THE ANOPLURA *of* AFRICAN RODENTS AND INSECTIVORES

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THE ANOPLURA
of
AFRICAN RODENTS AND INSECTIVORES

By
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FOREWORD

Man's traditional concern with living animals has resulted largely from the economic importance of his domestic livestock, or the avocational value of animals as game or zoological specimens. Only a relatively few far-sighted biologists have had the acuity to recognize the role played by wild animals in the illnesses of man. Yet there are approximately one hundred diseases naturally transmissable between animals and man. In many instances, one or several members of both the vertebrate and invertebrate fauna play important parts in determining the ecology and epidemiology of the diseases, and hence their importance to mankind. To be able to cope with these diseases, we must know them not only as diseases of men, but also as they infect native animals and potential vectors. Very often the most efficient method of controlling diseases of this sort is to control or eradicate the animal reservoir or vector, rather than attack the disease in its human host. Such diseases are notorious for their disregard of political boundaries and are capable of escaping the geographic confines of a continent. Knowledge of their presence and behavior in Africa provides a first line of defense for the protection of American health and agriculture.

The first step toward gaining an understanding of the complexities of the basic factors involved in arthropod-transmitted diseases is discrimination among the species of arthropods likely to be responsible for transmission of the pathogen, either to man, or among animals harboring the disease. These studies provide the base upon which the whole subsequent structure of biological knowledge will be built. This Technical Bulletin is such a report. It reflects the long-established responsibility of the Department of Agriculture for the conduct of research in systematic entomology and publication of the results of such research. It further demonstrates the continuing cooperation between the Departments of Agriculture and the Navy by making available results of part of the long-range investigation by the Naval Medical Research Unit No. 3.

E. F. KNIPLING
Director,
Entomology Research Division.

ACKNOWLEDGMENTS

I wish to thank Dr. Hoogstraal and NAMRU–3 for donating the Anoplura collected by NAMRU–3 to the U.S. National Museum.

My thanks also go to the following: Theresa Clay and G. H. E. Hopkins of British Museum (Natural History) and J. Bruneau, Institut Pasteur du Maroc, Casablanca, who lent and donated specimens most useful to this study; R. L. Wenzel of the Chicago Natural History Museum, who lent valuable supplementary specimens of Egyptian Anoplura collected by P. Q. Tomich and an interesting collection from Angola obtained by Gerd Heinrich; F. Zumpt of the South African Institute for Medical Research, Johannesburg, who presented and lent numerous specimens of African Anoplura that proved indispensable to this study; and Jane B. Walker of the East African Veterinary Research Organization, who checked many of the East African place names.

The host mammals collected by Dr. Hoogstraal and his associates were determined by H. W. Setzer, Division of Mammals, U.S. National Museum, and P. Hershkovitz of the Chicago Natural History Museum. It is a pleasure to acknowledge gratefully their indispensable help. Mr. Hershkovitz determined all the mammals from the 1956 NAMRU–3 Kenya-Uganda-Tanganyika collections, and the skins and skulls are deposited in the Chicago Natural History Museum. Most of the Egyptian and Sudanese mammals were determined by Dr. Setzer. Skins and skulls of these mammals are in both the U.S. National Museum and the Chicago Natural History Museum.

I am much indebted to Dr. Setzer not only for his mammal determinations but also for his cheerful and willing instruction in the taxonomic relationships, habitats, and special characteristics of the mammal species listed or discussed in this publication.

CONTENTS

THE ANOPLURA
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By Phyllis T. Johnson, Entomology Research Division, Agricultural Research Service[1]

This report on Anoplura associated with the rodent and insectivore fauna of the African continent and adjoining areas of the Near East is based in great part on collections made by Harry Hoogstraal and his associates of the U.S. Naval Medical Research Unit Number 3, based in Cairo, Egypt. Dr. Hoogstraal's collections from Egypt, Sudan, and British East Africa are providing a solid basis for our growing knowledge of the African Anoplura. Although the taxonomy of African sucking lice is still in the descriptive stage, Dr. Hoogstraal's collections also have elucidated host relationships and the geographical distribution of many known louse species. From the standpoint of the medical entomologist and the epidemiologist, information of this sort is invaluable. All blood-sucking arthropods are suspect in the maintenance in an animal population or in the transmission to man of diseases of the lower animals or in both. Knowledge of the geographical distribution and host specificity of the lice of African rodents is therefore of considerable interest.

African mammals, particularly the rodents, are not well known and vast areas exist where no collections have been made. Because of this, final decisions on relationships of the rodent hosts recorded in this publication cannot be made until sometime in the future. I have recorded the mammal names in the combinations given me by Dr. Setzer and Mr. Hershkovitz. In the case of subspecies, species, and higher categories that are variously attributed to one group or another I have at times given comments within the discussion of the pertinent Anoplura species.

Both Ferris (1951)[2] and Hopkins (1949) have suggested that mammalian hosts of the Anoplura should be listed only to species,

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[1] Also consultant, Department of Medical Zoology, U.S. Naval Medical Research Unit Number Three, Cairo, Egypt. This report (Research Report NM 520 803.22) is in part a contribution from the Scientific Working Party on Ectoparasites sponsored by the U.S. Naval Medical Research Unit Number Three, Cairo, and the East African Veterinary Research Organization, 1956.

The findings in this publication do not necessarily reflect the views of the Navy Department or the naval service at large.

[2] References to Literature Cited (p. 109) are indicated by the name of the author (or authors) followed by the year of publication.

not subspecies, since so far as is known, host specificity in the Anoplura does not operate at the subspecific level of the mammalian hosts. If I could presume agreement among mammalogists as to what subspecific name pertains to what specific name, I would agree heartily with Ferris and Hopkins. In dealing with well-known mammalian faunas like those of Europe and North America, the procedure of naming the hosts only at the specific level should work very well in almost all cases. Unfortunately, the mammalian faunas of Africa, Asia, and South America do *not* enjoy nomenclatorial stability, because, as I have mentioned, collections are still so limited and such large areas remain uncollected that revisionary work is impossible at this time.

Several examples of errors that might occur by following Hopkins' and Ferris' suggestions can be found in this publication. To cite just one example: One mammalogist lists the rodent species *smithi* as *Tatera robusta smithi*. Other mammalogists consider *smithi* to be *Tatera liodon smithi*. If I list louse species "A" as from *Tatera robusta*, omitting the name *smithi*, from now on species "A" will be recorded as having *Tatera robusta* as one of its hosts. If other published listings of louse species "A" from *smithi* (given in the combination *T. liodon smithi*) are listed only as *Tatera liodon*, it would appear that species "A" occurs on both *liodon* and *robusta*, although this may not be the case at all.

The reports of Hopkins (1949) and Ferris (1920–35; 1951) are necessary references for a serious study of the Anoplura, and I have constantly referred to them during my research. I suggest that individuals using this paper supplement it with the report of Ferris (1920–35), which contains illustrations to almost all the species not illustrated in this paper.

The supraspecific heirarchy of Ferris (1951) is followed in this publication. All the Anoplura dealt with belong in the family Hoplopleuridae, whose members are the typical anopluran parasites of the mammal order Rodentia.

The subspecies category has not been used in this publication. Taxonomists of Anoplura and Mallophaga who use trinomials define subspecies (in practice) as being (1) more closely related to one another than they are to other species of the genus and (2) found on closely related hosts or on the same host species. I am unaware of any instances in which these "subspecies" are based on geographical variation or of the description of a geographical zone of intergradation (or good evidence for any other kind of zone of intergradation) between "subspecies" of lice. The definition of subspecies presented by Mayr, Linsley, and Usinger (1953, p. 314) is as follows: "A subspecies is a geographically defined aggregate of local populations which differs taxonomically from other such subdivisions of the species." Edwards (1954) allows us a rather broad definition of "geographical" which—regardless of our agreement or disagreement with the rest of his thesis—allows us to accept as subspecies, populations that are in one way or another reproductively isolated from one another on all but a strictly genetic basis. (His examples include geographical isolation on the micro or macro level, and temporal isolations. Ecological isolation as described by

Edwards is for practical purposes synonymous with microgeographic isolation.)

However, we must subjectively decide whether two or more louse populations would interbreed, if given a chance. In free-living animals or parasites which may disperse without aid of their host's movements, the possibility of finding intergrading populations is much greater than in the lice. So far as I can ascertain (as mentioned above) no clear-cut instance of intergradation between louse populations has been described. We have, therefore, no facts on which to theorize.

The two examples of the use of subspecies in Anoplura and Mallophaga given below show what grounds have been given for use of trinomials in the taxonomy of lice. The reader is also referred to the discussion by Ferris (1951, p. 269) of the supposed subspecies of *Pediculus humanus* Linnaeus.

Webb (1948) in his review of the "subspecies" of *Haematopinus asini* (Linn.) from *Equus caballus* (horse), *E. asinus* (ass) and *E. burchelli* (common zebra) comes to the conclusion that *E. caballus* and *E. asinus* have their own subspecies of *H. asini* and that *burchelli* has two and possibly three subspecies of *asini*, although in his discussion he questions his own use of the term "subspecies" as applied to *asini* of the horse and the ass. The character on which Webb separated the two forms of *asini* found on the horse and the ass was the length of the head, which ranged from 0.75 to 0.87 mm. for the *E. asinus* form (based on 5 males and 5 females) and from 0.95 to 1.10 mm. in the *E. caballus* form (based on 4 males and 21 females). Other than the fact that Webb's figures were based on an extremely small sample, it appears that he was influenced by a prevalent belief that two species of hosts should not share the same species of louse. Particularly when dealing with the ectoparasites of man's domestic animals, one must take into consideration the close contact of hosts, and the chances of secondary infestation. Following Webb's reasons for presuming separate subspecies of *asini* on the horse and the ass, might one then expect to find on the mule specimens with head lengths from 0.75 to 1.10 mm.? The two "subspecies" of *asini* on *E. burchelli* are said to occur regularly on the same host animal. Webb reported that Hopkins had never found intergrades between the two forms, and further, Webb says that he presumes these "subspecies" do not interbreed.

Although Hopkins (1949, p. 406) has pointed out that there are undoubtedly different ecological niches on the host animal, these niches are not so separated that lice occupying different niches would not have frequent opportunity to come in close contact with one another (considering now only the mammals) and—if genetically able—to interbreed effectively. In fact, one may wonder if subspecies of lice could arise by ecological separation alone. How could a population with a more-or-less homogeneous gene pool and in constant reproductive contact, develop varieties with differing ecologies, with this differentiation based on loss or "drift" of the existing genes following physical isolation of the populations? In my opinion one must here assume mutations adaptive to a particular ecological niche together with either concurrent or subsequent

reproductive-isolating mutations, and this is not the situation which (theoretically) leads to the formation of subspecies.

In the Mallophaga, Emerson (1955) reduced five species of *Rallicola* to subspecies of *R. ortygometrae* and described four other subspecies of *ortygometrae* (all from species of different genera of the Rallinae or true Rails) because: "The differences in size, external morphology, and male genitalia are so slight that it is the opinion of the author that, for the present, all forms should be treated as subspecies of *R. ortygometrae*."

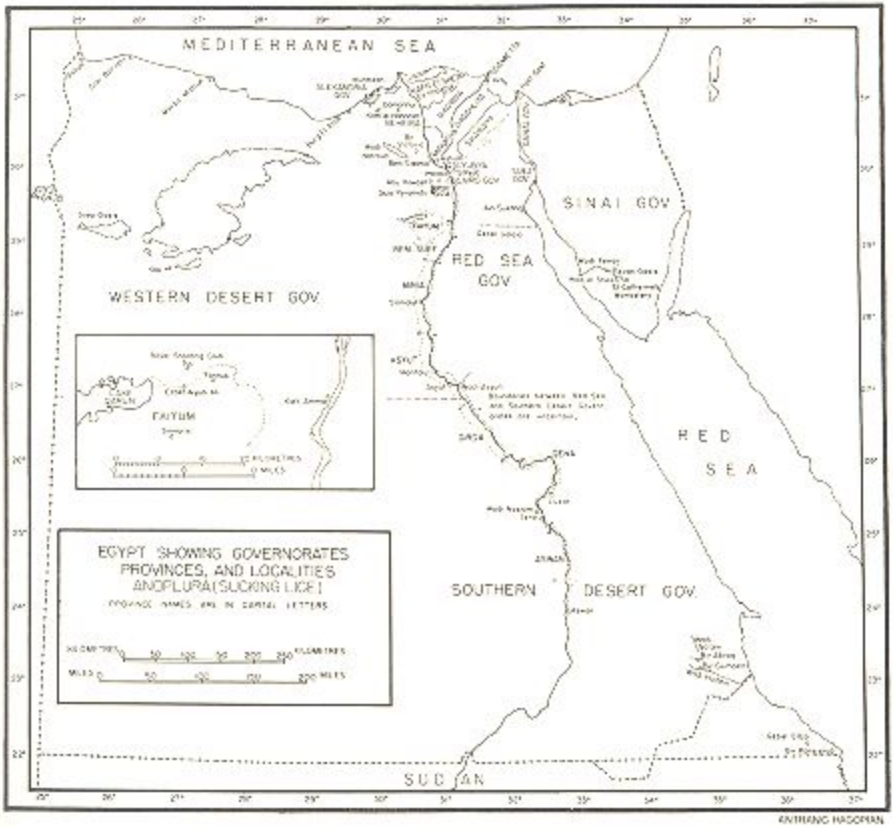
In using trinomials both Webb and Emerson were emphasizing the close relationships of their respective species groups of lice, and assuredly the species of *Haematopinus* on *Equus* must have come from common stock, as did the species of the *Rallicola ortygometrae* group found on the Rallinae. However, in neither case do I see indications that the authors advanced adequate reasons for use of the subspecies category.

The subspecies category is differently interpreted by taxonomists and there are some who would abolish it. As a matter of logic and convenience it would be desirable to treat all stable recognizable forms of Anoplura and Mallophaga as species, and varieties such as Webb's *asini* from the horse and ass as categoeries below the subspecies and thus of no concern in nomenclature. Webb's "subspecies" of *asini* from the zebra in my opinion are sibling species, not subspecies. Members of the *Rallicola ortygometrae* group, which have been treated as an assemblage of subspecies by Emerson, might or might not be capable of interbreeding but there is really no reason for assuming they would be. Probably the most that can be said is that species of the *ortygometrae* group all arose from common stock and perhaps have not been effectively isolated for as long a time as the other species of *Rallicola*.

Evolution (and morphological divergence) would not be expected to proceed at the same rate for all free-living species since evolution and structural divergence depend on the interaction of many unequal factors. The evolution of lice is further complicated by the fact that evolutionary divergences and resultant isolation of their hosts leads to isolation of louse populations which may then evolve into different species. Our problem, then, is not in recognizing that subspecies may exist in Anoplura and Mallophaga (here defining subspecies as isolated populations differing taxonomically from one another but capable of interbreeding and producing fertile offspring should the populations be brought together) but in demonstrating by scientific method at *what point* taxonomically differing populations should be considered subspecies, not species.

New records based on collections other than Hoogstraal's are credited to the appropriate institution or individual as follows: South African Institute for Medical Research (SAIMR), Chicago Natural History Museum (CNHM), Dr. J. Bruneau (J. B.), and British Museum (Natural History) (BM).

Specimens of the Anoplura collected by NAMRU–3, including paratypes of the new species described herein (where available), have been given to the following institutions: South African Institute for Medical Research, British Museum (Natural History), Chicago Natural History Museum, Stanford Natural History Museum, and Museé Royal du Congo Belge.



Many older references to British East African localities do not identify the political division. The appropriate name (Kenya, Uganda, or Tanganyika) has been inserted, in brackets at the end of the locality name, in the majority of such localities quoted in this publication. Antique spellings or actual misspellings are also found in the literature. Here, the correct modern name is inserted in brackets following the old or misspelled name. The English equivalents of certain Arabic words commonly used in Egyptian locality names are as follows: bir=well, wadi=valley, ain=spring. Egyptian localities where personnel of NAMRU-3 collected Anoplura may all be found on the included map. Hoogstraal's British East African localities may be found on any good map of that area.

The figures of the corresponding parts of Anoplura species compared in this publication, which occur on any one plate, are drawn to the same scale. All figures were drawn by the author.

PARASITE INDEX [1]

[1] Synonyms are in italics. Generic and specific names only are included.

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