Phytotaxa 9: 22–40 (2010)
www.mapress.com/phytotaxa/

Article

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

Early Land Plants Today (ELPT): How many liverwort species are there?

MATT VON KONRAT[*1,4], LARS SÖDERSTRÖM[*2], MATT A. M. RENNER[*3], ANDERS HAGBORG[*1], LAURA BRISCOE[1] & JOHN J. ENGEL[1].

[*] *Equal contributors to manuscript*
[1] *Department of Botany, The Field Museum, 1400 South Lake Shore Drive, Chicago, IL 60605–2496*
[2] *Department of Biology, Norwegian University of Science and Technology, Trondheim, Norway*
[3] *National Herbarium of New South Wales, Royal Botanic Gardens Sydney Sydney, NSW, Australia*
[4] *Corresponding author; mvonkonrat@fieldmuseum.org*

Abstract

Estimates of extant liverwort species range from 4,500 to 9,000, with estimates in the past decade converging on 5,000 to 6,000. Potential problems and pitfalls of deriving species estimates are addressed, including binomial accumulation, the impact of synonymy, taxonomic inflation, the impact of unrevised species-rich genera, species concepts and cryptic species. We present a revised mean estimate of 7,500 for the number of liverwort species based on estimating rates of synonymy in a sample of recently monographed and revised taxa. This estimate does not include infraspecific names and may underestimate global diversity as a result. We also present a databased estimate of about 8,500 species derived from the Early Land Plants Today data set. We argue higher estimates are supported by: 1) the number of published species has not reached a plateau and new species continue to be discovered; 2) not all regions have been thoroughly explored and with equal intensity, with survey effort being historically biased toward northern temperate regions; 3) synonymy rates are not uniform across taxonomic groups; 4) novel discovery of species outpaces new species derived from elevation in rank (taxonomic inflation); and 5) species numbers are not necessarily distorted by large unrevised genera. A standardized global worldwide liverwort checklist with strong community participation coupled with the critical need for ongoing monographs and revisions, will aid in arriving at a clearer estimates of liverwort diversity. We promote and encourage interest in the topic using an evidence-based approach and quantitative data.

Key words: biodiversity, estimation, liverworts, species numbers

Introduction

"How many species are there on Earth?" (May 1988). This question transcends the discipline of taxonomy, reaching across science through conservation to the media as well as politics (Erwin 1991). Estimates of global species diversity are fundamental descriptors of life on Earth (Gaston & Hudson 1994). Measuring biological diversity often concerns enumerating species (Diamond 1985; May 1988), and biodiversity estimates are typically based on raw counts of currently recognized named species (Alroy 2002). An understanding of the extant number of species has an important bearing on a countless range of studies including extinction (Alroy 2002), conservation, land-use planning, management and policy (Pitman & Jørgensen 2002; Mueller & Schmit 2007), global biodiversity and biodiversity hotspots (Myers *et al.* 2000), bio-prospecting (Wilson 2000), and ecosystem function (May 1990).

A number of recent papers investigate various aspects of global species richness patterns (e.g., Isaac *et al.* 2004; Bebber *et al*. 2007; Kier *et al*. 2005, 2009)) and estimate global numbers for many major groups of organisms, including seed plants (e.g., Scotland & Wortley 2003; Govaerts 2003; Wortley & Scotland 2004),

 Accepted by J. Shaw: 28 Jul. 2010; published: 30 Sep. 2010