scattered papers by the same author, Uhler, Fitch, Stal, Provancher, Woodworth and others are more or less essential. Gillette and Baker's "Hemiptera of Colorado," Gillette's "Typhlocybinae," Osborn and Ball's "Review of the Genus

Deltocephalus," "Review of the Genus *Agallia*," "The Genus *Pediopsis*," "The Genus *Idiocerus*," Ball's "Review of the *Tettigonidæ* of North America North of Mexico," Osborn's "The Genus *Scaphoideus*," are useful for certain groups.

The writer is especially interested in the species affecting grasses, and will be pleased to assist anyone who may desire to take up a study of the group, by aiding in the identification of species. If preferred, specimens may be sent unmounted in pill boxes and duplicates returned, as far as time permits, and sample mounts or hints as to methods will be given those who desire to go thoroughly into study of their home fauna. Collections from eastern and southern localities are especially desired.