



# 泰宁世界自然遗产地 生物多样性研究

THE BIODIVERSITY OF TAINING WORLD  
NATURAL HERITAGE

李振基 陈小麟 刘长明 著



科学出版社

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The Biodiversity of Taining World Natural Heritage

李振基 陈小麟 刘长明 著

Edited by Zhenji Li, Xiaolin Chen, Changming Liu

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## 内 容 简 介

泰宁世界自然遗产地是中国丹霞世界自然遗产的六大遗产地之一,位于福建省西北部,在武夷山脉中段东南侧,是典型的青年期丹霞景观地貌区域。区域内有9个植被型,63个群系和92个群丛,其中丹霞草本植物群落、丹霞硬叶常绿阔叶林、沟谷常绿阔叶林为泰宁世界自然遗产地的特色。悬崖峭壁上耐旱植物区系发育极为良好,在沟谷中,耐水湿的植物区系发育良好;保存了大量的珍稀濒危野生动植物。该地区有维管束植物共212科645属1412种,脊椎动物36目105科382种,无脊椎动物25目231科1512种,是小区域单位面积上生物多样性较为丰富的地区之一。

本书由泰宁世界自然遗产地生物多样性考察队伍经过较为系统的科学调查后撰写而成,系统介绍泰宁世界自然遗产地的自然环境、植物多样性、植被类型多样性、脊椎动物多样性、昆虫多样性,重点突出了泰宁世界自然遗产地的植被原生演替过程、特色动植物类群。全书约为80万字,附有精美的照片和珍稀动植物分布图等。

### Synopsis

The Taining World Natural Heritage is one of the six China Danxia World Natural Heritage, is located at Northwest of Fujian, at southeast side of the center-section of Wuyi Sierra, is the typical adolescence World Natural Heritage. In this region, there are 92 associations that belong to 63 formations of 9 vegetation types, in which the Danxia herb communities, the Danxia chaparral forests, the Danxia gully evergreen broadleaved forests are the characteristic vegetations of Taining World Natural Heritage. On the cliff, the drought enduring flora flourish, in the gully, the moisture tolerant flora grows well. There are 1412 species of vascular plants that belong to 645 genera of 212 families in this area, 380 species of vertebrates that belong to 105 families of 36 orders, 1512 species of insect that belong to 232 families of 25 orders. A large number of wild animals and plants are preserved. It is one of small area with high biodiversity.

*The Biodiversity of Taining World Natural Heritage* bases on the systematically scientific investigation by the Taining World Natural Heritage biodiversity expedition. This book introduces the natural environment of Taining World Natural Heritage's, the plant diversity, the vegetation diversity, the vertebrate diversity and the insect diversity systematically, and highlights the community succession process of Taining World Natural Heritage, the characteristic of fauna and flora. In the end, fine photographs and distribution map of endangered and precious vegetations, plants and animals were given.

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# 《泰宁世界自然遗产地生物多样性研究》

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# The Biodiversity of Taining World Natural Heritage

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# 前言

泰宁世界自然遗产地位于福建省西北部，是中国亚热带湿润区发育到青年期的山原（平台）-峡谷组合式丹霞的代表。泰宁具有地貌类型的多样性和地貌景观的奇特性。与一般的丹霞主要以山景取胜不同，泰宁丹霞的精妙之处是规模宏大、错综复杂的峡谷群、深切峡谷曲流，数量巨大、多姿多彩的丹霞洞穴和与丹霞密切共生的良好的生态环境。在生物多样性上，泰宁丹霞地貌地区悬崖峭壁上耐旱植物区系发育良好，在沟谷中，耐水湿的植物区系发育良好。由于历史以来的有效保护，这里成为珍稀濒危的长叶榧树、铁皮石斛、闽楠的庇护地。由于沟谷纵横，山体陡峭，洞穴众多，这里成为许多珍稀猛禽的乐园。在森林植被分布上，这里是中亚热带东部湿润区典型常绿阔叶林的分布区域，生态系统类型多样，保存了我国中亚热带地区森林植被发展的典型的原生生态过程。

泰宁属中亚热带季风型湿润气候，温和湿润，四季分明。年平均气温 17.1℃，1 月均温 5.9℃，极端最低温 -10.6℃；7 月均温 29.7℃，极端最高温 38.9℃。年平均降水量 1788mm，年平均相对湿度 84%；3~6 月为雨季，7~8 月多雷阵雨，9 月至翌年 2 月为少雨季节。

从 2007 年 9 月开始，由厦门大学生命科学学院、福建农林大学植物保护学院、福建省地质调查院、泰宁风景名胜区管委会等的专家、学者组成了泰宁世界自然遗产地科考队，通过进一步的考察，充分肯定了本区具有丰富的动植物种类，森林生态系统具有典型性，也是野生动物理想的栖息繁衍场所，区内生物多样性丰富，组成复杂，区系较古老，特有现象较高。

在泰宁丹霞景观区，由于丹霞地貌生境异质性、特异的地质地貌和复杂多样的演替阶段，导致了该区域内植被类型的多样性与特有性。该区域内的植物群落划分为 9 个植被型，63 个群系和 92 个群丛。在崖顶、峭壁的极旱生环境有旱生性植物群落，如卷柏群落、刺柏群落、萱草群落，经过演替早期及中期，这些生境形成了丹霞地貌区特有的地形顶级群落——乌冈栎群落和尖叶栎群落等；在山麓中生性环境，有山麓中生性植物群落，包括闽楠群落、甜槠群落、黑叶锥群落和苦槠群落；在沟谷湿生性环境，有沟谷湿生植物群落，包括喜树群落、细柄蕈树群落；薄叶润楠群落、在常年积水的环境，则有水生植被，包括睡莲群落、金鱼藻群落、水龙群落、茶菱群落；在崖壁阴湿环境，则发育了喜湿崖壁植物群落，如多花兰群落、槲蕨群落、长叶铁角蕨群落、倒挂铁角蕨群落、长叶榧树群落等。此外，丹霞地貌特有种和珍稀种组成的群落包括梧桐群落、紫果槭群落、短尾鹅耳枥群落和旋蒴苣苔群落、绢毛马铃苣苔群落等草本群落。在丹霞地貌区域，植被类型丰富，原生性演替过程的各个阶段一览无遗。这里是研究中国中亚热带地区东部湿润区域常绿阔叶林演替过程的最佳区域之一。

泰宁世界自然遗产地地处泛北极植物区和古热带植物区的过渡地带，调查得出泰宁世界自然遗产地有维管束植物 212 科 666 属 1412 种，其中，蕨类植物 39 科 77 属 176 种，裸子植物 6 科 9 属 9 种，被子植物 167 科 580 属 1227 种。本书对其区系的组成成分、属的地理成分等进行分析，并与周边地区的植物区系进行对比研究，结果表明，本区植物种类丰富，热带和亚热带成分居多；地理成分复杂；区系成分古老，单型或寡型属占一定比例；珍稀物种多，具有一定特有成分的植物和植被类型。

泰宁世界自然遗产地位于福建省西北部的武夷山脉中段，以青年期丹霞景观地貌为特征。对该区域特色植物进行了对比分析，结果表明：①泰宁世界自然遗产地的苦苣苔科、卷柏科、兰科植物发育良好；②泰宁世界自然遗产地的区域特有成分很多，其中长叶榧树（*Torreya jackii*）、大齿唇柱苣苔（*Chirita juliae*）、建宁金腰（*Chrysosplenium jienningense*）、仙霞铁线蕨（*Adiantum juxtopositum*）、白背蒲儿根（*Sinosenecio latouchei*）等是局域特有成分；③IUCN 红皮书植物长叶榧树在泰宁世界自然遗产地的不同坡面形成群落，种群稳定；④在泰宁世界自然遗产地的长叶榧树种群呈现聚集格局，尤其是小树，而且在阴坡更为明显，这表明其生长和分布的限制因子是水分和光照。

在泰宁世界自然遗产地的 1412 种维管束植物中，列入 IUCN 红皮书的植物有铁皮石斛、银杏、银

钟花等 10 种, 列入 CITES 附录禁止国际贸易的植物有金毛狗、金线兰等 65 种, 国家 I 级保护植物有银杏、南方红豆杉与伯乐树 3 种, 国家 II 级保护植物有闽楠、花榈木、红豆树、伞花木、喜树等 11 种, 列入《中国物种红色名录》的植物有铁皮石斛、银杏等 75 种。

泰宁世界自然遗产地的经济植物资源丰富, 物种繁多, 可利用性强。在泰宁世界自然遗产地的 1412 种维管束植物中, 有食用植物 101 种、药用植物 616 种、园林绿化植物 221 种、材用植物 113 种、鞣质与染料植物 59 种、油料植物 115 余种、香料植物 56 种、蜜源植物 117 种、纤维植物 88 种。

泰宁世界自然遗产地位于福建省西北部, 是野生动物理想的栖息繁衍场所。2007 年 9 月以来的考察表明, 该地有脊椎动物资源 36 目 105 科 382 种。其中鱼类 5 目 13 科 48 种, 种类占闽江水系鱼类总数的 30.19%, 占福建省淡水鱼类总数的 24.12%; 两栖动物 2 目 7 科 26 种, 占福建省两栖类总种数的 59.09%; 爬行动物 3 目 12 科 63 种, 占福建省爬行类总种数的 51.22%; 鸟类 18 目 53 科 200 种, 占福建省鸟类总种数的 36.83%; 哺乳动物 8 目 20 科 45 种, 占福建省兽类总种数的 40.91%。豺 (*Cuon alpinus lepturus*) 属于 IUCN 濒危种 (EN), 白颈长尾雉 (*Syrnaticus ellioti*)、金猫 (*Catopuma temmincki*) 和鬲羚 (*Capricornis sumatraensis*) 属于 IUCN 易危种 (VU), 穿山甲 (*Manis pentadactyla*) 和小灵猫 (*Viverricula indica pallida*) 属于 IUCN 低危种 (LC); 属于《濒危野生动植物种国际贸易公约》附录 I 的有 4 种, 列入附录 II 的有 33 种。国家重点保护野生动物 (1988 年) 的 I 级保护动物 2 种, 国家 II 级保护动物 36 种。有福建省重点保护动物 34 种, 福建省一般保护动物 259 种。在双边国际性协定保护的候鸟中, 中国及日本两国政府协定保护候鸟 42 种, 中国及澳大利亚两国政府协定保护候鸟 10 种。缨口鳅、黑斑肥螈、华南湍蛙、武夷湍蛙、小棘蛙、弹琴蛙、沼蛙、日本林蛙、阔褶蛙、金线蛙、花臭蛙、小黄麂 12 种脊椎动物属于中国特有种。泰宁世界自然遗产地 334 种陆生脊椎动物的区系中, 具有我国东洋界和古北界两大界的成分。其中东洋界陆生脊椎动物 215 种, 占总数的 64.37%; 古北界 49 种, 占总数的 14.67%; 广布种 70 种, 占总数的 20.96%。

泰宁世界自然遗产地有昆虫纲昆虫 25 目 232 科 1512 种。在已查明的昆虫种类中, 以东洋区成分占多数, 种数约占自然遗产地昆虫种数的 42.40%; 东洋-古北区成分所占的比例为 39.15%; 多区分布的昆虫占 12.50%; 全球广布的昆虫占 5.95%。在泰宁世界自然遗产地, 金裳凤蝶 (*Troides aeacus*)、宽尾凤蝶 (*Agehana elwesi*)、箭环蝶 (*Stichophthalma howqua*)、双星箭环蝶 (*Stichophthalma neumogeni*)、枯叶蛱蝶 (*Kallima inachus*)、双突多刺蚁 (*Polyrhachis dives*)、鼎突多刺蚁 (*Polyrhachis vicina*)、丽叩甲 (*Camposternus auratus*)、双叉犀金龟 (*Allomyrina dichotoma*)、中华奥锹甲 (*Odontolabis cuvera*) 是“三有名录”种类, 其他重要的昆虫种类有五倍子蚜 (*Schlechtendalia chinensis*)、巨圆臀大蜓 (*Anotogaster sieboldii*)、松毛虫赤眼蜂 (*Trichogramma dendrolimi*)、广大腿小蜂 (*Brachymeria lasus*)、神农洁蜣螂 (*Catharsius molossus*) 等。

在长期研究的基础上, 由厦门大学生命科学学院、福建农林大学植物保护学院、泰宁风景名胜区管委会等的专家、学者组成了泰宁世界自然遗产地生物多样性研究队伍, 进行了较为系统的科学调查, 取得了丰硕的成果, 编写形成了本书。其中 2 幅丹霞地貌景观照片由刘贤健先生提供。在本书编写与出版过程中, 得到国家自然科学基金 (基于生物多样性的自然保护区群网研究, 31070464) 资助, 特此致谢!

本书吸收和概括了前人的研究成果和进一步的考察成果。由于水平有限, 在编写过程中难免存在缺点和疏漏之处, 敬请专家、读者批评指正。

编 者

2011 年 10 月

## Preface

Taining World Natural Heritage is located in Northwest of Fujian, it is representative of the plateau mountain (platform) -canyon landscapes at a youthful stage of landform development in the subtropical humid zone of China. It exhibits a variety of landform types and uniqueness in its geomorphological landscape. Taining has intricate and fascinating grand valleys, incised meanders, numerous colorful caves, and the favourable ecological environment. From the aspect of biodiversity, drought-tolerant flora well develop on cliffs in Taining, while moisture-tolerant flora in gullies as well. Taining belongs to the typical evergreen broad-leaved forest belt of the eastern mid-subtropical humid region, has various types of ecosystems, has preserved the classic primitive ecological processes of the forests in the eastern mid-subtropical region.

Taining is subjected to the influence of a mid-subtropical humid monsoon climate. It is mild and moist, with four distinct seasons. The annual mean temperature is 17.1°C, while the average temperature in January is 5.9°C, with the extreme minimum temperature of -10.6°C. The average temperature in July is 33.7°C, with the extreme maximum temperature of 38.9°C. The annual mean precipitation is 1450 mm, and the annual average relative humidity is 84%. The rainy season lasts from March to June, and thundershowers occur frequently in July and August, while the period from September to February receives little precipitation.

Since September, 2007, experts from School of Life Sciences of Xiamen University, College of Plant Protection of Fujian Agriculture and Forestry University, Geological Survey Research Institute of Fujian and Management Committee of Taining National Scenic Spot established an investigator team to survey. Comprehensive scientific investigation has affirmed that according to Udvardy's system, Taining belongs to the biotope in the mid-south biogeographic province of Chinese subtropical forest in the Palearctic realm. It has comparatively rich biodiversity. It is located in the "East Asia Tropical Forest Zone" of "India-Malaysia" region in the 200 "Biological Zones of WWF". Evergreen broadleaved forests here are typical eastern mid-subtropical humid evergreen broadleaved forest vegetation subregion. There are many varied ecosystems, some of which have very small scale. All of which creates a complicate ecological pattern and a very favourable environment for wildlife. Danxia Heritage provides us a model site to study succession.

Taining World Natural Heritage, as a result of Danxia landscape habitat heterogeneity and specific geological landform and complex diverse successional stages, has led to diversity and endemism of vegetations. In this region, plant communities can be divided 92 associations that belong to 63 formations of 9 vegetation types, forming cliff xeric plant communities on the naturally dry cliff and top habitats, mesophytes communities on the piedmont habitats, wet valley communities and in the naturally wet habitats, valley aquatic vegetation in the valley pond and ditch. In the top and cliff habitats, extreme xeric plant communities naturally dry environment, the *Selaginella tamariscina* communities, *Hemerocallis fulva* communities, *Juniperus formosana* forests, through the succession of early and mid-term, reach the last Danxia topographical climax- *Quercus phillyraeoides* forest and *Quercus oxyphylla* forests and so on; naturally in the piedmont habitats of the valley are covered with mesophytes communities, including the *Phoebe bournei* communities, *Castanopsis eyrei* communities, *Castanopsis nigrescens* communities and *Castanopsis sclerophylla* communities; in the naturally wet valley habitats are covered with val-

ley wet plant communities, including *Camptotheca acuminata* communities, *Altingia gralilipes* communities, *Machilus leptophylla* communities; in the perennial water habitats, there are aquatic vegetations, including *Nymphaea tetragona* communities, *Ceratophyllum demersum* communities, *Ludwigia adscendens* communities, *Trapella sinensis* communities; in the cliffs wet habitats are covered with the hygrophilous cliff plant communities, such as *Cymbidium floribundum* communities, *Drynaria roosii* communities, *Asplenium prolongatum* communities, *Torreya jackii* communities. In addition, the endemic and rare species in Danxia landscape formed the unique plant communities such as the *Firmiana simplex* communities, *Acer cordatum* communities, *Carpinus londoniana* communities and *Boea hygrometrica* communities, *Chirita juliae* communities, *Oreocharis maximowiczii* communities. In the Taining World Natural Heritage, different types of vegetations rich, all stages of primary succession can be glimpses, here is the ideal research site for succession process of Chinese eastern humid subtropical evergreen broadleaved forest.

Taining World Natural Heritage is located in holarctic-paleotropical transition zone. In Taining World Natural Heritage, there are 1412 species (varieties, subspecies and formations) of vascular plants that belong to 666 genera of 212 families, in which 176 species, 77 genera, 39 families of ferns, 9 species, 9 genera, 6 families of gymnosperms, 1227 species, 580 genera, 167 families of angiosperms.

Among the plants, *Ginkgo biloba*, *Taxus wallichiana* var. *mairei* and *Bretschneidera sinensis* are under the first grade protection, 11 are under the second grade protection, such as *Phoebe bournei*, *Ormosia henryi* forest, *Eurycorymbus cavaleriei*, *Torreya jackii* and *Camptotheca acuminata*. 10 are on IUCN Red Lists, including *Dendrobium officinale*, *Halesia macgregori*. Some 65 are on the CITES appendices, which are prohibited from international trade, such as *Cibotium barometz*, and *Anoectochilus roxburghii*. Some 77 species have been listed on the Red List of China, such as *Dendrobium officinale*.

The composition of vascular plant flora and areal-types of genera are compared with the neighboring flora. The results showed that: The flora is rich in plant species and the tropic and subtropical elements are the dominant composition; geographic components of the flora is complex; the flora is of an old origin, monotypic and oligotypic species are abundant; there are lots of rare, precious plants, unique plants and vegetation types.

The areal-types of families, genera and species basing survey in this region were analyzed. The results showed that, (1) Species belong to Gesneriaceae, Selaginellaceae, Orchidaceae flourished in Taining World Natural Heritage; (2) Chinese endemic species of seed plants in this area are abundant in this area, and the *Torreya jackii*, *Chirita juliae* *Chrysosplenium jienningsense*, *Adiantum juxtopositum*, *Sinosenecio latouchei* are endemic plant in Taining; (3) The IUCN red plant *Torreya jackii* form communities in different canyons and have a stable population in Taining Scenic and Historic Interest Area; (4) The pattern of spatial dispersion varied with the size class of *Torreya jackii*. Its saplings are more clumped than adults, more clumped in the shady slope. Water and light is the limited factor for *Torreya jackii* to grow and distribution.

The economical plants is affluent in Taining World Natural Heritage, which are characterized by rich variety and sustainability. This chapter presents a general introduction to various plants, which are further divided into medical herbs, gardening plants and timber woods. Based on this, the paper puts forward specific measures in order to maintain varieties and sustainable development of plants in Danxia World Natural Heritage. Investigation shows that among 1412 vascular plants, there are 101 species of food plants, 616 species of medical herbs, 221 species of landscape plants, 113 species of timber plants, 59 species of tanned plants, more than 115 species of oil plants, 56 species of aromatic plants, 117 species of honey plants and 88 species of fiber plants.

Taining World Natural Heritage is located in north west of Fujian Province, and is an ideal habitat



for wildlife breeding sites. The study since the September 2007 showed that there were vertebrate resources of 36 orders, 105 families and 382 species, among these, there are fish of 5 orders, 13 families and 48 species, that is Anguilliformes, Cypriniformes, Siluriformes, Synbranchiformes and Perciformes, accounting for 30.19% of the total fish species in Minjiang River, and accounting for 24.12% of the total freshwater fish in Fujian Province; amphibians of 2 orders, 7 families and 26 species, accounting for 59.09% of the total amphibians in Fujian Province; reptiles of 3 orders, 12 families and 63 species, accounting for 51.22% of the total reptiles in Fujian Province; aves of 18 orders, 53 families and 200 species, accounting for 36.83% of the total aves in Fujian Province; mammals of 8 orders, 20 families and 45 species, accounting for 40.91% of the total mammals in Fujian Province. *Cuon alpinus lepturus* belongs to IUCN Endangered Species (EN), *Syrmaticus ellioti*, *Catopuma temminckii*, *Capricornis sumatraensis* belong to IUCN Vulnerable Species (VU), *Manis pentadactyla* and *Viverricula indica pallida* belonging to IUCN Low-risk Species (LC). There are four species belonging to the International Trade in Endangered Species of Wild Fauna and Flora (CITES) Appendix I, 33 species in Appendix II. Protection of animals, Two species are first grade national key protected animals (1988), 36 species are second grade national protected animals. There are 34 species of key protected animals in Fujian Province, 259 species of the general protection of animals in Fujian Province. In bilateral international agreements on protection of migratory birds, 42 species belong to the protect migratory birds in the agreement between the two governments China and Japan, and 10 species belong to the protect migratory birds in the agreement between the two governments China and Australia. *Balitoridae*, *Pachytriton brevipes*, *Amolops ricketti*, *Amolops wuyiensis*, *Paa exilispinosa*, *Rana adenopleura*, *Rana guentheri*, *Rana japonica*, *Rana latouchii*, *Rana plancyi*, *Rana schmackeri*, *Muntiacus reevesii* etc. are endemic to China. 334 species of terrestrial vertebrates of Taining World Natural Heritage can be divided two part, with the China Oriental and Palaearctic two sector components, in which 215 species of terrestrial vertebrates are the Oriental species, accounting for 64.37% of the total number; 49 are the Palaearctic species, accounting for 14.67% of the total number; 70 species are widely-distributed species, accounting for 20.96% of the total number.

The Taining World Natural Heritage has the insect 1512 species that belong to 232 families of 25 orders. In verified insect species, most occupies by the Oriental region ingredient, the number to approximately accounts for 42.40%; The Palaearctic ingredient accounts for 39.15%; The multi-area distributed insect accounts for 12.50%; The global blazon's insect accounts for 5.95%. In the Taining Dan rosy cloud landscape region, the *Troides aeacus*, *Agehana elwesi*, *Stichophthalma howqua*, *Stichophthalma neumogeni*, *Kallima inachus*, *Polyrhachis dives*, *Polyrhachis vicina*, *Campsosternus auratus*, *Allomyrina dichotoma*, *Odontolabis cuvera* has been listed into the List of National Protected Terrestrial Wild Animals with Important Ecological, Economic and Scientific Values, other important insect type has *Schlechtendalia chinensis*, *Anotogaster sieboldii*, *Trichogramma dendrolimi*, *Brachymeria lasus*, *Catharsius molossus* and so on.

Based on the long-term research, the scholars of School of Life Sciences of Xiamen University, the College of Plant Protection of Fujian Agriculture and Forestry University, the Management Committee of Taining National Scenic Spot and so on have formed the biodiversity research team of Taining World Natural Heritage. After system's science investigation and substantial progress, we edit and publish "the Biodiversity of Taining World Natural Heritage". Two pictures of Danxia landscape were provided by Mr. Liu Xianjian. In the compiles and publication process, the State Natural Sciences Foundation (Research network of Nature Reserve based on biodiversity, 31070464) provide foundation, hereby expresses out gratitude!

Editor in Oct. , 2011

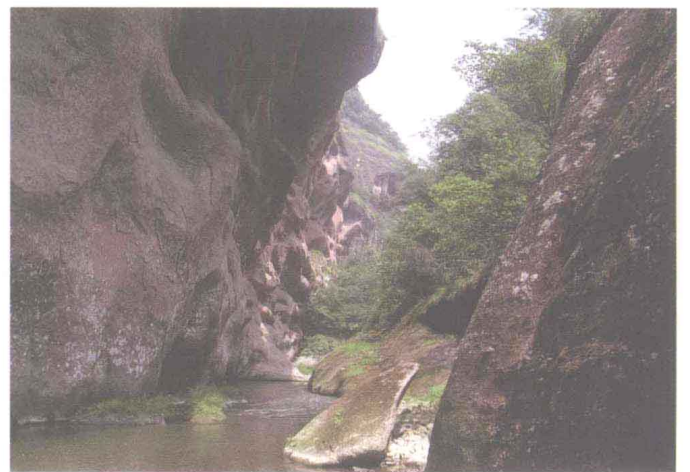
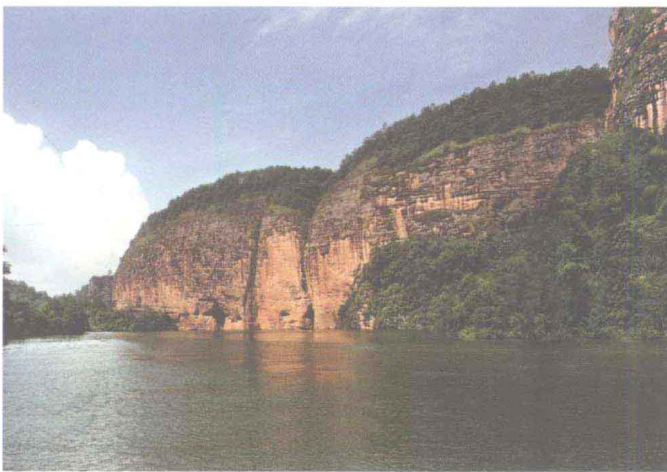


图1 泰宁世界自然遗产地的景观  
Fig. 1 The landscape in Taining World Natural Heritage

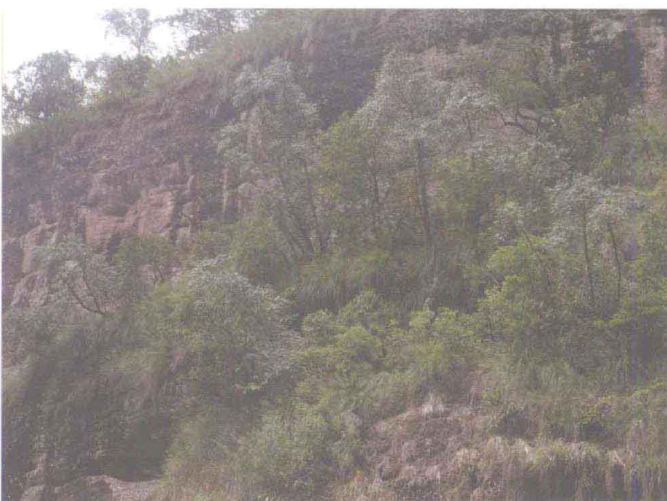


图2 泰宁世界自然遗产地丰富的长叶榧树  
Fig. 2 The *Torreya jackii* Chun in Taining World Natural Heritage



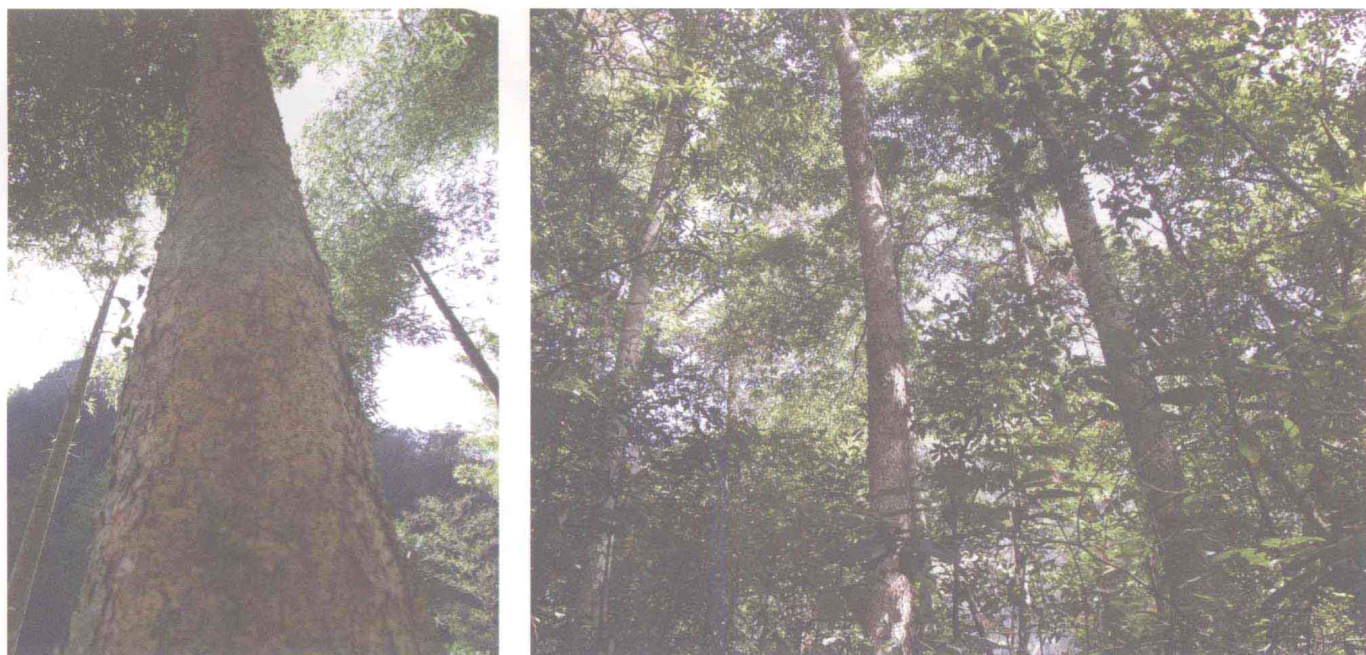


图3 泰宁世界自然遗产地内数量众多的闽楠  
Fig. 3 The *Phoebe bournei* in Taining World Natural Heritage



图4 泰宁世界自然遗产地的特色植物  
Fig. 4 The local endemic plants in Taining World Natural Heritage



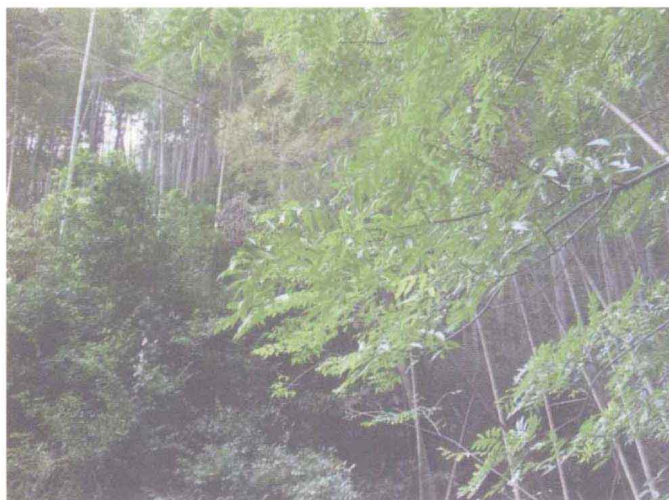


图5 泰宁世界自然遗产地的珍稀植物  
Fig. 5 The rare plants in Taining World Natural Heritage



图6 泰宁世界自然遗产地的花卉植物  
Fig. 6 The flowering plants in Taining World Natural Heritage



图7 泰宁世界自然遗产地的药用植物  
Fig. 7 The medicinal plants in Taining World Natural Heritage



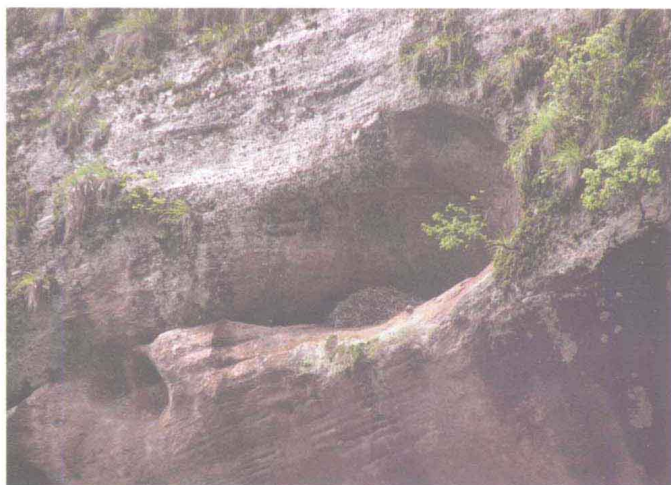


图8 在上清溪和状元岩拍摄到的隼形目鸟类鸟巢  
Fig. 8 The Falconiformes birds nests in Taining World Natural Heritage



图9 普通鵟和白腹隼雕在泰宁世界自然遗产地上空盘旋  
Fig. 9 *Buteo buteo* (Linnaeus) and *Hieraetus fasciatus* Vieillot in Taining World Natural Heritage



图10 泰宁世界自然遗产地的林雕和黑耳鸢  
Fig. 10 *Istinaetus malayensis* (Temminck) and *Milvus lineatus* (J. E. Gray) in Taining World Natural Heritage





图11 泰宁世界自然遗产地的蛇雕和鹰雕  
Fig. 11 *Spilornis cheela* (Latham) and *w* (Hodgson) in Taining World Natural Heritage



图12 泰宁世界自然遗产地的两栖动物与爬行动物  
Fig. 12 The amphibian and reptile in Taining World Natural Heritage



图13 泰宁世界自然遗产地的昆虫  
Fig. 13 The insects in Taining World Natural Heritage



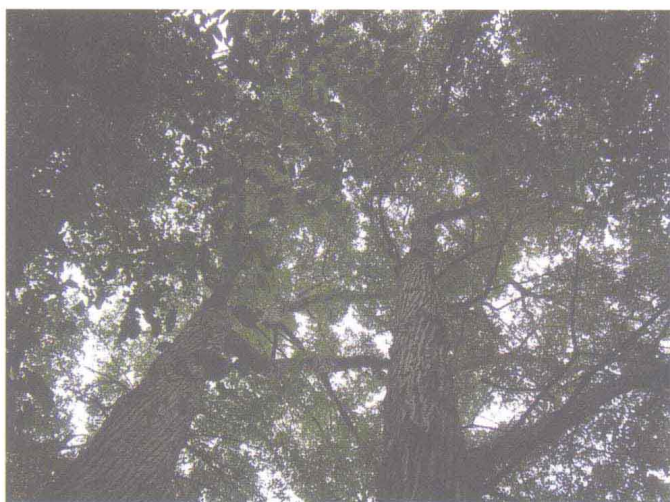
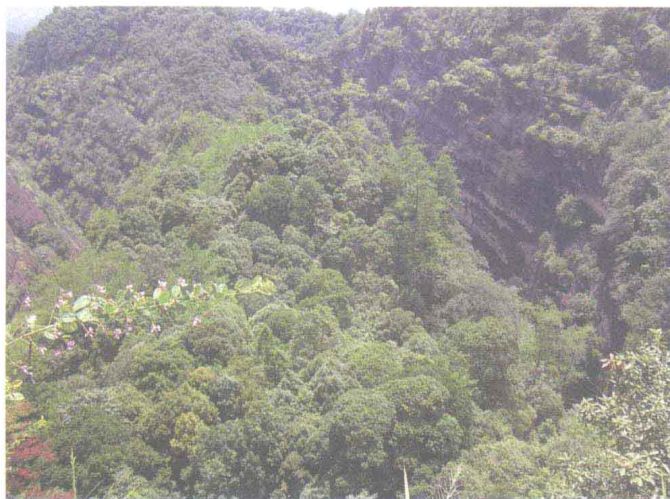


图14 泰宁世界自然遗产地山麓的常绿阔叶林  
Fig. 14 The evergreen broadleaved forests in Taining World Natural Heritage



图15 泰宁世界自然遗产地山坡的落叶阔叶林  
Fig. 15 The deciduous forests in Taining World Natural Heritage



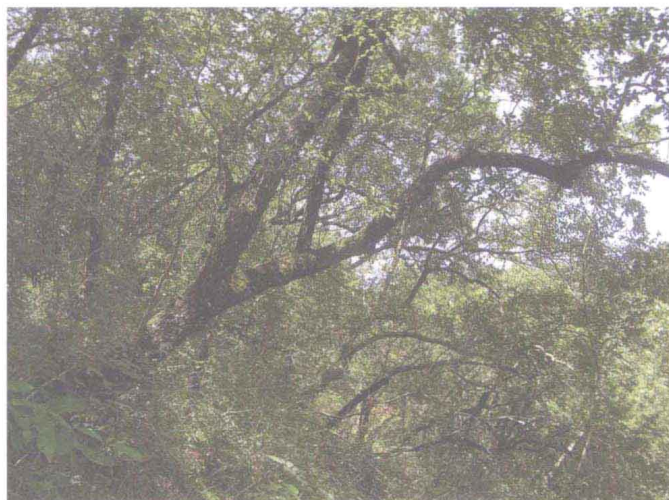


图16 泰宁世界自然遗产地山顶的硬叶林  
Fig. 16 The chaparral forests in Taining World Natural Heritage

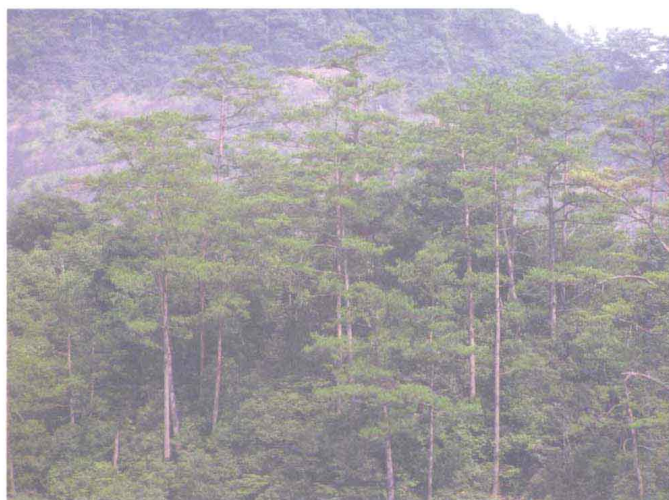


图17 泰宁世界自然遗产地山坡的针叶林  
Fig. 17 The coniferous forests in Taining World Natural Heritage



图18 泰宁世界自然遗产地山麓的竹林  
Fig. 18 The piedmont bamboo forests in Taining World Natural Heritage





图19 泰宁世界自然遗产地崖壁干旱草本植物群落  
Fig. 19 The cliff drought herb communities in Taining World Natural Heritage

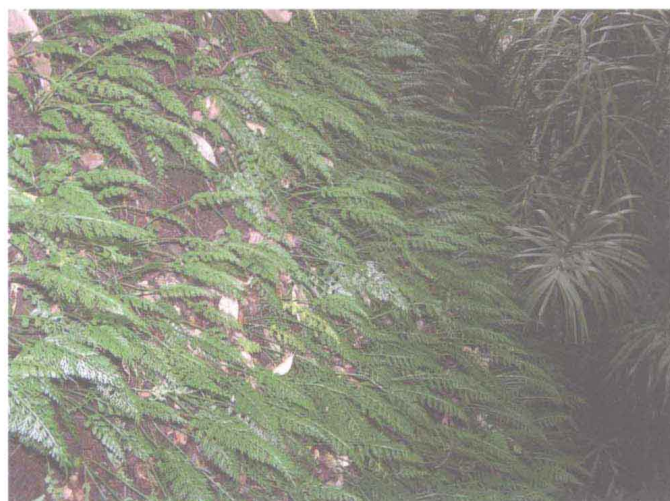


图20 泰宁世界自然遗产地崖壁湿生草本植物群落  
Fig. 20 The cliff wet herb communities in Taining World Natural Heritage

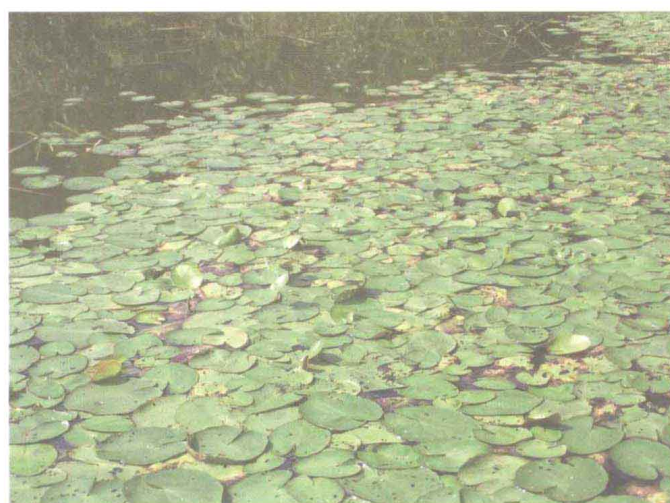


图21 泰宁世界自然遗产地的水生植物群落  
Fig. 21 The aquatic communities in Taining World Natural Heritage