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LIVING

Suddenly, a miniature forest

Walk the bare November woods and look down – the mosses are everywhere

At first glance, a walk in the forest on a November day may seem uneventful, with little of interest to catch our attention. This is, however, a wonderful time of year to explore the forest floor. Now that the profusion of green has retreated, one of the first things we notice is how common the various mosses are. Since they remain green all winter they tend to stand out clearly at this time of year and invite close observation. Take time to get down on your hands and knees to examine them carefully. It is like entering a verdant, Lilliputian forest.



Drew Monkman

OUR CHANGING SEASONS

Since the beginning of agriculture, man has been intimately familiar with plants that bear flowers and seeds – from tree blossoms becoming apples to grass flowers becoming kernels of wheat. But, failing to find any flowers or seeds on mosses, early farmers and naturalists were puzzled. How could they reproduce? In Europe, a folklore developed that moss flowers and seeds must be invisible, and that anyone who had the ability to collect them could become invisible, too. This superstition has actually carried over into one of the botanical names for mosses and ferns – the Cryptogams, which means “hidden marriage.” Little did people know that moss flowers and seeds don’t even exist and that moss reproduction depends on quite a different mechanism.

BOTANICAL TIME MACHINE

Observing mosses is like gazing into a botanical time machine. The first species appeared some 400 million years ago, well before modern flowering plants. At that time, floating algae was evolving the ability to survive in the open air. Algae soon began a land invasion that totally transformed the Earth into a green paradise. In 2007 the secrets of these first steps onto land were brought to light, thanks to the genetic sequencing of a modern descendant of the first terrestrial pioneers, a dainty moss known as *Physcomitrella patens*. All these years later, it still sprouts on recently exposed shorelines, quickly produces spores, and then dies. The key adaptation that evolved in these early land plants was a way of protecting their seeds or spores from drying out when exposed to the air. More about that later.

Although mosses are indeed plants – they produce their own food through photosynthesis – they share little in common with modern, vascular plants. Although they have tiny stems and leaves, the stems only serve as a support for the leaves and do not actually conduct water or food to other parts of the moss. This is a major difference from ferns, conifers, and flowering plants, all of which are said to be “vascular,” meaning they have tissues for conducting resources throughout the plant. The absence of specialized conducting tissues means that mosses are doomed to remain small – unlike a sunflower or tree, for example.

Mosses also lack roots. Rhizoid filaments anchor the moss to the ground, rock or tree bark but play no part in absorbing water or minerals. Rain and snow, fortified by minerals washed from the forest canopy above, brings mosses their required moisture and nutrients.

But by far the most interesting characteristic of mosses lies in how they reproduce. First of all, moss really consists of two distinct generations – the familiar green, leafy plant, known technically as a gametophyte and the wiry and leafless sporophyte with the capsule on top. These spiky projections are easy to see in most clumps of moss.

When these capsules ripen they open up and spores are dispersed. Spores are reproductive structures but they are different from seeds. First, they are better adapted for dispersal and for surviving extended periods of desiccation and heat. Second, they contain very little stored food resources, as compared with seeds. Spores are also so small that millions occur in a single sporophyte capsule.

SPORE GOES GREEN

If a spore lands somewhere with sufficient moisture it will begin to grow into a mass of green hairs. Buds appear on these hairs that grow into stems with narrow leaves – the typical “moss plant.” These structures are called gametophytes and can be male, female, or sterile. Some of the stems will produce male or female sex organs among clusters of leaves at the top. Sperm produced in the male organ use a film of water in the form of rain or dew to swim to the female organ on another stem and thus fertilize the egg. Mosses,

therefore, will only release egg and sperm when the plants are bathed in moisture.

The embryo, embedded in the cluster of leaves surrounding the female organ, then grows to form a “sporophyte,” the familiar long, wiry stalk with the capsule at the end. The base of the sporophyte remains anchored in the cluster of leaves at the top of the female gametophyte. The latter essentially becomes host to the parasitic sporophyte. Spores develop in the capsule which escape, germinate and repeat the cycle.

ASEXUAL OPTION

Mosses can also reproduce asexually (vegetatively). This sometimes happens when bits of the stem or even a single leaf from the moss plant are accidentally broken off. These bits can regenerate to form a new plant. You can actually cut up a moss plant and get any part to grow into separate plants. It is believed that most mosses spread to new locations through asexual reproduction.

One moss story you’ve no doubt heard is that moss prefers the north side of tree trunks. In the northern latitudes, trees and rocks do indeed have proportionally more moss on the north side than on other sides. This makes sense. The north side of an object does not receive direct sunlight and therefore holds moisture longer. As we’ve seen, moisture is necessary in moss repro-



DREW MONKMAN photo



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Juniper moss (top left) with red sporophytes and capsules towering above is a colourful addition to the forest floor. Another visual treat found in the Kawarthas is this unidentified moss species (above) with long, wiry sporophytes. Hair cap moss (left) has wiry, red-stalked sporophytes, while common brown peat moss (below) is, as its name suggests, the most common moss found locally.



duction. In heavily shaded habitats, however, mosses grow equally well no matter what the directional exposure.

The Kawarthas is home to dozens of species of mosses. In conifer swamps, different types of sphagnum (peat moss) usually dominate. They are spongy and can form carpet-like mats. Other common groups of mosses include the upright species such as juniper and hair-cap moss, hummock forming species like pin cushion moss and creeping mosses like shaggy moss.

Right now is a great time to begin to familiarize yourself with these plants. Take along a camera with a macro setting and maybe a copy of Forest Plants of Central Ontario by Lone Pine Publishing. A new world awaits you!

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