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LICHENS IN NOVA SCOTIA: A 'HOW-TO' GUIDE FOR BEGINNER NATURALISTS

INTRODUCTION

As one of six global hotspots for cool-temperate rainforest lichens, Nova Scotia has much to offer a keen student of natural history from a lichenology perspective. Our province also has a long history of contributions from amateur naturalists and those outside of the traditional academic community. For example, the Nova Scotia Museum's Research Associate Frances Anderson, a retired librarian-turned-semi-professional naturalist, has contributed to several scholarly articles and reports in lichenology[1,2], published a revised provincial checklist of macrolichens[3], and co-authored a book on lichen identification[4]. With some dedicated study and practice, a devoted naturalist could certainly detect new county records, if not new provincial ones, and further enhance our knowledge of Nova Scotia's rich lichen communities. This report outlines the basic tools and methods that you will need to become proficient with identifying and studying lichens.

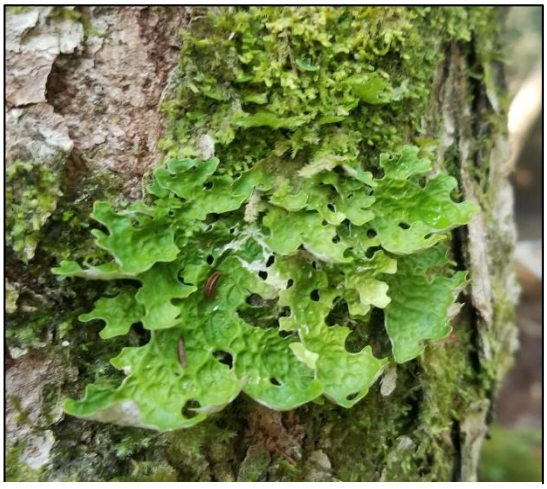

Figure 1: Tree Lungwort (Lobaria pulmonaria) on a Red Maple, surrounded by mosses.

METHODS

Get the tools

Some basic tools are required for becoming a student of the natural history of lichens. These include a good hand lens ($10-$80) and field guide ($40). At a more advanced level, observers could invest in more sophisticated resources: a dissecting microscope ($300-$6000), forceps ($10-$30) for handling, a scalpel ($10-$30) or razor blades ($5-$10) for dissections, chemicals for spot tests ($20-$60), and some advanced identification books, including a regional or continental flora and associated keys ($80-$120). If you're unsure about investing in such things, keep your eyes open for local workshops or courses where you can try these things out for free!

Hand lenses

The first and most important tool is a hand lens or loupe. A hand lens is a hand-held magnifying device that is more powerful than a magnifying glass, but much more portable than a microscope. As with a microscope, you hold it right up to your eye when using it, and you need good light. Some models even have an LED light built-in, to ensure good illumination in all settings. But like a magnifying glass it is portable: you can put it in your pocket, or hang it on a lanyard about your neck, for quick access. An appropriate magnification for starting out is in the 10× to 16× range; higher magnifications are difficult to use outside of a lab (noses get scraped on stones and bark). But beware of the discount manufacturers! General online stores can offer excellent value but may unwittingly be selling lenses that are not as powerful as they claim. Visit a specialist store in natural history or scientific equipment for better reliability.

Field guides

The best all-around guide for a beginner in Nova Scotia is McMullin & Anderson's Common Lichens of Northeastern North America[4]. It is easy to navigate, based on substrate categories and the colour of the lichens. Another helpful (and free!) resource is called "Identifying lichens in Nova Scotia: a reference guidebook"[5] – see the bibliography for the URL to download it. If you decide to get into more difficult groups, the illustrated Macrolichens of New England[6] is the next step, and will ease you into the use of the more difficult keys that come later[7].

Rich habitats & simple species

Unlike identifying birds and butterflies, the backyard is not necessarily the best place to start identifying lichens, especially if you live in a city. While there are a handful that can be identified, many of the lichens that live in cities are small and tricky to identify. Instead, a good place to begin is in

mature mixedwood or hardwood forest. In particular, look for north-facing slopes with big trees, where the trunks are at least a few meters apart – these will have lots of big leafy lichens that grow conveniently at a height most people can reach (Figure 1). In particular, be sure to look on tree bases, rotting logs, and erratic boulders when you're in such habitats. Other places include bogs and other peatlands, where the tops of Sphagnum hummocks will often be covered with Reindeer Lichens (Figure 2).

Figure 2: Star-tipped Reindeer Lichen (Cladonia stellaris), growing on a raised spot in a forested wetland in Queens County, NS.

In addition to focusing on good habitats, it can be helpful to either start by learning just the genus names (for example, *Cladonia, Usnea,* or *Lobaria*), or to pick a subgroup of lichens to focus on. That way, you can more quickly come to master a single group and will be less frustrated by the huge amount of diversity that exists. In general, leafy macrolichens are a good group to begin with, especially those with cyanobacterial photobionts*. This essentially narrows your suite of possible species from over 900 to less than 60.

Phone a friend

It's often more fun to go lichen hunting with a friend, and always nice to have a second set of eyes to offer a perspective on lichen identification. This helps us to avoid having a simple misinterpreted description send us on a wild goose chase through the books, only to arrive at something that looks nothing like our specimen. If you're not likely to convince a friend to join in your efforts, keep your eyes peeled for upcoming hikes and workshops on lichens with your local naturalist club, or consider offering to volunteer at your local herbarium, where a professional botanist or mycologist may be willing to share their expertise in exchange for some help with data entry or specimen care. In Nova Scotia, the two main herbaria with lichenological holdings include the Herbarium at the Nova Scotia Museum in Halifax, and the E.C. Smith Herbarium at Acadia University in Wolfville.

Photographic methods & crowdsourcing

For some species, you may need to take upwards of 5 distinct photos to give your observation a chance at crowd-sourced identification. These include:

i. a large-scale photo of the whole lichen, including parts of the habitat and the position of the lichen on its substrate (Figure 3a),
ii. a macro photo of the upper surface, showing details of the branching pattern, as well as general textures and colours (Figure 3b),
iii. a micro photo of the upper surface, showing details of thallus ridges, reproductive structures, or various lobules and outgrowths (Figure 3c);
iv. a micro or macro photo of the lower surface, showing details of colour, venation, and rhizines (Figure 3d), and
v. a micro or macro photo of any chemical spot-tests you used to identify the species (Figure 4a). For micro-photos, holding a hand-lens against your cell phone's camera lens can be a good method to zoom in without removing the lichen from its substrate. For macro-photos, it's often a good idea to include a ruler, pocket knife, coin, or other object of known size as a scale reference (Figure 4b).

Participating in crowd-sourced identification

Using a crowd-sourced identification platform, such as iNaturalist, can be beneficial both for your own development as a naturalist and to help scientists. Uploading your photos to such a platform means you get feedback on your identifications and can easily keep track of your observations. You can also practice your identification skills by identifying photos that other people have posted. Such platforms are also powerful tools for biodiversity experts to keep track of changes in the distribution and abundance of many species. However, small, difficult-to-identify things (including many lichens) are notoriously problematic on these platforms. Many of the observations that people upload simply do not have the necessary magnification or perspective to identify the species, and consequently the rates of misidentification are much higher than for trees or large animals. To ensure that these platforms are used effectively, both from the standpoint of your own development as a naturalist, and from

* A "photobiont" is the algal or cyanobacterial partner in the lichen symbiosis; see NSM infosheet "Lichens in Nova Scotia: photosynthetic fungi, drinking and breathing, dry spots in wet places, and very old things" for additional information on lichen biology and ecology.

the perspective of the scientists who may use the data, consider the following guidelines:

i. Photograph all the important parts, and if you're not sure what is needed, err on the side of more photos.
ii. If you think the species might be rare or at-risk, change the location to "obscured" or "private".
iii. Tag the general group of the organism if you don't know the name (e.g., "lichens" or "fungi"). This way it will show up in the observation feeds of people who are interested in that group.
iv. When reviewing other people's observations, always improve on the previous suggestions if you can. In other words, aim for a finer level (more precise) unless you disagree with the identification. Otherwise, you may set back the identification efforts of others.
v. Keep in mind that you will receive suggestions from both experts and beginners. If you suspect a crowd-sourced identification might be wrong, check with an expert. This can sometimes be done by tagging people you know in an observation, or by simply emailing your photos to a local authority (e.g., the Ask a Curator service of the Nova Scotia Museum[*]).
vi. Be forthright but polite in your interactions; effective crowdsourcing relies upon good relationships and clear communication.

Summary

Lichens are an exciting and rewarding group to turn your attention to as a naturalist, but they can still, at times, be challenging to learn. Ultimately, there's no substitute for simply spending enough time with a new group, but there are ways to make it easier on yourself: (a) get the right tools – most critically a hand lens; (b) buy or borrow some books, and read the free reports; (c) target rich habitats and easy species at first, (d) take lots of photos, ensuring you can see all the correct parts; (e) use a crowd-sourced identification platform; and (f) get in touch with a local expert. With some dedicated time, study, and effort, you too can contribute to Nova Scotia's age of enlichenment.

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[*] https://museum.novascotia.ca/collections-research/ask-curator

Figure 3: Photos of Tree Pelt Lichen (Peltigera collina), showing (a) the whole lichen including the habitat or substrate, (b) a macro-view of the upper-surface, (c) a micro-view of the upper surface, and (d) a micro-view of the lower surface.

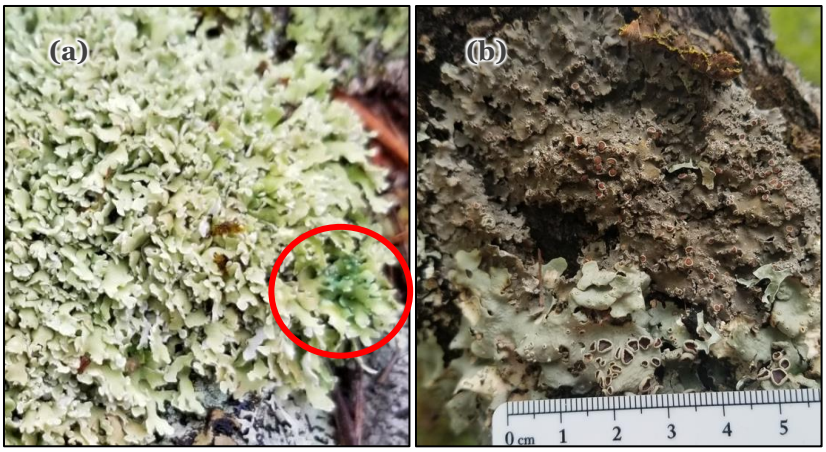

Figure 4: Photos of (a) Olive Cladonia (Cladonia strepsilis), showing a green colour-change in response to a chemical spot test (NaClO, with spot indicated by a red circle), and (b) a mixture of Smooth Lungwort (Lobaria quercizans) and Wrinkled Shingle Lichen (Pannaria lurida), showing the use of a ruler as a scale-reference.