



## The genus *Lithophyllum* in the north-western Indian Ocean, with description of *L. yemenense* sp. nov., *L. socotraense* sp. nov., *L. subplicatum* comb. et stat. nov., and the resumed *L. affine*, *L. kaiseri*, and *L. subreduncum* (Rhodophyta, Corallinales)

DANIELA BASSO<sup>1</sup>, ANNALISA CARAGNANO<sup>1,4</sup>, LINE LE GALL<sup>2</sup> & GRAZIELLA RODONDI<sup>3</sup>

<sup>1</sup> Università degli Studi di Milano–Bicocca, Dip.to di Sc. dell'Ambiente e del Territorio e di Scienze della Terra, Sez. di Sc. Geologiche e Geotecnologie, Piazza della Scienza 4, 20126 Milano, Italy.

<sup>2</sup> Unité Mixte de Recherche 7205, Equipe "Exploration, Espèces et Evolution", Institut de Systématique, Evolution, Biodiversité, ISYEB - UMR 7205 - CNRS, MNHN, UPMC, EPHE, Muséum National d'Histoire Naturelle, Paris, France.

<sup>3</sup> Università degli Studi di Milano, Dip.to di Bioscienze, Via Celoria 26, 20133 Milano, Italy.

<sup>4</sup> Present address: Inst. pour la Recherche et le Développement (IRD), UMR ENTROPIE Centre de Nouméa, Promenade Laroque, 98848 Nouméa, New Caledonia.

Corresponding author: [daniela.basso@unimib.it](mailto:daniela.basso@unimib.it), Fax +39-0264482073

### Abstract

Based on literature, the genus *Lithophyllum* was represented in the whole Indian Ocean by 14 taxa, mostly in need of revision in a modern context. Molecular analyses integrated with morpho-anatomical comparisons between the recently revised type material of *Lithophyllum kotschyanum* Unger, and the related infraspecific taxa, lead to a resumption of *L. affine*, *L. kaiseri*, and *L. subreduncum*, and the description of *L. socotraense* sp. nov., *L. yemenense* sp. nov., and *L. subplicatum* comb. et stat. nov. Detailed accounts are provided for each species, including keys, along with information on synonymy, examined collections, distribution, habitat as well as sequence data of the 5' end of the LSU from the type specimens. The anatomical features of the tetrasporangial conceptacle that were considered collectively diagnostic for species identification are: the mean diameter of the tetrasporangial conceptacles, the length of the pore-canal in the tetrasporangial conceptacles (with the number of cells in roof filaments), the occurrence of a depression at the top of the conceptacle roof in relation to the pore opening, and the number of cells from the floor of the tetrasporangial conceptacle chamber to the thallus surface. This study provides evidence of a previously unsuspected diversity within the Red Sea and NW Indian Ocean species of *Lithophyllum*.

**Key words:** biodiversity, coralline algae, Foslie, Heydrich, Indo-Pacific Ocean, Red Sea, Arabian Sea, Persian Gulf, integrated taxonomy, Lithophylloideae, TRH

### Introduction

The coralline flora of the Indian Ocean is insufficiently known. A survey of the literature available for the area revealed that the subfamily Lithophylloideae was represented by 19 species and infraspecific taxa, and that 8 of them were in need of a revision in a modern taxonomic context. In particular, only *Lithophyllum kotschyanum* Unger, and its infraspecific taxa *L. kotschyanum* forma *affine* and *L. kotschyanum* forma *subplicatum*, together with *L. orbiculatum* and *L. okamurae*, were listed from the NW Indian Ocean (including Red Sea, Gulf of Aden, Arabian Sea, and Persian Gulf, in the boreal emisphere, and toward the east to include the western Indian coasts; Table 1).

In the framework of a large-scale investigation on Red Sea and Indian Ocean corallines, we collected some common *Lithophyllum* plants, bearing abundant trichocytes (Basso *et al.* 2014). In order to correctly identify the species, we provided morphological and molecular data (the 5' end of the nuclear LSU) to compare the recently revised type material of *L. kotschyanum* Unger, and the related infraspecific taxa, namely *L. kotschyanum* forma *affine*, *L. kotschyanum* forma *madagascarense*, *L. kotschyanum* forma *subplicatum* and *L. kotschyanum* forma *subreduncum*, housed at TRH (abbreviations following Holmgren continuously updated). The objective of this study is to use both morphological and molecular data to assess species delineation within this taxon. This study contributes to the discussion on coralline biodiversity in the north-western Indian Ocean and Red Sea, focusing on the genus *Lithophyllum*.