高黎贡山植物

李 恒 郭辉军 刀志灵 主编

科 学 出 版 社

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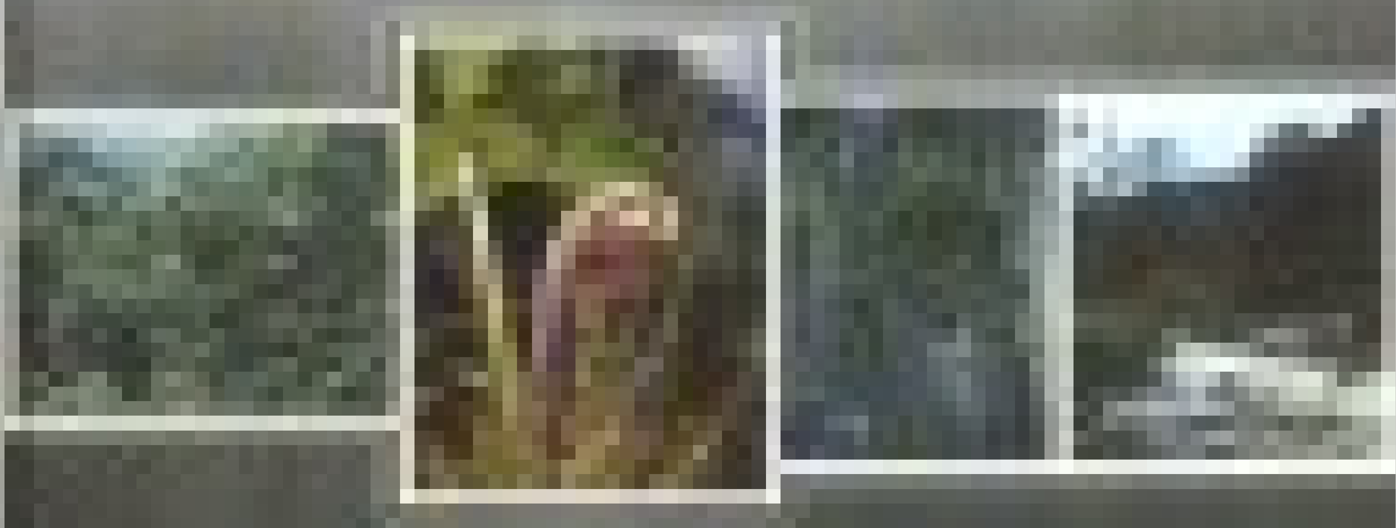

国家科学技术学术著作出版基金资助出版

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研究项目资助机构：

国家自然科学基金委员会
麦克阿瑟基金会
云南省科学技术委员会
美国地理学会（NGS）
美国加利福尼亚科学院（CAS）

出版资助机构：

国家科学技术学术著作出版基金委员会
中国科学院昆明植物研究所
联合国大学/联合国环境署/全球环境基金

科学出版社

2000

内 容 简 介

本书是一部记述中缅交界的高黎贡山地区种子植物区系和植物资源的专著。全书共十章，介绍了塑造高黎贡山植物景观的历史地理因素，分析了高黎贡山种子植物区系的实质，讨论了高黎贡山植物区系中的特有种、属及特殊的分布式样，介绍了本地区的珍稀植物和重要经济植物及其保护生物学；专题探讨了有关高黎贡山植物的一些生物地理学问题：诸如板块位移的生物效应、东亚特有科的起源、重要科属的生物多样性、物种替代和隔离分化、细胞地理学、民族植物学等。第十章系统地列出了高黎贡山4303种种子植物的名称，在高黎贡山的生长地点、生境、海拔、凭证标本、分布地区及经济用途。

本书可供植物学、林学、园艺学、植物地理学、植物资源学、保护生物学等的科技工作者参考。

图书在版编目（CIP）数据

高黎贡山植物/李恒等主编. -北京：科学出版社，2000

ISBN 7-03-008081-5

Ⅰ.高… Ⅱ.李… Ⅲ.山地-植物志-云南 Ⅳ.Q948.527.4

中国版本图书馆CIP数据核字（1999）第68018号

科学出版社 出版
北京东黄城根北街16号
邮政编码：100717

新蕾印刷厂印刷

科学出版社发行 各地新华书店经销

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2000年6月第 一 版 开本：787×1092 1/16
2000年6月第一次印刷 印张：84 3/4 插页：8
印数：1—1 200 字数：2 624 000

定价：186.00元

（如有印装质量问题，我社负责调换（新欣））

FLORA OF GAOLIGONG MOUNTAINS

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The Research Project is funded by:

The National Natural Science Foundation of China
The John D. & Cathering T. MacArthur Foundation
Yunnan Science & Technology Committee
National Geographic Society (U.S.A.)
California Academy of Sciences

Publishing supported by:

China National Science & Technology Monograph Publication Fund Committee
Kunming Institute of Botany, The Chinese Academy of Sciences
UNU-UNEP-GEF/PLEC

Science Press
2000

前　言

高黎贡山地区指怒江和伊洛瓦底江之间的分水山脉和山脉两侧地域，位于北纬24°40′—28°30′，全境面积111 000km²，包括中国云南西界腾冲全境，龙陵、保山、泸水、福贡、贡山等县部分或大部分地区和缅甸北部的克钦邦。在地质构造上，指古南大陆掸邦—马来亚板块的北段，系华南板块和扬子板块两大陆壳板块之间的中间板块，是冈瓦那古陆的一部分。由于特殊的地史和独特的生态环境，这一地域是具有国际意义的生物资源和生物多样性关键地区之一，是地学和生物学研究的热点。然而，由于自然条件险恶以及经济落后，除北段西坡的独龙江地域外，关于高黎贡山植物地理以及生物多样性的系统研究并不多，无论专业性的或科普性的出版物都处于空白状态。尤其是高黎贡山西坡的缅北地区，是目前世界上唯一未被综合考察或探险的地区。

近十年来，在国家自然科学基金委员会、麦克阿瑟基金会、云南省科学技术委员会和美国地理学会等国际国内组织的资助下，中国科学院昆明植物研究所先后组织了高黎贡山北部“独龙江流域资源与环境研究”、“独龙江植物区系越冬考察”、“高黎贡山植物多样性及其评价”等项目，该所科技人员得以对高黎贡山的植物资源进行比较系统的考察和研究，初步认识到高黎贡山的科学价值。

1. 特殊的地质地貌、奇特的生物效应和生物地理现象

高黎贡山地势北高南低，地面起伏剧烈，山高谷深，最高峰（贡山县的楚鹿腊卡）4640m，最低处920m（腾冲黑石子河口坪子，伊洛瓦底江支流）和645m（怒江下段、保山与龙陵交界处）。在地史上，高黎贡山地区所处的掸邦—马来亚板块在中生代与中国大陆（欧亚大陆的一部分）缝合，成为东亚大陆的西南缘，由于印度板块与青藏地块的碰撞，中新世以来，掸—马板块从赤道热带向北移动了约450km并发生右旋，使高黎贡山再度活化，强烈隆起，形成了平均深度约达2000m的世界第二大峡谷——怒江峡谷，铸就了本地区极为独特的地貌和丰富多彩的生态环境，导致了一系列的生物效应，形成了非常奇特的生物地理现象，如云南境内滇东南至滇西北生态地理对角线的形成、从峡谷到山顶不同类型植物群落的更替等。高黎贡山植物种群的分化，分布区的形成和间断无不与这一地史背景相关联。

2. 东亚植物区系的摇篮

中国有16个东亚特有科，高黎贡山地域就保存有其中的10科；占该地区东亚特有科的62.5%，其中十齿花科 Dipentodotaceae、九子母科 Podoaceae、旌节花科 Stachyuraceae 等东亚特有科属均起源于高黎贡山地区。此外。高黎贡山还是众多东亚特有属的发祥地，如五枫藤属 *Holboelia*、常春木属 *Merrilliopanax*、钩萼属 *Notochaeta*、竹叶吉祥草属 *Spatholirion*、大百合属 *Cardiocrinum*、豹子花属 *Nomocharis*、假百合属 *Notholirion* 等。可见，高黎贡山地区对东亚植物区系的形成和演化有着非常重要的意

义。

3. 东喜马拉雅植物区系之源

东喜马拉雅指尼泊尔东部至我国西藏南部及东南部的地区，即东经 89°—96°（不含察隅的高黎贡山部分），北纬 26°—29°，与高黎贡山紧邻。经初步分析，东喜马拉雅植物区系中 30%以上的种来源于中国的高黎贡山，如果加上缅北克钦邦的种类，则东喜马拉雅种子植物区系将有 50%的种系从高黎贡山地域迁入。于是，作者认为，高黎贡山地区是探讨东喜马拉雅植物区系起源的关键地区。

4. 古南大陆和古北大陆植物区系的融合带

在全部种子植物 1086 属中，古南大陆起源的有 544 属，占 50.09%；古北大陆起源的 474 属，其中康滇地区和华中地区起源的属（岩匙 *Berneuxia*、鬼吹哨属 *Leycesteria*、珙桐属 *Davidia* 等）在高黎贡山地区均占有显著地位。这些数字标志着古南大陆和古北大陆植物区系在高黎贡山地区曾经长期共存并进行了深度的融合，这一融合过程是探讨中国和东亚植物区系起源和演化的重要环节。

5. 物种多样化的中心舞台

由于地史和生态气候的原因，高黎贡山生物分化过程特别强烈，现知高黎贡山有种子植物 4303 种（变种），为西藏全境 5296 种（变种）的 81.25%；为整个华北地区 3925种（变种）的 109.63%，种群密度之大，至少为中国各地之冠。高黎贡山特有植物极为丰富，在种子植物中，44.83%即 1929 种（变种）是特有种（计 1116 个中国特有种，379 个云南特有种，434 个高黎贡山特有种），很大部分出现在高黎贡山的云南特有种也是起源于高黎贡山的。高黎贡山有 36 种（变种）竹子，其中 11 种是高黎贡山特有的，11 种为云南特有种，6 种为中国特有种。高黎贡山还有自己的特有属，贡山竹 *Gaoligongshania megathyrsa* 是世界上唯一的附生竹。杜鹃花属 *Rhododendron*、树萝卜属 *Agapetes* 等大属以及耳唇兰 *Otochilus* 等众多小属都以高黎贡山为分化中心。如果说横断山区是物种多样化中心，那么，高黎贡山应是这个中心的核心。

6. 地球上生物资源最丰富的地区之一

高黎贡山以生物资源丰富而著名。抗癌药物紫杉醇的原料植物——红豆杉最集中的产地是高黎贡山，传统中药材——贝母以独龙江和北缅高山的最为珍贵；当地居民视为灵丹妙药的滇黄连 *Coptis teeta* 成片长在路旁和林下。大面积的原始秃杉林在高黎贡山保存得最好。高黎贡山有兰科植物 263 种和 3 变种，闻名于世界的大树杜鹃 *Rhododendron protistum* var. *giganteum* 只有在高黎贡山才能找到。仅贡山县境内的高黎贡山就拥有冬天开花的木本观赏植物 100 余种（杜鹃、滇丁香等），冬季开花的草本观赏植物（凤仙、龙胆等）更为丰富。高黎贡山相对偏辟和边远的地理位置使该地区森林的状况较云南其他地方为好，该地区的原木、花卉和药用植物都是省内保护得最好的。高黎贡山也是云南这个生物王国里动物资源最丰富的地区，如孟加拉虎、云豹、扭角羚、多种灵长类、多种雉类、眼镜蛇、裂腹鱼等均栖息在这一地区。

研究这里的植物多样性的组成结构、合理保护措施以及永续利用方式将对本地区乃至喜马拉雅和东亚自然资源的开发利用具有重要的科学意义。

7. 丰富的自然资源和落后的经济状况

高黎贡山地区，特别是怒江傈僳族自治州，是一个生产落后的贫困地区。一方面，当地人民还保持着诸如刀耕火种之类的耕作方式，另一方面，当地各族人民在几百年来的生产实践中发展的桤木混农林、麻栎截头作业和秃杉、黄楠人工种植传统技术，为解决当地薪柴资源短缺等问题和提高农业生产力，具有重要应用推广前景，为世界有关科学家重视和关注，这些成功的传统农业和林业技术系统，起源于高黎贡山。随着人口的增长和生产的发展，生物资源的保护和持续利用已是当务之急。《高黎贡山植物》的出版将为区域经济的发展及植物资源的保护提供科学依据。

高黎贡山不但具有独特的自然环境和社会文化，而且在历史上就是我国云南与境外交流的要道。早在公元前 4 世纪，高黎贡山就已是西南丝绸古道的枢纽，沟通着中华与南亚的文化交流和贸易往来。第二次世界大战期间又有史迪威公路通过，并成为第二次世界大战的重要战场之一，在各民族间留下许许多多的悲壮史篇。

8. 研究历史

由于交通不便，经济落后，高黎贡山在生物多样性研究方面一直是一个薄弱地区。明代崇祯年间，著名地理学家徐霞客曾翻越高黎贡山进行过地貌与植被考察，留下了极为简略的记述。19 世纪中叶英国人 Nils Johan Anderson（1868 和 1875 年）两次率队从缅甸进入高黎贡山采集过动物标本。

植物标本采集始于 19 世纪末，本世纪初。

1904—1937 年，美国人 J. F. Rock（1922），奥地利人 Reginald Farrer（1914）、Heinrich Handel-Mazzetti（1916），英国人 Frank Kingdon-Ward（1922，1937，1938—1939 在缅甸南塔迈河）、George Forrest（1904—1932，先后 7 次）等在华西南及滇西北进行采集时也到过高黎贡山，采集种苗和标本。有关标本分别收藏在欧、美的标本馆内，其中英国爱丁堡植物园最多。他们的采集物中包括许多新种，部分已经发表，也有许多标本尚待整理。关于高黎贡山的植物资源和植物区系，却一直缺乏系统的研究，即使是 G. Forrest 和 F. Kingdon-Ward 的标本至今也还有许多没有鉴定或没有经过详细研究，以天南星科 Araceae 植物为例，中国科学院昆明植物研究所李恒根据高黎贡山考察队 7824（1996 年 10 月 18 日采）描述了高黎贡山特有种 *Arisaema bogneri*，但同种标本 Kingdon Ward 8299，8318 在 80 年以前就已收藏在英国邱园了。1992 年发表、以独龙江考察队 4819、5111 为模式的 *Arisaema dulongense* 与 Kingdon Ward 20281（in Kew）是同一种；*Arisaema pianmaense* 的模式为段政权等 13，采自高黎贡山西坡片马，同种标本 Forrest 24522 于 1914 年 5 月采自同一地点，存于爱丁堡植物园标本室。1995 年李恒前往爱丁堡清理天南星科标本时，才予以定名。又如 *Arisaema tengtsungense* 模式标本杨竞生 63－1294，1963 年采自腾冲，1977 年由李恒发表，藏于爱丁堡植物园的同种标本 Kingdon Ward 1709 早在 1914 年就从泸水片马岗房采到，但在 80 年之后这号标本才有自己的合法名称。类似的情况似乎可能说明一点，外国人虽然在高黎贡山采集了大

量标本，但深入系统的研究还应该是中国人。

20世纪30年代开始，中国植物学家俞德浚、蔡希陶、王启无率先在高黎贡山地区进行了比较系统的采集，标本主要收藏于中国科学院昆明植物研究所标本馆、中国科学院植物研究所标本馆以及国外各大标本馆。相继冯国楣先后在腾冲、贡山等地进行过植物考察，50年代以来，在腾冲、保山、泸水、福贡、贡山采集的主要有中国科学院昆明植物研究所毛品一、尹文清、陈介、武素功和陶德定（南水北调队综合考察队、滇西北分队）、李生堂、邓向福、林芹（怒江考察队）、赵嘉治等。1981—1983年，青藏考察队和横断山考察队考察了横断山区在云南大理以北的横断山区60个县，进行了植物调查和采集，高黎贡山的泸水、福贡（含碧江）、贡山和察隅日东乡也在60个县之列，但腾冲、保山不在其中。

1993年，在上述历次采集和考察的基础上，王文采主编的《横断山区维管植物》（上、下册）出版，包括横断山区大理以北60个县的维管植物3门，219科，1467属，8559种。该书列举的植物虽涉及高黎贡山的4个县区（察隅、贡山、福贡、泸水），但并不意味着书中所指的有关4县就是高黎贡山，因为这些县的版图都跨越怒江两岸，既包括西岸的高黎贡山，又包括东岸碧落雪山的东坡，何况，本书没有涉及腾冲和保山西部的高黎贡山植物区系问题。因此，《横断山区维管植物》远远不能代表高黎贡山的植物。高黎贡山植物区系的系统研究仍然处于空白状态。

1990年10月至1991年6月，独龙江植物区系越冬考察队在高黎贡山西北部独龙江地区进行了比较系统的考察，采集标本7075号近4万份。考察队由李恒任队长，考察队员有云南怒江州农业局局长高应新，中国科学院昆明植物研究所的潘福根、杨建昆和黄锦岭。根据俞德浚等在独龙江流域采集的标本和独龙江考察队的植物，1992年在《独龙江地区植物》专辑中发表了部分新种和一些新的区系资料。1993年出版了《独龙江地区植物》，含独龙江维管植物1994种，几乎列举了独龙江地区的已有全部标本；1994年在《独龙江种子植物区系研究》专辑中对独龙江种子植物区系进行了分析。1996年出版了《独龙江和独龙族综合研究》专著，是为高黎贡山中一个狭小自然区的系统研究工作。至于整个气势磅礴的高黎贡山，其自然环境如何复杂？植物资源到底有多丰富？生物区系到底有何等绚丽多彩？对科学工作者、自然资源的使用者、土地经营者以及广大的自然爱好者说来，仍然是不解之谜。

1995年以来，中国科学院昆明植物研究所李恒、郭辉军和他们的课题组与保山地区自然保护处，怒江州自然保护处的科技人员一起；1996年与英国植物学家合作，1997年和1998年与英国、美国、澳大利亚植物学家合作，先后在保山百花岭、腾冲的高黎贡山、泸水怒江西岸、福贡西北部、贡山怒江河谷西侧进行了8次考察，新采集标本近7000号，加深了我们对高黎贡山的认识。在此基础上，着手编著《高黎贡山植物》。

《高黎贡山植物》作为高黎贡山生物多样性及可持续发展研究的一个阶段性成果，是一部有关高黎贡山植物资源和植物区系地理的专著。

本书包括种子植物2门210科1086属4303种和变种。其中裸子植物7科17属32种1变种，被子植物203科1069属3961种309变种。每种植物包括种名、在高黎贡山的分布地点、凭证标本号、生活型、生境、海拔；在云南分布的县，国内及国外分布；

经济用途及科学价值。由于篇幅过大，排在本书最后的第十章。

第一至第八章介绍高黎贡山区系的环境背景、植被、植物区系性质和特征、特有现象、珍稀植物、资源植物、民族植物学；第九章另设专题论证区系起源、系统演化、物种替代、隔离分化、分布区的形成和间断、细胞地理学、板块位移的生物效应等重要生物地理学问题。

国家自然科学基金委员会、国家科学技术学术著作出版基金委员会、云南省科学技术委员会、中国科学院昆明植物研究所、麦克阿瑟基金会、美国地理学会、美国加利福尼亚科学院、联合国大学/联合国环境署/全球环境基金，出资支持了高黎贡山植物资源和植物区系项目的考察、资料分析、成果出版等过程，我们表示衷心感谢。

郭辉军　李　恒

1999－05－08 于昆明

PREFACE

Rising between the great Salween (Nujiang) and Irrawaddy (Dulongjiang) rivers, the Gaoligong (Kao-li Kung) Mountains lie in the border area between southwestern China and Northern Myanmar (Burma) between 24°40′ and 28°30′N latitude. These mountains cover a total area of 111 000 km^2, including most of Tengchong (Teng Yueh), Longling, Baoshan, Lushui, Fugong, and Gongshan counties of Yunnan Province (China) and the eastern part of Myanmar's Kachin State. The Gaoligong Mountains and the adjacent regions within China west of the Salween River are the area for the floristic and biogeographical studies that are reported here. The regions turbulent geological history and special ecological and micro-environmental diversity have resulted in an exceptionally rich flora characterized by high species endemism, interaction between tropical and temperate East Asian and East Himalayan floristic elements, and a complex evolutionary history. This area has been identified by the Global Environment Facility (GEF) and the United Nations Environment Program (UNEP) as one of the global biodiversity "hotspots". Yet, because of physical isolation and recent political instability of Northern Myanmar, the Gaoligong Mountains are among the floristically least known parts of the world.

1. Special Geological History and Geomorphology

The Gaoligong Region contains extremes in altitude within a very short distance, with the highest point of 4640 m in Gongshan County to the north and the lowest elevation of 930 m along a branch of the Irrawaddy River in Tengchong County to the south. The region forms the northern part of the Burma-Malaya Geoblock of Gondwanaland and lies between the Indian and Yangtze landmasses. During the Mesozoic, this geoblock collided with Laurasia and became the southwestern border region of the East Asia Plate. Since the Miocene, the Burma-Malaya Geoblock has moved about 450 km northwards from the equatorial tropical zone and rotated in a clockwise direction. This new tectonic movement led to substantial uplift and was significant in outlining the present geomorphology and subsequent biological diversity of the area.

2. Cradle of the East Asian Flora

In a preliminary survey of the northern part of the Gaoligong Region, ten of the 16 families of seeds plants endemic to the East Asian were found in the Gaoligong Mountains (GLGS), in which Stachyuraceae, Dipentodotaceae, and Podoaceae may well have originated in the GLGS. At the generic level, *Holboelia* (Lardizabalaceae), *Merrilliopanax* (Araliaceae), *Notochaeta* (Labiatae) and *Spatholirion* (Commelinaceae) may also have their origins here. Three genera endemic to the East Asia in the Liliaceae (*Cardiocrinum*, *Notholirion*, and *Nomocharis*) may be derived from the Gaoligong Mountains. Further study will likely provide more such examples.

3. Motherland of the East Himalayan Flora

The East Himalayan Region extends from eastern Nepal eastwards to southern and southeastern Xizang (Tibet) of China and lies roughly 89°—96°E longitude and 26°—29°N latitude. An analysis of the floristic elements of the GLGS flora suggests that 30% of the East Himalayan flora may come from the Chinese side of the Gaoligong Mountains. If plants from the Myanmar side are considered, this percentage could be at least 50%. The refore, the Gaoligong Mountains are recognized as the key area for understanding the origin of the flora of Eastern Himalaya.

4. Fusion Zone of the Gondwanaland and Laurasian Floras

A study on northern part of the Gaoligong Mountains shows there are 1086 genera of seed plants on the western slope. 544 genera (50%) can be considered as Gondwanaland elements while around 477 genera (44%) have a predominantly temperate Laurasian distribution. The latter includes interesting genera such as *Berneuxia* (Diapensiaceae), *Leycesteria* (Caprifoliaceae), and *Davidia* (Davidaceae) which have a Western Sichuan - Yunnan or Central Chinese origin. This distribution pattern reflects the mixing that occurred between the floras after two ancient continents were combined. Exchange between east and west was possible, but as mountains building gradually occured in the region, these mountains formed a barrier for plant dispersal and restricted migration to a north-south axis. The process of fusion between Gondwanaland and Laurasia floras is a key to understanding the origin and evolution of the Chinese and East Asian floras. Further research will surely provide more information about this fusion and subsequent development involved in the formation of the flora.

5. Center of Species Diversification

Due to geological history, ecological and climatic diversity, the Gaoligong Mountains Region has been one of the refuges for some ancient floristic elements and experienced a quite strong diversification process. There are 4303 seed plant species recorded in the small area of Chinese part of Gaoligong Mountains, which accounts for 81.25% of the flora of the whole Tibet (5296 species and varieties), 109.63% of the whole northern China (3925 species and varieties). If the little-known Myanmar part is added, this number would be much higher. The flora of Kachin State in northern Myanmar is extremely interesting botanically but almost unknown. Kingdon-Ward, Gorge Forrest and Reginald Farrer explored the southern part of the western slope of the Gaoligong Mountains. The species density of GLGS is the highest at least in China. The Gaoligong Mountains is also very rich in endemic plant species, 44.83% seed plants (i. e. 1929 species and varieties) are endemic plants (in which, 1116 are endemic to China, 379 are endemic to Yunnan and, 434 endemic to Gaoligong Mountains), most of the endemic species of Yunnan originated from the Gaoligong Mountains. For example, there are 36 species and vareties of bamboo, of which, 11 species are endemic to the Gaoligong Mountains, 11 species are endemic to Yunnan, and 6 species are endemic to China. the Gaoligong Mountains has its own endemic genera, for instance, *Gaoligongshania meagthyrsa* is the only epiphytic bamboo in the world. The Gaoligong Mountains is the diversification center of many large genera such as *Rhododendron*, *Agapetes* etc. and many small genera such as Otochilus etc. If the Hengduan Mountains area is considered as one of the species diversification center, the Gaoligong Mountains should be the core of this diversification center.

6. One of the Richest biological Resources Areas in the World

Unlike other montane ecosystems in Yunnan Province, forests in the Gaoligong Mountains have been protected by virtue of their remote location. This area is rich in biological resources such as medicinal and ornamental plants, timber, and wildlife. For example, *Taxus yunnanensis*, a source of taxol with anti-cancer properties, has its distribution center in the Gaoligong Mountains. *Fritilaria*, an important genus of medicinal plants used in traditional Chinese medicine, is richly represented in DLJR and in northern Myanmar. A preliminary survey found that there are more than 100 species of winter-flowering woody plants (*Rhododendron* and others) in the Gongshan Country. Many herbaceous species such as *Gentiana* and *Impatiens* have also been discovered, and there are over 263 species of orchids.

7. Rich Natural Resources but Poor Economic Condition

The Gaoligong Mountains Region, especially the Nujiang prefecture, is agriculturally a fairly low-productive and poor area. The local people remain mostly in subsistence agriculture. With increases in population and economic development, the relationships between protection and sustainable use of biological resources have became the urgent problem. "Flora of the Gaoligong Mountains" will provide a scientific base for regional economic development and protection of plant resources.

The Gaoligong Mountains are not only special as a natural environment and social culture but have historically been the main path between Yunnan and other countries to the southwest. The Gaoligong Mountains were a key part of the old silk road in southwest China before 400 BC which formed a commercial and cultural link between China with South Asia. During the Second World War, the Stephen's highway traversed the Gaoligong Mountains. This area was one of the important war fields during the Second World War.

8. History of Study

Because of a poor economy and difficult transport, there have been few studies on biodiversity in the Gaoligong Mountains. During the Ming Dynasty, Xu Xia-Ke, a famous geographer, climbed over the Gaoligong Mountains to study the landscape and vegetation. He briefly recorded information about the mountains. In the mid 19th century, Nils Johan Anderson from Great Britain led two expedition teams from Myanmar to the Gaoligong Mountains (1868 and 1875) to collect zoological specimens. Plant specimens were not collected until the early 20th century in the Gaoligong Mountains .

From 1904 to 1937 plant collections from the region for specimens and seeds were made by foreigners and included Reginald Farrer (1914), Heinrich Handel-Mazzetti from Austria (1916), Joseph F. Rock from America (1922), Frank Kingdon-Ward from Great Britain (1922, 1937, 1938—1939 in the Nam Tamai Valley), and George Forrest from Great Britain (seven expeditions between 1904 and 1932). The plant specimens resulting from these expeditions were deposited in of European and American herbaria. The most extensive collections are at the Royal Botanic Gardens, Edinburgh which has the first set of Forrest's collections as well as specimens by other collectors.

Although there have been new taxa described from these early collections, there has been no systematic study of the region based on these collections, and there are many collections by Forrest and Kingdon-Ward that still need to be identified and studied. An example of this need can be seen from the recent studies Araceae in Great Britain by Li Heng of the Kunming Institute of Botany. *Arisaema bogneri*, *A. dulongense*, and *A. pianmaense* are three species endemic to the Gaoligong Mountains Region that have been described by Li Heng from recent collections. She has subesequently found undetermined collections made by Kindon-Ward and/or Forrest of all three species in the herbaria of the Royal Botanic Gardens in Edinburgh and Kew. These examples underscore the importance of Chinese botanists studying these early collections in foreign collections.

The next phase in botanical exploration in the Gaoligong Mountains Region was by Chinese botanists such as Yu Dejun, Cai Xitao, and Wang Qiwu in 1930s. The specimens were deposited in the herbaria of the Kunming Institute of Botany, Institute of Botany in Beijing, and in herbaria in other countries. Subsequently Feng Guomei's made collection in Tengchong and Gongshan in 1940s and 50s. Other collections were made in Tengchong, Baoshan, Lushui, Fugong, and Gongshan counties in the 1950s and 60s by collectors from the Kunming Institute of Botany such as Mao Pingyi, Ying Wenqing, Chen Jie, Wu Sugong, Tao Deding, Li Shengtang, Deng Xiangfu, Lin Qing, and Zhao Jiazhi.

From 1981 to 1983, the Qinghai-Xizang Expedition Team and the Hengduan Mountains Expedition collected many specimens in the Hengduan Mountains and covered more than 60 counties including Lushui, Fugong (Bijiang), Gongshan, and Chayu of the Gaoligong Mountains Region but excluded Tengchong and Baoshan counties. "Vascular plants of the Hengduang Mountains" edited by Wang Wen-Cai was published in 1993 based on all these expeditions and included 3 phyla, 219 families, 1467 genera, and 8559 species. Distribution area of plants that are listed in this book include four counties in Gaoligong Region, but these counties are only part of the Gaoligong Mountains Region. The book does not include Tengchong and Baoshan, so the whole southern end of the Gaoligong Mountains is missing from this publication. As a result the publication cannot be used as a substitute for a flora of the Gaoligong Mountains, and the flora of the Gaoligong Mountains still remains unknown.

The most recent and comprehensive investigation of the region was over-winter expedition by Li Heng's from October 1990 to June 1991. During this eight month adventure, 7075 collection numbers were made and were the main base of "The Flora of Dulongjiang Region" published in 1993. In addition, a collection of related research written paper by Li Heng, entitled "Phytogeographical Studies on the Flora of Seed Plants in Dulongjiang" was published in Acta Botanica Yunnanica (Suppl. VI) in 1994.

The most recent phase in study of the plants of the Gaoligong Mountains Region started in 1995. Li Heng and Guo Hui-Jun along with their project team at the Kunming Institute of Botany, staff from Baoshan and Nujiang nature reserve management agencies, and botanists from Great Britain, U. S. A., and Australia have made seven collecting expeditions to Baoshan, Tengchong, Gongshan, Lushui, and Fugong counties. Some 7000 collection numbers were made and have added to our understanding of the flora of the region.

《Flora of the Gaoligong Mountains》 is based on all these collections and studies, and is an outcome of the studying on biodiversity and sustainable development of the region. It is also a monograph about plant resources and flora of the Gaoligong Mountains.

The book covers all the seed plants found in the Gaoligong Mountains, including 2 phyla, 210 families, 1086 genera, 4303 species and varieties. There are 7 families, 32 species, and 1 variety of Gymnospermae and 203 families, 1069 genera, 3961 species, and 309 varieties of Angiospermae. Each species is listed with scientific name; distribution (within the region, in Yunnan, in China, and outside China), collection number (s), life form and habitat, altitude, economic uses, and scientific values. These data are in Chapter 10 at the end of the book.

Chapters 1 through 8 cover the background of the flora, vegetation, characters and features of the flora, endemism, rare plants, resource plants, and ethnobotany. Chapter 9 gives some biogeographic studies including the origin of flora, systematic evolution, species substitution, isolation, disjunct of distributions, cytogeography, and biological effect of geoblock movement.

We gratefully acknowledge support for expeditions, studies, and publication from the National Natural Science Foundation of China National Science & Technology Monograph Publication Yunnan Science & Technology Committee, Kunming Institute of Botany, John D. & Cathering T. MacArthur Foundation, National Geographic Society (U. S. A.), California Academy of Sciences (U. S. A.), and UNU-UNEP-GEF/PLEC.

GUO Huijun and LI Heng

8th May, 1999, Kunming

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