

The Role of Mosquito Taxonomy in Medical Entomology

Bruce F. Eldridge¹

Department of Entomology

Walter Reed Army Institute of Research

Walter Reed Army Medical Center

Washington, D. C. 20012

Most medical entomologists have the feeling that sometime within the last decade we reached a peak of de-emphasis of the importance of mosquito taxonomy to medical entomology. This feeling is a reflection of collective attitudes as much as anything else and usually, attitudes are expressed in private conversation much more frequently than in print. Unless, then, some one takes the time to analyze such things as level of monetary support, number of published papers, and the number of mosquito taxonomists active over a period of time, it is difficult to speak in terms other than attitudes. Nevertheless, anyone who is in a position of defending a research budget knows how important attitudes can be, especially those of individuals who decide how research funds shall be apportioned. All of us are familiar with the sentiment which, expressed in various ways, usually goes about like this: "We have thoroughly mined the descriptive phase of medical entomology and should now restrict our energies to the experimental phase. The principle vectors of all the important arthropod-borne diseases are now well known taxonomically and further taxonomic studies can only shed light on little-known groups whose importance is, at best, marginal".

These sentiments were frequently expressed by non-taxonomically oriented biologists whose own specialties had undergone great changes in methodology. They seemed to assume, however, that taxonomic research had not experienced similar advances. In some individual instances, this was undoubtedly true. Also, since some of the recent advances in technique now utilized in mosquito taxonomy were originally developed in non-taxonomic disciplines, it is only natural that recent advances made in mosquito taxonomy as a result of these techniques lagged similar advances in other fields of study.

If we examine the progress of medical entomology and mosquito taxonomy over the years, however, we will see, I believe, that if there has been a de-emphasis of the importance of the latter, it has been only temporary. Taxonomy has been and continues to be a basic tool in medical entomology. All undergraduates learn that taxonomic studies must come first in any ecological study, and that the results of the latter are only as valid as those of the former. Perhaps, then, the difficulty has been in the lack of appreciation by non-taxonomists, as to the actual status of knowledge of the taxonomy of vector mosquito species. Some years ago, the discovery of species complexes containing members differing but little morphologically, yet differing considerably in vector capacity demonstrated the dependence of medical entomology on carefully done taxonomic studies. The Anopheles maculipennis and Culex pipiens complexes became well known to all mosquito workers, but until relatively recently there were few examples to add to these.

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This was partly due to limitations in technique and adherence to the concept of morphologically defined species, but also due to the presence of unmined descriptive ground. This unmined ground does not pertain to mosquito species only remotely related to human disease, but to vectors of malaria, viral encephalitides, and other important diseases.

Thus Anopheles gambiae is now known to consist of at least five species, which epidemiological evidence indicates vary in malaria transmission potential (Davidson, et al. 1967)

Workers have failed to find consistent morphological characters to differentiate infraspecific forms of Culex tritaeniorhynchus Giles, yet the geographical distribution of Japanese B encephalitis does not conform to the distribution of this species which is its principle vector. This, plus the difficulty of identifying adults of C. tritaeniorhynchus from closely related species makes the interpretation of biological data risky (Bram 1967). Additional research in taxonomy and epidemiology is clearly indicated here. Perhaps an investigation of behavior over its entire range will serve to provide clues for further morphological study aided by cytogenetic or biochemical techniques.

I do not mean to imply that we have gone as far as we can go utilizing conventional morphological techniques. There are many unsolved disease-vector relationships which remain so because insufficient material has been collected and studied over a great enough portion of the geographical ranges of the various species. Consequently, when ecologists attempt to utilize keys which are based on limited collections, and which depend upon varying characters of polymorphic species, trouble results. Such difficulties cropped up in the identification of presumably well known species of Anopheles collected in conjunction with ecological surveys of the proposed sea-level canal routes in Eastern Panama and Northwestern Colombia. Here, the presence of undescribed species, insufficient knowledge of ranges, and unreported polymorphism made the use of keys difficult.

A further example of the need for carefully done conventional taxonomy has been recently discovered by workers at the Southeast Asia Mosquito Project. They report that much material has been submitted to them identified as Aedes albopictus which is in reality A. pseudalbopictus and members of the A. scutellaris subgroup. This makes suspect much of the epidemiological data collected involving these species and demonstrates the need for greater knowledge of the respective geographical distributions. (de Meillon 1968).

Much of this ignores the most obvious and straight-forward gaps in our knowledge of the taxonomy of potential vector mosquitoes: those geographic areas of the world which contain little-studied mosquito faunas, and some entire taxonomic groups which are very poorly known such as the sabethines of the New World.

One could go on at great length citing examples of unsolved taxonomic problems, but these examples are well known to mosquito taxonomists. One would hope, rather, that other medical entomologists are aware of the spectrum of genetic variation which exists in mosquitoes, and which can be manifested in morphological, physiological, and behavioral differences. If there is an appreciation of the relationship of this variation at the species level as well at the infra- and supra specific level to vectorial capacity, geographical distribution, ecological amplitude, and all the other factors which medical entomologists have to consider, there will be no question as to the importance of mosquito taxonomy to medical entomology.

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