

## The Mosquitoes of Churchill

One of the first types of wildlife you encounter during a summertime visit to Churchill are swarms of biting flies as they hone in on you in search of a blood meal to develop their eggs. Black flies, horse flies, and mosquitoes are present in large numbers from late June to early August, making outdoor activities difficult without protection from the incessant hordes. There are 10 genera and 81 species of mosquitoes known from Canada, of which 26 species from 3 genera have been recorded from the Churchill region. The most common mosquitoes are *Aedes* species whose eggs hatch in early spring when the snow begins to melt. Innumerable shallow pools of water form in boreal forest and subarctic tundra habitats and the combination of permafrost and poor drainage with warm summers and abundant algal growth provides almost unlimited larval habitats. This allows mosquitoes to attain the extraordinarily high populations found in Churchill.



Figure 1. A tundra meadow with numerous shallow pools of water that provide potential mosquito larvae habitat.



Figure 2. Large pools of water form between heaved bedrock (created by frost action) that lie in contact with the permafrost, remaining cold into mid-July.

## Description

Adult mosquitoes are slender, fragile insects with long legs and wings that are densely covered in scales. They are most easily recognized by their long proboscis, used by both males and females to feed on nectar and by females to obtain a blood meal from their vertebrate hosts. Adults are identified by the colour, location, and type of scales and hairs that cover most of their bodies. Males generally have long palpi and plumose antennae. Females have short palpi and their antennae have shorter and fewer hairs.



Figure 3. Female *Aedes campestris*



Figure 4. Male *Aedes pisonipis*

## Life Cycle

Mosquitoes pass through seven stages during their development: egg, four larval instars, pupa and adult. In Churchill, most species overwinter in the egg stage and have only one generation per year. The eggs are laid in locations that flood when the snow melts in spring, which stimulates the eggs to hatch. Larvae develop in the resulting pools of water and after 2-3 weeks, depending on the temperature and species, they change into the final aquatic stage, the pupa. During this stage, the mosquito undergoes metamorphosis and changes into its more familiar adult form. Adult mosquitoes emerge into the air and mating usually occurs within the first few days of adult life. Mated females of most species then seek a blood meal to initiate and develop a batch of eggs. The eggs must be subjected to several weeks of cold temperatures in order to hatch and thus don't hatch until the following year, after the cold winter has passed.

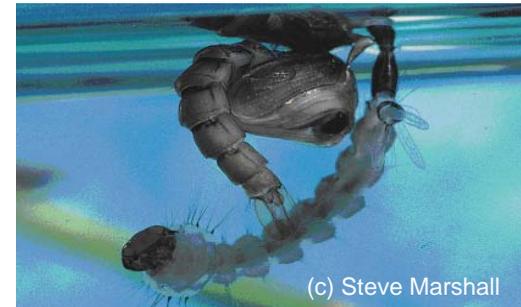


Figure 5. *Aedes* larva and pupa



Figure 6. Adult *Aedes* mosquito emerging from pupa.

## Blood-feeding vs. Autogeny

The females of most mosquito species require a blood meal to obtain the nutrients needed for egg development. However, the females of some species do not share this requirement and can develop their eggs without a blood meal (called autogeny). *Aedes rempeli*, present in Churchill, is one such species. *Ae. rempeli* females develop their eggs using an extensive nutrient reserve in the form of larval abdominal musculature. Species that do not take blood meals are considered obligately autogenous. There are some species, including *Ae. impiger* and *Ae. nigripes*, that usually take blood meals for egg development but are able to develop eggs without one if necessary (called facultative autogeny). It has been speculated that some species can maintain their populations in this manner when weather conditions are poor hosts too hard to find.

## Orchid Pollinators

When you think of flowers and pollination, the first insects that come to mind are bees. However, other types of insects can pollinate flowers, including dipteran flies such as mosquitoes. In Churchill, mosquitoes are commonly collected bearing the pollinia of the Northern Lady's Slipper orchid, *Habenaria obtusata*. The pollinium consists of a mass of granular pollen packets connected to a sticky base by a long stalk. These are located just above the openings of the nectaries. When a mosquito inserts its proboscis to obtain nectar, the sticky pad at the base of the pollinium adheres to its eye. Each time the mosquito visits another orchid flower, a layer of pollen is shed, fertilizing the flower and initiating seed development. The pollinia do not inhibit the mosquito from blood feeding and the highest number of pollinia recorded on a single mosquito is seven.



Figure 7. The Northern Lady's Slipper Orchid, *Habenaria obtusata*



Figure 8. Female *Aedes* mosquito with a pollinium stuck to its eye.



Figure 9. Mosquitoes prefer dark-coloured clothing and can be seen clustering on the left shoulder of the man in the dark blue sweater.

## Fight the Bite

If you're planning to be in the Churchill area during peak mosquito season, be prepared for the psychological menace that results from the constant attack of mosquitoes, black flies, horse and deer flies. It is advisable to wear light-coloured long-sleeved shirts tucked into pants, long pants tucked into socks, and a pair of good hiking shoes. While insect repellents with high concentrations of DEET help to prevent bites, only head nets or bug jackets will prevent them from flying into your nose and mouth. When populations reach peak abundances, their persistence can be astounding, biting through both clothes and DEET to obtain the blood meal they need in order to reproduce. There are currently no mosquito-borne diseases in the Churchill area. However, increasing temperatures related to global climate change may allow vector species to expand their ranges northward to Churchill in the future.

## Research in Churchill

During the 1940s and 50s, a government space program was established outside of the town of Churchill. The vast numbers of biting insects no doubt spurred the biting fly surveys and control studies that followed soon thereafter. Those buildings, including an abandoned rocket launch, are now the location of the Churchill Northern Studies Centre (CNSC). The CNSC is an arctic education and research center that facilitates a wide variety of undergraduate, graduate, and public research and teaching opportunities. Today, Arctic and Boreal Entomology and Ecology field courses are still taught through the CNSC and there has been renewed interest in the biting flies of Churchill. Scientists from around the world are collaborating on the Barcoding of Life project - the development of a readily accessible library of species-specific DNA sequences to allow quick and reliable species identification. One project involves discovering these species-specific sequences for every living species in Churchill, including the biting flies. The vast amount of data that was collected on biting flies during the initial studies in Churchill provides an excellent opportunity to study the effect of climate change by comparing it to biting fly data collected now and in the future.

## References

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Figure 10. The Churchill Northern Studies Centre



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Cover Figure. Female *Aedes* mosquitoes on Small Round-Leaved Orchid (*Amerorchis rotundifolia*).