

The Merlin Trust

The Flora and Habitats of Sub-Arctic Canada

By Garry Mentanko

In July of 2015, I was fortunate enough to be able to travel to the Hudson Bay Lowlands of Canada after receiving a grant from the Merlin Trust. For myself, the aim of this journey was to build a better understanding of sub-arctic plants, in particular, their various adaptation methods in regards to climate, landform, and soil conditions. It was also a chance to explore an incredibly remote and dynamic region which always intrigued me since I was young.



OUTCROP RIDGES OF QUARTZITE

The journey starts in Winnipeg, Manitoba, nearly the centre of North America. From there it is a 1000 km train ride north to shores of the Hudson Bay. Norther Manitoba is extremely undeveloped with only 88,000 people living in an area the size of France with few roads and none to the final destination of Churchill. The landscape moves from vast agricultural fields of rapeseed, mustard, and wheat to deep forested regions occasionally interspersed

with lakes and the exposed igneous rock of the Canadian Shield. Birch, poplar and various pine species make up the beginning stages of the boreal forest. These however, thin out nearing the end of the journey with only three type of trees present in Churchill: larch (*Tamarix laricin*), black spruce (*Picea mariana*) and stunted specimens of white spruce (*Picea glauca*).

The arrival into Churchill reveals a harsh but beautiful view of the land undulating away from the sea. The coastline here has been rising since the melting of the ice sheet some 8000 years ago. This is due to an effect called isostatic rebound, the elevation of the

continent that was previously compressed under the weight of the glaciers. This rate continues today, at approximately 1 meter every century. As the slope of the seafloor is quite shallow, new coastal beaches are created constantly with up to ten fossil beaches existing in a single kilometre. This pattern is repeated over 100km inland, shadowing the modern Hudson coastline.



GRAVEL RIDGES

Churchill and its surroundings are situated at a unique meeting point of three vastly different biomes: boreal forest, tundra and coastal communities. As beaches rise to meet bog and fresh and salt water mix at different consistencies, a variety of different ecosystems straddle one another, each housing a unique community of plants and animals. Migrating geese and other birds from across North America



EXPOSED OUTCROPS

come here in the summer time to feed on the vast grass marshes as do polar bears who move southward after the Hudson Bay ice melts. The caribou travel through this area in the thousands each year as do arctic foxes, hares and wolves, each in a tangled relationship of predator and prey. Ponds, lakes and the Hudson itself are home to an abundance of aquatic life including beluga whale which congregate at the mouth of the Churchill River each spring after thousands of kilometres of travel.

The shifting climatic conditions of the region play a large role in the development of the local ecology. The massive Hudson Bay coastline draws Arctic air southward, creating a much lower tree line than elsewhere in Canada. Indeed, 80km north of Churchill is entirely treeless. Shifts in wind off the Hudson can cause temperatures to plummet in the summer from 25°C to just above freezing in only a couple hours. These conditions allow many true arctic species to reach their southern most range here in Churchill such as *Dryas*

integrifolia and *Pyrola grandiflora*. High wind velocity coupled with blowing ice crystals in summer and salt/sand in summer causes the twisted “krummholz” spruce trees which are famous in this region. The lack of precipitation throughout the region makes it classified as a semi-arid environment.



“KRUMMHOLZ” SPRUCE TREES

Another important factor in the growing conditions around Churchill is the permafrost which persists throughout the summer and sits as close to the surface as 40cm. The development of bogs is due organic matter’s insulation properties around the frozen soil which prevents proper water drainage. Plants have adapted with shallow rooting tendencies to avoid damage from colder soil pockets. Despite the fact that Churchill has over six months of snowless conditions, it has only 81 frost-free days a year and these are never consecutive. Gardening for food or ornamentals by Churchill’s residents is almost non-existent.

This northern journey was organised by the Churchill Northern Studies Centre, a rural state-of-the-art scientific base which facilitates researchers in a variety of fields: ecology, climate modelling, atmospheric study, and astronomy. Under the tutelage of Karen Johnson, an American botanist who has been coming to this region for the last 40 years, we visited various habitats such as outcrop ridges, bogs, riverbeds, exposed outcrops and coastlines in search of the unique plants of this region.

The exposed outcrops along the Hudson Bay are a particularly good place to see the lingering effects of the last ice age. Grey, scarred quartzite rock sits proudly along the shore, exposed to the frigid winds. These rocks are among the oldest on Earth dating back an unbelievable 3 billion years. Traces of more recent sedimentary rock, layered from the sea floor some 100,000 years ago still nestle in the crevices and wounds which the last ice sheet tore. The peak has no vegetation but moving only feet below to sheltered aspects, the hardiest of groups begin to emerge. The White Mountain Avens, *Dryas integrifolia* is a common arctic-alpine-montane plant mostly growing near the sea as a mat forming subshrub. Swaths of swaying white and yellow flower heads are common wherever alkaline soils are present

and along with several species of grass, *Dryas* is an important stabiliser of beaches. Interestingly, this plant has a petal adaptation which resemble suntan mirrors: each white petal reflecting light into the centre. This provides a warm resting spot for pollinating insects sheltering from cold winds.



DRYAS INTEGRIFOLIA

One of several arctic louseworts is also present here, the yellow petalled *Pedicularis lapponica* as well as the tough Wintergreen, *Pyrola grandiflora*. The later is a leathery leafed perennial that has a circumpolar range having spread from northern Russia in both

direction, east via the Bering Strait as well as westward through Scandinavia, Iceland and Greenland. Reaching up to 20cm in height it normally grow underneath the stunted willows which provide it with a small microclimate. Lower on this rocky setting, one finds two types of *Saxifragas* nestled in quartzite cracks, the uncommon *S. caespitosa* and the Prickly Saxifraga, *S. tricuspidata*. The leaves from the later were used by the First Nations people to toughen up the foot pads of husky dogs by placing them in the sleeping quarters. Another plant growing from 2 to 25cm, which is easily mistaken for a *Saxifraga*, is the Longstalked Chickweed, *Stellaria longipes*, with it distinctive red anthers. Betu



STELLARIA LONGIPES



SAXIFRAGA TRICUSPIDATA



**RHODODENDRON LAPPONICUM,
R. SUBARCTICUM & BETULA GLANDULOSA**



OUTCROP PEAK WITH THE HUDSON BAY IN DISTANCE

Moving lower on the ridge, an acidic vegetation begins to build up with broad swaths of edible cranberry (*Vaccinium vitis-idaea*) and crowberry (*Empetrum nigrum*) mixed with matted *Cladonia rangiferina*, a white lichen which is a major food source for migrating



caribou. Here we start to find what appear to be vegetation contradictions, acidic plants growing alongside calcareous plants such as two of the most showy *Rhododendrons* of the north. The bright purple *R. lapponicum* grows in small alkaline patches of broken sandstone while the pure white *R. subarcticum*

CROWBERRY AND REINDEER LICHEN

nettles in shallow hummocks of peaty soil. These plants are intermixed throughout the region along with tiny shrub birch (*Betula glandulosa*), Snow Willow (*Salix reticulata*) and the creeping Alpine Bearberry, *Arctostaphylos alpina*.

Only a kilometre walk from the outcrop ridges, declining in elevation toward the sea shore, the landform changes dramatically. Debris from the Hudson Bay washes up on a course sandy beach where only two type of plants are capable of enduring the twice daily tides of salt water, *Mertensia maritima* and *Hockenya peploides*. Both are low spreading circumpolar plants with rubbery flesh which resembles the flavour of oysters if eaten. As the beaches build up layers of inward moving sand, ridges begin to form which are stabilised by Sea Lime Grass (*Elymus arenarius*) and the aforementioned Mountain Avens.



HOCKENYA PEPLOIDES

The lee side of the ridge is a mix of several dozen grass and rush species alongside several unique subarctic vegetation. The only endemic plant in these parts is a variation of flax, *Linum lewisii* which at this latitude has lost its blue colouring appearing a shocking white. *Bartsia alpina*, a tufted, royal purple perennial from the Scrophulariaceae family, sits in interspersed drifts here. If not for the difficulty in growing this semi-parasitic species, it would make for a charming rockery plant. One of the most abundant plants around



BARTSIA ALPINA

Churchill, Sweet Vetch, makes its first appearance here. *Hedysarum mackenzii* is a striking leguminous plant growing up to 35cm in most habitats, from rocky slopes and sandy areas to river and lake sides. A bright show of purple drifts, often highlighted by the white of *Dryas*, is apparent each July. In damp dune hollows behind the stabilised ridges, the furry and insulated Arctic Ragwort, *Senecio congestus* sits alongside flowing cotton billows of *Petasites sagittatus*, the Arrow Leafed Colt's-Foot. This plant is rather uncommon at

Churchill but where found it sways in large colonies with an overpoweringly sweet smell.

Several kilometres away, climbing past older sand ridges, we encounter another collection of quartzite rock but in a region which has had a



HEDYSARUM MACKENZII

significant build up of vegetation over time. The soil around the outcrop ridges is somewhat more acidic than previously encountered. In several hundred years, this buildup of organic material combined with the permafrost present will cause this region to turn into a bog.

Orchis rotundifolia, is a perennial orchid growing 4 - 25cm in height with a single distinctive round leaf at the stem base and purple speckles on its otherwise white flower. It is abundant in moist peaty areas and is pollinated by mosquitos which swarm the damp regions around Churchill. *Dryas*, *Hedysarum*, and *Rhododendron lapponicum* are all present again however what looks like the *Rhododendron subarcticum* is actually another species. *R. groenlandicum* grows to be more than 50cm taller than *R. subarcticum*, has a



larger head of flowers and is found on wetter, more acidic inland sites. One of the smallest flowers from this region, *Androsace septentrionalis*, with its white basal rosettes, was spotted amongst a sandy patch, tucked away from the shuddering windfalls.

ORCHIS ROTUNDIFOLIA

In the outcrop ridges we also encounter a couple plants which are present in Ireland however in vastly different concentrations. Bog Rosemary, *Andromeda polifolia* displays its candy pink bells shaped flowers, growing in damp conditions abundantly. A curious member of the *Rubus* genus is an especially interesting encounter. *Rubus chaemaemorus*, the Cloudberry, is one of the earliest berries to ripen, turning from red to an amber yellow in mid-summer. Like most plants at this latitude, it is a low growing shrub, not reaching more than 40cm. Though we only encountered several in our journey, around Churchill it is a rather common plant and has been used by the Inuit people for generations. In Ireland however, proclamations on the extinction of *R. chaemaemorus* have occurred at least a

couple of times and now only a single clonal bush remains on a slope on Mullaghclogha in County Tyrone.

The following days saw a significant turn in the weather with high winds and temperatures plummeting to 3 degrees Celsius. Much of the bog areas along the Twin Falls Road are sheltered by stunted spruce trees, making the trekking somewhat easier to tolerate. Here ponds of stagnant water sit next to peat mounds caused by frost heave, the pressurised swelling of soil in freezing conditions. Here, on July 5th nonetheless, we glimpsed the last vestige of winter with a single patch of snow surrounded by a vast show of tiny pink flowers. *Kalimia procumbens*, the Arctic Azalea, emerge just after snowmelt on mossy hummocks, growing no higher than 30cm.



KALIMIA PROCUMBENS

The carnivorous *Pinguicula vulgaris* is abundant here with its greasy leaf pads trapping dozens of small flies and mosquitos on its surface. Another member of this genus, *P. villosa* was also found on a patch of sphagnum moss. This rare plant resembles *P. vulgaris* greatly, however is much smaller, with the flower only measuring up to 9mm and achieving a height of around 20mm. These are intermingled with patches of bearberry, reindeer

lichen, clubmoss and snow willow, the stark white Bog Asphodel, *Tofieldia pusilla* is a welcome site on such a dark and dank day.

Two more orchids were seen, each protected beneath patches of shrub willow.

Corallorhiza trifida is capable of photosynthesis however it derives most of its energy from

living on decayed wood and dead material through mycorrhizal relationships.

Plantanthera obtusata, the Small Northern Bog Orchid, grows on mats of moss and is pollinated by mosquitos which can often be seen covered in masses of yellow pollen ejected from the flowering hood.



PLANTANTHERA OBTUSATA

Across the Churchill River, a fragment of Canada's frontier history provides a haven for an abundance of plant life. The Prince of Wales Fort was a trading post for the Hudson Bay Company who used these waterways to trade furs and rendezvous with the settlers and First Nations people. Built piecemeal over 25 years in the 18th century with its 20 foot thick wall, it still stands as reminder of earlier, harder times in the North. This fortification has been the site of scientific discovery dating back nearly 300 years and today its heat radiating walls protect many species of local plants.

Healthy pockets of the stemless raspberry, *Rubus acaulis* and *Hedysarum* line the base of



ARNICA ALPINA



CASTILLEJA RAUIPII

sunny walls while the showy yellow petals of *Arnica alpina* reflect the bright sunshine in this grey fortress. This sunflower-like plant is one of the tallest perennials in Churchill, growing up to half a meter on open, well drained mediums. Five types of buttercup grow at this latitude with *Ranunculus pedatifidus* being the tallest and abundantly present here. One of the showiest plants of the sub-arctic is *Castilleja rauipii*, a hemi-parasitic member of the *Scrophulariaceae* family with its floral bracts looking as though they'd been dipped in pink paint. This plant reaches its easternmost range at Churchill and was one of the highlights of our plant journey.



The peninsula that the fort sits on is a constant source of polar bear activity so it was fortunate that the Parks Canada Guides allowed our party to venture a kilometre away to look for a very rare plant in these parts. Churchill is the southernmost latitude for the circumpolar *Campanula uniflora*, a dwarf

perennial herb which blooms for less than a fortnight. The minute Arctic Bluebell prefers calcareous sandy soils and has only been found at this site and at one across the river.

Our journey around Hudson Bay was capped off by a last day of warm sunny weather along a narrow riverbank in search of the rare Northern Lady Slipper, *Cypripedium passerinum*. Unfortunately, the change in temperature brought out the hordes of frenzied mosquitos that were spoken off constantly by the local people. Despite being covered in many dozens of these persistent insects, our patience was paid off with several examples of this elegant northern flower with its distinctive white sparrows egg shape. This nodding orchid spreads usually by rhizomes though it does grow from seed despite its pollinator being still unknown to science.



CYPRIPEDIUM PASSERINUM

Overall summary

The Hudson Bay Lowlands are a remote and beautiful environment where the natural ranges of plants and animals drape across one another in complicated ways. The value of

observing this landscape firsthand can not be overstated as so many diverse habitats can be experienced in a relatively close area. Simply walking from the Hudson Bay shore to the inland literally traces the landform through ridges of time. The complex and fragmented nature of the habitats here, with alkaline and acidic loving plants growing side by side, gave me great insight into the soil and vegetation development. The plants which live in this place of extremes have adapted in a variety of ways and it was fascinating to be able to observe *Pyrola*, *Saxifraga*, *Pedicularis* and various orchids huddled into the microclimates of crevices, sheltered rock aspects and under-stories of trees. The survival instinct is abundant here for all species needing the next generation to survive.

The journey north has rewarded me both professionally and personally, allowing me to become further enmeshed in the faceted mosaic of my home country.

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