

Current Studies on Tick Biology in Relation to Diseases in Eurasia, Africa, Madagascar, and Australia¹

HARRY HOOGSTRAAL

Medical Zoology Department, United States Naval Medical Research Unit Number Three, Cairo, Egypt, U. A. R.

TICK TAXONOMY

During the periods between World Wars I and II, remarkably little serious attention was devoted to tick taxonomy. Volume IV of Nuttall's Monograph of Ticks, dealing with the genus *Amblyomma*, was prepared and published by L. E. Robinson in 1926. By far the most substantive of the Tick Monograph series, the *Amblyomma* volume, still requires only slight revision after more than 40 years. In Rostock, now East Germany (DDR), Professor Paul Schulze studied ticks from many parts of the world and proposed numerous taxons in an often erratic and haphazard fashion, a fact that has complicated subsequent taxonomic research.

However, the modern era of tick study was ushered in during the 1920's by Dr. R. A. Cooley, later assisted by Glen M. Kohls, at the Rocky Mountain Laboratory. Cooley recognized that study of tick taxonomy, biology, and disease epidemiology must proceed apace if tickborne diseases are to be effectively controlled. The value and need of this concept and approach have been amply confirmed by subsequent historical events. Today they are being more realistically and actively applied than ever before. Cooley's chief interest centered on Rocky Mountain spotted fever. He studied the taxonomy and biology of numerous tick species that were known or potential vectors of the disease from the subarctic forests of Canada to the tropical jungles of Brazil.

The far-flung combat activities and vast population movements of World War II were immediately followed by increased speed and frequency of civilian travel, greater interest of peoples the world over in activities abroad, and rapid expansion and wider distribution of agricultural and industrial products. Restless migrations and urbanization were induced by the human population explosion and by attempts to raise man's living standard. Both combat and peacetime activities on every continent revealed totally unexpected diseases caused by ticks the biological features of which were unknown and their species characterization and identity were uncertain. These diseases sometimes disrupted major agricultural and developmental programs.

Modern specialists, following the lead of Cooley, function as taxonomist-biologists. They work under the assumption, continually demonstrated, that a

unique relationship exists between each tick species and each disease-causing agent in a specific environmental and geographic association. Thus, tick taxonomists have not found themselves targeted by the controversial and unwarranted charge that taxonomy is less important than atoms or molecules. Indeed, in trying to confine the present part of this discussion to its subtitle—tick taxonomy—I find it difficult not to discuss in the same sentence or paragraph classic taxonomic procedures in relationship with biological-epidemiological research.

In this discussion, we need not repeat any discussion of foreign studies made by other speakers in this symposium or elsewhere in this year's meeting of the Entomological Society of America.

Regional Reviews.—Monographic or book-length reviews of regional tick fauna are being prepared for the following countries: Switzerland (Aeschlimann), Madagascar (Uilenberg, Hoogstraal, and Klein), Kenya (J. B. Walker), Uganda (Matthysse and Colbo), central Sudan (Hoogstraal), Egypt (Hoogstraal, Kaiser, and Madbouly), Afghanistan (Hoogstraal), USSR (Filippova), Nepal (Hoogstraal), West Pakistan (V. C. McCarthy), India (Hoogstraal and T. Ramachandra Rao), Ceylon (Hoogstraal and G. B. Thompson), Burma (Hoogstraal), Malaya (Hoogstraal, Lim, Nadchatram, and Anastos), Indonesia (Anastos et al.), Vietnam (Hoogstraal et al.), Taiwan (Hoogstraal and Kuntz), Japan (V. J. Tipton and N. Yamaguti), Australia (F. H. S. Roberts), New Guinea (N. Wilson), Luzon (Philippines) (D. W. Parrish), and Galapagos (Hoogstraal and Kohls). A monumental manuscript on ticks of Africa has been prepared by P. Morel of France. Thus, much general information regarding tick species in many areas of the world will become generally available within the next few years.

Argas Taxonomy.—Recent elucidation of morphological characters for recognition of bird-infesting *Argas* species, together with studies based on all developmental stages of laboratory-reared materials, are revealing a truly remarkable number of new species with much new information on *Argas* biology and host interrelationships. Particular attention is being given by various workers to *Argas* ticks in Egypt, southern Africa, USSR, Nepal, Afghanistan, Australia, Thailand, Japan, and the Americas. Much of this work is correlated with the efforts of Drs. Jordi Casals and Harald N. Johnson of Rockefeller Foundation, Carleton M. Clifford and Conrad E. Yunker of Rocky Mountain Laboratory, NAMRU3, and others, to obtain a broader and more meaningful

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