Revealing hidden fungal species using DNA: The importance of recognizing cryptic diversity

May 10 2013

A colorful collage of lichens growing on rock in an arid region of the Southwestern USA. Lichens play a variety of important ecological roles and are often a dominant biological component in extreme environments. Credit: Dr. Steve Leavitt

Our ability to assess biological diversity, ecosystem health, ecological interactions, and a wide range of other important processes is largely dependent on accurately recognizing species. However, identifying and describing species is not always a straightforward task. In some cases, a single species may show a high level of morphological variation, while in other cases, multiple morphologically similar species may be hidden under a single species name. Cryptic species, two or more distinct species that are erroneously classified under a single species name, are found in all major groups of living things.

As an alternative to traditional morphology-based species delimitation, an international research group, including scientists from Germany, Iran, Spain, and the USA, describe five new species of lichen-forming fungi from what was traditionally considered a single species using differences in DNA sequence data. The authors state that "the effective use of genetic data appears to be essential to appropriately and practically identify natural groups in some phenotypically cryptic lichen-forming fungal lineages". The study was published in the open access journal *Mycokeys*.

They also provide a reference DNA sequence database for specimen identification using DNA barcoding, making specimen identification more accessible and more reliable at the same time. The application of DNA-based identification can potentially be used as a way for both specialists and nonspecialists alike to recognize species that are otherwise difficult to identify.

The green rock-posy lichen (center right) occurs on all continents, except Australia. Traditionally, the fungal partner of this lichen was considered to be a single species, but recently genetic data revealed six distinct species sharing a similar appearance. Credit: Dr. Steve Leavitt

Lichens are commonly used to monitor ecosystem health and the impact of atmospheric pollution. In addition, some lichens are potentially valuable sources of pharmaceutical products, including antibiotics, antioxidants, etc. In spite of their occurrence in all terrestrial ecosystems and overall ecological importance, lichens are commonly overlooked. DNA barcode identification can be performed in a variety of ecological, pharmaceutical, and biomonitoring studies in order to quickly sort specimens into the correct species.

The authors argue that the use of molecular sequence data in identifying species will likely become increasingly important and routinely applied.

Other disciplines such as ecology, conservation, and physiology will benefit from a more objectively based species circumscription, enabling us to interpret distribution and ecological patterns more precisely, while more accurately monitoring environmental disturbance and climate change. The authors predict that this approach will prove to be an important tool in making critical conservation-related decisions.

More information: Leavitt SD, FernaÅLndez-Mendoza F, PeÅLrez-Ortega S, Sohrabi M, Divakar PK, Lumbsch TH, St. Clair LLS (2013) DNA barcode identification of lichen-forming fungal species in the Rhizoplaca melanophthalma species-complex (Lecanorales, Lecanoraceae), including five new species. MycoKeys 7: 1, doi: 10.3897/mycokeys.7.4508

Provided by Pensoft Publishers