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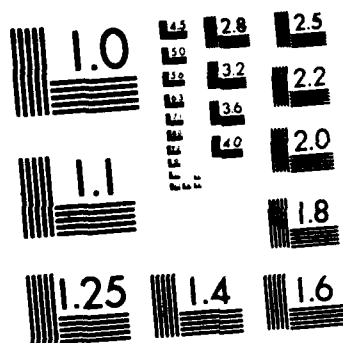
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SYSTEMATICS OF AEDES MOSQUITO PROJECT

ANNUAL REPORT

Wayne N. Mathis

January 1984

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The Systematics of <u>Aedes</u> Mosquito Project (SAMP), a cooperative venture between the Smithsonian Institution and the U.S. Army Medical Research and Development Command, conducts biosystematic research on mosquitoes of medical importance to the Army. SAMP fulfills these objectives by performing bio-systematic studies on important groups of aedine vectors of arboviruses, thus providing information on potential vectors for the guidance of military field research teams and other governmental agencies and preparing monographs and		

technical papers, which summarize data on the ecology, taxonomy and medical importance of these vectors in Africa. In addition, SAMP performs curation and research on the national collection of mosquitoes at the National Museum of Natural History (NMNH), Smithsonian Institution.

Research continues on the arbovirus vector groups of the subgenus Stegomyia, genus Aedes, of the Afrotropical Region.

SUMMARY

The Systematics of Aedes Mosquito Project (SAMP), a cooperative venture between the Smithsonian Institution and the U.S. Army Medical Research and Development Command, conducts biosystematic research on mosquitoes of medical importance to the Army. SAMP fulfills these objectives by performing biosystematic studies on important groups of aedine vectors of arboviruses. SAMP provides information on potential vectors for the guidance of military field research teams and other governmental agencies and prepares monographs and technical papers, which summarize data on the ecology, taxonomy, and medical importance of these vectors in Africa. In addition, SAMP performs curation and research on the national collection of mosquitoes at the National Museum of Natural History (NMNH), Smithsonian Institution.

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INTRODUCTION

Biosystematic studies, which lead to the precise identification of vectors, are fundamental to any investigation of epidemiology and to the planning of control or eradication. These studies enable recognition of the vector(s); further study of the ecology and habits of the vectors; and effective diffusion of information about vectorial capacity, resistance to insecticides, geographic distribution, etc. Many instances of failure to control diseases resulting from vector-borne pathogens can be traced to neglect of this aspect of research in entomology.

The Systematics of Aedes Mosquito Project (SAMP) was developed to perform biosystematic research on medically important mosquitoes to meet the U.S. Army Medical Research and Development Command's requirements for accurate identification of actual or potential mosquito vectors of pathogens of man in Africa. Thus, SAMP is able to respond to these needs and the resources of the project are used to accomplish these requirements. The research was accomplished by 1 professional entomologist plus the principal investigator. The work was supplemented by 4 professional entomologists from the Walter Reed Bio systematics Unit (WRBU) on assignment to the Smithsonian. In addition, upon request, SAMP Assists various military and other medical entomologists in biosystematic studies of medically important mosquitoes. This level of support may range from furnishing entomologists with keys, necessary literature, and other identification guides, to the loan of specialized collecting and rearing equipment, which cannot be obtained from other sources. Such support has proven invaluable to all concerned, as the Smithsonian Institution has received extremely worthwhile material from these entomologists.

REVIEWS OF PROGRESS FOR THE PERIOD
August 1st - December 31, 1983

1. Biosystematic studies on Aedes

Basic to all studies on mosquitoes and to the control of mosquito-borne diseases is a determination of the exact species involved. A detailed knowledge of all life stages and both sexes is usually essential to determine the species. Thus, taxonomic studies should be based on some reared material with their associated larval and pupal skins. This type of material can only be obtained from individual rearings of field-collected larvae or eggs or through rearings of progenies from wild females. There is at present very little of this type of material available for the African fauna. Thus, efforts during the past 5 months were primarily directed toward processing recently acquired specimens, preparing for field work and developing contacts in other countries where the need is greatest for critical material.

During this period the project was begun with work toward a revisionary study of the subgenus Stegomyia (genus Aedes) of the Afrotropical Region as the primary objective. Initial research was focused on studying specimens of the Africanus and Simpsoni species complexes. These complexes contain species that are important vectors of Dengue, Chikungunya, Yellow Fever, Rift Valley Fever and Zika viruses. During a recent field trip to Cameroon and Kenya in the early part of 1983 numerous specimens were collected, mostly as reared series. Other specimens were borrowed from the Division of Vector Borne Diseases (DVBD), Ministry of Health, Nairobi, Kenya, during the field trip to Cameroon and Kenya.

The DVBD houses a major collection of African mosquitoes, mostly from East Africa and neighboring territories that is not duplicated elsewhere. There is a large accumulation of material from the last 40 years of European entomological studies in Africa. The collections at the DVBD were carefully studied and identified, and the data from 678 specimens were recorded. A total of 116 of the most important specimens were selected for loan to the Smithsonian for further study.

During the 1940's British researchers in Uganda incriminated Aedes (Stegomyia) simpsoni (Theobald) as one of the primary vectors of Yellow Fever virus in primates and man in Eastern Africa. Since that time the major medical and public health texts on African arboviral vectors have listed simpsoni as the major endemic vector of primate Yellow Fever in Africa. As early as the 1940's, however, 2 distinct populations of simpsoni were recognized in Uganda, one man-biting and the other non-man-biting.

Study of the collections in DVBD of the "simpsoni" specimens which were made primarily in Uganda, Kenya, Tanzania and Malawi, has revealed that the species from which Mahaffy et al. (1942) isolated Yellow Fever virus is Aedes (Stegomyia) bromeliae (Theobald) and is the common man-biting member of the complex in East Africa. The species previously called simpsoni in Kenya, Tanzania, and Malawi is bromeliae. In Uganda, specimens of Bwamba and Kampala counties, which were identified as simpsoni, are bromeliae, and the specimens of Karamoja Kaabong, identified as simpsoni, are bromeliae and lilii (Theobald). However, 91% of the specimens of the complex were bromeliae and only 9% of the specimens were lilii, which may be the non-man-biting member of the complex.

Examination of all available specimens at SAMP, including those on loan from many museums in Europe and Africa, thus far has revealed that "simpsoni" is actually a complex of at least 3 species. Aedes simpsoni is found to be restricted to South Africa, and is not known to be involved in the transmission of arboviruses. Aedes bromeliae is a common species widespread in the Afrotropical Region, while Aedes lilii is also widely distributed across Africa, but less prevalent.

As a result of these studies, a manuscript on "Aedes (Stegomyia) bromeliae (Theobald), the Correct Identity of the Sylvan Yellow Fever Vector in East Africa" is in progress and will be submitted for publication in 1984. To date a total of 647 adult specimens have been critically examined, and 90 male and female genitalia slides were prepared.

Examination of the "africanus" specimens, which were recently brought back on loan from DVBD, has indicated that the species previously called africanus in East Africa - Uganda (Entebbe), Ethiopia (Kaffa Prof.), and Kenya, is a different species. Aedes africanus was incriminated as a vector of Yellow Fever in the forest cycle in Uganda (Haddow et al., 1948) and during a major epidemic in Ethiopia in the 1950's and 1960's. This species was considered the primary link between the sylvan and human phases of the Yellow Fever cycle in Ethiopia (Neri et al., 1968). The probability that this is a new species, not A. africanus, will cause a major change in vector concepts regarding the sylvan Yellow Fever cycle in Africa. A detailed study of the Africanus subgroup is under way. However, much more material from both East and West Africa will be needed before final decisions and a revision of the subgroup can be made. A manuscript describing a new species of African Stegomyia in the Africanus complex will be submitted for publication in Mosquito Systematics during 1984.

In addition to the above, study was also initiated on the Aedes (Diceromyia) furcifer taylori group from Senegal, Kenya, and South Africa. For this study, 50 adult specimens were examined, and 19 male genitalia slides were prepared.

Considerable time was devoted to preparation for conducting field work in West Africa in the early part of 1984. The purpose of the trip is to undertake field studies in Sierra Leone, collecting and individually rearing topotypic and other critical material, obtaining biological and ecological information, with primary emphasis on potential Aedes arbovirus vector species and with secondary emphasis on species of Anopheles and Culex.

In conjunction with the Sierra Leone trip, a stop is planned in Dakar, Senegal to visit Dr. M. Cornet, Office de la Recherche Scientifique et Technique Outre-Mer (ORSTOM). This portion of the trip is designed to develop arrangements for conducting field work in the Ivory Coast in conjunction with ORSTOM during the contract year August 1984 - July 1985. It is anticipated that a 60-day field trip to Ivory Coast will be supported by United States Army Medical Research and Development Command (USAMRDC) during the coming grant period.

2. Curatorial Activities

During this period new material consisting of 348 adults (including 342 individual rearings with associated larval and/or pupal skins) of African Stegomyia were acquired from the following sources: (1) 34 adults, 31 larval skins, 34 pupal skins from Mrs. M. Coetzee, Tzaneen, South Africa; (2) 239 adults with larval and pupal skins from Mr. D.L. Theron, National Institute for Tropical Diseases (NITD), Tzaneen, South Africa; (3) 34 adults, 47 larval skins, 69 pupal skins (Senegal), from CPT. M.E. Faran et al., United States Army Medical Research Institute of Infectious Diseases (USAMRIID). In addition, 294 adults, 144 larval and/or pupal skins, and 6 lots of eggs of other subgenera of Aedes (Aedimorphus, Diceromyia, Finlaya, Mucidus, Neomelaniconion) from Senegal were received from CPT. M.E. Faran et al., USAMRIID.

3. Other Activities

(1) Identified 115 Aedes (Aedimorphus, Diceromyia, Finlaya and Stegomyia) mosquitoes from Senegal for CPT. M.E. Faran, USAMRIID; (2) Translated 3 Chinese papers regarding Anopheles, Aedes, and Uranotaenia for Dr. R.A. Ward, WRAIR; (3) Reviewed 1 manuscript written by other for publication.

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Appendix 1: LIST OF SAMP CONSULTANTS

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- Professor Kenneth L. Knight, North Carolina State University, Raleigh, North Carolina 27650. Aedes (Finlaya)
- CPT Kenneth J. Linthicum, Ph.D., Department of Arboviral Entomology, U.S. Army Medical Research Institute of Infectious Diseases, Fort Detrick, Frederick, Maryland 21701-5000. African Aedes and Neotropical Anopheles
- Dr. Botha de Meillon, Philadelphia, Pennsylvania. African Culicidae and Ceratopogonidae
- Dr. J. Mouchet, ORSTOM, Head, Department of Entomology, Bondy, France. Culicidae
- Dr. Lewis T. Nielsen, Biology Department, University of Utah, Salt Lake City, Utah 84112. North American Aedes (Ochlerotatus)
- Dr. Shivaji Ramalingam, University of Malaya, Kuala Lumpur, Malaysia. Topomyia, Malaya, Armigeres and Malaysian Culicidae
- Mrs. Rampa Rattanarithkul, Department of Medical Entomology, U.S. Army Component, Armed Forces Research Institute of Medical Sciences, APO San Francisco 96346. Aedes (Finlaya) and Thailand Culicidae
- LTC John F. Reinert, Ph.D., Headquarters USAMRDC, SGRD-DPM, Ft. Detrick, MD 21701. Aedes subgenera
- Dr. Ronald A. Ward, Department of Entomology, Walter Reed Institute of Research, Washington, D.C. 20012. New World mosquitoes

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