

DIVERSITY OF BACTERIA ASSOCIATED WITH ROCK TRIPE LICHENS INHABITING ARCTIC, ANTARCTIC AND ALPINE LOCATIONS.

Merry S. Faluaburu¹, Katsuhiko Kasihara¹, Jun Uetake², Satoshi Imura² and Takeshi Naganuma¹

¹Graduate School of Biosphere Science, Hiroshima University, 739-8528 Japan

²National Institute of Polar Research, 190-8518 Japan

Correspondence: takn@hiroshima-u.ac.jp

Lichens are a well-known symbiotic organism which is a composite of fungi, and photosynthetic partners such as algae and cyanobacteria. Recent studies on a number of different species of lichens have shown to include associated diverse bacterial flora. Rock tripe, the common name given to various lichens belonging to the genus *Umbilicaria*, is widely distributed and can be found growing in hostile environment. Although the biogeography of rock tripe is fairly well-studied, however, little is known on the diversity and patterns of bacterial flora associated with the rock tripe. Therefore, this study assessed the bacterial flora associated with rock tripe lichens.

The 16S rRNA gene characterization was employed to investigate the bacterial flora associated with rock tripe specimens that were collected from Arctic and Antarctic locations, as well as the equatorial alpine Rwenzori Mountains in Uganda. In particular, lichen samples were first verified as belonging to *Umbilicaria* genus by using 18S rRNA genes and Internal Transcribed Spacer (ITS) characterization. Next, clone libraries of the 16S rRNA gene were created and sequenced. Finally, the dataset from cloned libraries were BLAST searched, and analyzed.

Here we show that the bacteria associated with rock tripe lichens from the Arctic, Antarctic and Rwenzori locations demonstrated distinct bacterial flora. Distinct bacterial patterns were also observed at closely located lichens. We found that, of the six rock tripe from Antarctic that were characterized by ITS and 18S rRNA genes, five were identified as *Umbilicaria yunna* and one as *Umbilicaria vellea*. The *Umbilicaria yunna* lichens were closely situated, however each hosted distinct bacterial flora. Furthermore, bacterial phyla associated with rock tripe lichens found at geographically distant Arctic, Antarctic and Rwenzori Mountains in Uganda, demonstrated diverse dominance. For instance, rock tripe lichens found at Arctic were predominantly associated with bacterial phylum *Acidobacteria*, mostly by *Edaphobacter* species. Rock tripe lichens from Antarctic were predominated by *Bacteroidetes* phylum, particularly by *Sphingobacteriaceae* species. This study slightly differs from previous studies that reported *Proteobacteria* phylum predominance. Those previous studies looked at other lichen species that were also found at Arctic and Antarctic. The bacterial flora at Rwenzori Mountains were dominated by *Acidobacteria*, followed closely by *Armatimonas* phylum. Based on the results, it can be infer that rock tripe lichens themselves served as micro-habitats for diverse bacterial flora, and that, the associated bacterial flora were shaped by different abiotic and biotic environments.