

THE TICK REFERENCE LIBRARY AT KAMLOOPS, BRITISH COLUMBIA, AND ITS APPLICATION TO TICK STUDIES IN CANADA

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The tick reference library at Kamloops consists of about 5000 references on 5 x 8 cards, together with more than 1200 reprints. Because there is no comparable library elsewhere in Canada and because it may be of service to those engaged in related fields of study, particularly those of zoonosis, it is timely to draw attention to its main headings. Its role in aiding present studies on ticks is exemplified by references to current and future problems on these parasites.

The ticks of Canada received their first recognition through C. G. Hewitt, when, as the Dominion Entomologist at Ottawa, he published "A contribution to the knowledge of Canadian ticks" (Hewitt, 1915). He cited sixteen species and emphasized the importance of ticks as carriers of serious diseases to man and animals. Only seven of the names then listed remain unchanged in the present list of over thirty species recorded in Canada (Gregson, 1956). On the other hand, the cause of the disease, tick paralysis, which had been recognized then only for three years, is still little understood.

Projected research on ticks did not begin until 1928 when Eric Hearle, Officer-in-Charge of the newly-established Dominion Entomological Laboratory at Kamloops, commenced his studies on insects affecting livestock and man in British Columbia. Kamloops has since remained the center for tick studies and attention has accordingly been paid to the compilation of references pertinent to this work. At first these were mainly confined to North American publications on taxonomy, with little regard

to tick-borne diseases south of the forty-ninth parallel. As knowledge of bird migrants and parasites increased and as world-travel became an everyday occurrence it became increasingly important to recognize species of ticks and diseases transmitted by them that were of potential importance to Canada. Similarly, as literature on ticks increased, it became desirable to refer to any fundamental research being done elsewhere on species similar to those in Canada. Thus the reference library now covers every aspect of tick research that has come to the writer's attention, including publications on tick-borne diseases, for these frequently contain information on the vectors and their hosts. Reprints have been secured wherever possible. However, complete works of foreign publications and their translations are often difficult to obtain. A third of the references to ticks and tick-borne diseases, for example, are in foreign languages; more than half of these are in Russian.

An arbitrary filing system was adopted to include the main sections on systematics, morphology, tick-borne diseases, and control. However, because many of the references referred to data on more than one of these subjects, priority was given to the first category. References to specific ticks are filed according to their respective genera; those containing several genera are filed under a "grouped" heading. For convenience Nearctic references are filed separately. When the emphasis is on morphology, disease, or control, they are filed under these headings or

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subheadings thereof. To date no attempt has been made to cross index the individual references for subject matter, or to make an author index of the whole series. Both are desirable.

1. Systematics

Over 1500 separate references are in this category. The vast amount of information in many of the foreign works, Russian in particular, can be extracted only as the publications are acquired and studied. Such papers on Old World species, their hosts and habits, have much to offer when compared with our own studies, for in Canada we are in a favourable position to appraise our north-western species in terms of Holarctic origins. Considered in this light, it is important to speculate on their capacity to transmit tick-borne diseases at present confined to Asia and Europe.

Looking southwards, an observant eye must be kept on all Nearctic records and descriptions of ticks, particularly those which may be transported on bird or bat migrants. Recent taxonomic studies of certain argasids in this group have cast doubt on the identity of at least one species that is presumed to have been brought in on a bird. Past records of ticks from caves, seashore retreats, beaver houses, burrows, and human dwellings, have shown that they may well extend their normal range in such protected conditions; the biology and epizootic significance of southern species cannot be ignored. Amongst species occurring in Canada are taxonomic problems of variation in size, host specificity, and distribution which can profitably be compared with similar findings in the U.S. and other parts of the world.

2. Morphology

This section contains over 600 references and is broken down to include anatomical observations, studies on

behaviour and physiology, reproduction, and feeding. Histological and embryological studies go back little further than 1900. Since then there have been several major works on the feeding mechanisms of various members of the Ixodoidea, the last originating from this laboratory in 1960, but controversy and ignorance still exist over the exact function of certain structures of the sucking apparatus. Considerable study in Europe has also been made on the cuticle of ticks in relation to water balance; again, experience has shown that these researches could profitably be extended to cover local species.

References to the behaviour of ticks cover such challenging subjects as host specificity, diapause, photoperiodic rhythm in feeding, questing habits, attractants, and phenological correlations. Knowledge of any one of these topics can aid our search for better methods of tick control; taken together they represent the intricate relationships that exist between the tick, its environment, and its host.

Studies on parthenogenesis, fertility, the egg waxing organ, and other aspects of reproduction are of special significance to local population research. This becomes apparent when it is realized that the potentiality of tick population is measured largely in terms of the several thousand eggs that a female lays. Because mating causes an increase in the engorging rate of female *Dermacentor andersoni* Stiles, these studies are also of interest at Kamloops where attempts are being made to feed ticks by artificial means.

3. Tick-Borne Diseases

There are over 2000 references to tick-borne diseases, with emphasis on Texas fever, Rocky Mountain spotted fever, tularaemia, relapsing fever, tick paralysis, Q fever, and Colorado tick fever, all of which occur in North

America. Except for Texas fever, all have been recorded in Canada. Since British Columbia is unique in having a greater tick paralysis problem than anywhere else in the world, the 350 references to this disease are particularly complete. In addition, there are about one hundred references to kindred conditions of toxicity produced by tick bite.

The value of these references to disease will be not so much in their practical use as in providing data for a fundamental picture of tick-borne disease potentialities. In Canada, particularly in British Columbia, are heavy populations of ticks at the border of many urban areas. The fact that these ticks are largely free of virulent forms of disease should not be accepted as a fortuitous circumstance—rather, it should be studied as a phenomenon peculiar perhaps to our latitude, and correlated with records of the complex interrelations that exist between ticks, their hosts, and their geographic positions.

4. Control

Five hundred references to control show that ticks have been fought mainly by sprays and dips of arsenicals, and recently of chlorinated hydrocarbons. Resistance to chemicals has appeared in South Africa, Australia, Brazil, and the United States. To date none has occurred in Canada; the brown dog tick (*Rhipicephalus sanguineus* (Lat.)) will probably be the first to show resist-

ance here. Russian references to the control of ticks on vegetation by smokes, dusts, and sprays, and to their elimination by manipulation of either their natural or domestic hosts are of importance, particularly in relation to tick-wild-life complexes in Canada. Although tick parasites have been studied and released on many occasions, there is a lack of information on other means of natural control, such as predation and tick diseases. Voles and ground beetles have been cited as devouring ticks, and there is one reference to a fungus attacking the genitalia of ticks. The causes of fluctuations in the population of ticks in British Columbia are largely unexplained. In North America the tick parasite, *Ixodiphagus texanus*, has been taken as far north as Idaho; in Africa the northward movement of similar parasites has been observed in a parasitized tick on a migrating bird. It has not been determined whether such parasites play a part in British Columbia.

Hewitt hoped that the meagreness of his records would stimulate others to add to the knowledge of a group which offered problems of unusual interest. Since his time there have been about ninety publications on ticks and tick-borne diseases in Canada; more than a third of which pertain to tick paralysis. Although much fundamental research remains to be done there is little doubt that his wish is being fulfilled.

References

- Gregson, J. D. 1956. The Ixodoidea of Canada. Can. Dept. Agric. Pub. 930. 92 pp.
Hewitt, C. G. 1915. A contribution to a knowledge of Canadian ticks. Trans. Royal Soc. of Canada. 9: 225-239.