

中国科学院中国孢子植物志编辑委员会 编辑

中国苔藓志

第九卷

藻苔目 美苔目 叶苔目

高 谦 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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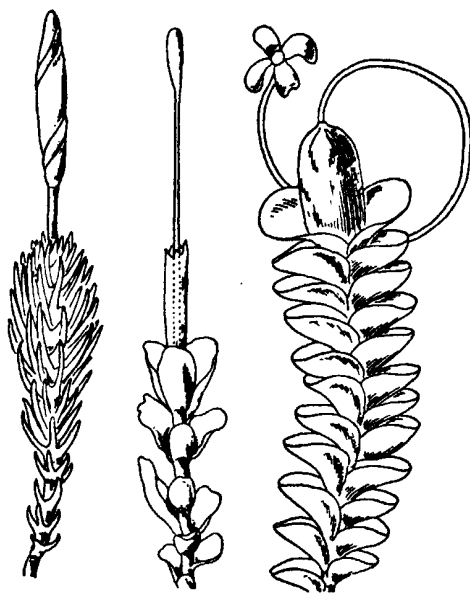
藻苔目 美苔目 叶苔目

高 谦 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

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ACADEMIAE SINICAE EDITA

FLORA BRYOPHYTORUM SINICORUM

VOL. 9

TAKAKIALES CALOBRYALES JUNGERMANNIALES

REDACTOR PRINCIPALIS

Gao Chien

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Beijing

《中国苔藓志》第九卷研编分工表

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(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，陆生与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

中国孢子植物志序

中国孢子植物志是在中国科学院中国孢子植物志编辑委员会主持下编辑出版的关于中国孢子植物资源的大型系列著作，是中国孢子植物资源的综合信息库。

孢子植物在系统演化上并不是一个单一的自然类群，但是，这并不妨碍在全国统一组织协调下进行中国孢子植物志的编写和出版。中国孢子植物志之所以被限制在非维管束孢子植物范围，是因为属于维管束孢子植物的蕨类植物早先已被纳入《中国植物志》计划之内，而非维管束植物——苔藓以及藻类、真菌和地衣则处于《中国植物志》计划之外。为了将上述生物类群作为孢子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“筹建中国科学院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，中国科学院中国孢子植物志编辑委员会的筹建工作在中国科学院的领导下随之启动，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（简称“三志”）工作会议上正式成立。

由于孢子植物包括的生物类群较多，因而，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》，在中国科学院中国孢子植物志编辑委员会统一主持下编辑出版。

尽管在演化系统上，黏菌与卵菌已从真菌界分出，但是，长期以来，由于它们一直是由真菌学家进行研究的，而且，包括黏菌与卵菌在内的《中国真菌志》作为中国孢子植物志的组成部分业已陆续出版，因此，沿用上述含义的《中国真菌志》名称是必要的。

自编委会于 1973 年成立以后，中国孢子植物志的编研工作由中国科学院资助，自 1982 年国家自然科学基金委员会参与部分资助，在中国科学院中国孢子植物志编辑委员会主持下，组织协调全国有关科研机构和大学进行中国孢子植物志的编前研究和编写工作。

自 1993 年以来，“三志”的编写及编前研究作为国家自然科学基金委员会重大项目，在以国家自然科学基金委员会为主、中国科学院和国家科学技术部参与的联合资助下，中国孢子植物志的编前研究和编写工作继续进行并不断取得重要进展。

中国孢子植物志是在系统与进化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，是孢子植物物种多样性研究的主要内容之一，是物种保护的重要依据。孢对植物与人类活动及环境变化甚至全球变化都有不可分割的联系。

中国孢子植物志是记述我国孢子植物物种的形态、解剖、生理、生化、生态、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。

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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 *Flora Cryptogamarum Sinicarum*

Flora Cryptogamarum Sinicarum is a series of monographs on Chinese non-vascular cryptogamic plants, 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 or evolutionary point of view, which, however, does not present an obstacle to the editing and publication of *Flora Cryptogamarum Sinicarum* by a coordinated, nationwide organization. *Flora Cryptogamarum Sinicarum* is restricted to non-vascular cryptogamic “plants” including the bryophytes, algae, fungi and lichens. The ferns, a group of vascular cryptogamic plants, were earlier included in the plan of *Flora Sinica*, and are not taken into consideration here. In order to bring the above groups into the plan of Fauna and Flora Sinica of China, some leading scientists on cryptogamic plants, 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 Sinica, including Cryptogamic Flora of China, held by CAS in Guangzhou in March 1973.

Flora Cryptogamarum Sinicarum is composed of *Flora Algarum Marinarum Sinicarum*, *Flora Algarum Sinicarum Aquae Dulcis*, *Flora Fungorum Sinicorum*, *Flora Lichenum Sinicorum*, and *Flora Bryophytorum Sinicorum*. They are edited and published under the direction of the Editorial Committee of the *Cryptogamic Flora of China*, CAS. 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 *Flora Cryptogamarum Sinicarum* 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 *Flora Cryptogamarum Sinicarum* by organizing and coordinating the main research institutions and universities all over the country. Since 1993, study and compilation of the “fauna and floras”, especially *Flora Cryptogamarum Sinicarum*, has 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.

Flora Cryptogamarum Sinicarum derives its results from the investigations, collec-

tions, 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. *Flora Cryptogamarum Sinicarum* 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 *Flora Cryptogamarum Sinicarum* 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缘关系，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，因此，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为主，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 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 鉴定与撰写。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 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 large group in the cryptogams, have less complex construction compared with that of Pteridophytes. The common character of the bryophytes with the other cryptogams is that they usually use the spores for propagation.

Historically the bryophytes were classified with the other taxa of the cryptogams in a same group, based on their habitat is rather moist. In 1801 and from 1844 to 1947, the Musci and the Hepaticae were established separately in the plant kingdom. In 1970s', the hornworts were isolated from the Hepaticae, thus the division of Bryophyta consists of Hepaticae, Anthocerotae and Musci right now. Systematically, their position is arranged between pteridophytes and algae, and recognized as a lateral branch of the systematic "tree" of the plant kingdom; otherwise someone called them a "blinding branch" of the plant kingdom, since they still haven't any exact relationships with other plant groups.

The bryophytes are distributed world wide from the tropical rain forests to the cold harsh deserts including Antarctic. Generally, there are 23 000 species of bryophytes in the world, among them 8 000 species are liverworts, about 100 species are hornworts and 15 000 species belong to mosses. China occurs wide area involving the tropical rain mountain forests, evergreen broad leaved forests, coniferous forests, meadows and dry harsh deserts and various microhabitats. The Qinghai-Xizang (Tibet) Plateau and the Hengduan Mts of China are the unique regions in the world, hence there are about 1/10 species of bryophytes of the world in China, which is also rich in endemic to China and East Asian types.

The project "Flora Bryophytorum Sinicorum", established at the Guangzhou "Fauna, Flora and Cryptogamic Flora of China Workshop" in 1973, is one part of the major project including the flora of fresh algae, marine algae, fungi, lichens and bryophytes. Under the leadership of the Editorial Committee of the *Cryptogamic Flora of China*, the *Flora Bryophytorum Sinicorum* was financially supported by the Chinese Academy of Sciences and prepared for more than ten years. As well, a series of field works and the close cooperation between the institutions and universities had been maken, then the editorial schedule and editorial plan were designed.

Since 1993, the Flora Cryptogamarum Sinicarum, Flora Reipublicae Popularis Sinicae and Fauna Sinica, as one of the major project was arranged in the "Eighth Five-Year Plan" of the National Natural Science Foundation of China, and under the cooperated financial support by the National Natural Science Foundation of China, the Chinese Academy of Sciences and the National Science and Technology Department, the *Flora Bryophytorum Sinicorum* is being published one by one. Eight volumes of the Chinese bryophytes are looking forward to be published during the "Ninth Five-Year Plan" and the total 12 volumes of the

Flora Bryophytorum Sinicorum will be completed in the “Tenth Five-Year Plan”.

In the infra-system of bryophytes, the hepaticae are usually rather simple in construction and weak in adaptation. Generally, the hepaticae are primitive, and the anthocerotae follow the former ones, then the mosses are rather advanced. In both systems of liverworts and mosses, the group with erect stems and acrocarpous capsules are primitive, while the group with creeping stems and pleurocarpous capsules are advanced. In consideration of the present study on Chinese mosses, the publish order of the *Flora Bryophytorum Sinicorum* is the mosses earlier than the liverworts. The volume number 1~8 are for mosses and 9~12 are liverworts. The taxonomic system of the *Flora Bryophytorum Sinicorum* is adapted the one of Brotherus' modified by P. -C. Chen for mosses in 1963, however the liverwort one is combined both Schuster (1966~1992) and Grolle's (1983) systems.

The research history of Chinese bryophytes can be backdated to the end of 1930s'. At that time, the *Symbolae Sinicae* written by Brotherus and Nicholson, Herzog and Verdoorn for mosses and liverworts separately was a preliminary monograph of the bryoflora of China, based on the number of thousand bryophyte specimens collected by the Austrian Handel-Mazzetti from Southwest China, and some one-third and one-sixth of Chinese mosses and liverworts were included separately 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*. Among them 95% species of the mosses of China up to date were listed, although the literature citation and description of each species were not included. The three volumes of the *Flora Bryophytorum Sinicorum* and the followed local bryofloras including *Iconographia Cormo-phytorum 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 Shangdongicorum* established a steady foundation for the compilation of the *Flora Bryophytorum Sinicorum*.

Under the situation 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, therefore the publications of the *Flora Bryophytorum Sinicorum* will stimulate the environment protection, better usage of plant resources and make great contributions to the studies on the correlation in 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

《中国苔藓志》第九卷，是在中国几代苔藓植物学家共同采集调查、积累资料的基础上，经过著者们多年的艰苦努力、系统研究完成的重要成果。它是中国苔藓植物系统分类研究的总结，是中国苔藓志的一个组成部分。

本卷包括苔纲 (HEPATICAЕ) 的藻苔目、美苔目和叶苔目的一部分，共 14 科 37 属 221 种和种下分类单位，其中新分布属 8 个，新分布种 27 个，新种 11 个。它的排列系统是按 Grolle (1983) 和 Schuster (1966) 修订的苔类系统编排的，以纲、目、科、属、种等级单位排列，在不同情况下也采用了相应等级下的分类单位。拉丁学名按现行国际植物命名法规规定考订使用；中名采用科学出版社《孢子植物名词名称》和《苔藓名词及名称》为主，并参考已出版著作，著者考订中名的优先权或新拟名称使用。科的文献不引证，属仅引用原发表文献，种除去引证原始发表文献之外还引用国内地方志和国内外有关专著，部分种引证了重要的同物异名，在可能的情况下，多数已指明模式产地和存放标本馆，以便今后考订。种的特征描述之后有生境、产地、分布等详细记载，部分种最后还有分类特征讨论，多数种均有特征附图。产地系指我国标本采集地点，按省或自治区为一级产地，以下是县、地区或山（河、岛）等具体地点，有时一个山脉跨 2~3 个省、自治区（县）时，则标明了某省、自治区（或县）某山（名）。标本引用则按产地、采集人、标本号，括号内的外文字为存放标本馆缩写代号，每个县仅引用了 2~3 号标本。分布是从国内外文献资料查出汇集而成，说明本种群在国内外分布范围，近以国名（或地区），远以洲名（或大地区）记录。

本卷是集体研究成果，书中护蒴苔科和绒苔科由曹同、衣艳君，剪叶苔科由傅星、高谦，指叶苔科由高谦、张光初，叶苔科由高谦、吴玉环，隐蒴苔科、甲克苔科由高谦、谢维，藻苔科、美苔科、复叉苔科、大萼苔科、拟大萼科、兔耳苔科等由高谦研究编写。最后高谦汇总综合审编成书。本卷研编过程中，由于标本、资料和著者们水平所限，深感书中内容不全，谬误之处望读者和同仁指正。

研究编写本卷过程中，得到了中国科学院生物局和国家自然科学基金委员会的资助。在中国科学院孢子植物志编辑委员会领导下，中国科学院昆明植物研究所黎兴江、臧穆、曾淑英以及中科院植物研究所及其他高校和研究室的罗健馨、吴鹏程、赖明州、张满祥、林邦娟、李登科、李植华、胡人亮、李乾等同仁提供了标本、资料等多方面的支持和帮助，特致以衷心的感谢。同时也得到了纽约植物园 William R. Buck 博士、赫尔辛基 T. Koponen 和 S. Piippo、服部植物研究所 Z. Iwatsuki 和 M. Mizutani，以及新加坡国立大学 Benito C. Tan 等教授借阅标本和资料，特致以谢意。

高 谦

2001 年春

Preface

This volume, as a part of the Bryoflora of China, is finished after several decades of endeavor by researchers based on the numerous specimens collected by several generations of Chinese bryologists. The work was started by collecting and studying of specimens, and finally completed by further identifying, describing and illustrating work in the help of many references.

This volume comprises 14 families, 37 genera, and 221 species and intraspecific taxa from Takakiales, Calobryales, and part of Jungermanniales, including eight new genera as well as 27 new species records and 11 species new to science. The systematical arrangements in this volume mainly follow Grolle (1983) and Schuster (1966), with the ranks including class, order, family, genus and species, and infrank taxa if necessary. All the scientific names of each taxon were given in accordance with the International Code of Botanical Nomenclature (St. Louis Code) and all the Chinese names were treated following the principle of priority. All the original citations of genera and species including the important synonyms related to China and the adjacent countries with type locations were provided. Detailed morphological descriptions, habitats, localities, and worldwide distribution, as well as discussion of brief diagnostic characteristics and taxonomic problems were given for each species included. The illustrations of main recognizable characteristic features were also attached to each species. If the species is widely distributed in China, only the representative collections were cited. The types and important voucher specimens were checked as possible as we can. If it was impossible to do so, we still cited their collectors and specimens numbers, for further studies.

Most families in this volume were written solely by Gao C., with the exception of Calypogeiaceae and Trichocoleaceae (Cao T. & Yi Y. J.), Herbertaceae (Fu X. & Gao C.), Lepidoziaceae (Gao C. & Zhang K. C.), Jungermanniaceae (Gao C. & Wu Y. H.), Adelanthaceae and Jackiellaceae (Gao C. & Xie W.). The whole volume was checked and edited by Gao. C.

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L. of East China Normal University, and Li Q. of Ya'an Middle School, as well as foreign bryologists, Profs. T. Koponen and S. Piippo of Helsinki University, Dr. W. R. Buck of New York Botanical Garden, Drs. Z. Iwatsuki and M. Mizutani of Hattori Botanical Laboratory, and Dr. B. C. Tan of Singapore National University for providing specimens and literature.

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