

upshot will be remains to be seen and it might be of interest to maintain blocks of orchard trees under the spray programme used in, we will say, 1940 or thereabouts. Some valuable information might be forthcoming affording as it would, a direct comparison on insect populations.

A remark made by the president of the British Horticultural Society a few months ago gives one food for thought. He drew attention to the

fact that, most of our leading types of livestock, cattle, horses, sheep, poultry, etc., were produced by the efforts of ordinary farmers, with little, or no assistance from Science as we know it today. He also put forward the idea that Science may, at times, actually delay discoveries by splitting too many hairs.

There is a good deal of truth in these statements, but it will be for the younger men to ponder them.

THE HISTORY OF THE STUDY OF EXTERNAL ARTHROPODS AFFECTING ANIMALS AND MAN IN BRITISH COLUMBIA

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The earliest observations of insects affecting man and animals date back to records made by early explorers on the voracity of some of these pests. In Dr. Cheadle's diary of his trip across British Columbia in 1863 are such comments as "Fearful amount of gadflies. Horses half mad . . . tormented to death by flies. Sandflies and musquitos terribly annoying . . . musquitos murderous." Remarking on the terrible "musquitos" at the plains of Sumas, he states that "Indeed men from all countries agree that the musquitos of B.C. are unmatched for numbers and ferocity."

In the early nineties the mosquito still occurred in millions in the Fraser Valley, rendering work a "purgatory" from early July until September. Relief was obtained when the area was dyked. The first economic studies of animal insect pests were undertaken by Dr. Seymour Hadwen, Animal Pathologist at Agassiz in 1912. From his pen arose publications covering ticks, warble flies and other livestock pests, and under joint authorship with Dr. E. A. Bruce, he published his observations of the migration of warble larvae through the tissues of cattle. In a later bulletin he treated comprehensively the control of insects affecting livestock. In 1919, under the direction of the Dominion Entomologist,

Dr. Hewitt, Mr. Eric Hearle commenced his studies of mosquitoes in the Fraser Valley. This was followed by his 1927 publication of the "Mosquitoes of British Columbia."

The study of insect and ticks affecting animals and man was placed on a firm footing with the official establishment of a Dominion Insect Unit at Kamloops in 1928. Eric Hearle was transferred from Indian Head, Saskatchewan, to act as Officer in Charge—and staff. His wire to the Dominion Entomologist, Mr. Arthur Gibson, that he had "located a place that is admirably suited to our needs" referred to an old shack that was located in the centre of town and which had served in its time various purposes from a funeral parlour to a bootlegging joint.

Once established, he set himself, singlehandedly, to the terrific task which lay before him. Not only was he treading on virgin territory as far as his work was concerned, but he was working in a province that contains a richer supply of biological material than all the rest of Canada. This is readily evidenced in later taxonomic studies of various insects.

During the first summer he studied and collected all data and specimens he could lay his hands on. This included mosquitoes, blackflies, sandflies, horseflies, ticks, mites and lice. His

surveys covered the whole of lower British Columbia. Thirteen districts were examined for warbles, which were causing 75 per cent. warble damage in hides. Half a dozen addresses were given during the first month alone. Questionnaires on tick paralysis were sent to all doctors in the Interior and a display was set up at the Vancouver Exhibition. During most of this period he lacked a stenographer.

Within the next two years, mosquito controls had been inaugurated at Kamloops and Kelowna. Tick studies had advanced to include life-history studies of the more important species, including observations of their effect on both domestic and game animals. This brought to light many tick paralysis cases, including an outbreak at Douglas Lake involving 100 head of cattle, out of which 30 were lost. Tularaemia was first recorded for British Columbia in rabbits at Vavenby.

In 1931, the first of a series of large-scale warble control measures were undertaken at Tranquille. From this work it was demonstrated that the grub incidence in cattle could be brought successively from 19 per cent. to 0.3 per cent. within four years. During 1932 and 1933 Hearle spent several months in the vicinity of Jasper Park Lodge making a detailed survey of biting fly conditions. Over 1400 blackflies alone were pinned and determined. Following this work, at the age of 41, his health broke and he was confined to bed. There he continued with the classification of ticks, mosquitoes, blackflies and horseflies, practically completing manuscripts on the ticks and blackflies of British Columbia, before his untimely death in the spring of 1934. His paper "The Ticks of Western Canada" and his bulletin "Insects and Allied Parasites Injurious to Livestock and Poultry in Canada" were published posthumously.

Immediately following Hearle's death, Professor G. J. Spencer took charge of the laboratory during the summer months. On the staff at that

time were two assistants, T. K. Moiliet and the writer, and a stenographer. It was during the same year that the original working quarters burned down. While much of the laboratory equipment had been transferred to the Post Office Building, this fire resulted in a loss of field facilities. Steps were taken to secure 32 acres of land three miles west of Kamloops, and a plea issued for the construction on it of a laboratory, wherein the expanding problems of ticks and their diseases could be undertaken with greater safety to the public. It was shortly after Mr. Allen Mail's arrival, in 1937, from Montana, to take over his duties as Officer-in-Charge, that these plans went into effect, and a \$21,000 two-storey building was erected. The occupation of the building was followed by the co-operative inclusion of members of the Dominion Rangeland Department and of the Department of Pensions and National Health. The presence of the latter marked the commencement of Western Canadian studies of plague and spotted fever, and surveys of ticks and fleas for their testing were first made by members of the entomological staff. Quarantine quarters and animal housing were added for this disease work, which is still in progress under the supervision of Dr. Humphreys, in what is now the Department of National Health and Welfare.

The next phase of study in livestock insect control appeared with the advent of power spraying, and extensive tests were made to determine the optimum pressures and derris mixtures for warble control under British Columbia conditions. The presence of wartime shortages in addition necessitated comparisons being made with derris and pyrethrum substitutes. Along with these studies came those pertaining to the protection of armed forces from the attacks of biting flies, and in this connection, many tests were made to determine the effectiveness and practical value of mosquito repellents.

In 1943, Mr. Mail resigned his post at this laboratory to accept work in

the United States, leaving as his successor, J. D. Gregson. At this time chemical advances in the production of synthetic insecticides were creating a new aspect in insect control. Before long DDT and thiocyanates replaced pyrethrum fly sprays; citronella and other aromatic oils were cast aside for such superior compounds as 612, dimethyl phthalate and indalone. Gammexane was discovered to be a long-awaited acaricide and mosquito and blackfly oil larvicides were discarded for those embodying DDT. These and other discoveries shed a new light on insect control and, of course, provided much room for new research to meet our conditions. In tick control it has been necessary to discover dosages of BHC that will give maximum protection to cattle and sheep from ticks and keds, yet not prove injurious or objectionable in any way to the host or to its consumer. This has involved numerous field tests each year using artificially infested animals. These experiments have progressed from the deliberate application of overdoses on laboratory animals to cautious recommendation, and finally widely accepted use on range stock. During recent years attention has been devoted to the intriguing study of systemic insecticides, where it has been found possible to rid an animal of its external parasites by a single oral dose of material.

Mosquito control, the administration of which has long passed to the hands of some two dozen communities in British Columbia, has likewise undergone a great transformation, and since the establishment in 1949 at Kamloops of a Household and Medical Unit laboratory, its Officer-in-Charge, Mr. L. C. Curtis, has been engaged in perfecting modern control methods. These include air-spraying and fogging. The latter method is coming into popular use as an adulticide and can be generated by means of a gas engine exhaust adaptation. Since DDT is an effective biting-fly larvicide in such small amounts (one part in 20 million for blackflies), appropriate

methods for its release in water are also being studied.

Linked with the economic progress of livestock insect control has been the advance of academic knowledge. Here may be included taxonomic studies, such as have stepped up the known number of British Columbia ticks from 12 to 20 within the past 20 years. The number of flea species known to exist in the province in 1907 was six. During the next 30 years Jordan and Rothchild of the Zoological Museum, Tring, England, described many additional species and by 1936, G. J. Spencer of the University of British Columbia had built this number up to 61. G. P. Holland, now Chief of the Systematic Unit, Ottawa, in his monograph of the fleas of Canada, lists over 90 as now occurring in British Columbia. Spencer's check lists in our proceedings have similarly demonstrated our increased knowledge of pediculous and dipterous parasites.

Ecological observations made at Kamloops have shed much light on tick behaviour, have shown tick life-cycles as long as 21 years, and indicated the gradual increase and decrease of such economic tick species as *Dermacentor andersoni* and *Ixodes pacificus* as apparently affected by civilization. Such outstanding species as the southern spinose ear tick *Otobius megnini* and the relapsing fever carrier, *Ornithodoros hermsi*, have in recent years been taken a number of times during field collections. Particular attention has been paid to the life-history of the warble fly, and by the use of specially constructed girdles on infested cattle, some 400 grubs have been collected for fly studies each spring.

In retrospect, the study of insects and allied parasites affecting man and animals in British Columbia has advanced rapidly and fully. With a staff of twelve now at the Kamloops laboratory, and with the increasing co-operation of Provincial, Dominion and University departments, the future should hold even greater progress.