WORLD WIDE MOSQUITO CONTROL

FOUR DAYS IN THE MUSKEG

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In July 1943 I had an opportunity to make a few brief observations on several phases of mosquito ecology in northern Canada. At the request of the Quartermaster General and the Surgean General of the United States Army, Dr. Terris Moore and I were making some practical field tests on mosquito repellents and other field equipment. Two officers and twelve enlisted men were detailed from one of the northern bases to assist us. We made a four-day march into typical muskeg country under conditions almost identical to those of a forced march. We followed no trails; we carried our food, shelter, and all equipment in packs strapped to our backs; and it was up to us to protect ourselves by any means we could use against the myriads of mosquitoes which were constantly present. Our special equipment included several kinds of head nets, clothing, footgear, sleeping bags, pup tents, and insect repellents.

The first day the constant swarm of mosquitoes about our ears was not too annoying, but by the end of the second day their ever-present proximity began to wear on all members of the party. The hours of sunlight were long, since the sun rose between two and three o'clock in the morning and did not set until about eleven o'clock at night, and even at dusk, when the temperature was high enough, mosquitoes were abroad and in search of blood meals.

Some of our sleeping bags were designed to give protection from mos-

Near the Arctic Circle **Aedes nigripes** is the only species found in water which seldom reaches 40°F. This willow, our guide informed us, is one of the tallest for several hundred miles around.

quitoes without the aid of a tent. These bags were satisfactory as far as they went—at least the mosquitoes could not bite through the materials—but it was difficult to get in and out of the bag without numerous bites and, likewise, it was difficult to allow an opening that would admit sufficient air and yet exclude the mosquitoes.

It was really a relief to each one of us when his turn came to spend a night within the confines of a pup tent. Even then, although the tent was equipped with a door of mosquito netting and a canvas door, dozens of mosquitoes slipped through when we crawled inside.

I had with me a couple of bombs of aerosol, and each night released a small amount of it in the tents after the occupants had completed their sleeping arrangements. As I made my final round one evening, I estimated rather closely 1900 mosquitoes roosting on one of the tents. The following morning I counted in the ventilator 126 dead mosquitoes, which had been carried inside by the two occupants. We were all grateful for these aerosol bombs, for they contributed largely to our comfort during the night spent in a tent.

We prepared our meals in the open, using equipment that we wanted to test under field conditions. The mosquitoes were thick at all times, even in considerable smoke, and all our meals were well seasoned with these insects.

The country through which we traveled was heavily overgrown with dwarf willows, spruce, and larch, and wet, boggy moss covered the ground. Although the water was not very deep, our feet were wet practically all the time. Our march was further complicated by low temperatures at night and high temperatures during the day.

With some difficulty we found small patches of ground that were high and dry enough to make camp. Drinking water, chlorinated, was obtained from the pools nearby, which only a week or two before were seething with **Aedes nearcticus** and **A. cataphylla.** The predominating vegetation was black spruce, larch, and willow, and in many places it was almost impenetrable.

In addition to arduous travel, we found it somewhat hard to locate a spot of ground high and dry enough in which to make camp. There were no running streams of water which we felt were safe to drink, and therefore all water supplies had to be chlorinated.

The mosquitoes observed close to the Arctic Circle were all of a single species, **Aedes nigripes.** A few hundred miles south these gave way to **A. cataphylla** and **A. nearcticus,** and still farther south they were succeeded by **A. flavescens** and **A. vexans,** which occurred to the American border. **A. cinereus, A. dorsalis, A. spencerii,** and **A. excrucians** were also present in the last association, but they were not taken in large numbers.

Some idea of the tremendous area over which these mosquitoes breed in prodigious numbers can be gained by referring to a map of northern Canada. The muskeg and tundra extends three or four thousand miles east and west and at least a thousand miles north and south. I believe I saw a representative section of that vast, unpopulated region, and over practically every square mile of it were large and small pools of water fed from below by melting ice.

Aedes vexans and **A. flavescens** were first seen in early June, **A. nearcticus** was abroad the last week in June, whereas **A. cataphylla** did not put in an appearance until July. The first adult **A. nigripes** was seen on July 5 within a hundred miles of the Arctic Circle. This species was not so abundant as the others, and I saw no other species associated with it.

I cannot imagine how the tremendous hordes of mosquitoes were able to obtain blood meals in these trackless wastes, for in much of the area visited there was practically no sign of animal life. Before the mosquito season the herds of caribou migrate northward beyond the range of all but **A. nigripes,** although a few lag behind. There are a few birds and indications of foxes, but scarcely any other animals. The great numbers of mosquitoes and the

A rocky cliff on the western shore of Hudson Bay. Beautiful pools of clear seep and rain water held by the rocks produce **Aedes cataphylla** in late June or early July.

apparent lack of suitable food made me wonder if they can lay fertile eggs without blood meals.

Most of the observations recorded were made close to the northern limits of tree growth, where **Aedes nearcticus** and **A. cataphylla** were numerous. Plant specimens collected from this region were determined as follows by S. F. Blake, senior botanist in the United States Department of Agriculture: Willow, **Salix** sp.; Labrador tea, **Ledium groenlandicum**; sedge, **Carex** sp.; lousewort, **Pedicularis** sp.; Alpine bearberry, **Arctostaphylos rubra**; buffaloberry, **Shepherdia canadensis**; crowberry, **Empetrum nigrum**; mountain avens, **Dryas integrifolia**; reindeermoss, **Cladonia rangiferina** group; sweet coltsfoot, **Petasites sagittata**; whortleberry, **Vaccinium uliginosum**; black spruce, **Picea mariana**; birch, **Betula glandulosa**; and larch, **Larix laricina.**

At the end of the trip the group voted unanimously in favor of the repellents over head nets and heavy clothing as a means of protection against the mosquitoes encountered in muskeg country.

MALARIA

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THE DISEASE

Malaria is a disease in which the fever rises periodically. It was recognized many centuries ago and because it occurred most frequently among people living in low-lying areas covered with swamps and marshes, it was thought to be due to bad air. This explains the derivation of the name. Malaria means literally "bad air."

It was not until 1880 that the real cause of the disease was discovered by a French physician (Laveran) to be a single-celled parasite (protozoan) which attacks and lives inside red blood corpuscles where it divides into

During a 4-day hike in the muskeg the men were constantly surrounded by swarms of 500 to 1500 mosquitoes. Head nets, gloves, and heavy clothing were indispensable when the best mosquito repellents were not used.