Two Little-Used Characters in the Mosquito Wing (Diptera, Culicidae)

by

Donald H. Colless
CSIRO, Division of Entomology
P. O. Box 1700
Canberra City, A.C.T. 2601

ABSTRACT. Attention is drawn to two folds in the cubital area of the culicid wing and to their potential as taxonomic characters.

INTRODUCTION

The wings of many insects exhibit ridges or furrows, sometimes with vein-like thickening, that are variously interpreted as, for instance, vestiges of veins that have suffered evolutionary loss or lines of stress or flexion in the membrane. They are generally inconspicuous and, unless corresponding to an important element of standard venation, are mostly ignored by taxonomists. There are notable exceptions, e.g., the "vena spuria" of Syrphidae, but faint structures are, naturally, not favoured for purposes of identification.

Nonetheless, if credible homologies can be established, any structure may be useful in classification or in reconstructing phylogeny. It is from this aspect that I draw attention here to two such features in the culicid wing. One is a ridge, the other a furrow, although the former is sometimes, and the latter usually, strengthened by vein-like thickening. Both are associated with vein CuA (Colless & McAlpine 1970; vein 5.2 in culicid numerical terminology). I have therefore named them the cubito-marginal *(c-m)* ridge and the precubital *(pc)* furrow.

In what follows I refer to their appearance when the dorsal surface of the wing is viewed under a binocular dissecting microscope, using both reflected and transmitted light.

The cubito-marginal ridge

The *c-m* ridge is most commonly seen as a rather faint ridge or convex fold in the membrane, running parallel to and close to the wing margin across the apex of CuA. Anteriorly, it extends at least halfway to the apex of M_{3+4} (vein 5.1); posteriorly, it fades away gradually in the vicinity of 1A (vein 6). It is most obvious at the CuA apex, but often needs carefully adjusted lighting to reveal it clearly.

Significant features in the distribution of the *c-m* ridge and its modifications are as follows:
(a) In species of *Toxorhynchites* the fold anterior to CuA is thickened and diverted away from, then back towards, the margin, forming a quite conspicuous V-shaped structure that has been mentioned by various authors (e.g.,

Edwards 1932, who figured it in Pl. 1, fig. 10). On information available to me, this modification of the ridge is completely diagnostic of the genus. (b) In Chaoboridae, all species of *Mochlonyx* and many species of *Chaoborus* (subgenus *Sayomyia*) have the ridge thickened anteriorly to CuA by a diversion of the apex of the vein, forming a characteristic "spur". Its taxonomic significance will be discussed elsewhere.
(c) The ridge is present in all Culicidae and Chaoboridae examined but absent in Dixidae. In other Nematocera, it is found only in Chironomidae, in which occasional species in all major subfamilies exhibit a faint trace of what seems to be the *c-m* ridge. Moreover, in *Cricotopus* and *Syncricotopus* (at least) the ridge is very distinct and thickened by a chaoborine-type spur.

The precubital furrow

The *pc* furrow lies in cell M_{3+4} close to and parallel to the apical section of CuA (vein 5.2). Usually it just fails to intersect the *c-m* ridge and extends basally at least halfway to the level of *m-cu* (the "cubital fork"). When present, it is almost invariably thickened, vein-like, and easily seen (especially if viewed obliquely from a slightly anterior direction to avoid screening by scales on CuA).

I can find no trace of such a furrow in any family but Culicidae, and there only in the subfamilies Toxorhynchitinae and Anophelinae. It is particularly distinct in *Toxorhynchites*, for which it was figured (only) by Edwards (1932; Pl. 1, fig. 10) and described by Belkin (1962). I can find no mention of it at all in descriptions of Anophelinae. This is curious since, in 30 species of *Anopheles* examined, from a wide range of species groups, the furrow is quite distinct in almost every case. The exceptions are *An. stigmaticus* Skuse and related, drab-winged Australasian species (*powelli, papuensis, pseudostigmaticus*); in these the furrow is not thickened and can be detected only with carefully arranged lighting. The same is true of species of *Bironella*, but not of the Oriental *aitkenii*-group which are drab-winged like *stigmaticus* and *Bironella* sp.

DISCUSSION

My purpose here is mainly to draw attention to these structures and their potentialities, even though the latter seem more phylogenetic than taxonomic. By the last phrase I mean that shared possession of a structure, while perhaps trivial for classificatory purposes, may well constitute (in Hennigian terminology) a synapomorphy, and thereby delineate a monophyletic group (sensu Hennig). And if such phylogenetic structure is made credible, there is no denying its interest. I therefore note below some implications of the distributions of the structures described. (a) The occurrence of the *pc* furrow in Anophelinae and *Toxorhynchites* (only) is somewhat intriguing, suggesting as it does a sister-group relationship between the two. However, the weight of evidence seems to ally *Toxorhynchites* more closely with the sabethine genera (Edwards 1932:64; Belkin 1962: 529; Harbach 1978: 329); Harbach's evidence from the larval labiohypopharynx is particularly convincing. The resemblance to Anophelinae in scutellar shape (noted by

Belkin 1962) is quite likely primitive (symplesiomorphous); but the shared possession of the *pc* furrow would seem to constitute a quite striking case of parallelism.
(b) There is no reason to believe that presence of the *c-m* ridge is primitive in Culicoidea. Therefore, its presence in Culicidae and Chaoboridae, but not in Dixidae further confirms the commonly accepted sister-group relationship between the first two families. However, the apparent presence of the ridge in Chironomidae would relate that family, rather than the Dixidae, to the Chaoboridae and Culicidae. That is scarcely the accepted view (e.g., Hennig 1966). As always, it can be rejected by invoking parallelism or symplesiomorphy; but it does add to suspicions, generated by other evidence (Colless, in press, J. Aust. ent. Soc), that phylogenies in this area need reconsideration.
(c) Finally, as a matter of plain, practical taxonomy, we may note that the joint distribution of these two rather obscure structures provides a near-perfect diagnosis of Anophelinae, Toxorhynchitinae, and Culicinae.

REFERENCES

Belkin, J. N. 1962. The Mosquitoes of the South Pacific (Diptera, Culicidae). Vol. 1, University of California Press, Berkeley & Los Angeles.

Colless, D. H. and McAlpine, D. K. 1970. Chap. 34. Diptera. *In* CSIRO. The Insects of Australia, Melbourne University Press, Melbourne.

Edwards, F. W. 1932. Diptera. Fam. Culicidae. Genera Insectorum 194: 1-258.

Harbach, R. E. 1978. Comparative structure of the labiohypopharynx of fourth stage mosquito larvae (Diptera: Culicidae), with comments on larval morphology, evolution and feeding habits. Mosq. Syst. 10: 301-333.

Hennig, W. 1966. Dixidae aus dem Baltischen Bernstein, mit Bemerkungen über einige andere fossile Arten aus der Gruppe Culicoidea (Diptera, Nematocera). Stuttg. Beitr. Naturk. 153:1-16.