

Funciones y servicios ecosistémicos de las turberas de *sphagnum* en la región de Aysén.

Erwin Domínguez y María Paz Martínez (editores).

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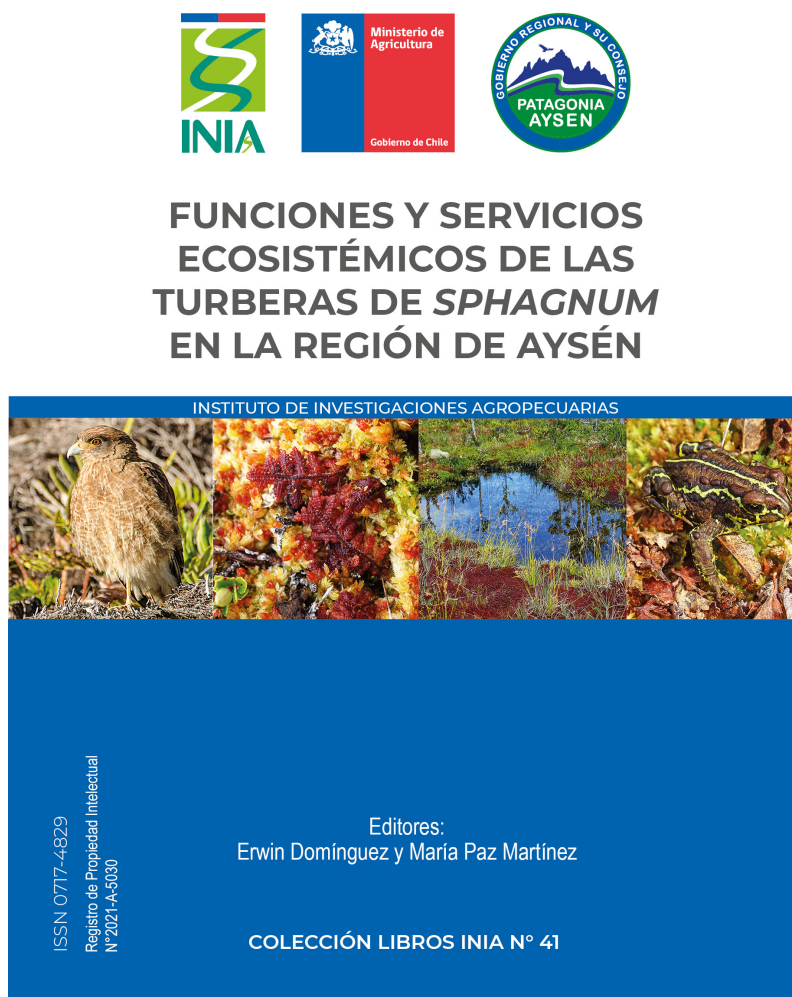
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This book constitutes a compilation of studies about the *Sphagnum* peatlands from the Aysén region of Chilean Patagonia. At the regional scale, the *Sphagnum* peatlands of Aysén are important from environmental, social, and economic perspectives. They occupy 15,240 hectares (~ 150km²) and contribute to society by regulating greenhouse gas exchange with the atmosphere, maintaining biodiversity, and regulating regional water flow. These peatlands also store a disproportionately high amount of carbon when compared to other terrestrial ecosystems.

This book is an important contribution to the body of knowledge on South American peatlands, and its publication is timely. Indeed, while the *Sphagnum* peatlands of Aysén have remained free from large-scale extractive practices, there is growing pressure from the peat harvesting industry to capitalize on this natural resource. In Chile, *Sphagnum* moss is primarily extracted and exported to other countries for horticultural use (orchid cultivation), and moss ranks among the top three non-wood forest product exports, bringing in ~ 15 to 20 million US dollars in annual revenues. The knowledge provided in this book – both in the form of new studies and syntheses – is essential to demonstrate the importance of the regional peatlands, ensure their sustainable management, and help inform future conservation policy. In particular, the chapters about the peatlands' distribution, structure, function, and biodiversity are well documented (see details below) and offer the information that is needed to develop and implement a comprehensive resource management plan. Likewise, the chapters dedicated to peatland use, including moss production as well as legal and



Fig 1.
Front cover
of the book..



economic aspects of moss extraction, offer up-to-date information that should be useful to a broad range of stakeholders, from the local resident to the peat farmer and government representative.

Domínguez and Martínez (the editors) are research scientists and project managers for the Chilean Ministry of Agriculture's Instituto de Investigaciones Agropecuarias (INIA). The 13 chapters of this book were contributed by 23 researchers with expertise on Patagonian peatlands. In the next paragraphs, I briefly share some chapter highlights.

Chapter 1 (Villarroel *et al.*) presents a cartography of the regional *Sphagnum* peatlands and includes new peatland digitization work. A key finding is that only

10% of the regional *Sphagnum* peatlands are located in nationally protected areas (Sistema Nacional de Áreas Silvestres Protegidas del Estado (SNASPE)). Chapter 2 (McCulloch & Reid) uses a ~10,000-year-old peat core from Aysén to reconstruct past changes in vegetation and moisture. To my knowledge, this is only the second time a peat core from this area is used as an archive of past environmental change. The study is preliminary but shows a compelling record thus far, highlighting another good reason for protecting these natural *Sphagnum*-dominated ecosystems. Chapter 3 (Hoyos-Santillan & Mansilla) offers a synthesis (96 sites) of existing data on the carbon sequestration capacity of Patagonian peatlands. The authors indicate that peat bogs in Patagonia have accumulated carbon at an averaged long-term rate of ~12 g C m⁻² yr⁻¹. Applying this value to the peatlands located in the Aysén and Magallanes regions (~4.5 million hectares), and assuming a complete stop of commercial exploitation, they estimate that these ecosystems could capture 13 million tons of carbon over the next 30 years (or 430,000 tons per year).

Chapters 4 (Reid & Torres) and 5 (Reid & McCulloch) focus on the hydrology of the regional peatlands. This is important work because anthropogenic impacts, either of the peatlands themselves (drainage canals) or around them (roads), can change the hydrology of these systems, in turn impacting their biodiversity, carbon dynamics, and water quality. In these chapters, a new regional field analysis reveals that surface and groundwater quality varies across different sites, particularly in terms of concentrations of nutrients and major ions, likely because of differences in substrate, rain composition, and local anthropogenic impacts. A case study in the Aysén valley looks at the annual water balance of a well-instrumented site. The authors document a positive water budget, which they link to the formation and persistence of pools on the peatland's surface. Such baseline work is needed to document and monitor any changes to their hydrology now and in the future.

The next few chapters document the regional diversity of testate amoeba (Chapter 6 by Fernández), bryophytes and lichens (Chapter 7 by Larrain & Vargas), flora (Chapter 8 by Domínguez & Silva), amphibians (Chapter 9 by Ortiz & Domínguez), and birds (Chapter 10 by Raimilla.). The results presented in these chapters constitute important steps towards our knowledge of the regional biodiversity; they also clearly demonstrate the importance of the *Sphagnum* peatlands of Aysén in the support of that regional biodiversity. For example, a total of 74 amoeba species were identified in the regional peatlands, of which 11 are endemic to southern Chile. As for peatland vegetation, 62 species of lichens (with *Cladonia arbuscula* subsp. being the most abundant), 13 moss species (with *Sphagnum magellanicum* being the most abundant), and 40 liverwort species were recorded. In another study, 67 native species of trees, bushes, shrubs, herbaceous plants, and epiphytes/cryptogams were identified, of which 26 are endemic to South. It is important to note that, in the studied *Sphagnum* bogs, only one introduced species was identified (*Carex canescens*), suggesting that intact peat bogs may slow down the spread of invasive plants across the region. As for amphibians, their diversity was shown to be impacted by peat harvesting. Lastly, the regional peatlands provide a unique habitat for many bird species. A total of 26 bird species were identified, with species richness between 1 and 10 per site, with *Sphagnum* peatlands being the sites with the greatest species richness.

Lastly, chapters 11 through 13 present information about regional peat moss exploitation. Chapter 11 (Sanhueza *et al.*) discusses the importance of the global *Sphagnum* market for local

economies. The authors present important information about the supply chains, from local producers to the major countries that import Chilean moss; they point out that local communities are not closely involved with the extraction process (with the exception of land owners), which contributes to the perceived transience of this industry and a general lack of knowledge about the peat industry. Chapter 12 (Carrillo & Pacheco) shows that the growth rate of *Sphagnum magellanicum* that are artificially grown in large greenhouses generally surpasses *Sphagnum* grown in “anthropogenic” (or impacted) peatlands by 6 to 80%. Their study provides a sustainable alternative to the production and export of *Sphagnum magellanicum*. Chapter 13 (Piñones & Domínguez) presents a critical review of the recent regulations that pertain to *Sphagnum* moss protection in Chile. They specifically discuss a recent law (2018) on the protection of *Sphagnum* moss (Decreto Supremo N°25) from the Ministerio de Agricultura, the authors claim, is insufficient to ensure the sustainable exploitation of the resource.

Prior to the publication of this book, little information was available about the *Sphagnum* peatlands of Aysén. With this book, which is filled with pictures and taxonomic details, baseline information about these important ecosystems can be assessed. The health of these ecosystems can also be monitored now and in the future. Crucially, the information provided in this book should be a useful tool to educate and empower anyone with an interest about the *Sphagnum* peatlands of Aysén.

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