



梵净山研究 · 10

贵州梵净山国家级自然保护区管理局

梵净山两栖爬行动物

FANJINGSHAN LIANGQI PAXING DONGWU

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序言

梵净山是武陵山脉的主峰,最高点海拔 2572m,具明显的中亚热带山地季风气候特征。本区为多种动植物区系地理成分汇集地,动、植物种类丰富,珍稀动物、古老和孑遗植物种类多,植被类型多样,垂直带谱明显,为我国西部中亚热带山地典型的原生植被保存地。梵净山建立自然保护区的历史可追溯到 1954 年全国人民代表大会第一次代表大会第三次会议。在此次会议上,竺可桢教授等科学家提议,要在全中国重要的原始林区建立“禁猎禁伐区”,其中就包括贵州的梵净山。并于 1956 年在梵净山建立了梵净山经营所。这些都可以认为是贵州梵净山国家级自然保护区的前身。说明了国家对这一区域的重视。1978 年正式建立了省级自然保护区,1986 年晋升为国家级自然保护区——贵州梵净山国家级自然保护区,在本书中简称为“梵净山国家级自然保护区”;同年被联合国教科文组织列入国际“人与生物圈”保护区网络成员,成为中国第 4 个国际生物圈保护区。保护类型为森林生态系统类型,主要保护对象是以黔金丝猴、珙桐等为代表的珍稀野生动植物及原生森林生态系统。本地区森林覆盖率 96%。梵净山国家级自然保护区内的原始森林被认定为是世界上同纬度保护最完好的原始森林,区内物种多样性丰富,其中不乏 7000 万至 200 万年前第三纪、第四纪的古老动植物种类,成为人类难得的生物资源基因库,举世瞩目的生物多样性研究基地;梵净山出露地层古老,有寒武纪窗口之称。由于这些特点,梵净山很早就成为中外科学工作者的研究对象。早在 20 世纪 30 年代,就有中外科学家如蒋英、陈焕镛、钟补求、焦启源等和奥地利人韩马列迪、美国人史德威等到梵净山做过植被调查工作。20 世纪 60 年代简竹坡教授带领中国科学院植物研究所人员对梵净山的植被,特别是水青冈群落进行了详尽的调查;与此同时,国内的大专院校、科研单位,特别是贵州的科技工作者也到梵净山开展了大量的调查研究工作,在兽类、鸟类、两栖类、地质、水文等方面获得了丰富的资料。但遗憾的是,这些资料大多分散而不系统,没有在更多的领域发挥应有的作用。20 世纪 80 年代以后,由于梵净山国家级自然保护区正式建立初始,保护区的上级管理机构和保护区自身的管理机构迫切需要对梵净山有较全面的了解,实现科学管理和合理利用梵净山的资源,从而使对梵净山的研究进入了一个较全面的综合考察阶段。这一阶段的工作主要包括了 20 世纪 80 年代初期,由贵州省环境保护局组织,周政贤教授、邓峰林高级工程师等主持的梵净山综合考察,涉及动物、植物、地质、土壤、气候环境等 12 个学科,近 30 位专家参与。20 世纪 80 年代中后期,在之前考察的基础上,又经贵州省林业厅、国家林业部安排,由梵净山国家级自然保护区管理处组织,省内外 20 余所大专院校和科研单位参与,进行了长达 10 年的综合考察和专题研究。到 20 世纪 90 年代初期,这些工作取得了大量的成果,包含了生物、环境、保护区社区的社会经济、保护区规划等 30 多个专题的研究,查明梵净山国家级自然保护区内生物物种达 3000 余种,并编著了《梵净山科学考察集》《梵净山研究》《黔金丝猴野外生态》三部专著,作为梵净山第一次本底调查的资料正式出版。这些成果对加深中外科学工作者对梵净山重要性的认识,指导梵净山国家级自然保护区的工作,补充国内生物多样性的资料都起到了重要的支撑作用。特别是在针对梵净山国家级自然保护区的保护和开发利用的决策上,起到关键的作用。由于这些成果的科学性和应用性,使其均获得国家或省部级的奖励,如《梵净山研究》获得国家科技进步三等奖;《梵净山研究》《黔金丝猴野外生态》还分别获得国家优秀科技图书二等奖。

进入 21 世纪,随着中国全面的快速发展,科学研究水平的提高和科技手段的更新。20 世纪对梵净山的研究虽然取得了重大成果,做出了重大贡献,但是,由于梵净山蕴含的资源太丰富,我们没有认识和涉及的领域还很多,对于一些已经调查研究的课题也还需要进一步深化,因此,梵净山国家级自然保护区管理局(下称“管理局”)在上级部门的支持下,继续对梵净山的环境、资源、人文地理等方面开展更深入的研究。管理局并决定,通过这次大范围全面深入的调查研究的基础上把梵净山国家级自然保护区建设成一个真正的科学研究基地和教学基地,发挥一个开放的科研平台的作用,和国内外的科技工作者一起共同研究梵净山,共同保护梵净山,充分体现和利用梵净山的科研价值,并将研究成果应用于社会。现在,梵净山国家级自然保护区管理局已经与北京林业大学、北京动物园、贵州大学、中国科学院昆明分院、贵州科学院、贵州省地质矿产局等建立了长期的合作伙伴关系,并通过贵州外国专家局和国家外国专家局的支持和帮助,广泛开展了国际合作,如和美国圣迭哥大学、美国圣迭哥动物园、意大利都灵大学、德国灵长类中心等开展了专项合作,研究的内容涉及地质地貌、动物、植物、环境保护、人文地理、旅游、中草药资源、保护生物学、社区经济等方面。在研究手段上,除了常规的深入保护区实地调查外,还大量采用遥感遥测、红外相机定点监测、卫星照片分析等手段。这些都使这一阶段的研究工作更加深入,获取的资料更丰富。仅从物种的多样性上看,现查明的生物物种就较第一次本底调查的物种增加了 1 倍,达到 6000 多种。从仍在开展的调查工作来看,这个数字还将会增加。通过自 2000 年以来 10 余年的调查研究工作,至今已经取得了大量的成果。根据国家林业局和贵州省林业厅的要求,由于第一次本底调查距今已经有 20 余年,以前的资料已经不能满足现在的需要,要求梵净山国家级自然保护区管理局尽快完成第二次本底调查研究。管理局决定,从 2000 年起,在以前这些年来研究工作的基础上,再进一步深化调查研究工作,并从 2012 年到 2015 年分批将这些成果编著出版,作为第二次本底调查的资料。显然,参加第二次本底调查研究的国内外研究单位和研究工作者更多,所获得的资料比第一次本底调查更为深入、详尽和专业,仅用一两本综合各学科的专著的形式是无法概括的,因此决定:采用《梵净山研究》系列著作的方式来出版这些成果,根据各个学科的资料篇幅,原则上一个学科撰写出版一本专著,或相邻的两个学科撰写出版一本专著,这样,《梵净山研究》将包括约 20 本专著。在资料使用上,除文字论述、图表分析外,还要求附研究对象的实物照片,如针对物种多样性的研究,就必须有研究物种的照片;针对地质地貌的研究,就要有地质结构、地貌特征的照片。我们认为:这种方式,将使《梵净山研究》更真实地反映梵净山国家级自然保护区的本底;同时,不仅专业人员能用,一些对某些学科有兴趣的业余爱好者也能用,而大量的照片也将起到保存这一阶段现实的历史的效果。

我们设想:《梵净山研究》系列著作将成为反映梵净山研究工作的资料库,在这一阶段第二次本底调查的工作基本结束后,对梵净山的研究工作还将继续进行和深入,新的认识和成果还将不断出现,对将来持续不断出现的对梵净山更深入的研究也将通过《梵净山研究》不断反映,这种形式不仅能持续地反映针对梵净山的研究轨迹和取得的研究成果,而且将使这些研究成果更有效地服务于社会实践。

《梵净山研究》编辑委员会

PREFACE

Fanjingshan, rising as high as 2572 meters at the summit, is the main peak of the Wuling mountain range. Here, the climate is distinctly characteristic of mid – subtropical montane monsoon type. It is a quintessential preserve of western China with a diverse array of native vegetation distributed discretely along an altitudinal gradient. Home to a wealth of wildlife species, Fanjingshan is a reservoir for a multitude of fauna and flora of different geographic elements, including several species of rare animals and ancient, relic plants.

Fanjingshan National Nature Reserve (FNNR) is one of China's oldest nature reserves. Its history can be traced back to the Third Session of the First National People's Congress in 1954. There, Professor Kezhen Du and colleagues urged the government to protect all major primary forests in China, including Fanjingshan in Guizhou Province, by creating a "special zone banning all forms of hunting and logging activity" within these pristine areas. As this recommendation was deemed important by our national leaders, the Fanjingshan Forest Management Station was created in 1956. However, it was not until 1978 that Fanjingshan was officially designated as a provincial nature reserve, and subsequently was promoted to a national nature reserve in 1986. In that same year, FNNR became the fourth reserve in China to join the United Nations Educational Scientific and Culture Organization's (UNESCO's) World Network of Biosphere Reserves of the Man and the Biosphere (MAB) Programme.

Particularly, FNNR is notable for its natural forest ecosystem with 96% of the original forest cover still being intact. Thus, it is considered the best preserved primary forest of equivalent latitude on Earth. Besides the main protection targets like the Guizhou snub – nosed monkey and the Chinese dove tree, the reserve harbors a rich community of fauna and flora, some of which have origins dating back 70 million to 2 million years to the Tertiary and Quaternary periods. Indeed, FNNR is a renowned field gene bank as it contains one of the world's greatest biological resources. Not surprisingly, Fanjingshan has been hailed as the "Window into the Cambrian".

Given its remarkable nature, Fanjingshan has been a mecca for many national and international scientists. Starting as early as the 1930's, botanists such as Y. Tsiang (Jiang Ying), W. Y. Chun (Chen Huanyong), P. C. Tsoong (Zhong Buqiu), C. Y. Chiao (Jiao Qiyuan), Heinrich Handel – Mazzetti and Dewei Shi were among the first researchers who surveyed this area. Later in the 1960s Professor C. P. Tsien (Jian Zhupo) led a team of researchers from the Institute of Botany, Chinese Academy of Sciences to study the composition, structure and diversity of the plant community, especially with regard to beech forests, in Fanjingshan. Also during this period, researchers and technical staff from a number of Chinese universities and scientific research institutes flocked to Fanjingshan to undertake studies of mammals, birds, amphibians, geology and hydrology. Unfortunately, much of the data was not collected systematically and therefore could not be broadly applied across many disciplines.

Since the 1980s, more comprehensive studies have been conducted in Fanjingshan. These scientific investigations were prompted by the establishment of the reserve, as both the higher offices and the Administration of FNNR realized the urgent need for an integrated approach to provide a scientific basis for management and utilization of natural resources. The initial research effort was organized by the Environmental Protection Bureau of Guizhou Province in the early 1980s. Professor Zhengxian Zhou and Senior Engineer Fenglin Deng assembled a team of nearly 30 experts who delved into 12 different subject areas that included animals, plants, geology, soil, meteorology and environmental protection. Building on this foundation, the Administration of FNNR, with support from the Forestry Department of Guizhou Province and the State Forestry Administration, launched a second set of scientific research and monitoring activities in the mid 1980s that spanned over the next ten years. More than 20 universities and research institutes from Guizhou and other provinces participated in this endeavor, which was comprised of comprehensive surveys, as well as case studies. Some of the major accomplishments were made in the areas of biology, environment, local community economic development, reserve planning, among over 30 subjects. Regarding species diversity, for instance, it was found that Fanjingshan is home to more than 3000 plant and animal species. These studies resulted in three monographs: the *Scientific Survey of Fanjingshan Nature Reserve* (1987), *Research on the Fanjing Mountain* (1990), and *Ecology of the Wild Guizhou Snub – Nosed Monkey* (2002), which represent published accounts of the first reserve – wide baseline assessment. The aforementioned contributions augmented our knowledge by providing much needed information on Chinese wildlife species, and helped steer research by forming a framework for future studies. Because the Administration of FNNR regards scientific research as the cornerstone of protection, these accomplishments have been vital to the reserve management in guiding conservation and development

policies. The scientific and applied values of these publications also led to multiple national and provincial accolades, such as the Third Prize of the National Science and Technology Advancement Award for Research on the Fanjing Mountain, and separately, *research on the Fanjing Mountain and Ecology of the Wild Guizhou Snub – Nosed Monkey* each garnered the Second Prize of the National Science and Technology Books Award.

Moving forward, in an era of rapid economic growth and scientific and technological advancements, we realize that our past achievements, though significant, were not comprehensive. As Fanjingshan contains such a wealth of resources, we need to conduct more extensive research into each subject. Consequently, supported by the higher authorities, the Administration of FNNR continues to hone in on studies in the areas of environment, biological resources, and human geography, among others. Due to the breadth of disciplines involved, the Administration has decided to create a field base within the reserve that serves as an open participation platform for national and international scientists to engage in research and training. As such, scientists working in concert may fully appreciate the biological values of Fanjingshan and best apply their research findings to benefit our society.

Currently, FNNR has established long – term collaborations with Beijing Forestry University, Beijing Zoo, Guizhou University, the Kunming Branch of Chinese Academy of Sciences, Guizhou Academy of Sciences, the Bureau of Geology and Mineral Exploration and Development of Guizhou Province, and others. Additionally, through the support of Guizhou Foreign Experts Bureau and the State Administration of Foreign Experts Affairs, the reserve has developed extensive international cooperation with the Zoological Society of San Diego (San Diego Zoo Global), San Diego State University, the University of Turin, Italy, and the German Primate Center, among others. These partnerships have resulted in new areas of inquiry ranging in subject from geology and geomorphology, animals and plants, environmental protection, human geography, tourism, Chinese herbal medicine, conservation biology, community economic development, etc. In terms of research methodologies, in addition to traditional field surveys, we are relying extensively on remote – sensing, Landsat imagery, camera traps, etc. to intensify our research efforts. Already, we have obtained a wealth of data based on these techniques. With regard to species diversity, the current count has doubled that estimated from our first baseline assessment; the number now exceeds over 6000 species, which is certain to increase as research continues.

Over 20 years have elapsed since the first reserve – wide baseline assessment. Despite the abundant scientific achievements and discoveries in the last decade, much of the information acquired is no longer valid and needs to be updated. Thus, at the request of the State Forestry Administration and the Forestry Department of Guizhou Province, the Administration of FNNR began conducting surveys in 2000 to expand our current knowledge. The period of 2012 – 2015 is dedicated to preparing manuscripts and publishing our research findings. This information will form the basis of the second reserve – wide baseline assessment. However, due to the number of participating researchers and institutions, it became abundantly clear from the beginning that a few interdisciplinary monographs will not cover the scope of our endeavor. Thus, we have decided to publish our results in Fanjingshan Research Studies as a series of books. Each book will encompass a single subject or two related subjects. Accordingly, there will be approximately 20 books in total in this series. Besides summarizing our data using text, tables and graphs, we will feature photographs of study subjects as illustrations, such as species, geological and geomorphological phenomena, etc. These photographs will provide a true representation of the baseline data that can be used by researchers and amateur hobbyists alike. This massive quantity of photographs will play an important role in preserving the history of the nature reserve during this period.

Our vision is that this book series, *Fanjingshan Research Studies*, will be considered a repository of knowledge and inspire new ideas in the future. We hope that results generated from this second baseline assessment will continue to offer insights and stimulate research studies, which will not only follow the trajectory set by *Fanjingshan Research Studies* but also provide practical outcomes to effectively serve our society.

Editorial Board of Fanjingshan Research Studies

前言

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梵净山国家级自然保护区处于我国云贵高原向湘西丘陵过渡带上,位于中国贵州省东北的印江土家族苗族自治县、江口县、松桃苗族自治县三县交界处。地跨北纬 $27^{\circ}49'50'' \sim 28^{\circ}01'30''$,东经 $108^{\circ}45'55'' \sim 108^{\circ}48'30''$ 。

梵净山是武陵山脉主峰,山体庞大,山脉多呈东北—西南向。地势隆起显著,最高峰凤凰山海拔 2570.5m,金顶海拔 2493.4m,同东坡山麓盘溪沟口(海拔 500m)比较,高差达 2000m。以凤凰山、金顶的中山峡谷地形为中心,四周逐次散布低中山、低山和丘陵各种地貌类型。全区山势雄伟,峰峦叠障;坡陡谷深、群峰高耸;溪流纵横,飞瀑悬泻;整个山地显现出崇山峻岭的地貌景观。

梵净山是乌江与沅江水系的分水岭,其山高谷深,冲沟密布,排水条件良好,地表河流发育。又因其山穹窿上升,故其水系呈典型的放射状,向四周分流:东有黑湾河、马槽河;南有凯士河、盘溪河;西有肖家河、牛尾河;北有淘金河、金厂河。

梵净山具明显的中亚热带山地季风气候特征,年平均气温 $6 \sim 17^{\circ}\text{C}$,1 月平均气温 $3 \sim 5^{\circ}\text{C}$,7 月平均气温 $15 \sim 27^{\circ}\text{C}$, $\geq 10^{\circ}\text{C}$ 积温 $1500 \sim 5500^{\circ}\text{C}$,年平均降水量 $1100 \sim 2600\text{mm}$ 。年平均相对湿度 80% 以上,具有我国典型的中亚热带季风山地湿润气候特征。第四纪以来,该区域一直处于温暖湿润的气候条件下,成为多种动植物保存和繁衍的场所。

因为梵净山特殊的地理位置,优越的水热条件,明显的垂直分异,古老的地质、地貌背景,复杂多变的地形所形成的各种生境类型,因而,它是十分独特和有重要保护价值的自然生态系统。这种特色和价值具体表现为:①梵净山的常绿阔叶林是我国中亚热带典型的地带性植被,且原生性强,垂直分异比较明显,类型丰富,还有不少孑遗群落;②梵净山生物资源极为丰富,根据目前正式发表在各种文献上名录的初步统计,梵净山共有生物种类 6000 余种。特别是有大量属于国家重点保护的珍贵稀有种类,根据国家颁布的《中华人民共和国野生动物保护法》,列入国家重点保护的野生动物有黔金丝猴 *Rhinopithecus brelichi* 等 4 种,二级保护的野生动物有 15 种,根据《中国珍稀濒危保护植物名录》记载,梵净山国际级自然保护区内有重点保护植物 17 种,其中一级 1 种,二级 8 种,三级 8 种;③梵净山不仅生物资源丰富,种类繁多,而且动植物区系成分古老,现存有大量的第三纪、第四纪古老植物和动物种类,特别是拥有珍稀濒危孑遗种类黔金丝猴和珙桐 *Davidia involucrata* 及珙桐的孑遗群落有 13 个分布片,总面积达 80hm^2 ,黔金丝猴分布区狭窄,仅分布在梵净山上,也是世界上濒危动物之一,为国内外动物界所关注;④梵净山自然环境及森林生态系统基本上未遭到人为活动破坏,保存了较原始状态,在全世界生态环境不断遭受破坏和日益恶化的今天,梵净山自然生态系统是我国亚热带地区极为珍贵的原始“本底”,加之梵净山森林生长茂密,保存完好,覆盖率达 80% 以上,是一个相对平衡的森林生态系统,因此其在保持水土、涵养水源、保护野生动物等方面,具有重大的生态效益和社会效益。

由于梵净山国家级自然保护区特殊的地理环境和丰富的生物多样性,从 20 世纪 30 年代开始,我国许多著名的动物分类学家都在该区进行过考察。国际著名的两栖爬行动物学泰斗刘承钊学部委员、胡淑琴、赵尔宓院士等 1962 年就在梵净山进行过考察,采集了两栖动物标本 20 种,爬行动物标本 26 种。

1982 年 3 月,费梁、叶昌媛在梵净山采到峨眉髭蟾 *Vibrissaphora boringii* 的成体标本,不仅为贵州省两栖类动物增添一个新记录种,也证明了他们 1963 年在梵净山西坡(印江)采到的待定蝌蚪是峨眉髭蟾的幼体。1982 年李德俊在梵净山采集到两栖动物标本 23 种,爬行动物标本 13 种。

2010 年、2012 年,张雷等在梵净山国家级自然保护区发现了角蟾科一新亚种——炳灵角蟾梵净山亚种 *Megophrys binlingensis fanjingmontis* 和 2 种两栖类贵州省新记录——白线树蛙 *Rhacophorus leucofasciatus* 和镇海林蛙 *Rana zhenhaiensis*,并根据当前分类系统(费梁等,2006,2009)进行了两栖动物分类修订。2012 年,牛克锋等在梵净山发现了 1 种两栖类贵州省新记录种——短肢角蟾 *Megophrys brachykolos*。吕敬才等 2013 年在梵净山发现了 1 种两栖类贵州省新记录种——川南短腿蟾 *Brachytarsophrys chuannanensis*,刘芹等 2013 年在梵净山发现了 1 种爬行类贵州省新记录种——四川华蝮 *Sinovipera sichuanensis*(Liu et al., 2014)。

截至目前,梵净山国家级自然保护区两栖动物有39种及亚种,隶属22属9科2目。其中有尾目2科2属2种,含隐鳃鲵科1属1种,蝾螈科1属1种;无尾目7科20属38种及亚种,含角蟾科4属7种,蟾蜍科2属2种及2亚种,雨蛙科1属2种及1亚种,蛙科7属12种,叉舌蛙科3属5种,树蛙科2属5种,姬蛙科1属4种。上述种类中,中国特有种有20种(亚种),占两栖类总种数的50.00%,如大鲵 *Andrias davidianus* 是国家Ⅱ级保护动物且列入《濒危国际贸易公约(CITES)》“E”级,即濒危度最高的动物,世界自然资源保护同盟(IUCN)濒危物种红皮书和中国濒危动物红皮书也将大鲵列为极危级动物。峨眉髭蟾、短肢角蟾、棘腹蛙 *Quasipaa boulengeri* 和双团棘胸蛙 *Gynandropaa yunnanensis* 列入IUCN濒危物种红皮书濒危级动物,峨眉髭蟾和短肢角蟾也列入中国濒危动物红皮书的濒危级动物,棘侧蛙 *Quasipaa shini* 和棘胸蛙 *Quasipaa spinosa* 列入IUCN濒危物种红皮书的易危级,绿臭蛙 *Odorrana margaretae* 和黑斑侧褶蛙 *Pelophylax nigromaculatus* 列入IUCN濒危物种红皮书的近危级。珍稀物种有武陵瘰螈 *Paramesotriton (Allemoesotriton) wulingensis*、峨眉髭蟾、峨山掌突蟾 *Paramegophrys oshanensis*、棘指角蟾 *Megophrys spinata*、炳灵角蟾梵净山亚种 *Megophrys binlingensis fanjingmontis*、小角蟾 *Megophrys minor*、中华蟾蜍华西亚种 *Bufo gargarzans andrewsi*、镇海林蛙 *Rana zhenhaiensis*、竹叶蛙 *Bamburana versabilis*、白线树蛙 *Rhacophorus leucofasciatus*。经济两栖动物有大鲵、棘腹蛙、双团棘胸蛙、棘侧蛙和棘胸蛙。

梵净山国家级自然保护区爬行动物有48种,隶属30属10科2目。其中龟鳖目有3科3属3种,含平胸龟科1属1种,淡水龟科1属1种,鳖科1属1种;蜥蜴亚目有4科5属6种,含石龙子科2属3种,鬣蜥科1属1种,蜥蜴科1属1种,壁虎科1属1种;蛇亚目有3科22属39种,含游蛇科16属32种,眼镜蛇科2属2种,蝮蛇科4属5种。上述种类中,爬行类中国特有种有17种,占总种数的35%。在梵净山国家级自然保护区48种爬行动物中,仅有中国平胸龟 *Platysternon megacephalum*、眼斑龟 *Sacalia bealei* 均被列入IUCN濒危物种红皮书和中国濒危动物红皮书濒危级动物。灰鼠蛇 *Ptyas korros*、滑鼠蛇 *Ptyas mucosus*、尖吻蝮 *Deinagkistrodon acutus* 被列入中国濒危动物红皮书濒危级动物。中华鳖 *Pelodiscus sinensis* 被列入IUCN濒危物种红皮书和中国濒危动物红皮书易危级动物。王锦蛇 *Elaphe carinata*、黑眉锦蛇 *Elaphe taeniura*、玉斑蛇 *Euprepophis mandarina*、银环蛇 *Bungarus multicinctus* 被列入中国濒危动物红皮书易危级动物。

由上述可见梵净山国家级自然保护区两栖爬行动物种类丰富,特有现象突出。

本书两栖动物简介、形态特征、分类学术语、科属种检索和描述主要依据《中国动物志两栖纲》(上、中、下卷)(费梁等,2006,2009)。爬行动物形态特征描述、分类术语等主要依据《中国蛇类》(赵尔宓,2006)、《中国动物志·爬行纲》(1~3卷)(张孟闻等1998;赵尔宓等1998)、《贵州爬行类志》(伍律等,1985)。爬行动物标本量度数据由作者在中国科学院成都生物研究所测量所得。

本书在标本采集过程中得到梵净山国家级自然保护区管理局杨传东研究员、石磊助理研究员、宜宾学院刘芹博士、谢雨林和蔡永军同学、成都理工大学研究生钟光辉的大力支持,大鲵贵州种群遗传与进化研究实验工作得到中国科学院昆明动物研究所车静研究员、颜芳博士的大力支持,在此一并致谢。

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本书梵净山野外调查和两栖动物分子实验获梵净山国家级自然保护区管理局资助,大鲵专项研究获国家自然科学基金(NSFC 31360144, NSFC 31372152), Darwin Initiative project 19003、贵阳学院贵州省生物多样性与应用生态学重点实验室科研平台和贵州省大鲵可持续利用协同创新中心科研平台资助。

本书两栖动物记述由贵阳学院魏刚、徐宁执笔,两栖动物分子鉴定由茅台学院李仕泽执笔,大鲵贵州种群研究由遵义医学院2012级研究生、贵州省生物研究所吕敬才执笔,大鲵皮肤保健酒抗氧化作用由茅台学院刘旭东执笔,大鲵皮肤保健酒对肠道微生物的影响由茅台学院杨亮执笔,爬行动物记述由宜宾学院郭鹏执笔。

FOREWORD

The Mount Fanjing National Nature Reserve is on the transition zone of Yunnan – Guizhou Plateau to Xiangxi hills, situated in the northeastern part of Guizhou province. It is located in the Yinjiang County, Jiangkou County and Songtao County, across latitudes $27^{\circ}49'50'' \sim 28^{\circ}01'30''$ and longitudes $108^{\circ}45'55'' \sim 108^{\circ}48'30''$.

Mount Fanjing is the main peak of the Wuling Mountains, stretching largely northeast to southwest. It is huge, comprising of Phoenix Mountain whose highest peak reaches 2,570.5m above the sea level while its golden summit is at 2,493m, rising from an altitude of just 500m at the foot of the mountain's eastern slope. Phoenix Mountain itself comprises of canyons at its centre surrounded by a succession of high and low peaks and hills. The whole region is home to spectacular mountainous scenery, surrounded by towering peaks, steep slopes and deep valleys, crisscrossed by streams and waterfalls.

Mount Fanjing sits at the divide between the Wu and Yuan Rivers. Its height, deep valleys and numerous gullies provide excellent drainage and contributes to the development of streams and rivers. Also, the mountain's dome – shaped incline results in a typical formation of waterways radiating outwards in all directions: to the East there are the Heiwan and Macao Rivers, South the Kaishi and Panxi, West the Xiaojia and Niuwei, and North the Taojin and Jinchang.

Mount Fanjing is characteristic of the central subtropical mountain monsoon climate, with an annual average temperature of $6 - 17^{\circ}\text{C}$, January average of $3 - 5^{\circ}\text{C}$, July average $15 - 27^{\circ}\text{C}$ and $\geq 10^{\circ}\text{C}$ accumulated temperature; 1,500 – 5,500 $^{\circ}\text{C}$; annual average precipitation is 1,100 – 2,600mm and annual average humidity of over 80%. The year – round warmth and humidity of the region has made it home to a great variety of flora and fauna.

The mountain's particular geography and climate provides it with a great variety of habitats, making it an extremely unique and valuable ecosystem. Its key attributes are as follows: 1) Its evergreen broad – leaved forests are typical of subtropical China's native vegetation, with a great degree of variation and diversity as well as numerous relict communities. 2) It is very rich in natural resources. The published lists estimate a total of 6,000 species, including a large number of rare nationally protected key species. Based on China's "Wildlife Protection Act", the region contains nationally protected key animal species, including the Gray Snub – nosed Monkey (*Rhinopithecus brelichi*); among these, four species are listed at the highest national level of protection and 15 at level two. According to "China's Rare and Endangered Protected Plants List", the region contains 17 protected plant species, of which one species is at level one, eight at level two and eight at level three. 3) Not only is the region rich in natural resources and diversity, it contains many ancient and distinct species such as the Gray Snub – nosed Monkey and Handkerchief Tree (*Davidia involucrata*), distributed across 13 relict communities covering 1,200 acres. Guizhou's Gray Snub – nosed Monkey, recognized globally as Critically Endangered, has a very narrow distribution range and is found only on Mount Fanjing. 4) The region's natural environment and forest ecosystems have largely maintained their ancient state, avoiding destruction resulting from human activities. With continuous environmental damage and change around the world, Mount Fanjing's natural ecosystems are critical in representing and preserving China's indigenous subtropical habitats. Additionally, Mount Fanjing's forests are in excellent condition with dense growth and canopy coverage of over 80%, illustrating a relatively balanced forest ecosystem. From the perspective of soil, water and wildlife conservation, it has very great ecological and social importance.

Due to its rich ecology and biodiversity, the area has been visited by a great number of eminent Chinese taxonomists since as early as the 1930s. Internationally acclaimed herpetologists dean Liu Chengzhao, Hu Shuqin and Zhao Ermi, amongst others, conducted research in the Fanjing Mountains in 1962, collecting 20 species of amphibian and 26 species of reptile. In March of 1982, Fei Liang and Ye Changyuan identified an adult specimen of the Emei moustache toad, *Vibrissaphora boringii*. Not only did this add a new addition to recorded amphibian species of Guizhou Province, it also proved that tadpoles the team had collected in 1962 on Fanjing's west slope (Yin River) are indeed *V. boringii*'s juvenile form. In 1982, Lin Dejun collected 23 amphibian and 13 reptile species from the area. 2010 and 2012, Zhang Lei *et al.* discovered a new subspecies of the Binling horned toad (*Megophrys binlingensis*) named *M. b. fanjingmontis*, along with two new amphibian species previously not recorded in Guizhou Province: *Rhacophorus leucofasciatus* and *Rana zhenhaiensis*, thus contributing to the revision of contemporary amphibian classification. In 2012, Niu Kefeng *et al.* discovered a species of amphibian not previously recorded on Mount Fanjing, the short – legged horned toad, *Megophrys brachykolos*. Furthermore in 2013, Liu *et al.* also discovered a reptile species not previously known in Guizhou, the Sichuan pit viper, *Sinovipera sichuanensis* (Liu *et al.* 2014).

Currently, the number of amphibian species and subspecies recorded in the Mount Fanjing National Nature Reserve stands at 39, belonging to 22 genera, 9 families and 2 orders. Of these, Caudata: 2 families, 2 genera and 2 species, including from Cryptobranchidae: 1 genus and 1 species and from Salamandridae: 1 genus and 1 species; Anura: 7 families, 20 genera and 38 species and subspecies, including from Megophryidae: 4 genera and 7 species, from Bufonidae: 2 genera, 2 species and 2 subspecies, from Hylidae: 1 genus, 2 species and 1 subspecies, from Ranidae: 7 genera and 12 species, from Dicroglossidae: 3 genera and 5 species, from Rhacophoridae: 2 genera and 5 species, and from Microhylidae: 1 genus and 4 species. Of the above, 20 species and subspecies (50.00%) are endemic to China. The Chinese giant salamander (*Andrias davidianus*), for instance, is a grade-2 nationally protected species, as well as being listed level E [Appendix I] under CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), i.e. for species requiring the highest level of protection. The Chinese giant salamander is also on the IUCN Red List of endangered species, listed as Critically Endangered. The China National Red List of endangered fauna is also moving to add the species to its list of Critically Endangered animals. The Emei moustache toad, short-legged horned toad, Boulenger's spiny frog (*Quasipaa boulengeri*) and Yunnan spiny frog (*Gynandropaa yunnanensis*) have also been listed as Endangered by the IUCN, the former two also included in China's National Red List of endangered fauna.

The spiny-flanked frog (*Quasipaa shini*) and giant spiny frog (*Quasipaa spinosa*) have been listed as Vulnerable by IUCN, Margareta's frog (*Odorrana margaretae*) and the dark-spotted frog (*Pelophylax nigromaculatus*) have Near Threatened status. Other rare species include the warty newt *Paramesotriton wulingensis*, the Oshan Metacarpal-tubercled toad (*Paramegophrys oshanensis*), the spiny-fingered horned toad (*Megophrys spinata*), the Binling horned toad (*Megophrys binlingensis*), the small horned toad (*Megophrys minor*), the Asiatic toad Chinese subspecies *Bufo gargarizans andrewsi*, the Zhenhai brown frog (*Rana zhenhaiensis*), the bamboo-leaf frog (*Bamburana versabilis*) and the white-striped tree frog (*Rhacophorus leucofasciatus*).

Mount Fanjing National Nature Reserve has 48 reptile species, belonging to 30 genera, 10 families and 2 orders. Of these, Testudines: 3 families, 3 genera and 3 species, including Platysternidae: 1 genus, 1 species, Trionychidae: 1 genus, 1 species and Geoemydidae: 1 genus, 1 species; of the suborder Lacertilia: 4 families, 5 genera and 6 species, including Scincidae: 2 genera and 3 species, Agamidae: 1 genus and 1 species, Lacertidae: 1 genus and 1 species and Gekkonidae: 1 genus and 1 species; suborder Serpentes: 3 families, 22 genera, 39 species, including Colubridae: 16 genera and 32 species, Viperidae: 4 genera and 5 species and Elapidae: 2 genera and 2 species. Of these, 17 species are endemic to China (35%). Included in these 48 reptile species, the big headed turtle (*Platysternon megacephalum*) and the Beal's-eyed turtle (*Sacalia bealei*) have Endangered status under the IUCN and China's National endangered fauna Red Lists. The Chinese softshell turtle (*Pelodiscus sinensis*) has Vulnerable status in IUCN and the Chinese National Red List. The Chinese rat snake (*Ptyas korros*), oriental rat snake (*Ptyas mucosa*) and the Chinese moccasin (*Deinagkistrodon acutus*) have Endangered status in the Chinese National Red List. The king rat snake (*Elaphe carinata*), beauty rat snake (*Elaphe taeniura*), Mandarin rat snake (*Euprepophis mandarinus*) and the many-banded krait (*Bungarus multicinctus*) are listed as Vulnerable nationally.

All the above illustrates Mount Fanjing National Nature Reserve's great amphibian and reptile biodiversity, with many specimens unique to the area.

This book's introductions to the amphibian species, their morphology, classification and scientific descriptions are largely based on the Fauna Sinica Amphibia Fauna Sinica, Amphibia, vol 1, 2 and 3 (Fei Liang *et al.*, 2006, 2009). For reptiles: China's Snakes (Zhao Ermi, 2006), Fauna Sinica, Reptilia, vol. 1-3 (Zhang Mengwen *et al.* 1998; Zhao Ermi *et al.* 1998), Guizhou's Reptiles Fauna (Wu Lu *et al.*, 1985). The majority of reptile specimens were examined by the author at the Chengdu Institute of Biology.

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In this book amphibians are described by Wei Gang and Xu Ning, amphibians molecular identification is written by Li Shize, the population study of Chinese giant salamander is written by Lv Jingcai, the antioxegenation of health wine is written by Liu Xudong, the influence of health wine is written by Yang Liang and the reptiles is written by Guo Peng.

Wei gang

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