

中国科学院中国孢子植物志编辑委员会 编辑

中国苔藓志

第四卷

真藓目

黎兴江 主编



科学出版社

中国科学院中国孢子植物志编辑委员会 编辑

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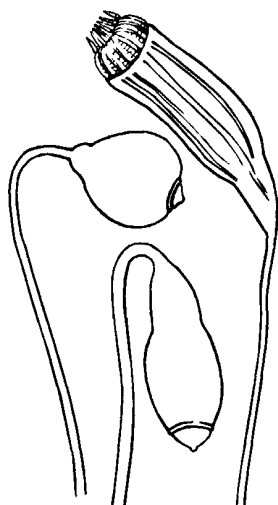
真藓目

黎兴江 主编

中国科学院知识创新工程重大项目

国家自然科学基金重大项目

(国家自然科学基金委员会 中国科学院 国家科学技术部 资助)



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ACADEMIAE SINICAE EDITA

FLORA BRYOPHYTORUM SINICORUM

VOL. 4

EUBRYALES

REDACTOR PRINCIPALIS

Li Xing-Jiang

**A Major Project of the Knowledge Innovation Program
of the Chinese Academy of Sciences**

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《中国苔藓志》第四卷

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FLORA BRYOPHYTORUM SINICORUM

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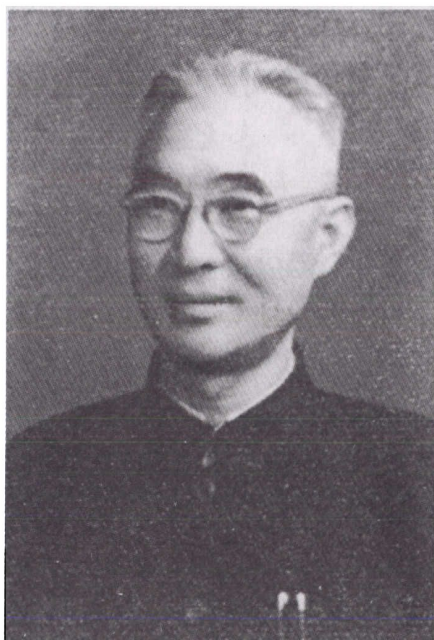
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献 给

中国苔藓植物学奠基者

陈邦杰 教授

(1907~1970)



**DEDICATUM
VOLUMEN HOC
PROF. PAN-CHIEH CHEN
(1907~1970)**

中国孢子植物志第四届编委名单

(1998年4月)

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序

中国孢子植物志是非维管束孢子植物志，分《中国海藻志》、《中国淡水藻志》、《中国真菌志》、《中国地衣志》及《中国苔藓志》五部分。中国孢子植物志是在系统生物学原理与方法的指导下对中国孢子植物进行考察、收集和分类的研究成果；是生物物种多样性研究的主要内容；是物种保护的重要依据，对人类活动与环境甚至全球变化都有不可分割的联系。

中国孢子植物志是我国孢子植物物种数量、形态特征、生理生化性状、地理分布及其与人类关系等方面的综合信息库；是我国生物资源开发利用、科学研究与教学的重要参考文献。

我国气候条件复杂，山河纵横，湖泊星布，海域辽阔，陆生和水生孢子植物资源极其丰富。中国孢子植物分类工作的发展和《中国孢子植物志》的陆续出版，必将为我国开发利用孢子植物资源和促进学科发展发挥积极作用。

随着科学技术的进步，我国孢子植物分类工作在广度和深度方面将有更大的发展，对于这部著作也将不断补充、修订和提高。

中国科学院中国孢子植物志编辑委员会

1984年10月 北京

中国孢子植物志总序

中国孢子植物志是由《中国海藻志》、《中国淡水藻志》、《中国真菌志》、《中国地衣志》及《中国苔藓志》所组成。至于维管束孢子植物蕨类未被包括在中国孢子植物志之内，是因为它早先已被纳入《中国植物志》计划之内。为了将上述未被纳入《中国植物志》计划之内的藻类、真菌、地衣及苔藓植物纳入中国生物志计划之内，出席 1972 年中国科学院计划工作会议的孢子植物学工作者提出筹建“中国孢子植物志编辑委员会”的倡议。该倡议经中国科学院领导批准后，“中国孢子植物志编辑委员会”的筹建工作随之启动，并于 1973 年在广州召开的《中国植物志》、《中国动物志》和中国孢子植物志工作会议上正式成立。自那时起，中国孢子植物志一直在“中国孢子植物志编辑委员会”统一主持下编辑出版。

孢子植物在系统演化上虽然并非单一的自然类群，但是，这并不妨碍在全国统一组织和协调下进行孢子植物志的编写和出版。

随着科学技术的飞速发展，人们关于真菌的知识日益深入的今天，黏菌与卵菌已被从真菌界中分出，分别归隶于原生动物界和管毛生物界。但是，长期以来，由于它们一直被当作真菌由国内外真菌学家进行研究；而且，在“中国孢子植物志编辑委员会”成立时已将黏菌与卵菌纳入中国孢子植物志之一的《中国真菌志》计划之内并陆续出版，因此，沿用包括黏菌与卵菌在内的《中国真菌志》广义名称是必要的。

自“中国孢子植物志编辑委员会”于 1973 年成立以后，作为“三志”的组成部分，中国孢子植物志的编研工作由中国科学院资助；自 1982 年起，国家自然科学基金委员会参与部分资助；自 1993 年以来，作为国家自然科学基金委员会重大项目，在国家基金委资助下，中国科学院及科技部参与部分资助，中国孢子植物志的编辑出版工作不断取得重要进展。

中国孢子植物志是记述我国孢子植物物种的形态、解剖、生态、地理分布及其与人类关系等方面的大型系列著作，是我国孢子植物物种多样性的重要研究成果，是我国孢子植物资源的综合信息库，是我国生物资源开发利用、科学研究与教学的重要参考文献。

我国气候条件复杂，山河纵横，湖泊星布，海域辽阔，陆生与水生孢子植物物种多样性极其丰富。中国孢子植物志的陆续出版，必将为我国孢子植物资源的开发利用，为我国孢子植物科学的发展发挥积极作用。

中国科学院中国孢子植物志编辑委员会

主编 曾呈奎

2000 年 3 月 北京

Foreword of the Cryptogamic Flora of China

Cryptogamic Flora of China is composed of *Flora Algarum Marinarum Sinicarum*, *Flora Algarum Sinicarum Aquae Dulcis*, *Flora Fungorum Sinicorum*, *Flora Lichenum Sinicorum*, and *Flora Bryophytorum Sinicorum*, edited and published under the direction of the Editorial Committee of the Cryptogamic Flora of China, Chinese Academy of Sciences(CAS). It also serves as a comprehensive information bank of Chinese cryptogamic resources.

Cryptogams are not a single natural group from a phylogenetic point of view which, however, does not present an obstacle to the editing and publication of the Cryptogamic Flora of China by a coordinated, nationwide organization. The Cryptogamic Flora of China is restricted to non-vascular cryptogams including the bryophytes, algae, fungi, and lichens. The ferns, a group of vascular cryptogams, were earlier included in the plan of *Flora of China*, and are not taken into consideration here. In order to bring the above groups into the plan of Fauna and Flora of China, some leading scientists on cryptogams, who were attending a working meeting of CAS in Beijing in July 1972, proposed to establish the Editorial Committee of the Cryptogamic Flora of China. The proposal was approved later by the CAS. The committee was formally established in the working conference of Fauna and Flora of China, including cryptogams, held by CAS in Guangzhou in March 1973.

Although myxomycetes and oomycetes do not belong to the Kingdom of Fungi in modern treatments, they have long been studied by mycologists. *Flora Fungorum Sinicorum* volumes including myxomycetes and oomycetes have been published, retaining for *Flora Fungorum Sinicorum* the traditional meaning of the term fungi.

Since the establishment of the editorial committee in 1973, compilation of Cryptogamic Flora of China and related studies have been supported financially by the CAS. The National Natural Science Foundation of China has taken an important part of the financial support since 1982. Under the direction of the committee, progress has been made in compilation and study of Cryptogamic Flora of China by organizing and coordinating the main research institutions and universities all over the country. Since 1993, study and compilation of the Chinese fauna, flora, and cryptogamic flora have become one of the key state projects of the National Natural Science Foundation with the combined support of the CAS and the National Science and Technology Ministry.

Cryptogamic Flora of China derives its results from the investigations, collections, and classification of Chinese cryptogams by using theories and methods of systematic and evolutionary biology as its guide. It is the summary of study on species diversity of cryptogams and provides important data for species protection. It is closely connected with human activities, environmental changes and even global changes. Cryptogamic Flora of

China is a comprehensive information bank concerning morphology, anatomy, physiology, biochemistry, ecology, and phytogeographical distribution. It includes a series of special monographs for using the biological resources in China, for scientific research, and for teaching.

China has complicated weather conditions, with a crisscross network of mountains and rivers, lakes of all sizes, and an extensive sea area. China is rich in terrestrial and aquatic cryptogamic resources. The development of taxonomic studies of cryptogams and the publication of Cryptogamic Flora of China in concert will play an active role in exploration and utilization of the cryptogamic resources of China and in promoting the development of cryptogamic studies in China.

C. K. Tseng
Editor-in-Chief
The Editorial Committee of the Cryptogamic Flora of China
Chinese Academy of Sciences
March, 2000 in Beijing

《中国苔藓志》序

苔藓植物为孢子植物中组织构造复杂性仅次于蕨类的一大类群。它与孢子植物其他大类的共同特点系通常以孢子来繁衍后代。

由于苔藓植物习生于水湿条件较丰富的生境，在历史上曾与孢子植物其他大类中生态习性近似的种类归为同一类群。在 1801 年和 1844~1847 年，藓类和苔类分别作为植物界的组成部分被确立。20 世纪 70 年代，角苔类被从苔类中分出，因此，苔藓植物门 (Division Bryophyta) 现包含苔纲 (Hepaticae)、角苔纲 (Anthocerotae) 和藓纲 (Musci) 三大类。在系统上，它们被置于蕨类植物和藻类植物之间，而认为系植物界大系统“树”发育上的一个侧枝，或因苔藓植物无演化成其他植物的渊源关系，也有称苔藓植物是植物界的“盲枝”。

苔藓植物在世界各地从热带雨林至寒温带荒漠包括南极洲在内均有分布。一般认为全世界约有 23 000 种苔藓植物，其中包括 8000 种苔类、100 种角苔类和 15 000 种藓类。中国地域辽阔，涉及热带山地雨林、常绿阔叶林、针叶林、草原和干旱荒漠以及形式多样的小生境。中国又具有世界独特的青藏高原和横断山区，现知中国苔藓植物的种类约为全世界的十分之一，并富有特有类型和东亚特有类型。

《中国苔藓志》是 1973 年广州召开的“三志”工作会议上确立，作为中国孢子植物志所包含的藻类(又分海藻和淡水藻)、菌类、地衣和苔藓等五志的一个组成部分。在中国孢子植物志编委会领导和中国科学院给予经费大力支持下，长达十多年酝酿，野外补点和全国有关科研机构及大学间协调，确定了编研分工和编研计划。

自 1993 年中国孢子植物志与《中国植物志》和《中国动物志》作为重大项目列入国家自然科学基金委员会“八五”计划，在国家自然科学基金委员会、中国科学院和国家科学技术部联合资助下，《中国苔藓志》正陆续开始出版，预期在“九五”期间将完成藓类 8 卷的编研任务，“十五”结束全部《中国苔藓志》12 卷的任务。

苔藓植物内在的系统多以苔类植物组织构造较简单，并对环境的适应性弱，而一般认为苔类植物较原始，其次为角苔类，然后是藓类。在苔类和藓类各自的小系统中，又均以植物体直立，孢蒴顶生于茎者为原始，而植物体匍匐的类型及孢蒴非着生茎顶者为进化。《中国苔藓志》的系统因考虑我国对藓类的研究力量较强，其出版顺序以藓类先于苔类，对卷的编号也以藓类在前，苔类在后，前者自 1~8 卷，而后者为 9~12 卷。就具体系统而言，《中国苔藓志》中的藓类部分系按陈邦杰在 1963 年修正的 Brotherus 系统，而苔类部分采用 Schuster(1966~1992)及 Grolle(1983)融合的系统。

《中国苔藓志》的研究历史可回溯至 20 世纪 30 年代末。当时以《中国植物志要》(*Symbolae Sinicae*)为名，由奥地利人 Handel-Mazzetti 在中国西南地区采集的数以千计的苔藓标本，分别按藓类和苔类由 Brotherus 及 Nicholson、Herzog 和 Verdoorn 鉴定和撰写。在该“志要”中所包含的种类分别为中国藓类种数的 1/3 和苔类的 1/6。

1963 年及 1978 年出版由陈邦杰主编的《中国藓类植物属志》上、下册系《中国苔

藓志》的雏形，虽然该套书不包括种的文献和描述，但已列入中国迄今所知约 95%的藓类植物。《中国高等植物图鉴》第一卷中的苔藓植物门及后来一系列的地区苔藓志：《东北藓类植物志》、《东北苔类植物志》、《秦岭植物志·苔藓植物门》、《西藏苔藓植物志》和《内蒙古苔藓植物志》及《横断山区苔藓志》等的出版，均为《中国苔藓志》的编研奠定了坚实的基础。

在我国已签署“国际生物多样性公约”，并重视加强对濒危和珍稀物种保护的前景下，《中国苔藓志》成果的陆续问世，无疑可为环境保护、植物资源的更为合理的利用，以及为地球上生物间的相互关系研究做出积极的贡献。

中国科学院中国孢子植物志编辑委员会

副主编 吴鹏程

2000年3月 北京

Foreword of Flora Bryophytorum Sinicorum

Bryophytes, as the second largest group in the cryptogams, have less complex construction than Pteridophytes. The common characteristic of the bryophytes with the other taxa in cryptogams is that they usually use their spores for propagation.

Historically, the Bryophytes were classified as members of the cryptogams, in which the majority of members are hygrophilous in habit. In 1801 and from 1844 to 1847, the Musci and the Hepaticae were established separately in the plant kingdom. In 1970s', the hornworts were isolated from the Hepaticae. Thus for the division of Bryophyta consists of Hepaticae, Anthocerotae, and Musci. In the system, the Bryophyta are arranged between the Pteridophyta and the Algae. They are recognized as a lateral branch of the phylogenetic tree in the evolutionary process of the plant kingdom, and seen as a blinding branch, and more so, this branch does not have confirmed connection with any other plant groups.

The bryophytes are distributed worldwide from the tropical rain forest to the cold harsh desert, including Antarctic. Generally, about 23,000 species of bryophytes exist in the world, among them 8,000 species of liverworts, about 100 species of hornworts, and 15,000 species of mosses. China contains not only various microhabitats, but encompasses a wide area, including tropical rain mountain forests, evergreen broad-leaf forests, coniferous forests, meadows, and dry harsh deserts. The Qinghai-Xizang(Tibet) Plateau and the Hengduan Mountains of China are some the most unique regions in the world. There are about 10 percent of the bryophyte species distributed in China, including also members of the endemic taxa and the Eastern Asian elements.

The project "*Flora Bryophytorum Sinicorum*", established at the "Fauna, Flora and Cryptogamic Flora of China Workshop" in Guangzhou in 1973, is a part of the major project that includes the flora of fresh and marine algae, fungi, lichens, and bryophytes. Academically directed by the Editorial Committee of the Cryptogamic Flora of China, the *Flora Bryophytorum Sinicorum* was financially supported by the Chinese Academy of Sciences and was prepared over a period of ten years. Additionally, through a series of field works, along the close cooperation between the institutions and universities, the editorial plan and schedule were designed.

Since 1993, the Cryptogamic Flora of China, *Flora Reipublicae Popularis Sinicae* and *Fauna Sinica*, as one of the major projects has been enlisted in the "Eighth Five-Year Plan" of the National Natural Science Foundation of China. Under the cooperative financial support of the National Natural Science Foundation of China, the Chinese Academy of Sciences, and the National Science and Technology Department, the total 12 volumes of the *Flora Bryophytorum Sinicorum* will be published in succession. Among which, eight volumes are

expected to appear during the “Ninth Five-Year Plan” and the others will be completed in the “Tenth Five-Year Plan”.

In the infra-system of Bryophytes, generally, the Hepaticae are more ancestral in their characters, followed by the more isolated Anthocerotae, and the more advanced Musci. In both systems of liverworts and mosses, the group with erect stems and acrocarpous capsules is evolutionally primitive, while the group with creeping stems and pleurocarpous capsules is advanced. In consideration of the present study on Chinese mosses, the published order of the *Flora Bryophytorum Sinicorum* is the mosses first, followed by liverworts. Volume 1~8 are for mosses and 9~12 are liverworts. The taxonomic system of the *Flora Bryophytorum Sinicorum* is adapted from one of Brotherus' works and modified by Pan-Chien Chen for mosses in 1963. The liverwort one combines both Schuster's(1966~1992) and Grolle's(1983) systems.

The research history of Chinese bryophytes can be dated back to the late 1930s'. At that time, the *Symbolae Sinicae*, written by Brotherus for mosses, and Nicholson, Herzog and Verdoorn for liverworts, was a preliminary monograph of the bryoflora of China, based on the thousand bryophyte specimens collected by the Austrian Handel-Mazzetti from Southwest China, with some one-third of Chinese mosses and one-sixth of Chinese liverworts included in that monograph.

The *Genera Muscorum Sinicorum*(Volume I and II), edited by Pan-Chien Chen in 1963 and 1978, are the embryonic form of the *Flora Bryophytorum Sinicorum*. About 95% of the species of mosses of China up to that time were listed, although the literature citation and description of each species were not included. The three volumes of the *Flora Bryophytorum Sinicorum* and following local bryofloras including *Iconographia Cormophytorum Sinicorum*, *Flora Muscorum Chinae Boreali-Orientalis*, *Flora Hepaticarum Chinae Boreali-Orientalis*, *Flora Tsinglingensis Tom. III: Bryophyta*, *Bryoflora of Xizang*, *Bryoflora of Hengduan Mts, SW China*, *Flora Bryophytarum Intramongolicarum*, and *Flora Bryophytorum Shandongicorum* established a steady foundation for the compilation of the *Flora Bryophytorum Sinicorum*.

Under the provision of the “Convention on Biological Diversity” signed by the Chinese government, the studies on the rare and endemic species of biology have been strengthening in China. The publications of the *Flora Bryophytorum Sinicorum* will stimulate environmental protection, promote better usage of plant resources, and allow for great contributions to be made to the studies on the correlation between the biological groups of the world.

Wu Pan-Cheng
Deputy Editor-in-Chief
The Editorial Committee of the Cryptogamic Flora of China
Chinese Academy of Sciences
March, 2000 in Beijing

前 言

我国苔藓植物分类学的研究,始于 19 世纪初期。在陈邦杰及王启无教授等先辈创始研究苔藓和大力培养苔藓学工作者的基础上,数十年来,在三代苔藓植物学家的共同努力下,先后搜集了近 50 万号标本和大量有关资料。有了这些基础,作者们始能对中国苔藓植物进行系统的研究,并编写成本卷志书。

本卷包括产于中国的苔藓植物最大的一个目,即真藓目;下设 9 个科(真藓科、提灯藓科、桧藓科、树灰藓科、皱蒴藓科、寒藓科、珠藓科、木毛藓科、美姿藓科),32 属及 216 种。书中拉丁学名系按现行国际植物命名法规考证使用;中名系根据陈邦杰等(1963)及吴鹏程等(1984)《苔藓名词及名称》使用,仅在特殊情况下,著者才使用中名的优先法和新拟名。书中不引用科的文献,属仅引用原始文献,在种以下除引用原始文献外,还引用国内地方志及国内外有关文献及著作,特别注意引用了国内主要异名及新异名。在每种的特征描述之后有生境、国内产地及世界分布等详细记载,其后有简要的该种识别特征、用途、分布及分类问题讨论,尽可能在每种后附主要识别特征图。

本卷志书在编研过程中,得到了国家自然科学基金委员会、中国科学院及国家科学技术部的资助;在中国科学院孢子植物志编委会领导下,承主编及各位副主编、编委及田金秀先生的多方面指导和帮助,承中国科学院植物研究所、昆明植物研究所、沈阳应用生态研究所、华南植物研究所、江苏植物研究所,以及上海自然科学博物馆、华东师范大学生物系、西北植物研究所、西安植物园、中山大学生物系、云南大学生物系、内蒙古大学生物系、新疆大学生物系及河北师范大学生命科学学院等单位的有关同仁及台湾东海大学景观学系赖明洲教授,以及有关标本馆协助借阅了大量有关科的标本、资料,在此一并致谢!本书编写过程中还得到国外苔藓学家和有关标本馆的大力支持,得以借阅了不少模式标本和资料,特别是芬兰赫尔辛基大学植物系 T. Koponen 教授及其标本馆、日本服部研究所标本馆及其冈崎分室岩月善之助教授、美国纽约植物园标本馆等在借阅标本资料方面给予了大力支持,并承 T. Koponen 教授为本书鉴定提灯藓科及珠藓科的疑难标本,在此一并致以深切的谢意。

本卷志书是在著者们分工负责,经过多年的研究及近 5 年的编写、绘图等工作集体完成的。其中提灯藓科经黎兴江及臧穆多年研究、编写,并承臧敏烈及吴锡麟协助绘图;真藓科由张大成、黎兴江研究、编写及绘图;珠藓科由臧穆研究编写及绘图;其余 6 个科均由黎兴江编写,臧穆绘图。最后由黎兴江汇总统编。在本书编研过程中,由于资料不足,著者们水平所限,深感书中内容不全,疏漏之处在所难免,盼苔藓学界同仁和广大读者给予补充和指正。

黎兴江

2002 年冬于昆明

Preface

So far as the author is aware, the early Sino-bryological taxonomic study began in 19th century, the works are included by professor P. C. Chen and C. W. Wang. After that, more younger Chinese bryologists continued to study with collections and identifications, often provided with meager field data though usually well localized. Much of the flora of the Tibet Plateau and tropics fall into this volume, Taxonomic experience and judgment are particularly important in this work, the descriptions and drawings are, where possible, based on Chinese specimens examined which are all deposited in the following Herbaria, Universities, Institutes, Museum. We owe a special debt of gratitude to the following sources: Cryptogamic Herbarium Kunming Institute of Botany, Academia Sinica, Institute of Botany, Academia Sinica, Institute of Applied Ecology, Academia Sinica, South China Institute of Botany Academia Sinica, Jiangsu Institute of Botany, Academia Sinica, Shanghai Nat. Hist. Museum, East China Normal University, North-westeren Botanical Institute, Xian Botanical Garden, Department of Biology, Sun Yat-sen University, Herbarium of Yunnan University, Department of Biology, Inner-Mongolia University, Dept. of Biology, Xinjiang University, College of life Science, Hebei Normal University, Herbarium of Donghai University, Taiwan etc.

The compilation of the *Flora Bryophytorum Sinicorum* is a complex work involving the systematics, phyto-relationships, phyto-resources, geographic distribuion patterns, habitats, nomenclature, specimens citations, illustrations etc. All are included if necessary.

This volume provides descriptions and illustrations that have hitherto been recorded in China. Nomenclature follows *Index Muscorum* (van der Wijk et al., 1959—1969), the Chinese-Han's nomenclature which follows *Genera Muscorum Sinicorum* (Vol. I—II.) (P. C. Chen & P. C. Wu, 1963, 1984)

A number of old and contemporary researchers have given me ready assistance and described in a number of genera and families in this text. I express my gratitude to them and absolve them from responsibility for any misconceptions that I have inadvertently retained. Those who have completed much descriptions and figures of the text are Xing-Jiang Li & M. Zang (Family Mniaceae), The figures were drawn by the following artists. Min-Lie Zang & Xi-Lin Wu, Da-Cheng Zhang & Xing-Jiang Li (Family Bryaceae), M. Zang (Family Bartramiaceae). I am especially indebted to Dr. Timo Koponen, Dr. Zen Iwatske and Dr. Ming-Chou Lai for their helps and supports.

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specimens, and also would deeply thank to the National Natural Science Foundation of China, the Chinese Academy of Sciences, the Ministry of Science and technology of China and The Editorial Committee of the Cryptogamic Flora of China, Academia Sinica.

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