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A STUDY IN WING VEINATION.

Family Aphididae.

BY C. E. BARTHOLOMEW.

The purpose of this paper is to give the results of a study of the wing venation in the family Aphididae with a view of replacing the arbitrary nomenclature as applied to this family by the general nomenclature of wing venation.

If the venation of the wing as found in the more generalized Aphid (fig. 2) of the subfamily Aphidinae is compared with the arrangement of the veins of a hypothetical wing (fig. 1) it will be seen that there is little or no resemblance. If, however, the wing of the developing nymph (fig. 3) is studied the resemblance is so close that but slight chance for mistake exists and the key to the venation of the adult wing is found.

In the wing of the young nymph the venation is nearly the same as in the hypothetical wing. In this case the subcostal vein (Sc) is two branched. The radical vein (R) is four branched, branch one (R₁) is not very well developed and branches four (R₄) and five (R₅) have coalesced. The medial vein (M) is three branched instead of four, but this loss is common when there is a reduction of this area of the wing, for instance, as in the Diptera. The cubital vein (Cu) is normally two branched, as it is in the hypothetical wing. There is but one anal vein (A).

In studying the wing of the mature nymph (fig. 4) the venation will be seen to be the same as in the mature wing except that the coalescence of the bases of the veins has not taken place.

This points out the veins which have been lost thru coalescence and the manner in which the reduction has taken place. The subcostal and radial areas are greatly reduced, as is also the anal area. The medial and cubital areas remain unreduced or possibly increased except in the proximal portion of the wing where all the cells have been lost. The result is that where there has been a reduction in area there has also been a reduction in the veins by coalescence. This coalescence has taken place to such an extent that all the veins have been lost either wholly or in part. The radial and subcostal veins even in the young nymph show a crowding together which in the older nymph have coalesced into a once branched vein, the main portion of which is composed of the coalesced subcostal and radius, and the branch, of the coalesced branches of the radial sector. The medial vein in the mature nymph is the same as in the young nymph. The cubital vein is bifurcated nearer the base and the anal vein lies nearer the anal margin of the wing.

In the adult wing of the more generalized Aphid (fig. 2) the venation appears as a single, much-thickened longitudinal vein from which arise four branch

veins, the third of which is again branched. This thickened vein is composed of the subcostal, the radial, except the radial sector, the basal portion of the medial, and cubital veins. The first and second apparent branches are the second and first branches of the cubital vein respectively. The third apparent branch is the medial with its three branches. The fourth apparent branch is the radial sector. The anal vein in the adult wing remains as only a fold at the base of the second cubital vein and forms a thickening for the attachment of the hooks of the caudal wing.

As specialization progresses in the other subfamilies of the Aphididae a reduction of the medial vein takes place and there is first a disappearance of the branches of this vein and, in the most specialized wing, a complete disappearance of the vein itself. In the subfamily Schizoneurinae (fig. 5) the further specialization is by the coalescence of branches, one and two, of the medial vein which leaves this vein but two branched. In other respects the venation remains practically the same as in the most generalized wing.

In the subfamily Pemphiginae (fig. 6) the specialization has been carried still further by the coalescence of all the branches of the medial vein into a simple vein.

In the most specialized Aphid, such as is found in the subfamily Chermaphinae (fig. 7), all trace of the medial vein is lost. There are three ways in which it may have disappeared. It may have coalesced with the subcostal and radial veins. It may have been suppressed early in its development. It may have coalesced with the cubital vein. The coalescence of the medial vein with the subcostal and radial veins is quite doubtful as the radial sector in the wings of this subfamily still retains its relationship to the radial and subcostal veins as in the other subfamilies. The entire suppression of the medial vein is also quite doubtful for, while, in some of the less specialized Aphid wings there are apparent partial suppressions of this vein, such a suppression would be unusual. Wing veins do not entirely disappear in this manner. The union of the medial vein with the cubital vein I am inclined to consider as the most plausible for, in many of the more specialized wings, there is a reduction in the area between the medial and cubital veins. There is also a partial coalescence of the medial and branch one of the cubital in the more generalized wing as is shown in (fig. 4a). This partial coalescence has probably been completed in the Chermaphinae, and the medial and branch one of the cubital are apparently a single vein.

The study of the hind wings is more difficult than the fore wings, as they are too small and delicate to obtain mounts of. It is quite probable, however, that the condition that exists here is the same as that in the Chermaphinae, except that the radial sector has been lost by coalescence with the subcostal and radial veins. In the hind wing of the Chermaphinae all the veins have coalesced into one single longitudinal vein.

The following table gives the relation between the general and the arbitrary nomenclature:

General,
Subcostal (Sc)
Radial (R)
Radial sector (Rs)
Medial (M)
Medial one (M₁)
Medial two (M₂)
Medial three (M₃)
Cubital one (Cu₁)
Cubital two (Cu₂)

Arbitrary.

Cubitus
Cubitus
Stigmal
Third Discoidal
Third Discoidal, first fork
Third Discoidal, second fork
Third Discoidal
Second Discoidal
First Discoidal

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EXPLANATION OF FIGURES.

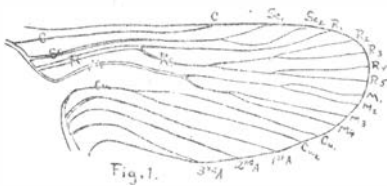


Fig. 1. Hypothetical wing, after Comstock.

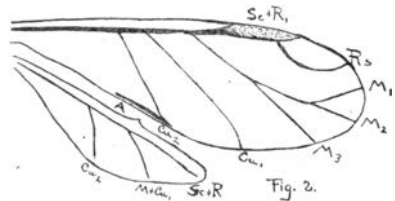


Fig. 2. Wing of *Macrosiphum* sp.

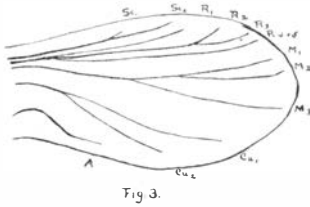


Fig. 3.

Fig. 3. Wing of young nymph. *Macrosiphum* sp.

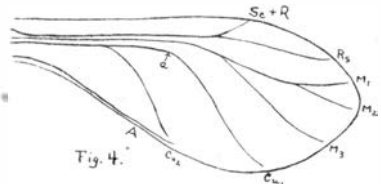


Fig. 4.

Fig. 4. Wing of older nymph. *Macrosiphum* sp.

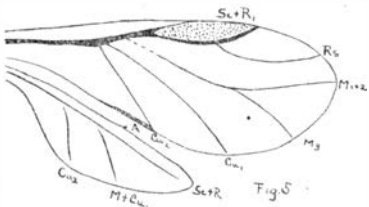


Fig. 5.

Fig. 5. Wing of *Schizoneura lanigera*.

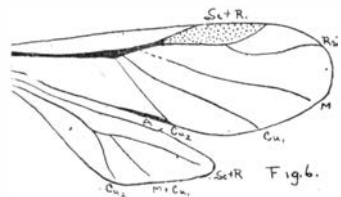


Fig. 6.

Fig. 6. Wing of *Pemphigus* sp.

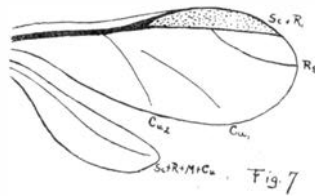


Fig. 7.

Fig. 7. Wing of *Phylloxera vastatrix*.