

Preface

The polar regions consist of the Arctic and Antarctica, which make up around 14% of the Earth's surface. Antarctica is essentially a continent, and about 1,900 m of ice covers the continent's ground on average. Approximately 98% of Antarctica is covered in ice and snow, and temperatures around the coastal areas usually range from 5°C to -35°C. Temperatures on the Antarctic plateaus are much more extreme, approximately ranging from -25°C in the summer to -70°C in the winter. On the other hand, the Arctic is mostly ocean, and approximately 10 m of ice covers the sea surface. Temperatures in the North Pole are usually around -18°C. Many people consider Antarctica and the Arctic to have the same environments; however, as mentioned above, they are quite different.

True Fungi without Blastocladiomycota, Chytridiomycota, Cryptomycota, Microsporidia are microorganisms that have the following characteristics: (1) they are eukaryotes, (2) they lack plastids, (3) they are heterotrophic organisms, and (4) they lack an amoeba-like stage. There are several reports that discuss about the estimation of fungal diversity. Currently, over 100,000 species of fungi have been reported, and they are known to be the second-most diverse organisms on the planet, next to insects. According to Hawksworth (1991), about 1.5 million species of fungi are estimated to exist in the world. Based on this estimation, most fungal species still remain undiscovered and are yet to be reported.

Fungi that inhabit the polar regions not only grow here, but also decompose organic compounds under sub-zero temperatures. Out of these, cold-adapted fungi work as decomposers and play crucial roles in the nutrient cycle of polar-region ecosystems. Fungal numbers in the polar regions are being shown to increase year after year, regardless of extreme environments such as low temperatures, dry ecosystems, and low water and nutrient availabilities.

The Japanese Antarctic Research Expedition (JARE) was started in 1957, and marked its 60th anniversary in 2017.

Furthermore, the base station at Ny-Ålesund (Spitsbergen, Norway) was established in 1991 and marked its 25th anniversary in 2016. This book was planned and written to commemorate both of these anniversaries. In this book, we focus on fungi that inhabit the polar regions i.e., the Arctic and Antarctica. It provides an up-to-date overview of several areas related to fungi and fungal ecology and physiology. Each chapter is written by experts in their respective field. The chapters

in this book approach the fungal biodiversity of different polar region areas, such as the Canadian Arctic, Nordic Arctic, and Antarctica, via culture base techniques and next-generation sequencing. Separate chapters are devoted to pathogenic fungi in the Arctic, along with a checklist of fungi isolated near the Syowa station, which is a JARE base. Some chapters also review application studies of fungi in polar regions for biotechnological advancements. Several previously published books generally focused on cold-adapted microorganisms and extremophiles. However, to best of our knowledge, this is the first book that specifically focuses on fungi inhabiting the polar regions. We gratefully acknowledge all the people who contributed to this book. We hope that it will provide a useful overview regarding the biodiversity and ecophysiology of fungi in polar regions. We also hope that this book will cultivate an interest about polar region fungi in the upcoming generations, and that they will study and contribute to this field in the future.

January 2019

Masaharu Tsuji
Tachikawa, Tokyo, Japan
Tamotsu Hoshino
Tsukuba, Ibaraki, Japan

Reference

- Hawksworth, D.L. 1991. The fungal dimension of biodiversity: Magnitude, significance, and conservation. *Mycol. Res.* 95: 641–655.