Lichens at Cloudbridge

Cloudbridge Nature Reserve - Nature Notes No. 16

What are Lichens?

Lichens are those crusty growth that give color to rocks and trees. The plant-like appearance of lichens hides their true identity. A lichen is not a single organism, but the result of a partnership (mutualistic symbiosis) between a fungus and a photosynthetic partner -- an alga or cyanobacteria. The fungi offer shelter while the algae convert light into nutrition. The body of a lichen consists of fungal filaments (hyphae) surrounding cells of green algae and/or blue-green cyanobacteria. The basis of the mutualistic symbiosis in lichens is similar to the partnership between some species of fungi (called mycorrhiza) and the roots of most rainforest trees. The lichen fungus provides its partner a benefit (protection) and gains nutrients in return.

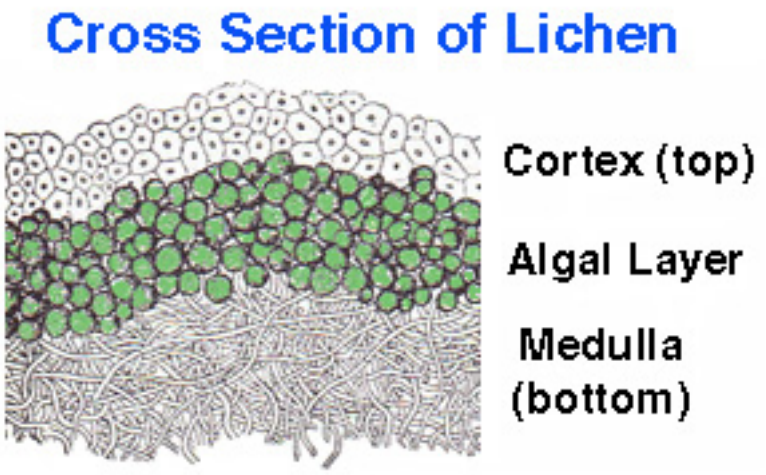
Daniela Lizano Quesada
University of Costa Rica
Ticolichen team member.

Naturalists group lichens according to their external appearance, which is crustose (low and crusty), foliose (leafy), or fruticose (bushy). The thallus -- crusty, bushy, or leafy -- is the growing part of the organism.

The complexity of lichen partnerships has caused lichens to be described as "small ecosystems." They are classified as members of the Fungus Kingdom because the fungus partner is always the major partner. After a lichen symbiosis is established, the fungus has the greatest influence on the final form of the lichen body's shape, and whether it is tough or flexible. The algal and bacterial partner(s) each have their own scientific names, but the lichen symbiosis is known only by the name of its fungus.

The photosynthetic partner possesses the green pigment chlorophyll, enabling them to use sunlight's energy to make their own food from water and carbon dioxide through photosynthesis. They also provide vitamins to the fungus. Cyanobacteria can make amino acids directly from the nitrogen gas in the atmosphere, something neither fungi nor algae can do. The fungus, in turn, protects its partners from drying out and shades them from strong sunlight by enclosing the photosynthesizing partners within the body of the lichen.

Lichens symbiotic with nitrogen-fixing cyanobacteria provide some forests with much of their nitrogen. Rain and mist wash soluble nitrogenous compounds from the lichens to the forest floor, where the mycorrhizal fungi in the tree roots absorb them as nutrients. Some tree species even send out roots from their branches into canopy lichens, thereby taking in fixed nitrogen directly.



Lichens are very important initiators of biological succession. By slowly wearing away and dissolving the minerals that compose the rocks on which they establish, lichens prepare the surfaces for the germination of seeds and the formation of rooted plant communities. Lichens thus acceler-

ate weathering and initiate the formation of soils. Despite their hardiness, lichens are very sensitive to certain airborne materials - for example, the sulfur dioxide and volatile metal compounds that are released when coal is burned. Thus, the presence of lichens and the state of their health are used as pollutant indicators.

Costa Rica is rich in lichens. A new study of them, called The Ticolichen Project, is being undertaken by a multinational team headed by Robert Lücking of The Field Museum in Chicago. A Ticolichen reseacher, Daniela Lizano Q., has visited Cloudbridge in search of interesting types. Some of her findings are shown below.

Usnea
(green with many apothecia)
Found Dec. 2002 by Daniela Lizano Q.
There are many species of usnea in Costa Rica, including the "old man's beard" found draped over tree branches.

Peltigera
(brown foliose between mosses)
Found Dec. 2002 by Daniela Lizano Q.

Heterodermia
(white rizines and single pretty apothecium)
Found Dec. 2002 by Daniela Lizano Q.

Cladonia
(cup-shaped structures)
Found Dec. 2002 by Daniela Lizano Q.