

GD/LM

7th March, 1963.

Dr. R.C. Muirhead-Thomson,  
Division of Malaria Eradication,  
World Health Organization,  
Palais des Nations,  
Geneva.

Dear Johnny,

Thank you for the copy of your letter to Paterson on speciation in A.gambiae. Having just read Dobzhansky's "Genetics and the Origin of Species", and White's "Animal Cytology and Evolution", and I am now in a position to make a few comments.

There are what seem to me very close parallels between the four forms of A.gambiae (two fresh-water, one East African salt-water and melas) and some species of Drosophila. D.pseudoobscura and D.persimilis resemble the two fresh-water forms of A.gambiae in producing a normal sex-ratio and sterility, in the F1 male only, when crossed; the females hybrids can be backcrossed. This crossing has been done in the laboratory. Evidence of crossing in nature is "very rare" and reproductive isolation considered more or less complete. This is Dobzhansky's criterion of a species. There appear to be no obvious morphological differences between these two Drosophila species which do however occupy slightly different ecological niches. Sterility between these two species is genic in origin and strong evidence exists for differences of more than 8 genes located on most of the autosomes. In the two fresh-water forms of A.gambiae a single autosomal sex-limited gene responsible for sterility is indicated. Dobzhansky would consider this unlikely (a one gene difference) and, in fact, uses a few-gene difference to define races - however, here there is no reproductive isolation.

Cont/...

Reproductive isolation seems to be the main criterion of a species and there is strong laboratory evidence of this in all four forms of the A.gambiae complex. No evidence is yet available, however, from the field, of the complete or general absence of genetic exchange between the forms.

As regards the abnormal sex-ratios obtained when fresh-water and salt-water forms of A.gambiae are crossed, parallels are found in D.mulleri x D.aldrichi and D.texana x D.montana. The latter cross is a closer parallel because the reciprocal crosses differ, one giving a normal sex ratio, the other giving all males. Here there is a lethal interaction between the texana X-chromosome and the cytoplasm of the montana egg.

It would thus appear at first sight that we have a strong case for calling all four forms of gambiae separate species on the grounds that reproductive isolation is indicated. However, there seems little point in calling them species if it is not possible for the "man in the field" to recognise them from morphological characters. I think, therefore, there is a case for a more intensive study of morphological differences and Coluzzi has already made a start on this. Until such time as absolute differences are forthcoming we should leave the question of specific naming in abeyance.

You may have seen by now papers on this subject by Kuhlöw (Riv. Malariol. XL1, 3, 1962, and Tropenmed. Parasit. 1. 13, 442, 1962). He is also suggesting specific rank for East African salt-water gambiae and, in fact, in the latter paper suggests A.tangensis. I do not, myself, think he has any more grounds for separating this form than there are for separating the two fresh-water forms, A and B, though he classifies the latter as sibling species. Surely the fresh-water and salt-water forms are also sibling near the coast.

We are now in the process of classifying Hadjinicolaou's exophilic, zoophilic and endophilic, anthropophilic strains from Southern Rhodesia. If these are found to belong to the two fresh-water groups and a definite association between this grouping and the behaviour can be established, then I think the case for specific status will be strengthened and the need for some easy method of recognition more urgent.

I certainly agree with you that Mattingly should be consulted before any decision concerning names is taken.

Yours sincerely,

G. Davidson.