Molecular phylogeny of parmotremoid lichens (Ascomycota, Parmeliaceae)

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Abstract: Parmotrema is one of the larger genera segregated from Parmelia s. lat. Additional genera recently have been segregated from this large genus based mainly on morphological and chemical features. We have employed molecular data from three genes to continue a revision of the generic concept within the parmotremoid lichens. A Bayesian analysis of nuclear ITS, LSU rDNA and mitochondrial SSU rDNA sequences was performed. The genera Canomaculina, Concamerella, Parmelia and Rimelia appear nested within Parmotrema. Alternative hypotheses to maintain the independence of Canomaculina, Concamerella and Rimelia are shown to be highly unlikely and are rejected. As a consequence these three genera are reduced to synonymy with Parmotrema. An alternative topology segregating Parmelia from Parmotrema s. lat. cannot be rejected with the dataset at hand. However we have established that this genus is closely related to Parmotrema rather than to catenrioid species as was considered previously. The revised genus Parmotrema includes species that have an upper cortex consisting of a palisade plectenchyma or rarely paraplectenchyma with vaults, have a pored or fenestrated epicortex, lack pseudocyphellae, have or lack cilia, have laminal, perforate or eperforate apothecia, usually have simple rhizines and filiform, cylindrical, bacilliform or sublageniform conidia. It is closely related to Flavoparmelia but the status of these genera requires further investigation. Nineteen new combinations are made.

Key words: Bayesian statistics, Canomaculina, combined analysis, Concamerella, Parmelia, Parmotrema, Rimelia

INTRODUCTION

The Parmeliaceae is one of the most common and well known ascomycete families comprising more than 2400 species in about 85 genera (Hawksworth et al 1995, Blanco et al 2004a, b). Within this large family, parmotremoid lichens, which formerly were placed in the huge genus Parmelia, are a monophyletic group based on mitochondrial SSU sequences analysis (Crespo et al 2001). They also are defined morphologically in typically having rhizinate thalli with laminal lecanorine apothecia, a Lecanora-type ascus and simple hyaline ascospores. Parmelioid lichens comprise more than 1500 species and exhibit significant biodiversity, especially in oceanic-tropical, tropical and subtropical ecosystems.

In the past few decades the number of genera comprising the Parmeliaceae has increased significantly, particularly among the parmotremoid lichens, due in part to a narrower generic concept (Hale 1984a). Hale initially proposed an infrageneric classification for the large and polyphyletic genus Parmelia s. lat. but several new genera subsequently were erected. These segregations were based mainly on morphological, anatomical and chemical characters (Culberson and Culberson 1981; Elix 1993; Elix and Hale 1987; Elix et al 1986; Hale 1974a, b, 1984b, 1986; Krog 1982; Kurokawa 1991; Sipman 1980). Many of these genera have not been fully accepted by a number of European lichenologists (e.g., Clauzade and Roux 1985; Eriksson and Hawksworth 1986, 1992, 1998; Poelt and Veza 1981; Santesson 1984; Purvis et al 1992; Nimis 1993; Llimona and Hladun 2001) and some of the segregates recently have been combined on the basis of morphological and/or molecular evidence (e.g., Rimeliella within Canomaculina; Chondropsis, Paraparmelia and Neofuscelia within Xanthoparmelia [Elix 1997, 2003; Hawksworth and Crespo 2002, Blanco et al 2004a]; Melanelixia and Melanohalea segregated from Melanelia [Blanco et al 2004b]).

Parmotrema (Massalongo 1860) is one of the larger genera segregated from Parmelia s. lat. It includes