

THE HERITAGE LECTURE

Some Aspects of a Limited History of Northern Insect Studies

by P. W. Riegert

A few of the most intriguing and compelling questions asked of entomologists were: "What insects inhabit northern Canada? Are they present right up to the North Pole? What kind of insects are they?" Fortunately, or unfortunately, every explorer or invader of our northern lands had a ready answer: "Biting flies". Thus it seemed quite natural that most clung to the old adage: "If it aint broke, don't fix it!" If all you are going to find in the north are the mosquitoes and blackflies, why bother?

Well some people have taken the bother to find out; their actions were not always intentionally entomological but rarely were insects ignored when strangers visited our shores. The first explorers were Norsemen from Greenland in the years 1000 to 1200 who explored the high arctic opposite their homeland. Then the good ship *Discovery* carrying Bylot and Baffin roamed through the northern channels in 1616. In neither instance do we know what insects they encountered but it is certain that they were aware of the presence of biting flies.

Then came the Sir John Franklin Expedition of 1825-1827. J. Richardson, the surgeon and naturalist, collected an impressive list of insects that included 10 orders, 152 families, and 447 species. Hard on the heels of that expedition came Captain John Ross in search of the North-West Passage. This was in 1829-1832. He collected near Spence Bay, N.W.T. When Ross failed to return, having succumbed to the rigors of the arctic, Captain George Black was commissioned to go out and find him. Here again the ships' surgeon and naturalist, Richard King, collected some insects on that voyage of 1833-1835, but little is known of them. From 1850 to 1855 Captain R. Collinson also searched for the North-West Passage but got caught in the ice and was marooned near Cambridge Bay where he also did some insect collecting. The Rev. W. Kirby travelled the northern districts from York Factory to Fort Simpson in 1858-1861. While doing so he collected insects and, presumably, some souls!

At about the same time, 1859-1862, Robert Kennicott, who was employed by the Smithsonian Institute, collected insects in what was then known as British America and Russian America. While Kirby and Kennicott were in the north-west, A. S. Packard collected insect specimens in Labrador. Here Moravian missionaries had collected insects as early as the beginning of the 18th century; many of their specimens were sent to and identified by such pioneer entomologists as Fabricius and Huebner.

Then followed a concerted drive by the Geological Survey of Canada to find out more about the natural history of northern Canada. We have Robert Bell, J. B. Tyrell, and his brother J. W. Tyrell, to thank for the many insect specimens collected during the years 1884-1893. These collections were made in the many districts of north-western Canada including Fort Chipewyan, Fort Churchill, and Baker Lake. In 1899 D. T. Hanbury made a notable trek across northern Canada from Winnipeg to Great Slave Lake; reversed his route in 1901 and got to Chesterfield from whence, after wintering with the Inuit at Baker lake, he went to Coppermine in 1902 and then back to Edmonton. Insects collected on the way comprised mainly Lepidoptera and added to our meagre information concerning the distribution of butterflies in the sub-arctic.

In 1913-1918 a real effort was made to collect insects; this by the Canadian Arctic Expedition commanded by Vilhjalmur Stefansson. The success of that venture can be judged by the eleven reports compiled by C. Gordon Hewitt, then Dominion Entomologist, and others, all dealing with various orders and species of insects collected by Frits Johannsen.

A few years later, in 1921-1924, some 350 specimens of 71 species in 11 orders were collected in the arctic by the Danish 5th Thule Expedition to Arctic North America. This was the last of the big expeditions into arctic Canada of which entomology was an integral component. Many incursions were made by individuals during the 1920's and 1930's, notably those of J. D. Soper in 1927 to Baffin Island; G. M. Sutton in 1927 to Southampton Island; O. Bryant in 1929-1930 to Aklavik; I. H. Cox in 1931 to Akpatek Island in the Hudson Strait; J. M. Wordie in 1934 to eastern Baffin Island; A. V. Harper in 1934 to Churchill; W. J. Brown in 1934 to Baffin Island; and T. N. Freeman in 1937 to Great Bear Lake.

The preceding voyages, expeditions, and individual incursions into arctic Canada are by no means the exclusive ones made into the northern unknown. They merely highlight the attempts made by scientifically-inclined people to assuage their curiosity and enlighten their entomological inclinations. Further information and references to early arctic entomology may be found in Hugh Danks' excellent presentation: "Arctic Arthropods."

World War II interposed itself on the world scene and all general activity was funnelled into other channels; there was no room for expansive entomological endeavours. When hostilities in Europe and in the Pacific had ended, tensions still remained high, especially between the two super-powers, the U.S.S.R. and the U.S.A. It became evident that Canada's northern and polar regions could be of vital strategic interest. For the U.S.A. long-range air routes, whether supplying their own forces in Alaska, or giving aid to European Allies, led over Canadian territory. The Alaska Highway provided a direct umbilical ground link between Alaska and its southern sub-continental parent. United States Army and Air Force installations had sprung up at Edmonton, Churchill, Gander, and many other places; their activities co-ordinated by the respective Defence Departments. All this served to show that Canada was indeed atwart a crossroad of the world.

Rumours and speculations of possible armed conflict between the two great nations led to the establishment of new military bases in Canada's far north. Also, new defence installations such as the Distant Early Warning (DEW) line of radar stations were strung out across the top of Canada. The sub-arctic and the arctic regions had suddenly become a bee-hive of human activity.

Canada's Defence Department established a Defence Research Board in 1947; a scientific department within the ministry to tackle scientific problems. The Board was interested in chemical and biological warfare as evidenced by the establishment of a research facility at Suffield, Alberta. Because one of the foremost biological agents that a soldier would face in the north was the biting fly, the Board immediately set out to learn more about insect life in the Canadian arctic.

A. C. Jones, Secretary of the Board, sought the advice of entomologists in the Canada Department of Agriculture, including the then Dominion Entomologist, H. G. Crawford; the Co-ordinator of Research in the Division of Entomology, R. Glen; and the Head of the Veterinary-Medical Entomology Unit, C. R. Twinn. Several notable academics: A. W. A. Brown, University of Western Ontario; F. P. Ide, University of Toronto; B. Hocking, University of Alberta; A. S. West, Queen's University; and several others, were also consulted. These scientists formed the Entomological Research Panel of the Defence Research Board. They charted the course that entomology would take in northern Canada.

The program of study that was developed by the Panel was the first major organized project of entomological research in northern Canada. The inaugural design of the program in 1947 comprised three phases as follows:

- a) *The Defence Research Northern Laboratory*, directed by W. E. Beckel, whose mandate was to develop successful rearing techniques for northern mosquitoes and to study the behaviour and systematics of certain *Aedes* species.
- b) *The Northern Biting Fly Project*, directed by C. R. Twinn; a program of research comprising studies of the life histories, habits, ecology, and control of biting flies.
- c) *The Northern Insect Survey*, directed by T. N. Freeman; a project that was to investigate the systematics, distribution, relative abundance and ecology of biting flies and other insects.

Permit me to elaborate further on the two latter aspects of this, the first comprehensive research program ever conceived and conducted by entomologists to study arctic insects.

The Northern Biting Fly Project

This was the principal project of the Defence Research Board. Because the United States Department of Defence had made significant contributions to North American defence, and had established military bases and early-warning radar units across the top of Alaska and Canada, its continued involvement in northern insect research was encouraged. Consequently entomological action was planned as a joint Northern Biting Fly Project involving the Canadian Division of Entomology on behalf of the Defence Research Board, and the United States Bureau of Entomology and Plant Quarantine on behalf of the U.S. Army Committee for Insect and Rodent Control, Office of the Surgeon General, United States Army.

The centre of operations was at Churchill, Manitoba. Here both the Canadian and American Defence Departments had military bases, whose facilities were made available to researchers. Personnel were housed in military barracks and some huts were made available and served as laboratories. Military equipment was also at their disposal, such as tracked vehicles (weasels), jeeps, and aircraft. The latter came complete with an operational crew.

For several years all personnel of the Project had to wear military uniforms and were identified by special shoulder flashes. They were given officer status, used officer facilities, and adhered to military rules regarding officers.

The American entomologists from the U.S.D.A. included W. C. McDuffie, H. F. Cross, C. N. Hussman, and J. B. Goldsmith. They participated for two years only, 1947 and 1948; thereafter the Project resumed as a solely Canadian effort. The Canadian entomologists included several specialists: A. W. A. Brown, who gave direction in aircraft application of



Northern biting fly project: combined Can. & U.S. teams at Ft. Churchill in — July 1947. Front row: R. W. Fisher, W. C. McDuffie, C. H. Twinn. Standing: Brian Hocking, J. B. Goldsmith, H. F. Cross, J. T. Sharp and C. Hussman CDA

chemicals for fly control; Brian Hocking, who was interested in blackflies and gave leadership to studies of their biology and the testing of larvicides; F. P. Ide, who supervised studies of weather and climate and the other meteorological factors that affect biting flies; and W. O. Haufe, who investigated the behaviour of biting insects, especially as it related to changing environmental conditions, and then attempted to forecast when their activity would be at a maximum.

Churchill was an ideal site for such investigations because it straddled the boreal and tundra zones where the lakes, bogs, swamp, muskeg, and streams offered ideal breeding grounds for incredible numbers of mosquitoes, blackflies, tabanids, and midges. Protective veils were the order of dress to prevent exsanguination and allergenic misery from the bites of clouds of mosquitoes that were constantly present. Even at midnight it was a relief to have an open fire and a smudge to ward off the stinging furies. Animals as well as man had to be protected, if not with veils and protective raiment, then with chemical protectants.

One of the experimental sites, with its temporary campsite, was located some 10 miles south of Churchill on Warkworth Creek. This was reached by riding a railway handcar or by "weasel". Alex Maltman, an ex-C.N.R. employee, was the camp boss; his wife was the cook. He delighted in telling the tenderfoot students about hotels and casinos located just off the track along a few of the side creeks. Gullible seasonal assistants soon found out that such places were sheer fantasy after they slid, stumbled, and slopped through swamp and muskeg while trying to find these northern "nightclubs", and suffered the relentless attacks of biting flies. At other times Maltman would yell at the students as they were travelling down the railway track on the speeder, to get off the track because the train was coming. To verify this he would point to the smoke in the distance, a sure sign of rail occupancy by a coal-burning steam engine that appeared to be bearing down on them. All hands would quickly remove the hand car from the tracks; they would wait patiently for the train to arrive and pass. Nothing came by. It was then the naive summer help realized that they had been duped; the "smoke" was an illusion of clouds of mosquitoes of such magnitude and density that it resembled actual smoke. Such densities of mosquitoes were commonplace at Churchill; truly an ideal place to study their biology.

Although Churchill was the centre of operations, the work was expanded in 1949 to include R.C.A.F. establishments in the North-West Air Command — whose headquarters were in Whitehorse, Yukon — at Fort St. John, Fort Nelson, Watson Lake, and Whitehorse. The Air Transport Command base at Goose Bay, Labrador, was also included in 1949 as a site of operations and continued to serve as an eastern headquarters until the Project terminated in 1955.



Northern biting fly project personnel: Churchill, 1951. Standing (L-R): Larry Burgess, Alex Maltman, Mrs. Maltman, Neil McLean, Ken Van Skyde, Herb Teskey, Wib Haufe, Bob Dunbar. Seated (L-R): Fred Ide, Brian Hoebing, Gordon Edmunds, Lou Pickering. Missing: Harold Welch, Don Herne.

The Division of Entomology, Canada Department of Agriculture had as many as 13 workers in the field in any one year, while the Defence Research Board employed as many as nine. Most of these workers were students, both undergraduates and post-graduate, available for summer employment only. Later some of them, like D. G. Peterson, W. O. Haufe, L. Burgess, and J. A. Shemanchuk became permanent members of the Division of Entomology. The Defence Research Board paid all expenses incurred by the Canadian group including the salaries of the summer students. Furthermore, grants to the Universities for entomological research in the north totalled more than \$250,000 over a 10-year period.

What had been accomplished? Entomologists had obtained an almost complete picture of the species complex of biting flies, their life histories and bionomics. Population densities were too high to be controlled effectively except in small areas for limited periods of time. Aerial spraying or ground treatments brought relief from mosquitoes for several weeks, from blackflies for a week, and from tabanids for only a few days. One example of good area control may be cited.

A circular area of about 200 square miles around Goose Bay airport was surveyed for blackfly breeding sites. Of the 163 streams and rivers in the area, 77 were treated with DDT from a helicopter (U.S.A.F.), 42 from the ground, seven from boats, and the Hamilton River was treated from a Dakota (C-47) aircraft (R.C.A.F.). It was a most arduous under-taking; more than 400 man hours being used for treatment alone. The work did point up the fact that blackflies could be eliminated for a season from the centre of a large treated area. Infiltration from outside the treated area slowly brought fresh pests; some species could readily migrate two miles. For those who did the work, who stumbled through willow and black spruce swamps, crawled through near-impenetrable alder thickets, or fell, slid, and splashed down rock-strewn gorges, clay banks, and bogs, it may have seemed a waste of time and a threat to life. However, for the armed forces at Goose Bay, the workers and travellers at the International Airport, and the crews of the iron-ore processors, relief from attack from the winged scourge was a most welcome experience.

To live in the arctic and subarctic, man had to rely on physical protective devices such as clothing and repellents. Of the more than 30 chemicals tested, either by direct application to exposed flesh, or by impregnating clothing, the old reliables such as DEET were still the best. The greatest problem to be overcome by many who tried to live in the north was not the physical presence of, and actual contact made by the biting flies. What was hardest to overcome was the psychological effect; the mere sight and sound of flying, biting flies. The presence of a "cloud" of insects and the high-pitched whine of their wing beat, would cause man to stop, to crouch as if in fear, to slap wildly, to squirm, and finally to run in mindless

confusion. The fact that this happened quite frequently indicated that in order to live with the insects man had to control himself, not his adversary. To have learned and documented this aspect of arctic entomology was, perhaps, of greater significance than all others that arose from studies of the Northern Biting Fly Project.

The Northern Insect Survey

As with the biting fly project the Defence Research Board was willing to participate in a survey of Canada's north, just to find out what insects were present. Most of the taxonomic and systematic work up to this time, had been performed by the Systematics Unit of the federal Department of Agriculture headed by J. H. McDunnough. He had retired in 1946 and the Unit leadership was undecided in 1947. The staff: W. J. Brown, T. N. Freeman, A. R. Brooks, O. Peck, G. E. Shewell, and S. Walley, were doing their best to carry on while the "upper management team" of K. W. Neatby and R. Glen went about finding a new Unit Head.

Tom Freeman was an experienced collector of insects; he was also partial to northern latitudes. He was willing to direct the Northern Insect Survey as proposed by the Defence Research Board and the Division of Entomology. To get the feel of it he flew into Churchill with the rest of the biting fly personnel in 1947 and collected in that vicinity for two months. Then final plans were made for the "big push". This joint program of research involved several administrative units: the Defence Research Board financed the Project, the Division of Entomology supplied the manpower, and the Armed Forces took care of transportation and shelter. This well-defined division of responsibility was an administrative jewel in its conception. Alas, as with family planning and motherhood, conception may be stimulating and mutually climactic, but delivery is usually a sobering, perhaps frenzied experience!

Survey parties — usually two men per party — were sent out into areas that were representative of major life zones, viz. the northern coniferous forest, the northern transition zone, and the barren lands or arctic tundra. This encompassed an area stretching from Nome, Alaska, to western Greenland, and north to Alert on Ellesmere Island some 470 miles from the North Pole. In the ensuing 14 years, 1948-1961, seventy-three field parties radiated out from Ottawa to collect insects over this huge territory.

They were young men, students at Canadian Universities. They not only had to be physically capable of withstanding the rigors of climate and the austerity of the terrain, but, hopefully, also capable of bearing the stress of isolation. The latter was of concern to Freeman and on occasion it became a nightmarish reality. However, despite a few harried exits from the north by home-sick youths, no serious accidents or illnesses occurred to mar the success of the program. It was probably due, in part, to the excellent briefings that were given to all collectors, to the painstaking care that Freeman took in compiling a "Manual of Arctic Survival and Useful Eskimo Words", and an "Instructive Guide for Northern Insect Survey Parties", that the program ran so smoothly and well.



T. N. Freeman, Ent. Res. Institute, Ottawa, 29 Dec. 1969.

The Defence Research Board withdrew its funding in 1962. The Entomology Research Institute continued the overall program as its own research endeavour entitled "Studies of Arctic insects". Most of this continued effort was conducted on Ellesmere Island at Camp Hazen on Hazen Lake in the high arctic (81° 49' N. lat., 71° 18' W. long.). Work parties were sent there until 1966; also to Alaska, Axel Heiberg Island, Melville Island, Greenland, Yellowknife, and Bay Chimo. The men involved in the operation were biologists; many remained to foster entomology in Canada, much of it of a systematic nature. Permit me to mention a few: David Hardwick, Dick Vockeroth, Guy Shewell, Bill Mason, Colin Curtiss, Ed LeRoux, Paul Bruggemann, Jack Martin, Antony Downes, Al Downe, Jim Chilcott, George Ball, Bruce Heming, Don Oliver, and 75 others who were just as worthy of mention.

These were the people who found 10,000 species of insects living south of the tree line in the transition and boreal forest life zones. They found only 1000 species in the tundra; still a surprising number in that often hostile land. Equally surprising was the discovery of species that occurred only in the barren lands and not further south. These were the men who logged thousands of hours of work to make known details of insect biologies, life histories, and distribution. This information is available in hundreds of scientific articles, in scholarly reports, and in scientific books. The insect specimens that were collected increased the holdings of the Canadian National Collection by some 100,000 to 150,000 specimens annually. Pinned specimens may near the two million mark at the present time. To the men of the Survey, to those who initiated the work, who planned it, and supervised it, we, as entomologists and Canadians owe a debt of gratitude and thanks for the scientific enlightenment they provided. Furthermore, as a Society and as Canadians we can be doubly proud that we have accomplished a herculean task of collecting and cataloging insects in the most forbidding terrain on earth, that of the Arctic Archipelago; and Canadians did it!

Each of the men who participated in the Survey has his own personal adventures to tell, viz. J. Brian Hartley confining his collecting activities to the west bank of a stream near Naknek, Alaska, so as not to encroach upon, or raise the ire of a big grizzly bear that was fishing on the east bank. Or there is Frank McAlpine frozen in his tracks when nearing the summit of a hill near Hazen Camp because a lone, huge, male muskox barred his way. Then there is Paul Bruggemann witnessing the "pirouetting dance of the arctic hare" when the latter is goaded into action by the blood hungry-mosquitoes seeking a meal from its ears.

Perhaps I can pay tribute to and acknowledge the endeavours, privations, and life's little touches, of all those who participated in the Survey, by adding these words that the "Bard of the Arctic", Robert Service, might understand and appreciate:

A bunch of the boys were whooping it up
In the malamute Saloon;
There was Tom, there was Jack, Bill and Antony too,
They'd been there since yesterday noon.
Their nets they had stashed, forsaken their tasks,
They longed for the news from the south;
Here's the tale they were told, for I know it came straight
And direct from the "horses mouth".
There are strange things done in the midnight sun
Caused by visions of men who are bold;
The arctic trails have their secret tales
That makes your blood run cold.
The Northern Lights have seen queer sights,
But the strangest they ever did see;
Was that night on the snow, at forty below,
When two men met their destiny
Tom Freeman decreed and George Holland agreed
That Rampart House was the next site;
To collect the fleas and the myriad of bees
From the permafrost frozen up tight,
The plane they were in had stalled in the thin
And wintery air on the lake;
So they trudged the three miles with nary a smile
Towing scanty supplies in their wake.
The house that they found was solid and sound
It was built quite sturdy and sleek;
They were safe from the cold but their food — I am told,
Would run out in the course of a week.

"However, a boat from Dawson will float
To bring the supplies that you seek;
So just hang tight in there and do not despair
For a month you'll be "just up the creek".

So Martin and Loan made the house their new home,
Ate wild garlic and fished through the ice;
And the rice that they found in the house, was quite sound
But was liberally sprinkled by mice!
They survived their sojourn, so let us not mourn
Nor lament their ordeal in the north;
There were ninety of them, all brave and young men
Who dared to step out and go forth.

The Insect Survey wasn't done in a day,
But lasted twelve years — even more;
And the insects they found on that permafrost ground
Set a record that's ne'er set before.
Mosquitoes were bold — and so I am told,
They would sap all your blood in a trice;
So commend what was done in the midnight sun,
But it's hell to eat mouse-peppered rice!

(With apologies to, and help from Robert Service)