South American lichen found to have 126 different species of fungi

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This recently described species of Cora is exclusively epiphytic and often forms large individuals. Credit: Robert Lücking

A team of researchers with members from the U.S. and several South American countries has found that a type of lichen that grows in several parts of Central and South America consists of at least 126 species of fungi and possibly as many as 400. As the team notes in their paper

published in *Proceedings of the National Academy of Sciences*, until very recently, the lichen was believed to have just one species of fungus.

Lichen is an organism that exists as a partnership between a fungus and photosynthetic partner—it's a photobiont. The main mass of any given lichen generally consists of fungal filaments which host algal cells. In the study in South America, the researchers looked at *Dictyonema glabratum*, which recently was divided into two separate genera, (Cora and Corella) with initial analysis suggesting 16 distinct species of fungi.

D. glabratum (lichen are named after the fungal component) is considered to be ecologically important to South America as it is one among many lichen that fix atmospheric nitrogen into the soil, which makes them natural fertilizers. *D. glabratum* is generally small, about the size of human fist, and grows in curly masses around other objects, such as tree trunks. In this new effort the researchers expanded on genetic research conducted by other teams that have found that some species of organisms are actually more than one—African elephants are actually two species, for example and there are two distinct species of the Nile crocodile and four species of Killer whales. Curious after the reclassification of *D. glabratum*, the research team used DNA barcoding and performed phylogenetic analysis on 356 samples and found an astonishing 126 different species of fungi.

The team next created a grid map of the range of the lichen, from Central and South America to the Caribbean islands and used it to create a computer model—a simulation from it predicted that it's likely the true number of fungi species in the lichen is close to 452.

The Galapagos Islands harbor at least two endemic species of Cora. Credit: Robert Lücking

In retrospect, the lichen may not have been hiding its many species, as evidence offering clues was abundant—they come in several colors, grow on several different surfaces and some even have unique features such as crinkled margins or fine hairs. Researchers have likely missed such clues, the researchers note, due to most studies being conducted using specimens that had been dried and stored for such purposes.

Páramo-like vegetation with a high diversity of mostly endemic Cora species is also found in the Central American cordilleras in Costa Rica. Credit: Robert Lücking

More information: A single macrolichen constitutes hundreds of unrecognized species, Robert Lücking, *PNAS*, DOI: 10.1073/pnas.1403517111

Abstract

The number of Fungi is estimated at between 1.5 and 3 million. Lichenized species are thought to make up a comparatively small portion of this figure, with unrecognized species richness hidden among little-studied, tropical microlichens. Recent findings, however, suggest that some macrolichens contain a large number of unrecognized taxa, increasing known species richness by an order of magnitude or more. Here we report the existence of at least 126 species in what until recently

was believed to be a single taxon: the basidiolichen fungus Dictyonema glabratum, also known as Cora pavonia. Notably, these species are not cryptic but morphologically distinct. A predictive model suggests an even larger number, with more than 400 species. These results call into question species concepts in presumably well-known macrolichens and demonstrate the need for accurately documenting such species richness, given the importance of these lichens in endangered ecosystems such as paramos and the alarming potential for species losses throughout the tropics.