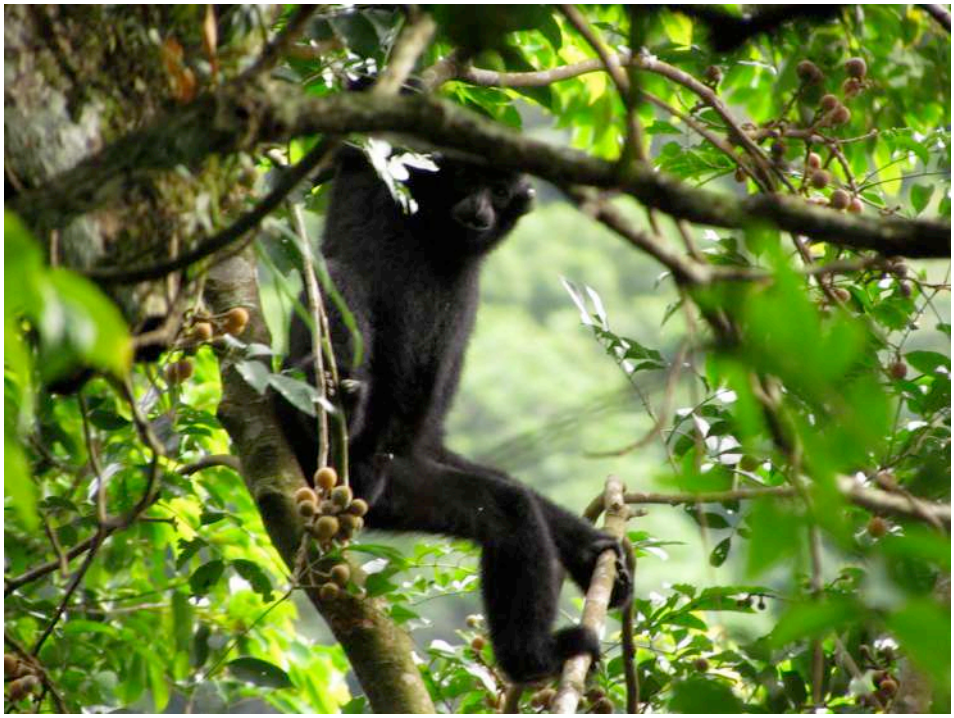
海南长臂猿保护行动计划

Hainan Gibbon Conservation Action Plan

2016–2020



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伦敦动物学会　Zoological Society of London

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世界保护联盟物种生存委员会灵长类分会小猿组　IUCN SSC PSG Section on Small Apes

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BFB	海南霸王岭林业局
BNNR	海南霸王岭国家级自然保护区
BNNRMO	海南霸王岭国家级自然保护区管理局
CAF	中国林业科学研究院
CPSG	世界自然保护联盟 物种生存委员会 中国灵长类专家组
FFI	野生动植物保护国际
HFB	海南省林业厅
HWCB	海南省野生动植物保护管理局
IFEEP	中国林业科学研究院森林生态环境与保护研究所
IUCN	世界自然保护联盟
KFBG	香港嘉道理农场暨植物园
PSG	世界自然保护联盟 物种生存委员会 灵长类专家组
SCNU	华南师范大学
SSA	世界自然保护联盟 物种生存委员会 灵长类专家组 小猿组
SSC	世界自然保护联盟 物种生存委员会
ZSL	伦敦动物学会

Abbreviations

BFB	Bawangling Forestry Bureau
BNNR	Bawangling National Nature Reserve
BNNRMO	Bawangling National Nature Reserve Management Office
CAF	Chinese Academy of Forestry
CPSG	IUCN SSC China Primate Specialist Group
FFI	Fauna and Flora International
HFB	Hainan Forestry Bureau
HWCB	Hainan Wildlife Conservation Bureau
IFEEP	Institute of Forest Ecology, Environment and Protection
IUCN	International Union for Conservation of Nature
KFBG	Kadoorie Farm & Botanic Garden
PSG	IUCN SSC Primate Specialist Group
SCNU	South China Normal University
SSA	IUCN SSC PSG Section on Small Apes
SSC	IUCN Species Survival Commission
ZSL	Zoological Society of London

摘要

海南长臂猿（*Nomascus hainanus*) (Thomas, 1982) 是中国境内唯一的特有长臂猿物种。海南长臂猿曾遍布海南全岛，分布于十二个县市，直至 20 世纪 50 年代，种群数量大约 2,000 只。然而现在该物种仅存 4 个家庭，种群数量少于 30 只，全部栖息于霸王岭保护区内，是全球最罕见及受威胁的灵长类动物。海南霸王岭国家级自然保护区于 1980 年建立，并于 1988 年晋升为国家级，35 年来为拯救海南长臂猿作出了不懈努力，但是该物种的灭绝风险依然十分严峻。

有鉴于此，海南霸王岭国家级自然保护区管理局联同伦敦动物学会、中国林业科学研究院森林生态环境与保护研究所、华南师范大学和海南省野生动植物保护管理局共同编制本行动计划，提出保护行动共 21 项，涵盖五个方面，2016-2020 年总投资预算为 **6,650** 万元，其中，优先性级别 I 的项目投资预算为 **835** 万元，主要针对加大对长臂猿及其栖息地的监管力度和栖息地恢复，投资渠道主要是省政府与社会团体。总投资预算分配如下：

1. 保护法规、基础设施与能力建设——9 项保护行动，总投资预算 2615 万元（至少 1705 万元已包括在保护区总规）；优先性级别为 I 级的保护行动投资预算为 245 万元。
2. 科研监测工程——5 项保护行动，投资预算 1520 万元，优先性 I 级的为 80 万元。
3. 保护管理工程——2 项保护行动，投资预算 250 万元，全部属优先性 I 级。
4. 栖息地恢复工程——2 项保护行动，投资预算 625 万元，优先性 I 级的为 260 万元。
5. 社区共管、发展与环境教育——3 项保护行动，总投资预算 1640 万元。

保护法规、基础设施与能力建设主要包括增加管理局人员编制和日常经费投入、改善管理体制、提高保护区基础建设水平和科研监测能力等，投资渠道主要为省财政。科研监测工程的内容包括研究长臂猿、栖息地和保护区内的人为活动、建立数字化监测体系和探索新式监测技术和设备等，投资渠道主要为国家科研或项目经费。保护管理工程包括建立人为活动监测与管理体系以及建立数字化巡护系统，投资渠道主要是省财政。栖息地恢复工程包括森林恢复与生态廊道建设，投资渠道主要是省财政。社区工作则涵盖社区共管与环境教育活动，以及发展替代生计，投资渠道主要为社会团体。

保护行动的执行单位为霸王岭保护区管理局，参与单位有海南省林业厅、海南省野生动植物保护管理局、海南霸王岭林业局、海南霸王岭林区森林公安局、白沙县政府、昌江县政府、香港嘉道理农场暨植物园、伦敦动物学会、野生动植物保护国际、中国林业科学研究院、海南大学，及其他利益相关者。

Abstract

The Hainan gibbon (*Nomascus hainanus*) (Thomas, 1892) is the only gibbon species endemic to China. The species was formerly distributed widely across Hainan Island, occurring in 12 counties and with an estimated population of 2,000 individuals until the 1950s. However, the species now consists of only four family groups and fewer than 30 individuals in total, all residing within BNNR, making this species the world's rarest and most threatened primate. Although BNNR, which was established in 1980 and achieved national-level protection status in 1988, has made ongoing efforts to protect the Hainan gibbon during the last 35 years, the species still faces an extremely severe risk of extinction.

As a response, BNNRMO, ZSL, IFEEP (CAF), SCNU, and HWCB have together drafted an action plan, outlining 21 conservation actions covering five categories. Between 2016–2020, an estimated total budget of 66.5 million Chinese yuan (approximately 10.4 million US dollars) will be used on conservation, of which 8.35 million yuan will be used on Priority Level I projects mainly focusing on monitoring gibbons and habitat restoration, funded mainly by the provincial government and social organizations. Details of the budget are as follows:

1. Regulations, Infrastructure and Capacity Building—9 actions, total budget 26.15 million yuan (at least 17.05 million yuan is already included in nature reserve planning), Priority I projects 2.45 million yuan.
2. Research and Monitoring Projects—5 actions, total budget 15.2 million yuan, Priority I projects 0.8 million yuan.
3. Conservation and Management Projects—2 actions, total budget 2.5 million yuan; all actions are Priority I projects.
4. Habitat Restoration Projects—2 actions, total budget 6.25 million yuan, Priority I projects 2.6 million yuan.
5. Community Co-management, Development and Environmental Education—3 actions, total budget 16.4 million yuan.

Regulations, infrastructure and capacity building include increasing the number of staff and budget for daily operations, improving the current management system, and enhancing basic and scientific monitoring skill levels; the main source of funding will come from the Hainan Provincial Department of Finance. Research and monitoring projects include studies on gibbons, their habitats, and human disturbance within the reserve, building a digital data management system, and trialing of new monitoring methods and equipment; the main source of funding will come from national-level scientific research projects. Conservation and management projects include building a human activity monitoring and management system and a digital data management system; the main source of funding will come from the Hainan Provincial Department of Finance. Habitat restoration projects include forest restoration and the construction

of ecological corridors; the main source of funding will come from the Hainan Provincial Department of Finance. Community projects include co-management, environmental education, and alternative sources of livelihoods; the main source of funding will come from social organizations.

Conservation actions will be implemented by BNNRMO, with the involvement of HFB, HWCB, Bawangling Forest Police Station, Baisha County Government, Changjiang County Government, KFBG, ZSL, FFI, CAF, Hainan University, and other stakeholders.

前言

海南长臂猿（*Nomascus hainanus*）（Thomas, 1892) 是中国境内唯一的特有长臂猿物种, 仅分布于海南岛。该物种被列为中国国家 □ 级重点保护动物，并被世界自然保护联盟列为极危种。随着近百年来海南大片原始森林的消失和狩猎行为，全球的海南长臂猿种群数量目前不足于 30 只。该物种的生存已经到了最后的关头。

2005 年，海南霸王岭国家级自然保护区管理局、香港嘉道理农场暨植物园、和瑞士苏黎世大学共同编制了首个《海南长臂猿保护状况调查及保护行动计划。在过去的十年当中，相关机构围绕这些行动做了大量的实际工作，包括对猿群进行长期跟踪监测、社区宣传与共管、生境恢复和保护区的能力培训等，使长臂猿种群呈现了增长趋势。虽然威胁依然严峻，但该物种的保护已现一线曙光。

为此，海南霸王岭国家级自然保护区管理局、伦敦动物学会（ZSL）、和中国灵长类专家组于 2014 年 3 月联合举办了《海南长臂猿保护博鳌国际论坛》。国内外专家和相关管理部门、非政府组织及社区的代表近百人出席了会议，对海南长臂猿的有效保护进行广泛而深入的研讨，为这一物种的未来提出了他们的建议。

此行动计划以 2014 年论坛总结报告为基础，旨在促进海南长臂猿各项保护行动的落实与有序实施。编写工作由世界保护联盟物种生存委员会灵长类分会小猿组和伦敦动物学会提供经费赞助。

Introduction

The Hainan gibbon (*Nomascus hainanus*) (Thomas, 1892), the only gibbon endemic to China, is only found on Hainan Island and is an extremely rare species. It is listed as a Class I protected species under Chinese law, and as Critically Endangered on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species. Due to nearly one century of primary forest destruction and poaching, the global population of the Hainan gibbon has dropped to fewer than 30 known individuals – an extremely dire situation for the species.

In 2005, BNNRMO, KFBG and the University of Zurich jointly prepared the first Hainan Gibbon Status Survey and Conservation Action Plan. Over the past ten years, the relevant authorities and agencies have actively pursued and enhanced gibbon monitoring, public engagement, and habitat restoration and capacity building, and an increase in the Hainan gibbon population has been seen at BNNR. Although it is still under severe threat of extinction, its conservation has shown progress and hope.

In March 2014, the International Conservation Planning Workshop for the Hainan Gibbon was held jointly by BNNRMO, ZSL and CPSG to discuss the current status and outlook of Hainan gibbon conservation. Nearly 100 people attended the workshop, including Chinese and international experts, representatives of government authorities, NGOs and local communities. The Final Report of the 2014 workshop has been used as the basis to develop this Hainan Gibbon Conservation Action Plan, to facilitate the implementation of conservation projects and to enhance the efficiency and coordination of conservation activities. The writing of this action plan was supported financially by IUCN SSC PSG SSA and ZSL.

第一章 编制背景与依据

一、背景

海南长臂猿是海南岛的特有种，种群数量不足 30 只，仅分布于海南霸王岭国家级自然保护区内。2007 年 10 月 29 日，IUCN 物种生存委员会（SSC）与国际灵长类协会（International Primatological Society）在海南省省会海口市举办新闻发布会，向世界公布全球最濒危的 25 种灵长类物种。其中一条重要消息引起了国际社会的广泛关注：“二十世纪全球无任何灵长类物种灭绝纪录，二十一世纪全球最有可能灭绝的灵长类物种是海南长臂猿”。2014 年海南省两会与全国两会分别收到有关加大海南长臂猿保护力度的提案；2015 年海南大学原创舞蹈，旨在唤醒人们保护海南长臂猿意识的《最后的黑冠猿》在全国第四届大学生艺术展演活动中荣获全国一等奖和优秀创作奖，反映了社会大众对保护海南长臂猿的强烈诉求。

海南长臂猿曾广泛分布于海南全岛，直至二十世纪五十年代初，仍遍布于海南省的 12 个县，其种群数量约 2,000 只。但近半个世纪以来，随着人口增长，热带雨林大面积丧失，长臂猿生境日益破碎缩小；加上大量的猎杀，海南长臂猿种群数量急剧下降。到 80 年代初，仅剩 30–40 只，分布于霸王岭与黎母山一带; 黎母山种群大概在短时间内灭绝。1980 年霸王岭国家级保护区的建立时，大约仅有的 7–9 只长臂猿分为两个家庭群在此幸存。随后 2003 年的第一次海南长臂猿大调查记录了 13 只长臂猿，2013 年第二次大调查记录了 23 只。

海南长臂猿是中国唯一的长臂猿特有种，也是海南热带雨林生态健康的指示物种。因此，它的研究与保护有着重要的科学意义。从 80 年代开始，多个科研单位先后对海南长臂猿进行了研究；而从本世纪初开始，多个环保团体也开始与保护区合作提高对该物种的管护效率。经过多年不懈的努力，长臂猿种群已增加至约 25–27 只。但是对这个高度受威胁物种的实际和潜在威胁依然存在，管护工作不容松懈。

二、依据

1.《中华人民共和国森林法》
2.《中华人民共和国环境保护法》
3.《中华人民共和国野生动物保护法》
4.《中华人民共和国森林法实施条例》
5.《中华人民共和国自然保护区条例》
6. 国务院《关于公布第二批国家级森林和野生动物类型自然保护区的通知》
7.《森林防火条例》
8.《森林和野生动物类型自然保护区管理办法》
9.《森林和野生动物类型自然保护区总体设计规程》
10.《全国野生动植物和自然保护区建设工程总体规划》
11.《自然保护区工程项目建设标准（试行）》

12.《国家林业局计资司关于编制有关局直属自然保护区总体规划的通知》
13.《国家重点保护野生动物名录》
14.《海南省生态省建设规划纲要》
15.《海南省自然保护区建设规划》
16.《海南省土地利用总体规划》
17.《海南省自然保护区条例》
18.《海南省林地保护利用规划》
19.《海南霸王岭国家级自然保护区科学考察报告》及其相关资料
20.《海南长臂猿保护博鳌国际论坛总结报告》
21.《海南霸王岭国家级自然保护区 海南长臂猿生态走廊项目可行性研究报告》
22.《海南霸王岭国家级自然保护区总体规划（2013–2025）》

三、指导思想和原则

（一）指导思想

遵循科学最佳实践与生态学及保护生物学的原则，以霸王岭国家级保护区内海南长臂猿种群及其栖息地得到有效保护、恢复及有效增长为目标，以优先保护行动为重点，在保护区内实施保护行动。通过完善保护管理、科研和宣传教育工作，提高保护区的综合能力。加强对外交流与合作，实现海南长臂猿保护事业的全面发展，逐步缓解和消除海南长臂猿面临的威胁。

（二）原则

1. 就地和近地保护原则——强调海南长臂猿及其自然栖息地的保护，在非必要时避免任何干预行为，有必要时则须在风险评估后谨慎进行。
2. 栖息地保护与栖息地恢复相结合的原则——根据不同地段的特征实施封山育林、栖息地改造与栖息地恢复，增加长臂猿食物种类与数量等手段，针对性地改善并扩大　　物种的生存空间。
3. 科技支撑的原则——以科技为先导，以生态学、保护生物学等理论为基础，采用新技术和新方法支撑日常的管护工作。
4. 执法与教育宣传兼并原则——在加强管护部门执法力度与效率的同时，通过社区教育和宣传逐步消除来自周边社区的威胁。
5. 统筹计划、分步实施、多渠道筹资的原则——积极争取国家投资，地方各级政府按财政体制分级承担，并广泛争取国际资助和合作，多渠道、多形式、多层次广筹建设资金。
6. 部门协作、共建共享的原则——打破传统的行业界限和部门分割的现状，借助已有部门与科研院校等单位优势，形成合力，共建共享保护成果。

四、愿景、目标与建设期限

愿景：

2014 年海南长臂猿保护博鳌国际论坛全体参会人员对海南长臂猿保护目标达成

了以下共同的愿景：

“我们期望海南长臂猿能够在更广阔的森林生态系统中健康地成长。我们期望在当地社区、公众、私营企业及政府有关部门的共同支持下，海南长臂猿能够得到更好的保护，并成为全人类引以为傲的物种。”

目标：

1. 确保现有猿群的安全与健康发展；
2. 降低当前长臂猿面临的威胁，使现有栖息地能有效地满足种群发展的需求；
3. 增加对海南长臂猿生物学与生态学了解；
4. 完善保护区的管理体制，长臂猿现有分布区得到有效保护；
5. 增进利益相关者之间的沟通与合作；
6. 通过科研、宣传及支持当地社区等方法争取全社会对海南长臂猿保护事业的关注、支持与参与。

建设期限：2016–2020 年，与《海南霸王岭国家级自然保护区总体规划（2013–2025 年）》第二期同步。

保护行动的优先性等级：为了体现保护行动不同的紧迫性、重要性及可行性，保护行动的优先性分为 I、II、III 三种级别，界定如下：

表 1.1. 海南长臂猿保护行动划分优先级别的依据

重要性	紧迫性	可行性	优先性等级
高 （对长臂猿保护有直接且显著的效应）	高 （须尽快执行）	高 （已具备执行条件）	**I**
高	高	中	**I**
高	中	高	**I**
高	中	中	**II**
中	高	高	**II**
中	高	中	**II**
中	中	高	**III**
中 （对长臂猿保护有间接的效应）	中 （须在其它活动的基础上执行）	中 （视乎执行条件而定）	**III**

Chapter 1 Background and Basis

1.1 Background

The Hainan gibbon is endemic to Hainan Island, China, with a surviving population comprising fewer than 30 individuals that is restricted entirely to BNNR. On October 29th 2007, IUCN SSC and the International Primatological Society held a press conference in Haikou, the capital of Hainan Province, to announce the 25 most endangered primate species in the world, which included the Hainan gibbon. The important message from this press conference, which aroused widespread concern in the international community, was that there has been no recorded primate extinction anywhere in the world in the 20th century, but the first species that is most likely to go extinct in the 21st century is the Hainan gibbon. In addition, in January 2008, at the first session of the Fifth Hainan Provincial Government meeting of the Committee of the Chinese People's Political Consultative Conference, a proposal was received for further strengthening the protection of the Hainan gibbon, calling for increased resource input, strengthened monitoring and scientific research for restoring Hainan gibbon habitat and protecting one of the world's most endangered primates. In 2015, students at Hainan University created "The Last Hainan Black-crested Gibbon", a dance performance promoting conservation and targeted at the general public, showing significant concern for the Hainan gibbon in the society of Hainan.

In the early 1950s, the species was widely distributed in 12 counties in Hainan, with an estimated population of about 2000 individuals. With the growth of Hainan's human population and the loss of large areas of tropical rainforest on Hainan during the second half of the twentieth century, suitable gibbon habitat was rapidly reduced and fragmented, and the decline of the Hainan gibbon population was further hastened by illegal hunting. In the early 1980s, only 30-40 individuals remained around Bawangling and Limushan, with the Limushan population probably extirpated shortly afterwards. At the time of the establishment of BNNR in 1980, it is estimated that as few as 7-9 individuals in two family groups may have survived in this landscape. Successive comprehensive surveys documented 13 individuals at BNNR in 2003, and 23 individuals in 2013.

The Hainan gibbon is the only gibbon species endemic to China, and is also an indicator species for the health of Hainan's tropical rainforest ecosystems. Therefore, research and conservation of the species has immense scientific value. Since the 1980s, many research groups have studied the Hainan gibbon, and since the beginning of the 21st century, multiple environmental organizations have started to collaborate with BNNR to increase the effectiveness of conservation management. Following many years of continued work, the Hainan gibbon population at BNNR now consists of an estimated 25-27 individuals. However, extensive conservation work is still required to tackle actual and potential threats to this highly vulnerable population.

1.2 Institutional Basis

Legal framework and various regulations governing Hainan gibbon conservation in China:

1. State Forest Law
2. Environmental Protection Act of the People's Republic of China
3. Wildlife Conservation Act of the People's Republic of China
4. Regulations for the Implementation of State Forest Law
5. Nature Reserve Regulations
6. State Council's Notice on National Forest and Wildlife Nature Reserves (second batch)
7. Forest Fire Prevention Ordinance
8. Regulations for Managing Forest and Wildlife Nature Reserves
9. Guidelines for Designing Forest and Wildlife Nature Reserves
10. Master Plan for National Wildlife and Nature Reserve Construction Project
11. Implementation Standards for Nature Reserve Construction Project (Trial)
12. Notification of State Forestry Council Funding Division on Nature Reserve Planning
13. Directory of Key Protected Species of the People's Republic of China
14. Planning Outline for Hainan Province as an Ecological Province
15. Nature Reserve Construction Plan for Hainan Province
16. Land Use Master Plan for Hainan Province
17. Hainan Province Nature Reserve Ordinance
18. Hainan Province Forest Conservation and Use Regulations
19. Bawangling National Nature Reserve survey reports and related information
20. Final Report of International Conservation Planning Workshop for the Hainan Gibbon
21. Bawangling National Nature Reserve Feasibility Assessment for the Hainan Gibbon Ecological Corridor Project
22. Bawangling National Nature Reserve Master Plan (2013–2025)

1.3 Guiding Concepts and Principles

1.3.1 Guiding Concepts

To follow best-practice scientific methods and the principles of ecology and conservation biology, with the vision of effectively protecting BNNR's Hainan gibbon population and restoring its habitat, and to prioritize conservation action within the reserve. To increase the capacity of BNNR through improving and increasing conservation management, research and public education work. To enhance communication and collaboration between Chinese and international actors, to

develop and carry out Hainan gibbon conservation actions from multiple perspectives, and to progressively reduce threats to the species.

1.3.2 Guiding Principles

1. Prioritize *in situ* conservation—emphasizing the conservation of natural Hainan gibbon habitat, with all proposed interventions carefully considered and dependent upon a thorough risk assessment.
2. Combine gibbon conservation with wider restoration of natural habitat—maintain and enhance the natural environmental characteristics of gibbon habitat within BNNR; restrict human use and disturbance of gibbon forest; restore, enhance and increase available forest habitat; and increase the variety and quantity of gibbon food sources.
3. Practise science-based conservation management—ground gibbon recovery activities in principles of ecology and conservation biology, and use the most innovative technologies and approaches for day-to-day management of the reserve and conservation work.
4. Combine law enforcement and awareness-raising in local communities—simultaneously increase law enforcement intensity and efficiency, and awareness and education among local people to reduce threats to gibbons.
5. Holistic planning, step-wise implementation, and the involvement of multiple stakeholders—actively apply for governmental, provincial and local-level funding from different departments, as well as international funding and partnerships, to obtain multiple avenues of financial support.
6. Bridge multiple governmental sectors to share resources and results—breaking traditional administrative boundaries, consolidating available expertise, and achieving collaborative and multidisciplinary conservation solutions.

1.4 Vision, Target and Timeframe

Vision: At the 2014 International Conservation Planning Workshop for the Hainan Gibbon, the following consensus on the vision for a Hainan gibbon conservation goal was reached by all participants:
"*We envision an increased healthy population of Hainan gibbons living in several large areas as part of intact biodiverse forest ecosystems. We envision this population as enjoying full support of the local community, the general public, the private sector and the government, and to be a source of local and national pride into the future.*"

Target:

1. Maintain the safety and health of the current Hainan gibbon population.

2. Decrease the threats to the current Hainan gibbon population, and ensure that available habitat supports the growth of the population.
3. Increase knowledge of Hainan gibbon biology and ecology.
4. Strengthen the management system of BNNR in order to conserve the current Hainan gibbon population and its habitat more effectively.
5. Facilitate communication and collaboration between stakeholders.
6. Increase public awareness of and participation in Hainan gibbon conservation through scientific research, public education, and support for local communities.

Timeframe: 2016–2020, corresponding to the second phase of "Bawangling National Nature Reserve Overall Development Plan" (2013–2025).

Prioritization: Proposed conservation actions are categorized into priority levels I, II, and III on the basis of urgency, importance, and feasibility (Table 1.1).

Table 1.1. Basis of priority-level categorization for proposed Hainan gibbon conservation actions.

Importance	Urgency	Feasibility	Priority Level
High	High	High	I
High	High	Medium	I
High	Medium	High	I
High	Medium	Medium	II
Medium	High	High	II
Medium	High	Medium	II
Medium	Medium	High	III
Medium	Medium	Medium	III

第二章 海南长臂猿概况

一、生物学特征

海南长臂猿是我国历史上有分布的六种长臂猿之一。成年长臂猿重约 6–8 公斤，头顶竖立着一撮黑色毛发，故又名黑冠长臂猿。海南长臂猿具有强烈的雌雄性二型现象（图 2.1），成年雄性全身黑色，而成年雌性体毛为淡黄色、橘黄色或灰棕色，头上长着一撮黑色毛发，随着年龄增长变成灰棕色（Liu et al. 1984）。海南长臂猿的毛色会随着年龄转变：初生幼猿毛色较淡，与成年雌性的淡黄或橘黄色相近。在一个月内，幼猿的毛色会开始变黑，在三个月前变成全黑，与成年雄性的毛色无异（Chan et al. 2005）。当长臂猿进入性成熟年龄（5~8 岁后），雌性的毛色会起第二次变化，转为成年雌性的典型毛色（Fellowes et al. 2008）。

海南长臂猿曾经在海南的地底雨林中生活，但现在仅栖息于海南霸王岭国家级保护区海拔 800~1100 米的山地雨林中（Liu et al. 1984, Liu and Qin 1990）。它们是严格的树栖动物，主要以果实和嫩叶为食，已知食物种类逾 100 种植物（Liu and Qin 1990）。它们擅攀援，用手臂把身体悬挂在树枝上移动，极少下地（Liu et al. 1984, Liu and Qin 1990）。潜在的天敌主要有蟒、云豹、黑熊与猛禽，不过这些动物在霸王岭也都已经变得非常稀少（Peng et al. 2008）。长臂猿的鸣叫声独特，声音洪亮，于数里外尚能闻及。在早上特一对配对的长臂猿会进行多次的对唱或合唱来宣示领土主权，每次持续 5–20 分钟。进入性成熟的年轻个体会离群成为独猿，它们则较少鸣叫，其鸣叫称为独唱（Liu 1980）。海南长臂猿的地域性强，曾经的研究表明它们的家域范围介乎于 2–10 平方公里（Liu et al. 1984, Zhou et al. 2005），相对其他长臂猿种类大很多，但近期研究结果表明家域范围大约为 1.49 平方公里，与其他 *Nomascus* 长臂猿相似 (Bryant et al. 2016)。家庭群合力守护其领地不容外群侵犯（Chan et al. 2005）。家庭群以一雄两雌的家庭结构为基础。母猿一般每两年产一崽，同一家庭群的两只母猿轮流交替的生育，每个家庭群每年能增添一个成员。幼猿在 8–9 个月之前与母亲紧密相连，2 岁后能完全独立活动与采食，要到 7~8 岁后达到性成熟才能离群并寻找配偶繁殖后代（Chan et al. 2005）。

图 2.1 海南长臂猿的雌雄性二型，右图中间为年老母猿，毛色灰黄。

二、分类地位

海南长臂猿最早被分类学家分为长臂猿科（Hylobatidae）长臂猿属（*Hylobates*），但经过对 hylobatid 分类的更正，海南长臂猿属于 *Nomascus* 属。在过去海南长臂猿被认为是西黑冠长臂猿 *Hylobates concolor* 或东黑冠长臂猿 *Nomascus nasutus* 的亚种。直至二十一世纪初，分子生物学、形态学和声学的数据使得越来越多的学者视海南长臂猿为一个独立种，*Nomascus hainanus* （Thomas, 1892）(Liu 1980)。目前，10 个 *Nomascus* 种和亚种全部分布于中国南部、老挝及越南，均属濒危或极度濒危物种。

三、科学与保护价值

海南长臂猿是中国唯一的长臂猿特有种，也是海南省的特有种。该物种的进化史及生态行为学研究对于了解长臂猿的演化和生境适应等方面具有重要科学价值和意义。

海南长臂猿是海南原始热带雨林生态系统健康的重要指示物种。对海南长臂猿的有效保护具全球生物多样性保护战略意义，对海南乃至中国的生物多样性保护事业的有序开展和推进有着重要影响和指导意义。由于海南是个以自然资源推动经济与社会发展的省份，旅游与地产发展项目均以其独特而自然的环境作为招牌。所以，海南长臂猿应作为海南的吉祥物和生态名片，有助于竖立海南的绿色岛屿和生态文明形象。由于野生动物日益成为国家加强重视的自然资源，相关政府部门更应当齐心协力避免海南长臂猿走上灭绝的道路。

因为海南长臂猿的所有家庭群均分布于霸王岭国家级自然保护区内，资源可以有效地投入到保护工作中。通过霸王岭国家级保护区管理局与多家非政府组织多年的努力，长臂猿种群数量稍有回升，栖息地也没有进一步退化。但是种群的数量还是停留在极度濒危水平，持续被保护国际基金会评为全球 25 种最濒危灵长类物种之一。要使得海南长臂猿能长期存活下去，其种群数量和栖息地必须尽快增长。只有立即采取保护行动，投入大量人力、财力、及技术支持，才有可能达到这个目标。

四、种群分布与数量的历史变迁

宣统三年（1911）琼山县志物产篇写道：猿雄黑雌白，似猴而大，两臂甚长，攀缘树类，往来甚捷。一坠地水强矣。援水而不能走地。畜之者亦须置树间。近土气即病泻以死，煎附子汁饮立愈。在这一时期，从南部的崖县、乐东到北部的琼山、文昌、定安都有关于长臂猿的描述。

在 20 世纪五十年代初，海南长臂猿曾广泛分布在海南岛的十二个县，其种群数量经过粗略估计大约为 2,000 只（Liu et al. 1984）。至少直到 20 世纪的 60 年代末 70 年代初在吊罗山、尖峰岭、陵水县光坡镇、白沙县光雅镇等区域仍然有长臂猿活动（Liu et al. 1984）。随着人口的增长，长臂猿赖以生存的热带雨林日益破碎缩小乃至丧失， 加上人为的大量猎杀， 海南长臂猿的种群数量以及分布区

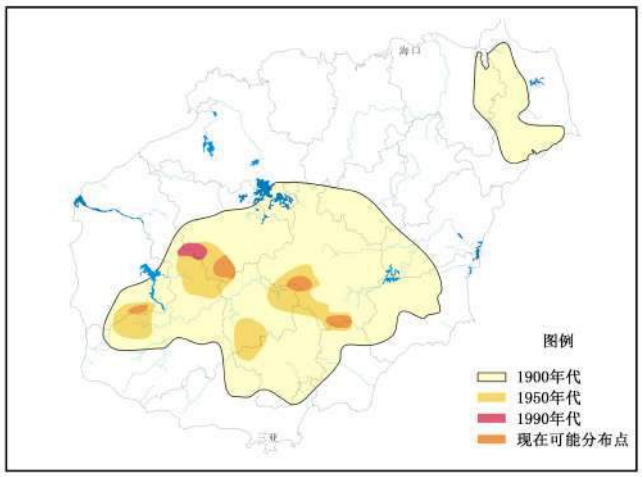

图 2.2 1900 年至今不断变化的海南长臂猿分布区域

急剧减少（图 2.2，2.3）。根据 21 个 1967–1980 年采集的海南长臂猿标本的相关数据，当时的长臂猿分布主要在海拔 250 至 850 米之间的低地雨林和山地雨林内（江海声，私人通讯）。由此说明，长臂猿的分布近年往高海拔迁移，其现有栖息地并不是该物种的最适宜生境。到 80 年代初，该物种仅能在霸王岭林区找到，当时该种群仅为 2 个家庭群，共 7–9 只。虽然仅几十年出现过吊罗山、尖峰岭、佳西、黎母山、五指山和鹦哥岭可能还有幸存海南长臂猿分布的报道，但是实地调查并未能证实这些信息的真确性（Turvey et al. 2016）。

霸王岭长臂猿种群数量自 1984 年的 9 只发展到 2015 年的 25 只。假设这个数目的变化确实反映了种群数量有所增长，而并不是因为不同的调查方法和力度所造成的误差，那么 31 年间的年均增长率为 5.7%在灵长类动物中并不算低。但是从 80 年代开始，种群数量并没有呈现持续的增长，而家庭群的数量在此期间也只是从 2 个增加至 4 个。由于繁殖雌性的数量取决于家庭群的数量，家庭群数量是种群增长率的主要因素。解答近几十年种群数量的增长为何会受限或不稳定，必须先研究离群的年轻个体为何难以形成新家庭群这个科学问题。根据 2013 年最近一次的长臂猿大调查，唯一能确认的海南长臂猿种群为霸王岭保护区内共 23 只，2015 年增加至 25 只。种群包含 4 个家庭群（A–D 群），和数量不明（估计在 4 只或以下）的独猿。虽然霸王岭保护区的总面积占近 300 平方公里，跨过昌江和白沙两县，长臂猿的现有分布却只限于斧头岭一带约 15 平方公里范围内（图 2.4）。该区域栖息地破碎化明显，海拔较高，并不是极度濒危的海南长臂猿种群最理想的栖息地。因此，改善栖息地的质量与连通性时刻不容缓，以促进种群的未来发展。

五、栖息地状况

在全省范围内，海南长臂猿的适宜生境随着过去几十年的林业发展快速衰退。根据 1991 年与 2008 年遥感影像的对比，原始森林面积发生了显著的减少，退化与破碎化严重，尤其是低海拔的高质量原始森林受到严重的破坏。在霸王岭保护区内森林质量也有一定程度的退化（Zhang et al. 2010）（图 2.4）。

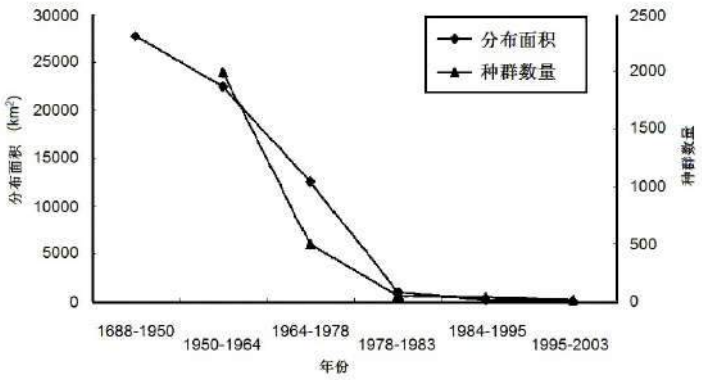

图 2.3 1688–2003 年海南长臂猿种群数量动态
（过往多次种群调查的方法有别，因此数据可能不具备可比性，应当谨慎对待。）

目前保护区内约 35%的面积被人工林所覆盖，而且几乎包围着现今长臂猿的分布区。长臂猿从不利用人工林，也很少到人类活动集中的地区。因此，人工林的存在严重限制长臂猿的种群发展。这些人工林现由霸王岭林业局管理，大部分还继续着经营活动。人工林的改造是栖息地恢复与降低人为干扰的一大前提，但是改造人工林和取缔林业生产活动的困难在于现有合同的约束以及林场工人的生活问题。另外，保护区内禁止任何形式的砍伐（包括人工林），也对栖息地改造造成障碍。

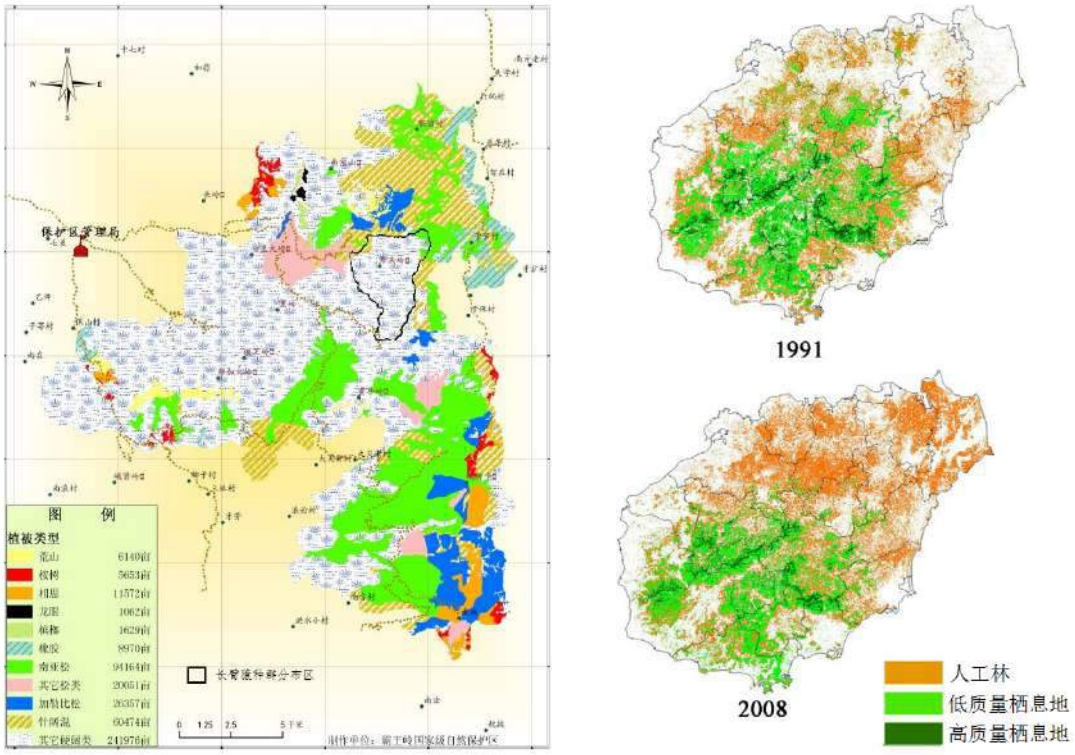

图 2.4 左，霸王岭保护区海南长臂猿和植被分布图。针阔混与其它硬阔类为天然林（多数为次生林），其它颜色均为人工林，包围了长臂猿的现有栖息地。**右，**1991–2008 年海南森林覆盖的减少。

Chapter 2 Overview of the Hainan Gibbon

2.1 Biological Characteristics

The Hainan gibbon is one of six gibbon species historically found in China. Adult Hainan gibbons weigh about 6-8 kg and have a crown of dark hair on top of their heads, giving them their alternative name of Hainan black crested gibbons. The species exhibits sexual dichromatism (Figure 2.1); adult males are completely black, while adult females are light yellow or orange yellow with a dark crown, and become grayish brown with age (Liu et al. 1984). Their hair colour changes with age: newborns are light yellowish, similar in colour to adult females, but within one month of birth they begin to turn dark, becoming completely black before three months of age, similar in colour to adult males (Chan et al. 2005). When female gibbons become sexually mature (age 5-8), their hair colour becomes yellow, while males remain black (Fellowes et al. 2008).

The Hainan gibbon is now restricted to montane rainforest at an altitude of 800-1100 metres at BNNR, although it formerly also occurred in low-elevation rainforest elsewhere on Hainan (Liu et al. 1984, Liu and Qin 1990). It is strictly arboreal, and feeds mainly on fruits and leaves. More than 100 species of food plants are known to be consumed by the gibbons (Liu and Qin 1990). Hainan gibbons are good climbers and use their long arms to move through the forest canopy, and they rarely come down to the ground (Liu et al. 1984, Liu and Qin 1990). Their potential predators include clouded leopard, black bear, python and raptors, although such animals are also now very rare at BNNR (Peng et al. 2008). The species' call is unique, and can be heard over an area of several kilometres. Gibbon pairs will sing in duets or choruses during the early morning to strengthen pair-bonds and define their territories, with singing bouts lasting for 5~20 minutes (Chan et al. 2005). Solitary sexually mature gibbons rarely sing solo calls (Liu 1980). The Hainan gibbon is strongly territorial; previous home range estimates for the species have varied from 2-10 km^2, much greater than for other gibbon species (Liu et al. 1984, Zhou et al. 2005), but recent research has shown that the Hainan gibbon's home range is about 1.49 km^2, similar to that of other *Nomascus* gibbons (Bryant et al. 2016). The whole family group defends its territory together (Chan et al. 2005). Family groups comprise one adult male and up to two adult females, each female giving birth to one offspring every two years. The two females in the same group alternate their births, resulting in one newborn every year per family group. Young gibbons remain closely attached to their mothers until they are 8-9 months old, can move and forage independently at age 2, and leave their natal group in search of potential mates when they approach sexual maturity at age 7-8 (Chan et al. 2005).

Figure 2.1. Sexual dichromatism in the Hainan gibbon.
Old female gibbons (right photo, centre) show greyish-brown colouration.

2.2 Taxonomy

The Hainan gibbon was originally assigned to the genus *Hylobates* within the family Hylobatidae (small apes), but following revisions to hylobatid taxonomy, it is now classified in the genus *Nomascus* (crested gibbons). In the past, the Hainan gibbon was often regarded as a subspecies of the black crested gibbon (*N. concolor*) or the Cao Vit gibbon (*N. nasutus*), but by the early 21st century it was generally recognized as the distinct species *Nomascus hainanus* (Thomas, 1892) based on genetic, morphological and acoustic data (Liu 1980). There are now seven recognized *Nomascus* species, distributed in southern China, Laos and Vietnam, which are currently all considered to be Endangered or Critically Endangered.

2.3 Scientific and Conservation Value

The Hainan gibbon is the only gibbon species endemic to China, where it is endemic to Hainan Province. The species is therefore of great scientific value in terms of its evolutionary history and behavioural ecology, for understanding wider gibbon evolution and adaptation. The Hainan gibbon also serves as an umbrella species and an indicator species for the health of Hainan's unique tropical rainforest ecosystems. Effective protection of the species is therefore of crucial importance to Hainan as well as at a national and international level. The economic and social development of Hainan is heavily reliant upon its natural resources, and the province's developing tourism and real estate industries depend upon its unique natural environment. The Hainan gibbon can therefore be promoted as the logo of Hainan's natural environment, to support the island's "green image". As wildlife is increasingly recognised as one of the country's most important resources, Chinese authorities should therefore work together to prevent the extinction of the Hainan gibbon.

As the Hainan gibbon is now reduced to a single population restricted to BNNR, resources for conserving the species can be allocated efficiently. After years of efforts by the HFB, BNNR, and NGOs, the Hainan gibbon population has recovered slightly,

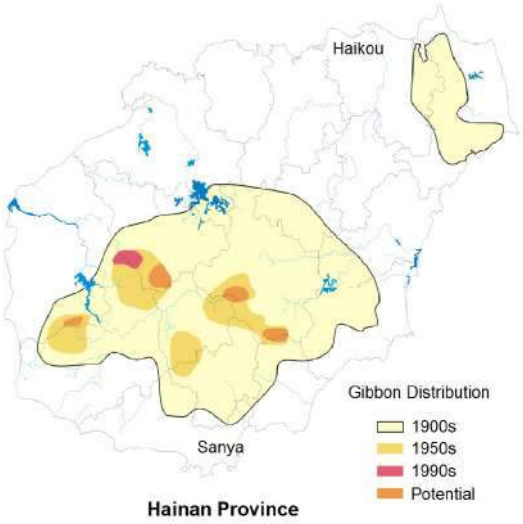

Figure 2.2. Changing distribution of the Hainan gibbon across Hainan Island, from 1900 to the present.

and habitat destruction has been largely halted. However, the Hainan gibbon's population size remains at a critically low level, and it continues to be listed as one of the world's 25 most endangered primates by Conservation International. To ensure long-term survival of the Hainan gibbon, its population size and available habitat must be increased as quickly as possible. In order to achieve this objective, conservation measures must be taken immediately, and a high level of manpower, funding and technical support are required.

2.4 Past and Present Distribution and Population Size

In 1911, the Qiongshan County Annal recorded that: "There are apes with black males and white females that are larger than monkeys, with long arms that can climb trees with agility. They can swim but not walk. They must be kept in trees, and if they are kept on the ground, they will die from diarrhoea, but can be treated by being fed with aconite juice." During the late Imperial Era, records of gibbons can be found in local gazetteers on Hainan from Yaxian and Ledong counties in the south, to Qiongshan, Wenchang and Ding'an counties in the north. In the 1950s, the Hainan gibbon was still probably distributed across twelve counties in Hainan, with a suggested population estimate of approximately 2000 individuals based on rough extrapolation (Liu et al. 1984). Gibbons were known to persist in Diaoluoshan, Jianfengling, Guangbo Township in Lingshui County and Guangya Township in Baisha County until at least the late 1960s or early 1970s (Liu et al. 1984). However, increasing human population, loss and fragmentation of tropical rainforests and intensive hunting led to a drastic decline in both the number of surviving gibbons and their distribution across Hainan during the twentieth century (Figure 2.2–2.3). According to data associated with 21 specimens collected between 1967-1980, Hainan gibbons were formerly distributed in both lowland tropical rainforests and montane tropical

rainforests, between 250-850 metres above sea level (Jiang Haisheng *pers. comm.*), indicating that their distribution has now become restricted to higher elevations and their current range may not represent ideal gibbon habitat. Since the early 1980s, the species has only been recorded with certainty from the Bawangling forest area, where a population of only 7-9 individuals in 2 family groups was originally detected. Possible surviving gibbon individuals or remnant populations have also been reported from other forest areas across Hainan in recent decades, including Diaoluoshan, Jianfengling, Jiaxi, Limushan, Wuzhishan and Yinggeling, but none of these alleged sightings have been verified through follow-up field surveys (Turvey et al. 2016).

Reported gibbon population size at BNNR has increased from nine observed individuals in 1984 to 25 in 2015. If this change in detected individuals represents a genuine population increase, rather than possible variation in detection caused by different levels of survey effort through time, this would represent an average annual growth rate of 5.7% over 31 years, which would be relatively high for a primate species. However, apparent gibbon population growth rate at BNNR has not been sustained since the 1980s, with the number of family groups only increasing from two to four during this period. Since the number of breeding females is dependent on the number of family groups, an increase in group number is vital to enable increase in population size. Understanding why population growth has been limited and inconsistent in recent decades therefore requires answering the question of what is preventing young dispersing individuals from forming new family groups. Recent surveys suggest that the Hainan gibbon population consisted of 23 individuals in 2013, and had increased to 25 individuals in 2015. The population now consists of four family groups (Group A-D), and an unknown number of additional solitary gibbons (estimated fewer than four). Although BNNR's total area covers 300 km^2 across Changjiang and Baisha counties, the reserve represents a fragmented forest landscape, and gibbons are only distributed within an area of about 15 km^2 around Futouling at relatively high elevation, probably not representing the most suitable habitat for the species (Figure 2.4). There is therefore a pressing need to improve habitat quality and connectivity within BNNR to facilitate gibbon population growth.

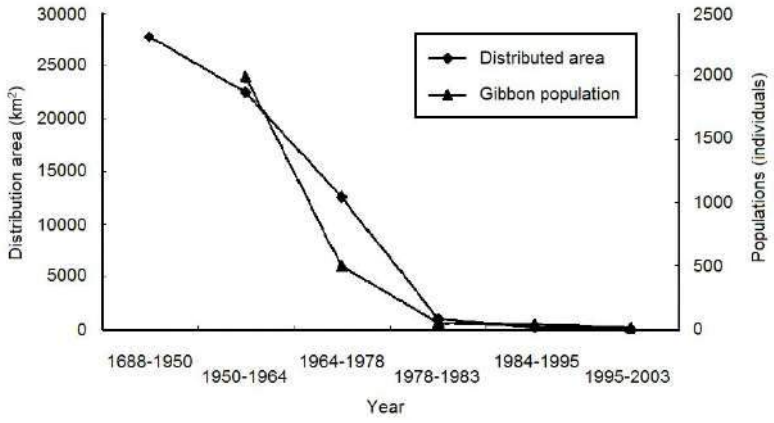

Figure 2.3. Hainan gibbon population trends, 1688-2003 (x axis not to scale). Due to differences in survey methods, population data are not directly comparable over time.

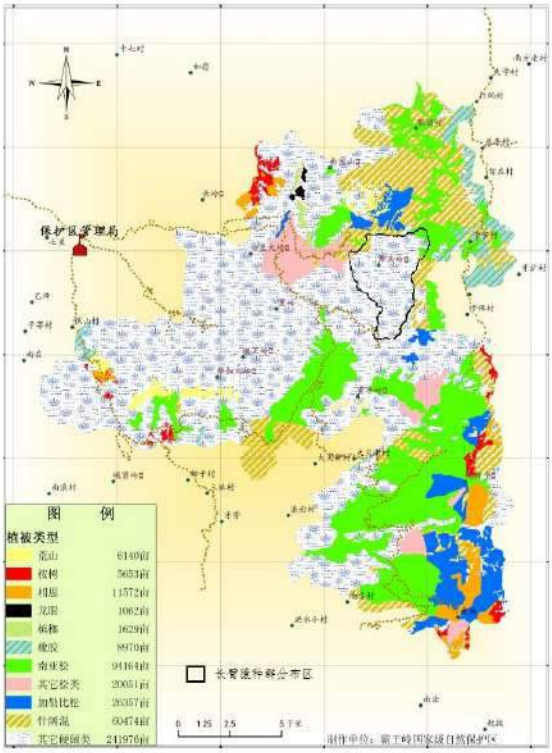

Figure 2.4. Vegetation cover and gibbon distribution in BNNR. Mixed coniferous and broadleaf forests are natural forests (mostly secondary growth), while other vegetation types are plantations that surround current gibbon habitat.

2.5 Habitat Status

Across the entirety of Hainan Island, suitable habitat for the Hainan gibbon has been rapidly reduced due to deforestation and the development of agroforestry during recent decades. Remotely-sensed satellite imagery reveals that from 1991 to 2008, old-growth forest on Hainan has been markedly reduced, with evidence of ongoing degradation and fragmentation especially in lower-elevation high-quality old-growth forests. Forest quality within BNNR also showed some degradation during this period (Figure 2.5) (Zhang et al. 2010).

Approximately 35% of BNNR's reserve area is now covered by plantations, which almost completely encircle the current distribution of the Hainan gibbon population in native forest on Futouling. Hainan gibbons never utilize plantations, and rarely visit areas with high human activity. Plantations have therefore adversely affected the potential growth of the gibbon population at BNNR. These plantations are managed by BFB, and support ongoing forestry activities. Conversion of plantation is thus an important prerequisite for effective habitat restoration and reduction of human disturbance in the BNNR landscape, but will require complex issues related to contractual obligations and forestry worker livelihoods to be properly resolved. Furthermore, the existing ban on logging of all tree species within Hainan's reserves, including plantation forests, may impede the restoration of natural habitat at BNNR.

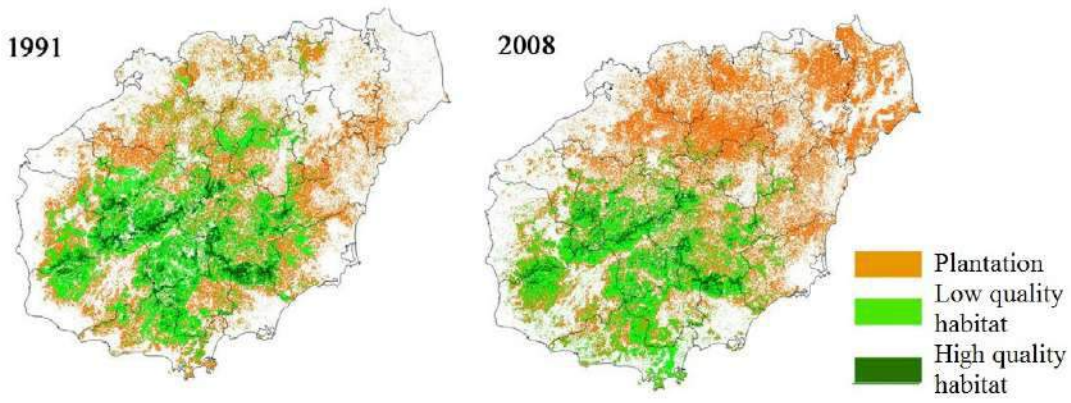

Figure 2.5. Loss of forest cover across Hainan from 1991–2008.

第三章 海南长臂猿保护现状

一、保护机构及队伍

霸王岭国家级自然保护区范围原是国有霸王岭林区内的一部分。1980 年，广东省人民政府批准建立省级自然保护区（粤办函[1980]199 号），面积 21.39 km^2（海南岛在 1988 年属于广东省管辖）。1988 年，国务院批准霸王岭长臂猿省级自然保护区晋升为国家级自然保护区(国发[1988]30 号)，面积扩大为 66.26 km^2。2003 年，海南省人民政府同意、国务院批准（国发[2003]58 号文）将海南霸王岭保护区面积扩大至 299.8 km^2（图 3.1）。地理位置：北纬 18°57′—19°11′，东经 109°03′—109°17′。其中, 核心区占地 105.4 km^2（35.2%），缓冲区面积 89.1 km^2（29.7%），实验区面积 105.3 km^2（35.1%）（图 3.2）。

1987 年广东省人民政府批准设置保护区派出所，1992 年海南省编委下文将霸王岭国家级自然保护区升为正科级事业单位，管理机构为海南霸王岭自然保护区管理局，委托霸王岭林业局管理。虽然保护区规格已被批为正处级，但机构设置没有相应批复，人员定编一直没有增加，还是原来省编委给予的定编 13 人，现在管护人员大部分属于编外人员。

海南霸王岭国家级自然保护区管理局下设行政办公室、科研教育科、保护宣传科、计划财务科、项目办及 20 个管理站点。为了加强保护区森林资源保护和管理，2002 年至 2006 年，为了更好的保护好海南长臂猿这一珍稀物种，霸王岭林业局调派 45 名人员参与保护区日常巡护、海南长臂猿保护监测和护林防火等

图 **3.1** 1980 年至今霸王岭国家级保护区边界的变化。

图 3.2 保护区功能区分布图

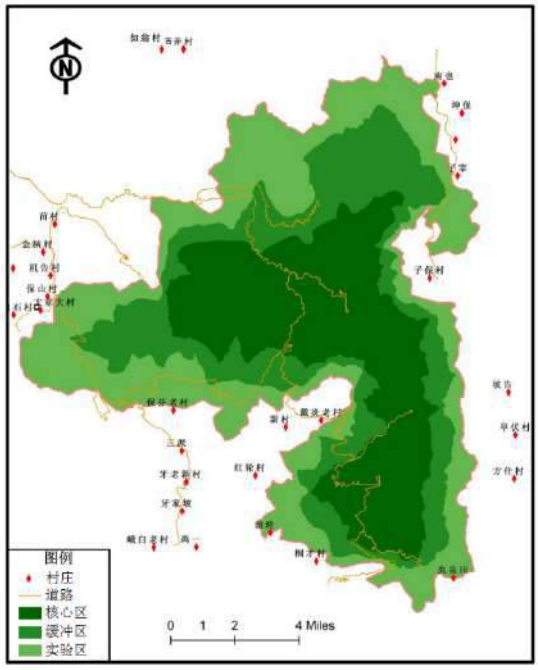

图 3.3 部分基础设施位置图

工作。现有在职职工共 20 人，其中，财政编制 12 人，林业局产业人员 8 人。现海南长臂猿监测队员有 9 人，全部为天保人员，均需各自承担面积约 2.7 km^2 的森林管护工作。为了弥补监测队队员的不足，香港嘉道理农场暨植物园（KFBG）从 2012 年开始聘请社区监测员 6 名，这些监测员由保护区与 KFBG 共同管理。

霸王岭国家级自然保护区管理局现为正处级事业单位机构，为独立的法人单位，隶属海南省林业厅管辖。保护区管理辖区为国有林区，无地方行政管辖权。

二、科研与保护

由于海南长臂猿具有极高的保护和科学价值，吸引了国内外许多高等院校、科研单位以及有关国际组织的专家、学者到霸王岭保护区进行考察和研究。近年来，霸王岭林业局和霸王岭国家级自然保护区先后实施了由联合国教科文组织援助的“人与生物圈”科研课题、国际热带木材组织(ITTO)的“热带天然林可持续经营”示范等项目，协助进行了海南长臂猿保护工作研究，还与多家国内外研究所合作开展海南长臂猿行为生态学研究。自 1980 年开始，保护区与华南濒危动物研究所合作共同承担了国家自然科学基金项目“海南长臂猿种群生态研究”，掌握了海南长臂猿种群结构、活动习性、繁殖习性、食性等基本情况。为进一步研究海南长臂猿奠定了基础；1984–1985 年同华南濒危动物研究所合作开展海南长臂猿栖息地结构分析；1987–1989 年与华南濒危动物研究所合作开展海南长臂猿家域利用及季节变化的研究。1998 年霸王岭保护区会同原海南省野生动植物保护站进行了海南长臂猿种群数量及其分布专项调查。2002–2006 年与华东师范大学开展海南长臂猿保护生物学现状及保护对策研究；2002–2008

年与东北师范大学合作开展了海南长臂猿的生态学及行为特征的研究；2002–2003 年与西华师范大学开展海南长臂猿栖息地选择行为研究；2005 年至今与香港嘉道理农场暨植物园（KFBG）合作开展海南长臂猿的野外监测工作；2006 年与华南农业大学合作共同承担海南长臂猿栖息地群落优势种及采食植物生态位特性研究及海南长臂猿主要摄食植物的区系分布多样性研究；2007 年与海南师范大学合作研究海南长臂猿的现状与生存；2008–2009 年与贵州师范大学合作开展海南长臂猿种群社会结构的研究；2010 年和 KFBG 合作研究限制海南长臂猿恢复的生态因素；自 2010 年以来与伦敦动物学会合作研究家域生态、遗传健康、种群数量恢复及种群监测方法。

近十年主要出版文献包括彭红元（2008）等发表的论文说明人类对热带雨林的破坏和直接猎杀是导致海南长臂猿分布区与种群数量急剧减少的根本原因。张明霞等（2010）发表的论文也指出，在海南省适合长臂猿栖息的雨林大幅减少，而残存的栖息地退化及破碎化也日益严重。报道海南长臂猿种群状态的有 Wu 等（2004），陈辈乐等（2005），周江等（2005，2008），和 John Fellowes 等（2008）。其它方面的研究有周江等对海南长臂猿的行为研究（2008），陈升华等关于海南长臂猿食性及栖息地研究（2006–2009）；以及 Jessica Bryant 等（2015，2016 a-c）, Samuel Turvey 等（2016）关于当地社区对海南长臂猿的认知。

从 1992 年起保护区内的管护与执法事务由霸王岭保护区、霸王岭林业局和霸王岭森林公安局分别承担。海南省于 1994 年实施天然林的全面禁伐，并于 1998 年实施天然林保护工程（简称：天保）；现天保工程已成为保护区的主要巡护力量。霸王岭林业局与保护区经常开展宣传教育活动，利用电影、标语、宣传车等宣传工具到周边社区进行各种宣传教育，使群众认识建立自然保护区和保护野生动植物资源的重要意义，增强自然保护意识。特别是 1996 年由华南濒危动物研究所、原海南省野生动植物保护站共同发起的全国 150 位保护学专家签名呼吁拯救海南长臂猿活动，《海南日报》对此活动作了大量的宣传报道，得到了社会各界的广泛关注与支持，为保护、拯救海南长臂猿起到了积极的影响。

近年关注海南长臂猿保护的非政府机构主要有嘉道理农场暨植物园（KFBG）、野生动植物保护国际（FFI）和伦敦动物学会（ZSL）。KFBG 自 2003 年应邀召开首届海南长臂猿国际保护研讨会开始全面开展一系列保护措施，包括组成长臂猿监测队、生境恢复、引入新的生态农业技术、资助科学研究等。FFI 也是于 2003 年开始海南长臂猿的保护工作，通过与当地政府、保护区管理局和周边社区的合作，进行了保护区工作人员的能力培训、社区共管行动计划、校园教育与宣传等活动。ZSL 的研究人员于 2010 年开始与多家机构开始研究海南长臂猿，于 2013 年正式开展海南长臂猿保护项目。2014 年 3 月，伦敦动物学会与霸王岭国家级保护区管理局共同举办了第二届海南长臂猿保护国际研讨会。

三、基础设施

近十多年来，海南长臂猿历史分布区和潜在栖息地先后建立了多个自然保护区，如霸王岭、吊罗山、尖峰岭、佳西、五指山和鹦哥岭。这些保护区建立了相应的保护基础设施。

目前唯一发现海南长臂猿的霸王岭保护区自晋升为国家级保护区以来，受到国家林业局、海南省林业厅的大力支持，先后投入近千万元，实施了保护区一期、二期和三期基础设施建设工程，极大地改善了海南长臂猿的保护设施和保护区基础设施现状。主要建设内容如下：管理局业务用房 720 m^2，职工用房宿舍 700 m^2，科研宣教馆 270 m^2，管理站点（12 处） 共 2316 m^2（图 3.2），气象观测站房 100 m^2，旧房维修 350 m^2，栖息地改造 13 km^2，巡护林道 388 km，固定监测样地 20 处，固定监测样线 15 km，埋设界桩界碑 183 个（其中界碑 36 个，界桩 147 个），宣传指示牌 8 座，通讯线路 23 km，以及购置野外巡护监测设备，为保护区的发展奠定的坚实基础。

四、法律法规及执法条件

海南长臂猿在 1989 年被列为中国国家一级重点保护动物，受《中华人民共和国野生动物保护法》、《中华人民共和国自然保护区条例》、《海南省野生动物保护条例》、《海南省自然保护区管理条例》等相关法律法规的保护和管理。目前，并无任何直接针对海南长臂猿或该物种保护区的法律文件。

霸王岭国家级保护区现有一森林公安派出所，办公地点在东干线入口处，有干警 6 人。无专项的办案经费、无执法交通用车辆，仅有警务摩托车 2 辆。执法主要是防止或检查进出保护区人员情况，禁止违法破坏森林资源等行为。执法力量（人力、物力和财力）严重不足。在部分少数民族聚居区域个人持有猎枪的现象仍然未能杜绝，依然有人埋下陷阱捕捉鸟类及其他动物。就算捕猎活动并不针对长臂猿，持续不断的人为捕猎干扰和生物多样性破坏都对海南长臂猿的长远生存力带来巨大压力。

另外，在 2003 年保护区面积扩大前种有橡胶、松树等的林业生产用地被划进保护区范围内。霸王岭林业局与保护区管理局拥有保护区内土地（森林）的所有权或经营权、管理权，现在还有经营割胶和采松脂等活动。已知，人工林并非长臂猿的适宜生境，各类林业活动会对长臂猿造成一定程度的干扰，也妨碍本土树种的自然更生。但是由于自然保护区条例并不允许采伐树木，外来树种也不例外，栖息地的改造与恢复因而受到了限制。

Chapter 3 Conservation and Management Status

3.1 Management Authority

The area now under the jurisdiction of BNNR originally formed part of the state-owned Bawangling forest concession. In 1980, Guangdong Provincial Government approved the establishment of Bawangling Provincial Nature Reserve, with an area of 21.39 km^2 (Hainan Island was under the jurisdiction of Guangdong Province until 1988). In 1988, the State Council approved the promotion of the reserve to a national nature reserve, and expanded the area under protection to 66.26 km^2. In 2003, the State Council further approved the expansion of the reserve to 299.8 km^2 (Figure 3.1), with a geographic location of: N18°57′—19°11′, E109°03′—109°17′. Within its current area, 105.4 km^2 (35.2%) is occupied by a core zone, 89.1 km^2 (29.7%) is occupied by a buffer zone, 105.3 km^2 (35.1%) is occupied by an experimental area (Figure 3.2).

In 1987, the Guangdong Provincial Government approved the establishment of a police station in Bawangling Provincial Nature Reserve. In 1992, the Hainan Provincial Government established Bawangling National Nature Reserve Management Office, under the management of the BFB. Although the reserve has been further expanded, the number of staff positions has remained at 13, and most of the current staff working in the reserve are not hired by the management office.

BNNRMO consists of an Administrative Office, a Research and Education Department, a Publicity Department, a Finance Department, a Community Affairs Department, and 20 management sites. In order to strengthen the protection and management of forest resources, between 2002 and 2006 BFB deployed 45 people to engage in daily patrols, gibbon monitoring and forest fire prevention at the reserve's management sites. There are now a total of 20 staff working within the reserve, of whom 12 are officially recruited by BNNRMO, and eight are employed by the

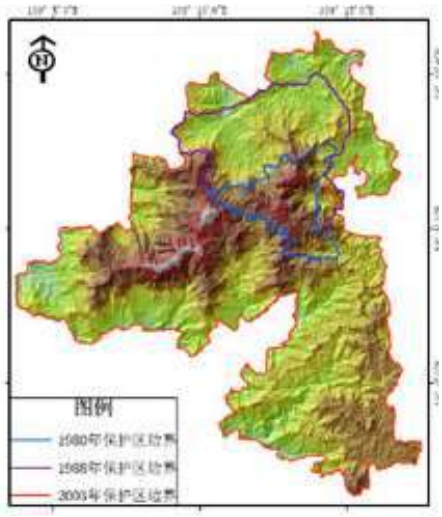

Figure 3.1. Changes to the coverage of Bawangling reserve from 1980 to the present.

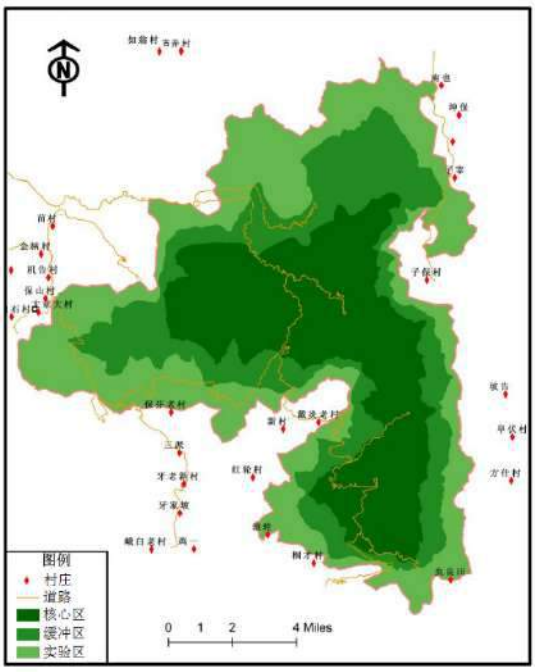

Figure 3.2.
Reserve functional zones.

Figure 3.3.
Locations of major constructions.

Industry Unit of BFB. Only nine staff are involved in gibbon monitoring, all of whom are staff of the Natural Forest Protection Project; each staff member is responsible for the protection of c.2.7 km^2 of forest. In order to address the issue of a lack of personnel for gibbon monitoring at BNNR, KFBG have provided support for 6 additional community wardens since 2012.

BNNRMO is under the jurisdiction of HFB, and is an independent legal entity. The reserve area is a state-owned forest region, and the management office has no local administrative power.

3.2 Research and Monitoring

The unique and highly threatened status of the Hainan gibbon has attracted various research institutions and international organizations to conduct research in BNNR. BFB and BNNRMO have implemented a UNESCO “Man and Biosphere” research project and an International Tropical Timber Organization “Sustainable Management of Tropical Natural Forest” demonstration project to support Hainan gibbon conservation, and have long-term collaborations with Chinese and international groups to study Hainan gibbon behavioural ecology. Started in 1980, the “Hainan black crested gibbon population ecology research project”, conducted by BNNR and the South China Endangered Species Research Institute and funded by the National Natural Science Foundation, provided a basic understanding on Hainan gibbon population structure, activity patterns, breeding characteristics and diet, and laid the foundation for further studies. These two organizations have collaborated further on

research projects on Hainan gibbon habitat structure (1984-1985) and home range utilization and seasonal variation (1987-1989). In 1998, BNNR collaborated with the former Hainan Wildlife Conservation Centre to investigate Hainan gibbon population distribution. BNNR worked with East China Normal University to study Hainan gibbon conservation status and policy from 2002-2006; with Northeast Normal University on Hainan gibbon ecology and behavior from 2002-2008; and with China West Normal University on habitat selection from 2002-2003. Since 2005, BNNR has cooperated with KFBG to monitor Hainan gibbons in the field. BNNR worked with South China Agricultural University in 2006 to investigate the dominant vegetation, the ecology of major gibbon food species, and the diversity of food species within Hainan gibbon habitat; with Hainan Normal University in 2007 on Hainan gibbon status and survival; with Guizhou Normal University from 2008-2009 on gibbon population and social structure; with KFBG in 2010 on the ecological limitations of Hainan gibbon recovery; and with ZSL from 2010 to the present on Hainan gibbon home range ecology, genetic health, population recovery, and population monitoring methods.

Major publications in the last decade include: Peng et al. (2008), which suggested that the drastic decline of the Hainan gibbon population was caused by rainforest destruction and hunting; Zhang et al. (2010), which also suggested that rapid loss of suitable gibbon habitat and forest fragmentation are the major causes of gibbon population decline; a series of studies on Hainan gibbon population status by Wu et al. (2004), Chan et al. (2005), Zhou et al. (2005) and Fellowes et al (2008); studies on Hainan gibbon social behaviour (Zhou et al. 2008) and diet and habitat characteristics (Chen et al. 2006-2009); and improved estimation of Hainan gibbon home range, genetic status of the last surviving population, drivers of unusual observed characteristics of behavioural ecology, detection of a new social group using acoustic call-playback, and local ecological knowledge about gibbons in communities across Hainan (Bryant et al. 2015, 2016a-c; Turvey et al. 2016).

Since 1992, law enforcement and management have been the joint responsibilities of BNNRMO, BFB, and Bawangling Forest Police Department. The Hainan Provincial Government has banned the logging of natural forests since 1994, and implemented the Natural Forest Protection Project in 1998; today, this project provides the main patrol workforce at BNNR. BNNRMO and BFB frequently conduct public outreach programmes using films, displays, and mobile campaign vehicles to engage the communities surrounding the reserve, with an aim to improve understanding of the purpose of the reserve and of the conservation of endangered flora and fauna. In 1996, the South China Endangered Species Research Institute and the former Hainan Wildlife Conservation Centre initiated a national petition, which was signed by 150 conservation specialists. The Hainan Daily provided wide coverage of this event, giving positive exposure to Hainan gibbon conservation efforts.

Organizations working on Hainan gibbon conservation in recent years include KFBG,

FFI and ZSL. Since organizing the first International Conservation Planning Workshop for the Hainan gibbon in 2003, KFBG has supported a comprehensive programme of conservation interventions at BNNR, including the formation of the Hainan gibbon monitoring team, habitat restoration, introduction of ecological agricultural technologies, and funding scientific research. FFI also started working on the Hainan gibbon in 2003 in collaboration with local government, BNNRMO and surrounding communities, with activities including training of reserve personnel, planning community co-management, and education programmes in schools. ZSL started a long-term collaborative field-based research programme on the Hainan gibbon in 2010, and formally established their Hainan gibbon conservation programme in 2013. In March 2014, ZSL and BNNRMO co-organized the second International Conservation Planning Workshop for the Hainan Gibbon.

3.3 Reserve Infrastructure

During recent decades, a series of protected areas have been established across Hainan to protect historical and potential Hainan gibbon habitat, including at Bawangling, Diaoluoshan, Jianfengling, Jiaxi, Wuzhishan and Yinggeling. Basic infrastructure has also been established for these protected areas.

Since BNNR, the only reserve in which Hainan gibbon presence has been confirmed, has been promoted to a national nature reserve, the State Forestry Administration and HFB have invested nearly 10 million yuan on Phase I, Phase II and Phase III construction projects. These constructions include: a 720 m^2 main office building, a 700 m^2 staff dormitory, a 270 m^2 research and education hall, twelve management stations and management points with a total area of 2,316 m^2 (Figure 2.3), a 100 m^2 meteorological station, a 350 m^2 building refurbishment, 1.3 km^2 of habitat modification, 388 km of patrol trails, 20 fixed monitoring plots, 15 km of fixed monitoring transects, 183 boundary tablets/poles, 8 publicity signs, 23 km of communication cables, and acquisition of new patrol and monitoring equipment.

3.4 Laws and Law Enforcement

The Hainan gibbon is listed as a National Class I Protected Species, and is legally protected under China's Wildlife Protection Law, Nature Reserve Regulations, Wild Animal Protection Ordinance for Hainan Province, and Natural Protection and Management Regulations for Hainan Province. However, there are no legal documents that specifically protect the Hainan gibbon or the reserve designated for protection of the species.

At present, a forest police station is situated inside the reserve at the entrance of Dongganxian, where six police officers are stationed. There is currently no funding provided specifically for law enforcement and no official vehicles are available, only two motorcycles. Law enforcement mainly involves controlling and checking on people going in and out of the reserve, and prohibiting illegal destruction of forest resources. The overall capacity for law enforcement, including equipment/facilities,

human and financial resources, is seriously insufficient. In some areas inhabiting by ethnic minorities, some people still possess shotguns and some still use traps to catch birds and other animals. Even though the Hainan gibbon is probably not the target species for local hunters, human disturbance and biodiversity loss associated with ongoing local hunting could cause tremendous pressure on the long-term viability of the last Hainan gibbon population.

Some rubber and pine plantations were included inside the boundary of BNNR when it was expanded in 2003. BFB and BNNR hold the area's land (forest) ownership and management rights, and commercial activities (rubber and resin tapping) are continuing inside these plantation areas. Rubber and pine forests do not represent suitable gibbon habitat and their presence prevents native trees from natural regeneration, so that these forestry activities continue to impede gibbon population growth and recovery and cause disturbance and threat to gibbons. Unfortunately, the current protected area laws that do not allow any felling of trees inside the reserve extend to exotic tree species, greatly limiting the effectiveness of habitat restoration within BNNR.

第四章
海南长臂猿威胁和限制因素分析

一、威胁因素分析

（一）人为干扰严重，周边社区依赖森林资源

保护区周边 4 个乡镇（白沙县的青松乡和金波乡，昌江县的七差乡和王下乡）均为省重点扶贫乡镇。居民近三万，均为少数民族（黎族占 90%，苗族占 10%），九成居民生活十分贫困，其生产方式落后，经济不发达，迄今为止，刀耕火种现象依然存在。当地人对森林资源的依赖性强，采集林副产品、猎捕野生动物仍为其经济来源之一，对保护区区内的生物多样性和森林生态系统健康构成一定威胁。

对生物多样性有形象的人为活动主要包括：

1. 采集林副产品 – 主要包括采集松脂、蜂蜜、灵芝、竹子、益智、红藤果、藤条、草豆蔻、牛大力、沉香、兰科植物等。除了蜂蜜和益智有特定的生产与采集时间以外，其它林副产品的采集基本没有季节性规律，其分布也几乎遍布整个保护区。采集活动会减少长臂猿食物，对长臂猿造成滋扰，对森林资源造成破坏，但是对长臂猿的直接影响不大。

2. 盗猎 – 盗猎的目标动物主要包括：野猪、小鹿、水鹿、果子狸、猕猴、松鼠、蝙蝠、雉类、猛禽、龟、蛇、鱼等。捕猎工具包括陷阱、猎枪、套子、电鱼、炸鱼。当地不同民族的男性都有上山打猎的传统习惯。长臂猿会被人类活动和枪声受到惊吓，同时，也可能在人类猎杀松鼠和猕猴等动物时被误伤。

3. 盗伐 – 主要盗伐树种包括坡垒和花梨等。盗伐活动没有季节性规律，但是空间上集中于保护区内某些片区，如东六和雅加一带有坡磊生长，东六和王下一带则有野生花梨的分布。由于长臂猿栖息地内并没有坡磊或花梨的分布，因此盗伐对长臂猿的直接影响不大。

以上人为活动有很大可能影响长臂猿栖息的森林生态系统健康，减少长臂猿食物数量，且增大森林火灾风险。虽缺乏人类活动的系统调查数据，但是根据周边居民提供的信息，每次进山能获取经济收益 50 至 1000 元不等，能增加家庭收入也作为消遣活动。

（二）栖息地破碎化

虽然保护区总面积为 299.8 km^2，但人工林面积约占保护区的 35.4%（见图 2.4）。长臂猿的适宜栖息地——海拔 900 米以下的成熟天然阔叶林总面积却不到 40 km^2（江海声，私人通讯），且由于森林破碎化与道路的分割（东干线，南叉河公路），现在实际被长臂猿利用的栖息地仅 15 km^2。研究分析也表明，在 1991 至 2008 年间，保护区内海拔 1300 米以下的成熟阔叶林面积总共减少约 7%，栖

息地破坏与破碎化严重。长臂猿被逼生存于一个较高海拔、小片、并非最适宜它们的区域内。

（三） 随机因素的威胁

即便没有持续的捕猎行为和栖息地减少，小种群更容易受到随机性情况的威胁，如性别比不平衡、繁殖期母猿的意外死亡、不利天气、自然灾害等，都可能对种群造成严重的危害。2014 年海南长臂猿保护博鳌国际论坛时做出的种群生存力分析显示，成年母猿数量是种群恢复速度的关键。到 2016 年为止，海南长臂猿能生育的成年母猿仅有 6 只（A 群 2 只，B 群 1 只，C 群 2 只，D 群 1 只），最多也只能有 8 只（每家庭最多 2 只），因此任何造成母猿死亡或丧失生育能力的意外都会对种群总体的恢复能力造成严重的打击。此外，小种群的遗传多样性流失速率较快，容易导致种群适应环境能力降低、繁殖率和个体生存率下降、种群数量减少，最终陷入种群灭绝的“漩涡效应”。

二、限制因素分析

（一）霸王岭保护区管理人员不足

即使 2003 年保护区面积扩大不少，霸王岭保护区管理局的人员定编一直没有增加。根据《自然保护区工程设计规范》，森林生态系统类型保护区每 10 平方公里标配一人。2009 年海南省编委批准霸王岭国家级自然保护区管理局从正科级晋升为正处级，只是在机构级别上升格了，但在人员编制尚未增加，内设机构不明确，仍保留原来的行政编制 13 人，且在编人员仅 12 人。当前，为了加强保护区的管理，从霸王岭林业局抽调了 8 人参与日常管理，但对于自然保护区现行管理面积来说，20 人仍远不能满足实际需要。此外，保护区的管理人员，特别是长臂猿监测人员学历都是本科以下，且没有一个野生动物保护研究的专业人才。上述问题已经成为制约海南长臂猿保护和科研工作开展的瓶颈。

（二）管理体制不顺

根据自然保护区条例要求，各级人民政府应把自然保护区建设纳入经济建设和社会发展计划。但是自霸王岭保护区建立以来，经费主要是靠省财政有限的行政事业经费及国家林业局给予的少量项目经费，而当地政府没有提供任何经费。目前，保护区在编人员及 8 名抽调人员的日常工作主要由保护区管理局安排，但区内 299.8 km^2 的天然林管护经费及管护人员由霸王岭林业局支配。保护区辖区内 3 座小型水电站及 93.3 km^2 人工松树林的承包费收入也不属于保护区。事实上霸王岭保护区和霸王岭林业局分别为两个不同的独立法人机构，这使得保护区正常经费开支严重不足，人员关系极为不顺，科研监测手段落后和管理水平不高。

（三）缺乏针对长臂猿有效管理的管理条例

海南长臂猿仅分布在霸王岭自然保护区，是霸王岭保护区乃至整个海南的旗舰物种，但目前还没有针对海南长臂猿保护需求的管理条例，因此很难实现针对性管理目标。

（四）日常管护经费严重不足

目前，霸王岭保护区每年的日常事业拨款经费仅为 100 万左右，除去人员工资之外，日常办公开支仅有 10 余万元，这使得保护区的正常经费开支严重不足，资源保护的各项业务发展受到制约，来自于国内能用于长臂猿等野生动物日常保护管理的经费基本无保障。

（五）基础设施不完善

保护区三期建设工程虽已完成，但总投资额才 1000 万，主要用于管理局办公楼及部分管理站点的办公与生活的基本设施建设。巡护道等管护设施的增修与维护资金并无保障，科研设施仍较为落后，宣教设施如标本室、展览室等规模也还很小，难以满足当前海南长臂猿保护工作的需求。

（六）缺乏信息共享和有效沟通的机制

海南长臂猿的研究已进行多年，积累了很多数据，但管理部门之间、管理部门与科研人员之间、科研人员之间、管理部门与社区之间等均缺乏有效的沟通和成果的共享，研究与保护活动也缺乏协调性，导致资源浪费和知识空缺，阻碍了有效管理和保护行动的实施。保护区采取了一系列的措施对入区活动人员的各种行为进行严格的限制和管理，但由于长期缺乏与社区的有效沟通，使得保护区和周边社区的矛盾和冲突日益加深，管护工作很难得到社区的理解和支持。当前，社区的发展诉求和对自然资源利用的需求日益增长，保护区和地方政府面临如何正确协调保护和发展这一重大挑战。

（七）缺乏海南长臂猿应急预案

近年的观测数据表明，现存的海南长臂猿种群繁殖率正常。但是由于种群数量太少仍受到各种危害和突发事件的威胁，如台风等极端天气。随着全球气候变化的趋势，这类事件将发生得更加频繁。但是管理部门如今仍缺乏应对不同类型和强度紧急事件的应急预案（如确定利益相关者、责任及时间安排），增加霸王岭保护区内长臂猿灭绝的风险。

（八）管护与监测能力较低

目前保护区主要采用人工巡护跟踪方法对长臂猿进行管护与监测，到检测点聆听鸣叫。这种能够方法劳动强度大，效率低，还受制于天气与地形条件，有些区域管护人员难以到达，故存在监测盲区，特别是不常或根本不鸣叫的独猿很难被发现；人手记录的数据也难以实现规范化或可视化。目前的检测力度无法满足全面有效的种群监测需求。

（九）保护知识空缺，科研力量薄弱

国内和国际研究机构在 20 世纪 80-90 年代就开始了对于海南长臂猿的研究。但由于保护区没有完整的科研管理机构和机制、没有稳定的专职研究和监测队伍及完整的科研监测计划，只能间接地参与和支持这些研究项目。在保护区取得的各项研究成果未能实现共享与整合，因而难以充分地利用到海南长臂猿保护管理工作中。

（十）公众对长臂猿的保护意识薄弱

公众对海南长臂猿的存在、现状、及保护意义认知不足，因而未能有效发挥群众力量推动、支持并监督长臂猿的保护事业。保护区周边社区内野生动物盗猎行为时有发生，而保护区的执法工作使保护区和当地社区之间的矛盾恶化。

Chapter 4 Threat and Limitation Analysis

4.1 Threat Analysis

(I) Human disturbance and dependence of local communities on forest resources
Four of the townships around the reserve (Jinbo and Qingsong townships in Baisha County, and Qicha and Wangxia townships in Changjiang County) are listed as key poverty townships in the province. These townships comprise nearly 30,000 minority people (90% Li, 10% Miao), of which 90% are classified as currently living in poverty. Agricultural production methods are outdated, the local economy is underdeveloped, slash-and-burn cultivation still exists, and dependence on forest resources remains strong. Non-timber forest products (NTFPs) and wild animals still contribute significantly to local economic income, posing major threats to biodiversity and forest ecosystem health.

The main anthropogenic activities that impact local biodiversity include:

1. NTFP collection – The main products are pine resin, honey, *Ganoderma* (medicinal mushroom), bamboo, *Alpinia oxyphylla* (medicinal plant), *Sargentodoxa cuneata* (glory vine), rattan, *Alpinia katsumadai* (grass cardamom), *Millettia* root (medicinal plant), *Aquilaria* (agilawood or Chinese eaglewood), and orchids. Except for the harvest of honey and Alpinia oxyphylla, the collection of all other products do not depend on seasonality, and all products are nearly distributed across the entire nature reserve. Collection activities could reduce Hainan gibbon food species, disturb Hainan gibbons, damage forest resources, but do not pose direct threats to the gibbon.

2. Poaching – The main hunted species are wild boar (*Sus scrofa*), red muntjac (*Muntiacus vaginalis*), sambar deer (*Rusa unicolor*), masked palm civet (*Paguma larvata*), rhesus macaques (*Macaca mulatta*), squirrels, bats, pheasants, raptors, turtles, snakes and fish. Poaching methods and gears include traps, guns, snares and electrofishing and explosive fishing. Local men from different ethnic groups all retain the tradition of hunting in the mountains. Hainan gibbons are disturbed by human activity and gunshots, and could also be harmed accidentally during hunting of squirrels and macaques.

3. Illegal logging – The main species logged are *Hopea hainanensis* and *Pseudocydonia sinensis* (rosewood). There is no seasonal pattern to illegal logging, but activity appears to be concentrated in certain areas of BNNR. For example, *Hopea hainanensis* is known to grow at Dongliu and Yajia, while rosewood is found at Dongliu and Wangxia. Since these two trees are not found within the current area of gibbon distribution in BNNR, illegal logging may not pose a direct threat to the species.

The above human activities are likely to impact forest ecosystem health, reduce Hainan gibbon food sources, and increase the risk of forest fires. Although data on human disturbance are lacking, according to information provided by local villagers, each trip to the mountain can yield between 50-1000 yuan in economic profit, and so supplements family income as well as providing a leisure activity.

(II) Fragmentation of gibbon habitat

Although BNNR covers an area of 299.8 km^2, plantation forest comprises 35.4% of the reserve (Figure 2.4). The area covered by suitable gibbon habitat, i.e. mature primary broadleaf forest below 900 metres elevation, covers less than 40 km^2 (Jiang Haisheng *pers. comm.*). This restricted area of potential suitable gibbon habitat has been further fragmented by roads (Dongganxian and Nanchahe Road), leaving an actual area of contiguous suitable habitat available to gibbons of only 15 km^2. Between 1991 and 2008, mature primary broadleaf forest below 1300 metres elevation in the reserve suffered a loss of 7% in total area, along with significant further degradation and fragmentation. The reserve's gibbon population is therefore now restricted to a small patch of probably suboptimal high-elevation habitat.

(III) Threats from stochastic events

Small populations are more vulnerable to stochastic events, such as an imbalance in sex ratio, accidental death of a breeding female, adverse weather events or natural disasters, that can have severe impacts to population persistence even in the absence of continued hunting or habitat loss. Population viability analysis conducted at the second International Conservation Planning Workshop for the Hainan Gibbon in 2014 indicated that the number of available breeding females is a major determinant of the rate of population recovery. As of late 2016, there are six breeding females (Group A: 2 adult females, Group B: 1 adult female, Group C: 2 adult females, Group D: 1 adult female), and the maximum capacity of adult females in four family groups is only eight (two each); therefore, any accidents that result in female deaths or fertility loss would be disastrous to population viability and recovery. In addition, genetic diversity can be lost at a more rapid rate in small populations, leading to reduced adaptive potential, reproductive rate and individual survival rate, which in turn can increase the rate of population decline and ultimately the likelihood of extinction (extinction vortex effect).

4.2 Limitation Analysis

(I) Lack of sufficient reserve staff

Although the reserve was expanded considerably in 2003, there has been no associated increase in the number of reserve staff. According to the "Standards of Nature Reserve Design and Construction", one member of staff is required for every 10 km^2 of area in forest protection reserves. However, the personnel capacity of BNNR remains at a total capacity of 13 people (staff quota given by BNNRMO Human Resource Department), while the number actually recruited (allowed by HFB)

is only 12. In order to strengthen reserve management, BFB has dispatched eight of its staff members to BNNR. However, a total of 20 staff is still insufficient to meet the actual management needs of the reserve. In addition, the reserve staff, especially those responsible for gibbon monitoring, have limited secondary-school educations, and none of them have obtained proper training in wildlife protection or research. All of these problems have significantly limited the effectiveness of Hainan gibbon conservation and scientific research at BNNR.

(II) Ineffective institutional management

According to Chinese protected area regulations, governments at all levels should include the establishment of nature reserves within their economic and social development plans. However, financial support for BNNR since its initial establishment as a protected area has consisted only of limited funding from the Provincial Government for administrative expenses and some funding from the State Forestry Administration for project expenses, with no funding provided from local county governments. At present, the daily work of the reserve staff and the eight further staff members provided by BFB is organised by BNNRMO, but the funds and personnel for management of the 299.8 km^2 of forest cover within BNNR are under the control of BFB. Jurisdiction of the three small hydropower stations and 93.3 km^2 of pine plantations inside the reserve, and the income they generate, also do not belong to BNNR. BNNRMO and BFB are two independent legal entities, and this complicated management institution has led to insufficient financial support, complex personnel relationships, low technical skills, and inefficient management.

(III) Lack of regulations for effective gibbon conservation

The Hainan gibbon is now distributed solely in BNNR; it is the flagship species of the reserve and also of Hainan. However, there are currently no regulations in place that support the specific needs of Hainan gibbon protection, making it difficult to achieve targeted management objectives for the species.

(IV) Insufficient financial input for management operations

At present, BNNRMO receives about one million yuan each year for basic operations. The majority of this funding supports staff wages, leaving less than 100,000 yuan for other running costs. This insufficient financial support poses major restrictions on effective resource protection at BNNR, and there are no other sources of funding currently secured from other bodies within China for protecting and managing the Hainan gibbon or other wildlife within the reserve.

(V) Insufficient infrastructure

Three phases of construction have been completed at BNNR with a total financial input of only 10 million yuan, which included construction of the main office building and the basic office and living facilities of some of the management stations. No funding has been provided for upgrading or maintaining patrol trails, and the current scientific research facilities and education facilities, such as the BNNRMO exhibition

room, are also limited. The current infrastructure at BNNR remains insufficient to meet the requirements of gibbon protection and reserve management.

(VI) Lack of mechanisms for information sharing or effective communication

Research on the Hainan gibbon has been conducted at BNNR for many years, and a large amount of data has been collected. However, due to a lack of effective communication or coordination between authorities, between authorities and researchers, among researchers, and between authorities and local communities, there has been a general lack of sharing of data, knowledge and resources, hindering the effective management and implementation of conservation actions. BNNRMO has adopted various measures to control and manage human activities inside the reserve, but because of a lack of effective communication with local communities, conflicts of interests have intensified, and it has proved very difficult to gain the understanding and support of people living around the reserve. As the demands of community development and utilization of natural resources grow, BNNRMO and local governments face an increasing challenge to balance nature protection and development.

(VII) Lack of Emergency Response Plan for the Hainan gibbon

Although survey data indicate that the Hainan gibbon population at BNNR has been breeding at a normal rate, because this population is extremely small it remains vulnerable to various threats and stochastic events such as typhoons and extreme climate events. These events may become more frequent in the face of climate change. However, there is no official emergency response plan in place and ratified by relevant government authorities to identify appropriate responses (including identified stakeholder roles, responsibilities and timelines) to different potential types of emergency scenarios that could impact the Hainan gibbon population at BNNR.

(VIII) Low management and monitoring capacity

Currently, gibbon monitoring is mainly conducted by means of patrolling and physical detection and tracking of gibbon groups using auditory surveying from listening posts. This monitoring approach is labour-intensive, inefficient, and subject to weather and terrain restrictions; there are management “blind spots” in areas that are difficult to reach; solitary gibbons are rarely found because they do not sing frequently or at all; and hand-written monitoring records are difficult to standardize or visualize. Current monitoring effort is therefore far from comprehensive or effective.

(IX) Insufficient scientific evidence-base for conservation management

Research on the Hainan gibbon has been conducted since the 1980s and 1990s, by both Chinese and international institutions. However, BNNRMO has only participated passively in these studies, and the reserve does not have a well-organised or full-time research team or a cohesive research and monitoring plan. Data from past studies conducted at BNNR have often not been shared or published properly by researchers, and so have been difficult to apply to Hainan gibbon protection and management.

(X) Low public awareness of gibbon conservation

There is a general lack of public awareness on the existence, status, or conservation importance of the Hainan gibbon. The public has therefore not been sufficiently mobilized to support conservation activities for the species. Conversely, because poaching is still prevalent in communities surrounding BNNR, law enforcement carried out by the reserve staff has instead tended to increase local tensions and reduce support for gibbon conservation.

第五章 保护行动

一、保护法规、基础设施与能力建设

行动 1.1 增加编制、能力，并逐步引进专业技术人才

目标： 针对限制因素 1（人员编制不足）和 2（管理体制不顺），增加人员编制，并分期、分批引进人才。

内容：

（1）于 2016 年完成 13 个编制人员安排，积极争取省编办支持，2020 年前将人员编制由现在的 13 人增加至 25 人以上，并依据实际工作需要明确保护区内设机构。

（2）争取省林业厅和人事劳动厅支持，于 2020 年前分期、分批引进自然保护区管理和野生动植物保护人才超过 15 人，从根本上改善保护区人员编制不足和专业人才缺少的不利局面。

考核指标与成果：人员入岗数

牵头单位： 海南省林业厅

参与单位：海南霸王岭自然保护区管理局、海南省野生动植物保护管理局

预算：满编后每年增加经费投入约 95 万元。

优先性级别：I。

投资渠道：省财政

行动 1.2 理顺管理体制

目标：针对限制因素 2（管理体制不顺），理顺霸王岭保护区与霸王岭林业局的关系。

内容：

争取省林业厅的理解和支持，于 2020 年前理顺保护区与霸王岭林业局之间的复杂关系，并明确保护区管理局为区内资源的直接受益者和管理者，对由森林资源使用产生的经济效益和补助资金应该由保护区管理局统一支配。由保护区根据实际工作需要，招聘森林资源的管护人员，实行统一管理。具体活动包括人员能力建设、召开会议、协调等。

考核指标与成果：保护区内公益林管护经费的支配权是否属保护区管理局，管护人员的日常管理是否为保护区管理局及区内资源产生的经济收益是否直接归属保护区管理局。

牵头单位：海南省林业厅

参与单位：海南霸王岭国家级自然保护区管理局、海南省霸王岭林业局

预算：总预算 10 万元。

优先性级别：II。

投资渠道：省财政

行动 1.3 争取日常经费投入

目标：针对限制因素 4（日常管护经费严重不足），争取各级财政部门对保护区工作的经费支持，并推动省级财政设立海南长臂猿专项资金，同时争取社会各

界爱心人士的关注和支持，设立海南长臂猿保护基金，逐步改善保护区经费及资金的不足。

内容：

（1）争取各级政府将自然保护区和海南长臂猿保护事业纳入到区域社会经济总体发展战略中，并在相关计划、规划中加以体现，将保护区建设纳入国民经济和社会发展规划与年度计划。

（2） 争取于 2017 年前建立海南长臂猿保护专项基金，积极争取国内外社团和个人的捐赠。积极开展与科研院所、国际组织的项目合作，利用非政府组织的项目资金开展海南长臂猿的科研及保护工作。

考核指标与成果：专项资金到位额度、海南长臂猿保护基金的建立及筹款数额。

牵头单位：海南霸王岭自然保护区管理局

参与单位：海南省林业厅、海南财政厅

预算：总预算 100 万元，每年 20 万元。

优先性级别：II。

投资渠道：省财政

行动 1.4 颁布《海南霸王岭国家自然保护区管理条例》

目标：针对限制因子 3（缺乏针对长臂猿有效管理的管理条例），在充分调研和深入了解各方诉求的基础上，依据《中华人民共和国森林法》、《中华人民共和国野生动物保护法》、《中华人民共和国自然保护区条例》等国家有关法律、法规，结合保护区特点，制定并正式颁布《海南霸王岭国家级自然保护区管理条例》，以促进海南长臂猿等珍稀动植物资源及森林生态系统的有效保护，规范科学展示和资源利用。

内容：

（1） 由省林业厅出面协调，将《海南霸王岭国家级自然保护区管理条例》纳入海南省人大 2016 年立法计划。

（2） 于 2020 年前由省人大通过并颁布实施。

考核指标与成果：《海南霸王岭国家级自然保护区管理条例》立法

牵头单位：海南省林业厅

参与单位：海南霸王岭自然保护区管理局、省人大立法委员会

预算：总预算 10 万元。

优先性级别：II。

投资渠道：省财政

行动 1.5 完善霸王岭国家级保护区基础设施建设

目标：针对限制因素 5（保护区基础设施不完善），到 2025 年完成实施保护区二期规划，通过逐步加大资金投入，改善保护区在保护、科研监测及宣教等方面的基础设施状况。

内容：

于 2016 年完成《海南霸王岭国家级示范自然保护区实施方案》的编制和专家评审工作，并报送国家林业局批准, 争取资金支持。争取于 2020 完成保护区内 5 公里巡护防火道路的硬化工程及生态监测点的建设任务，并在原有的基础上扩建保护区的标本室、宣教室，逐步完善保护区基层站点的相关配套设施。

表5.1 保护区基础建设投资表

单位：万元

支 出 项 目	金 额	备 注
1.5.1 巡护道路硬化	85（170/公里×5公里）	
1.5.2 生态定位观测点建设	100（20×5处）	
1.5.3 气象观测点	90（30×3处）	
1.5.4 水文监测点	60（20×3处）	
1.5.5 野生动物监测设备	50	
1.5.6 宣教设施	31.6	
1.5.7 宣教与培训设备	179.7	灯光、音响、办公家具、电脑、广播设备、多媒体设备、宣传车等
1.5.8 管护站点供电及通信规划	209	
1.5.9 管护站点生活设施设备规划	168.5	给排水工程、办公用品等
1.5.10 其它费用	192	管理费、勘察设计费、工程监理费
合 计	**1166**	

考核指标与成果：截止 2020 年，依据保护区二期规划内容基础设施的投资及工程完成情况。

牵头单位：海南霸王岭自然保护区管理局

预算：总预算 1,166 万元，已划入霸王岭保护区总体规划。

优先性级别：III。

投资渠道：省财政，已划入霸王岭保护区总体规划。

行动 1.6 组建科研监测中心

目标：针对限制因素 6（缺乏科研成果共享）和因素 8（管护与监测手段落后），保护区管理局与科研机构联合组建海南长臂猿科研监测中心。

内容：

组建工作队伍（约 10 人），并拨地建造中心办公楼和野生动物救护站，占地 2000 m^2。

考核指标及成果：2020 年前完成基础、机构和队伍建设。

牵头单位：霸王岭保护区管理局

投资预算：中心投资总预算为 539 万。日常工资、运转、管理等费用为事业费用，纳入财政预算，按年度拨款，事业费用为 145 万元/年。总投资额 684 万元，优先性级别 II 的行动预算为 245 万元（中心的设备与运作），优先性级别 III 的行动预算为 439 万元（土建部分），建设工程与设备（1.6.1-1.6.5）已划入霸王岭保护区总体规划。

投资渠道：省财政, 部分已划入霸王岭保护区总体规划。

行动 1.7 巡护与执法能力建设

目标：针对威胁因素 8（管护与监测手段落后），保证管护人员合理待遇与执法

表5.2 海南长臂猿研究及监测中心投资表

单位：万元

支 出 项 目	金 额	备 注
1.6.1 办公楼建筑工程	300 (0.3/平米×1000平米)	优先性级别：III
1.6.2 常规科研设备	50	优先性级别：II
1.6.3 野生动物救护站建筑工程	75 (0.25/平米×300平米)	优先性级别：III
1.6.4 笼舍	64 (0.08/平米×800平米)	优先性级别：III
1.6.5 设备	50	办公设备、业务用车、野外监测/跟踪设备，优先性级别：II
总 合 计	**539**	

表 5.3 海南长臂猿研究和监测中心事业费概算表

单位：万元/年

支 出 项 目	金 额	备 注
1.6.6 人员工资费用（含社会保险、法定福利等）	60 （0. 5/月.人×12月/年.人×10人)	优先性级别：II
1.6.7 水电费用	12 （1/月×12月/年）	
1.6.8 交通费（监测人员摩托车燃油、维修等）	7	
1.6.9 业务用车费（燃油、维修等）	24 （1/月.辆×2辆×12月）	
1.6.10 日常办公费用	12 （1/月×12月/年）	
1.6.11 研究、监测项目	30	
合 计	**145**	

安全，并提供适当的能力培训活动。

内容：

（1）2016 年，增加巡护执法专项经费，纳入保护区财政预算。

（2）2016–2017 年，制定保护区巡护和执法相关标准，包括巡护线路，执法和巡护程序和记录表格，研制相关移动巡护和执法设备。

（3）2017–2018 年，进行巡护和执法人员培训，编制巡护和执法手册。

（4）2018–2019 年，建立巡护和执法信息平台。

考核指标及成果：巡护和执法手册、标准、信息平台。

牵头单位：海南霸王岭自然保护区管理局

参与单位：海南省霸王岭林业局，海南霸王岭林区森林公安局

投资预算：投资预算30万元/年，五年共150万，并增加设备预算（执法设备、野外装备）。**优先性级别：**I。

投资渠道：省财政

行动 1.8 组建海南长臂猿保护工作委员会

目标：针对限制因素 6（缺乏信息共享和有效沟通的机制），组建海南长臂猿保

护工作组及学术委员会，通过加强沟通，提高保护的科学性、保护工作的协调性和有效性。工作组须定期进行会议，拟定工作计划并汇报工作进展。同时，定期编制及发报通讯刊物，以达到宣传和确保工作透明度的目的。聘请以中国灵长类学会及有相关专业领域专家为学术委员，协助主管部门编制海南长臂猿监测与研究指南，制定长臂猿监测与研究计划，评审年度监测与科研成果，并推动成果的实际应用。

内容：

政府多个有关部门与专家的有效沟通与合作是保护海南长臂猿的关键，因此，成立海南长臂猿保护工作组及学术委员会能促进保护行动的有序推行，并确保信息流通无阻。工作委员会分领导小组、工作小组.领导小组和工作小组由执行保护行动计划的有关人员构成.学术委员会由国内外有关专家组成.工作组和学术委员会旨在提升海南长臂猿的研究与保护方法，以达到国际水平，并为争取国际社会对海南长臂猿保护工作上的了解与支持作出贡献。

（1）2015 年，成立海南长臂猿保护工作委员会，指派人员专门负责联络、沟通与安排相关活动。

（2）领导小组和工作小组每年举行一次年度会议，检讨过去一年的工作进展并商议来年工作计划；根据具体保护行动举行规模较小的工作会议；每年产出年度报告，接受学术委员会的评核。学术委员会同时监督科研监测中心的所有活动，并提供技术建议。

考核指标及成果：2017 年前海南长臂猿保护工作委员会投入运作，给海南长臂猿保护工作提供常规性的指导。

牵头单位：海南省林业厅

参与单位：海南霸王岭自然保护区管理局、学术单位、非政府组织

投资预算：总投资预算每年40万元，5年共200万元。优先性级别：III。

投资渠道：省财政

行动 1.9 编写《海南长臂猿应急预案》

目标：针对限制因素 7（缺乏应急预案），为应对将来可能发生的森林火灾、森林病虫害、极端气候、疫源疫病等对海南长臂猿造成危害的特殊紧急情况，识别相应的应急措施。基层管理部门可以通过一定的审批程序启动《海南长臂猿应急预案》，要求上级部门允许其采取特殊的管护手段，如补食、项圈卫星跟踪、疾病排查、疫苗注射、迁地保护、人工繁育等，并为之增补人力与财力。

内容：

（1）2015~2016 年，利用气候变化情景数据，模拟气候变化情景和极端天气事件，分析气候变化情景和极端天气事件的各种风险。 召开海南长臂猿应急预案

表 5.4 海南长臂猿工作组与学术委员会投资预算表

单位: 万元/年

支 出 项 目	金 额
工作委员会工作费用	6
会议费（包括交通与补助）	30
印刷与宣传	4
合 计	**40**

研讨会，邀请国内外专家商讨对策，编制《海南长臂猿应急预案》。
（2）2017–2018 年，经过相关部门审议后落实预案各项内容，包括启动和执行机制。
（3）2019 年后每年进行更新（并审核），确保应变措施符合相关科技的最新发展。
考核指标及成果：2019 年前确立并完善预案启动与执行机制，并把《预案》特定的种群和栖息地观测变量临界点纳入保护区的日常监测工作中。
牵头单位：伦敦动物学会
参与单位：海南霸王岭自然保护区管理局、中国林业科学研究院等机构
投资预算：总投资预算 200万元。
优先性级别：II。
投资渠道：国家科研或项目经费、社会团体

二、科研监测工程

行动 2.1 调查评估林副产品采集及盗猎等人为活动对长臂猿的影响
目标:针对威胁因素 1（周边社区对森林资源利用程度高），调查评估周边社区的森林资源利用状况和盗猎活动对野生动物的影响。
内容：
（1）**林副产品采集活动调查研究**
通过社会访谈、市场调查、执法案件信息搜集，摸清林副产品的种类、分布、资源量及采集量、采集地点、采集时间、经济价值、占收入比例、采集人员组成，并评估林副产品采集活动对长臂猿的影响。
（2）**盗猎活动规律及影响调查研究**
通过访问老猎人、森林执法案例分析、执法案件信息搜集，了解盗猎主要对象种类、分布、频率、猎物经济价值、占收入比例、盗猎人员特征，并评估盗猎活动对长臂猿的影响。
（3）**其它人为活动干扰及影响调查研究**
如盗伐，用火，旅游等活动对长臂猿的影响。
考核指标及成果：调查研究报告
牵头单位：伦敦动物学会、霸王岭保护区管理局
参与单位：霸王岭林业局，霸王岭林区森林公安局，周边乡镇政府，中国林业科学研究院、海南大学等
投资预算：总投资预算 100 万元。
优先性级别：III。
投资渠道：国家科研或项目经费

行动2.2 建立长臂猿种群及生境数字化综合监控与分析体系
目标：针对限制因素 8（管护与监测手段落后），在保护区范围内建设长臂猿种群及生境数字化监测体系，弥补现有监测体系的不足。

行动 2.2.1 建立数字化巡护体系，实时掌握长臂猿人为干扰活动和种群动态

目标：建立标准化的野外巡护方法，研发保护区数字化巡护系统来支持科研和保护项目，分析长臂猿活动区域的人为干扰和种群动态。

内容：

（1）2016 年，引入数字化巡护系统，进行系统建设、调试和人员培训。

（2）2017 年，制定与落实巡护监测标准，利用巡护系统的信息制定与管理日常巡护工作。

1. 标准化保护区调查、巡护、执法方案

建立从管理局—管理分局—管理站—管护点的四级保护区移动调查、巡护、监测、执法系统标准化管理方案，每一个管理点确定需要管护和调查的内容，分级管理保护区各层面相关业务，最终将相关信息汇总至管理局控制中心。

2. 信息化管理系统功能

管护员使用集成 GPS、拍照、录音和视频功能的前端采集设备（PDA），采集管护过程中发现的各类信息，并实时或者在有网络连接时回传到数据管理中心，由此提升管理时效性，并实时将重要信息传输给保护区领导或者公安部门。管理员定期下载调查、巡护、监测、执法数据。信息系统控制中心在三维地球上实时监测各管护员工作状态，并统计分析保护区内动物分布情况、植物物候期、人为干扰分布情况、设备设施情况、偷猎盗猎情况等相关信息，快速生成调查、巡护、监测、执法报告。

3. 系统建设

为每个管护点配置 2–5 台 PDA，每个管理站配置 2 台台式电脑，每个管理分局配置 1 台服务器、2 台台式电脑、1 台笔记本电脑，管理局建立控制中心，配置 1 台服务器、4 台台式电脑、2 台笔记本电脑、4 米*3 米拼接屏，租赁 10M 带宽及静态 IP。

4. 系统培训

与科研单位合作，进行每一专项调查、每一条巡护线路、执法安排确定记录内容和管理制度，并进行培训。定期为保护区管护员和管理人员提供专业知识培训，提升管护员管护能力、管理人员数据分析能力和科学决策能力。实现保护区野外管护的标准化、数字化和科学化。

考核指标及成果：巡护监测标准、数字化巡护系统、人为干扰和长臂猿种群动态的月、季度、年报。

牵头单位：海南霸王岭自然保护区管理局

参与单位：中国林业科学研究院、其他科研单位。

投资预算：投资预算 80万元。

优先性级别：I。

投资渠道：国家科研或项目经费、社会团体

表 5.5 数字化巡护体系预算表

单位：万元

支 出 项 目	金 额
培训费	10
专家费	5
系统设计费	40
服务器与计算机	25
合 计	**80**

表 5.6 数字化监测体系投资估算表

单位：万元

序 号	项 目	小 计	备 注
一	**工程费用**	**550**	
1	土建工程	（200）	监控中心、机房、监测设备安装铁塔
2	设备购置	（160）	4 个森林防火视频监控点，10 个野生动物视频监控点，20 套野生动物监测设备，10 套野外植被数据采集设备，监控指挥中心集成系统、监控中心办公用品、机房附属设备等
3	基础配套设施	（30）	电线电缆等
4	技术支撑	（80）	监控中心综合集中控制系统、监测数据集成与标准化处理系统
二	**其他费用**	**50**	建设单位管理费、勘察设计费、工程监理费、招投标费等
三	**基本预备费**	**30**	
四	**后期维护费用**	**20**	每年 4 万元
	合 计	**570**	

行动2.2.2 建立长臂猿种群及生境数字化监测系统

目标：采用 3S（地理信息系统 GIS、遥感系统 RS、全球定位系统 GPS）技术、野外自动化监测技术和三维可视化技术，结合行动 2.2.1 的数字化巡护系统，打造以长臂猿及其生境数字化监测管理、信息服务、统计分析、动态追踪等为主要目标的长臂猿监测管护平台；并在此基础上采取互通、集成等技术手段，建立长臂猿综合监测管护体系，实现长臂猿监测管理工作可视化、数字化、信息共享化。

内容：

（1）2017 年，设计与筹备野外自动化和三维可视化监测系统。

（2）2018 年，系统建设、调试和人员培训。

考核指标及成果：2019 年数字化体系进入正常运作阶段，所有仪器设备发挥最大效能，为管理者与科研人员提供高精度、全面的数据。以此作为成功案例，推广保护区数字化体系的运用。

牵头单位：海南霸王岭自然保护区管理局

参与单位：中国林业科学研究院、伦敦动物学会

投资预算：总投资预算570万元。

优先性级别：II。

投资渠道：国家科研或项目经费、社会团体

行动 2.3 系统开展长臂猿生物生态学和栖息地特征调查研究

目标：针对限制因素 9（保护知识空缺），系统开展长臂猿生物生态学和栖息地特征调查研究。

内容：

（1）**种群分布与数量的区域性分析**

在社区问卷调查（包括霸王岭、吊罗山、尖峰岭、佳西、黎母山、五指山、鹦歌岭等）和全省尺度上的植被调查的基础上选择有可能有长臂猿残存的区域，生物声学科技开展野外调查。

（2）栖息地调查与研究

对长臂猿主要活动区及其周边的植被、水文、气候、土壤等进行调查，并全面系统地研究各种生态因子对其栖息地选择行为（包括游走、觅食、夜宿等）的影响。利用物种分布模型，评估霸王岭及周边山区长臂猿栖息地适宜性，确认影响栖息地适宜性的关键环境因子，分析海南长臂猿的最佳栖息地、适宜栖息地、非适宜栖息地等的生态学特点，并在此基础上绘制长臂猿栖息地适宜性等级分布图，为制定海南长臂猿栖息地恢复和改造提供科学依据。

（3）繁殖行为研究

系统开展海南长臂猿求偶、组群、交配、雄性取代、抚幼行为、幼猿出生与存活及发育规律等行为学和生态学研究，明确其增殖规律与限制因素。

（4）物候研究

长臂猿在不同季节采食不同种类的食物，对不同种类食物的依赖性也有不同。因此，应在对长臂猿的主要食物树种开展物候调查，可在同一地点研究不同物种、在不同地点（不同的生态条件）研究相同的物种。

以上各项研究可以同步执行。

考核指标及成果：各项研究报告。

牵头单位：海南霸王岭自然保护区管理局

参与单位：各个保护区、伦敦动物学会、嘉道理农场暨植物园、海南大学等

投资预算：总预算 370 万元。

优先性级别：II。

投资渠道：国家科研或项目经费、社会团体

行动 2.4 开展生物声学实验和无人机遥测新监测技术探索

目标：针对限制因素 8（管护与监测手段落后），探索长臂猿监测高新技术应用与发展。

内容：

（1）2015 年，针对已知猿群进行鸣声回放实验和声音采样，评估其有效性并设计下一步的实施方案。

（2）2015–2016 年，运用鸣声回放方法和声音采样进行猿群野外调查（行动 2.3）。探索无人机遥测技术在监测猿群活动中的有效性和可利用性。

（3）2017 年以后，根据需要运用以上两种新技术手段开展日常监测工作。

表 5.7 研究预算表

单位：万元

项 目	金 额
种群研究（社区问卷，野外调查）	100
栖息地研究	150
繁殖行为研究	60
食物树种物候研究	60
合 计	**370**

考核指标及成果：研究与评估报告。
牵头单位：海南霸王岭保护区管理局
参与单位：伦敦动物学会、嘉道理农场暨植物园、中国林业科学研究院
投资预算：总计 350 万元，其中生物声学试验 50 万元，无人机猿群跟踪技术 300 万元（2016 年）。
优先性级别：II。
投资渠道：国家科研或项目经费、社会团体

行动 2.5 建立海南长臂猿个体户籍档案管理体系
目标：针对限制因素 8（管护与监测手段落后），完成对已知猿群的所有个体的特征辨识并为之建立户籍档案管理体系。
内容：
（1）2016 年，以影像、音频和文字资料记录猿群各个体的特征，运用脸部特征识别技术、音频分析技术、遗传分析等手段，为其建立户籍档案，并定期更新。
（2）2017 年，编制准确且便于使用的个体辨识指南，并实现资料共享。
考核指标及成果：2016 年，海南长臂猿个体户籍档案建立完成；2017 年，海南长臂猿个体辨识指南编制完成并正式投入使用。
牵头单位：海南霸王岭自然保护区管理局
参与单位：中国林业科学研究院、伦敦动物学会、嘉道理农场暨植物园
投资预算：总投资预算50万元。
优先性级别：II。
投资渠道：国家科研或项目经费、社会团体

三、保护管理工程

行动 3.1 建立自动人为活动监测体系，对入区人员实施登记管理
目标：针对威胁因素 1（人为干扰严重、周边社区依赖于森林资源），对保护区人为活动实施严密监控管理，实行入区登记制度，防止区内的非法活动（林副产品采集与盗猎）发生。
内容：
（1）2016 年，在主要交通路口建立检查点，进区道路路口进行登记，每一个进出长臂猿关键栖息地的人员进行入区登记和教育。
（2）2017 年，在一些重要的区域安装摄像头和自动红外相机监控系统。
考核指标及成果：人为活动与破坏降低、进区人员登记记录、进区活动情况记录。
牵头单位：霸王岭保护区管理局
参与单位：中国林业科学研究院
投资预算：总投资预算200万元。
优先性级别：I。
投资渠道：省财政

表 5.8 人为活动监测体系预算表

单位：万元

项 目	金 额
带GPRS发送实时数据的红外相机	6（2000元/台 x 30台）
摄像头系统	14
检查点建设费	110
运行费	50（每年10万）
耗材费	20
合 计	**200**

表 5.9 核心栖息地保护工程预算表

单位：万元

项 目	金 额
科研监测	15
标识系统费用	25
宣传材料编制与印刷	10
合 计	**50**

行动 3.2 现有核心栖息地保护工程

目标: 针对威胁因素 1（人为干扰严重），加强对现有长臂猿核心栖息地的管护。

内容：

（1）在长臂猿活动地点范围内开展进一步的植物样方调查，综合考虑地形、植被类型、植被特征、优势树种、人为活动强度等环境因子研究长臂猿栖息地特征与需求。

（2）在现有长臂猿核心栖息地划建长臂猿保护红线，建立长臂猿核心栖息地警示标识系统（包括边界指示牌、保护宣传牌、违法警示牌等）。

（3）印发长臂猿宣传图册，宣传核心栖息地范围以及加强栖息地保护意识。

考核指标及成果： 警示标识体系的建立，核心栖息地人为活动减少。

牵头单位： 海南霸王岭自然保护区管理局

参与单位： 嘉道理农场暨植物园

投资预算： 总投资预算 50 万元。

优先性级别： I。

投资渠道： 省财政

四、栖息地恢复工程

行动 4.1 退化栖息地改造工程

目标： 针对威胁因素 2（栖息地破碎化严重），增加现有栖息地的面积、质量和连通性。

内容：

规划在东四管理站或南叉河监测站附近兴建一个 0.5 km^2 的苗圃以提供栖息地改

表 5.10 退化栖息地改造预算表

单位：万元

支 出 项 目	金 额
苗圃建设	10
苗圃日常营运	150 （每年30万）
《恢复计划》的编写与评审	40
苗木栽种与维护	50（每年10万）
成效评估费	10
合 计	**260**

造所需的苗木。根据行动 2.3 的研究基础选出面积至少 20 km^2 栖息地恢复优先区域和恢复树种，优先区主要为直接与现有栖息地相连的低海拔地区，恢复树种则包括长臂猿喜食植物、偶然取食植物及提供其活动和休息场所的乡土树种，包括乔木、藤本植物（如买麻藤、山橙等）。次生林封育种海南长臂猿取食植物乡土树种，松林改造则种阔叶树种。

（1）2016–2017 年，根据行动 2.3 的评估分析结果筛选恢复优先区域和恢复树种，进行工程设计及编写《海南霸王岭长臂猿栖息地恢复计划》，筹备恢复工程，包括兴建苗圃与育苗、松树的移除（须通过林业部门的批准）或修整。松林改造需考虑土壤高碱性的问题。

（2）2017–2020 年，苗木移栽与成效评估，每半年进行检查评估。

考核指标及成果：2017 年前编制完成《海南霸王岭长臂猿栖息地恢复计划》。2019 年实现新种树苗存活率 80%以上。

牵头单位：海南霸王岭自然保护区管理局

参与单位：嘉道理农场暨植物园、伦敦动物学会

投资预算：总投资预算 260 万元。

优先性级别：I。

投资渠道：省财政、社会团体

行动 4.2 生态廊道建设

目标：针对威胁因素 2（栖息地破碎化严重），通过树冠层动物迁移廊道和动物生境廊道的建设和管理，使霸王岭保护区的长臂猿栖息地和潜在栖息地的连通性增强。

内容：

（1）建立树冠层动物迁移廊道

沿东干线公路核心区与东五路口 3 公里路段建立树冠层动物迁移廊道 3 处，每处 200 米。在每一处路两边各 50 米种植速生的乔木树种和木质藤本植物（有必要时可辅以人工搭建结构）来实现树冠的连通，来满足长臂猿等动物类群在树冠间的迁移需求。适当种植食物树种可利于迁移廊道的利用。

（2）建立动物生境廊道

沿东干线公路核心区与东五路口 3 公里路段两侧 100 米的范围，通过人工抚育等手段促进植被的恢复和发育，清除原有的零星分布的人工树种（特别是加勒比松等人工针叶树种）、补种一些原生阔叶树种，以满足动物栖息的生态需求。在沿公路设立指示牌，提醒车辆缓慢行驶并切勿鸣笛。

（3）野生动物招引点

在动物生境廊道中设置 10 处饮水池、盐池，在其周围设置鸟巢，以招引中大型兽类和鸟类，增加动物生境廊道的使用率，促进野生动物的自然迁移与扩散。

考核指标及成果：编制《海南霸王岭生态走廊建设工程计划》，2020 年两类廊道和野生动物招引点建设完成。

牵头单位：海南霸王岭自然保护区管理局

参与单位：嘉道理农场暨植物园、伦敦动物学会

投资预算：总投资预算 365 万元。

优先性级别：II。

投资渠道：国家科研或项目经费、社会团体

五、社区自然资源共管、社区经济发展与环境教育

行动 5.1 周边社区自然资源共管试点

目标：针对限制因素 6（缺乏有效沟通机制）和限制因素 10（公众保护意识低），探寻实现自然保护与社区经济发展双赢的道路。

内容：

（1）与关键利益相关者就社区自然资源共管达成共识

组织人力深入社区，向村民介绍社区自然资源共管相关知识，与之就自然资源保护与管理及可持续利用进行互动式讨论，以达成共识。

（2）建立自然资源共管机制

组织各关键相关利益群体代表共同确定共管区域、自然资源类别、涉及群体等，建立社区自然资源共管机制。

（3）共管区域自然资源利用的专项调查

采用农户抽样调查及实地勘察了解社区自然资源种类、数量、分布及利用和管理现状以及资源可持续管理所面临的主要挑战。

（4）制定资源保护和发展规划

分析对社区自然资源利用现状、发展经济和生计所受的约束、主要冲突和问题解决方法。 根据不同区域的特点制定相关的功能区划，制定合理利用和发展

表 5.11 生态廊道建设预算表

单位：万元

支出项目	金 额
迁移廊道建设	173
生境廊道建设	36
野生动物招引点	10
廊道监测室、监测站建设	78
苗圃	24
宣传牌	9
其它费用	35
合 计	**365**

表 5.12 社区共管建设投资预算表

万元/年

支 出 项 目	金 额
宣传与培训	70（每年15万元）
共管委员会/小组工作费用	100（每年20万元）
人员工资	60（每年12万元）
调查与规划	50
合 计	**285**

规划。对保护区和周边社区可利用自然资源的可持续利用进行商讨，商议合理利用的具体管理方法，确定资源管理模式。

（5）开展共管能力培训

邀请专家进行共管知识培训和实地指导，组织代表到外地学习和实地考察，借鉴现有的成功经验和方法。

考核指标及成果：共管活动（宣传、培训、研讨会）报告、共管区域自然资源利用的专项调查报告、资源保护和发展规划。

牵头单位：海南霸王岭自然保护区管理局

参与单位：海南省霸王岭林业局、保护区周边乡政府、野生动植物保护国际、嘉道理农场暨植物园

投资预算：总预算为 285 万元。

优先性级别：II。

投资渠道：省财政、社会团体

行动 5.2 加强公众环境教育与意识培养

目标：针对威胁因素 10（公众保护意识薄弱），把海南长臂猿打造成为海南的生态名片。

保护区周边社区的教育与经济水平较落后，保护意识和动力薄弱，需要进行生物多样性保护教育。把海南长臂猿打造成海南的生态名片能快速提高海南省人民对海南长臂猿的认识与保护意识，并有助推广海南生态旅游的发展。让全国人民了解海南长臂猿的珍贵与保护的重要是提高国家保护力度的重要一步。考虑开展长臂猿认养计划、征名活动等，作为宣传与筹款手段。

内容：

在海南省范围的各大学、中学、小学进行海南长臂猿宣传活动，内容包括展览、讲座、绘画比赛、组建并开展“野生动物保护志愿者”行动等。邀请专家到院校针对环境与物种保护、海南生物多样性等专题发表演讲。印发有关生态环境保护的科普和法律、法规宣传材料；发挥报纸、电台、电视、互联网及社交网络等宣传工具的作用进行宣传教育。针对保护区周边社区，组织宣传队深入社区宣讲国家有关法律、法规；张贴宣传法律、法规的标语等，鼓励社区村民参与社区野生动物保护宣传教育。

（1）2016 年，结合多个关注海南生物多样性的非政府组织的力量，筹备与开展全省的校园宣传活动。组建“野生动物保护志愿队”向保护区周边社区进行意识培养活动。

（2）2017–2020 年，制作一系列海南长臂猿与海南生态环境的宣传材料，通过

不同的媒体工具进行宣传教育。建立“传媒、保护区、志愿者”互动平台。
考核指标及成果：活动报告、宣传材料、媒体报道。
牵头单位：海南霸王岭自然保护区管理局
参与单位：海南大学、海南师范大学、中国灵长类学会、嘉道理农场暨植物园、伦敦动物学会、野生动植物保护国际
投资预算：每年40万，总预算200万元。
优先性级别：II。
投资渠道：社会团体

行动5.3发展混农林业，提高相关技能培训，进行林下产品认证，开拓销售渠道
目标：针对威胁因素 1（保护区周边社区对保护区森林资源依赖并造成严重的认为干扰），建议发展混农林业为替代生计，根据当地生态条件、生物多样性、农业与经济发展状况提出可行的混农林业发展计划，提供适当的培训及补助等，推动行业的持续发展。可考虑在保护区实验区非长臂猿栖息地划出部分地区与农民共同发展林下经济，如养蜂、种益智、石斛等药用植物。
内容：
（1）2017–2018 年，混农林业发展可行性调研，设计发展计划。
（2）2018–2020 年，混农林业示范项目与相关技能培训，提供经济补助，开展宣传、质量监督、开拓销售渠道等活动。

1. 混农林业发展可行性调研

聘请相关科研机构进行混农林业发展可行性调研。根据当地的生态条件、生物多样性、农业与经济发展状况提出合适的发展计划，包括所有配套设施、措施、技术支持、支出预算等。必须以持续发展为目的，尽量降低未来市场变化可能造成的风险。

2. 混农林业示范项目，提供技能培训

邀请专家对社区进行农技知识的培训，以提高他们的生产水平，实现农作物增值。对社区的传统手工艺加工户的培训和产品市场化运作。

3. 为农民提供所需经济补助、贷款、材料及设备

必须为农民提供专营所需的经济援助，包括一定程度的补助和贷款。所需材料，如种苗和肥料，应免费或以成本价提供给农户；如需特别设备也应免费或低价提供租赁服务。

4. 开拓销售渠道

为了保障农产品的销售，达到行业的持续发展，必须开展有关的市场分析、宣传、质量监督、营销策略等技术支援服务。
考核指标及成果：混农林业发展可行性调研报告、混农林业发展计划、农业生产报告。
牵头单位：海南霸王岭自然保护区管理局
参与单位：昆明植物所、西南林业大学
投资预算：总预算为 1155 万元。
优先性级别：III。
投资渠道：国家科研或项目经费、社会团体

表 5.12 发展混农林业投资预算表

单位：万元

支出项目	金 额
调研费用	30
示范项目	50
宣传与培训	75 （每年15万元）
经济补助	800
材料与设备	200
合 计	**1155**

Chapter 5 Proposed Conservation Actions

5.1 Regulations, Infrastructure and Capacity Building

Action 1.1 Increase staff capacity and introduce professional/technical personnel

Objective: Targeting limitation I (lack of sufficient staff) and limitation II (ineffective institutional management) to increase number of staff at BNNR, especially professional and technical personnel.

Activities:

(1) Fill all 13 staff positions at BNNR by the end of 2016, through seeking support from the Hainan Committee Office of Public Sector Reform, increase staff capacity from 13 to at least 25 by 2020, and modify the institutional structure at BNNR according to actual management needs.

(2) Gradually increase number of professional staff who specialize in protected area management and wildlife conservation from eight (current number of staff from BFB) to 15 before 2020, with the support from HFB and Hainan Provincial Human Resource Department.

Indicator and outcome: Number of staff hired.

Leading organization: HFB.

Supporting organizations: BNNRMO, HWCB.

Budget: 950,000 yuan per year after all additional staff are recruited.

Priority level: I.

Source of funding: Hainan Department of Finance.

Action 1.2 Improve institutional management

Objective: Targeting limitation II (ineffective institutional management), clarify and improve the relationships between BNNRMO and BFB.

Activities: With support from HFB, clarify the complicated relationships between BNNRMO and BFB and the respective responsibilities and jurisdictions of these authorities, and delegate BNNRMO to be the sole manager of forest resources and the sole receiver of forestry income/stipends for the reserve. In addition, all forest workers should be hired and managed collectively by BNNRMO according to management needs. Detailed activities include building staff capacity, holding meetings, and coordination.

Indicator and outcome: Clarify whether BNNRMO has the allocation right for the management fund for “forests for ecological protection”, and whether it has full jurisdiction over its staff and over profits generated from natural resources in the reserve.

Leading organization: HFB.

Supporting organizations: BNNRMO, BFB.

Budget: Total budget of 100,000 yuan.

Priority level: II.

Source of funding: Hainan Department of Finance.

Action 1.3 Increase funding for daily reserve operations

Objective: Targeting limitation IV (insufficient financial input for management operations), increase financial support the Hainan Department of Finance, and urge the provincial government to provide specific funding for Hainan gibbon conservation. At the same time, raise attention and support from the public and establish a Hainan Gibbon Conservation Fund to increase and broaden the financial resources for species conservation.

Activities:

(1) Include BNNR and Hainan gibbon conservation in regional development strategic planning at all government levels, so they are also included in all relevant implementation plans. Include nature reserve development in national economic and social development masterplans and annual plans.
(2) Establish Hainan Gibbon Conservation Fund before 2017, and actively promote support and donation from Chinese and overseas organizations and individuals. Actively develop cooperative projects with research institutes and international organizations, to carry out scientific research and protection of the Hainan gibbon using non-government funding.

Indicator and outcome: Amount of funding received from government and non-government sources for projects and Hainan gibbon Conservation Fund.

Leading organization: BNNRMO.

Supporting organizations: HFB, Hainan Department of Finance.

Budget: 1 million yuan (total budget), 200,000 yuan per year.

Priority level: II.

Source of funding: Hainan Department of Finance.

Action 1.4 Issue "Bawangling National Nature Reserve Management Regulations"

Objective: Targeting limitation III (lack of regulations for effective gibbon management), issue "Bawangling National Nature Reserve Management Regulations" based on extensive research and consultation. These regulations should be based on current national laws and regulations relating to forest management and wildlife protection, and the current status of the nature reserve, in order to promote effective management of the Hainan gibbon, other wildlife and the wider forest ecosystem, and to promote and demonstrate scientific utilization of natural resources.

Activities:

(1) Include "Bawangling National Nature Reserve Management Regulations" in the legislative plan of the National People's Congress of Hainan Province in 2016.
(2) Regulations to be adopted and implemented before 2020 by the Provincial People's Congress.

Indicator and outcome: Enactment of "Bawangling National Nature Reserve Management Regulations".

Leading organization: HFB.

Supporting organizations: BNNRMO, Hainan Provincial Legislative Council.

Budget: 100,000 yuan (total budget).

Priority level: II.
Source of funding: Hainan Department of Finance.

Action 1.5 Improve infrastructure at BNNR

Objective: Targeting limitation V (insufficient infrastructure), complete the implementation of BNNR's second master plan by 2025, and improve infrastructure for protection, research, monitoring, and public education through gradual increase of financial resources.

Activities:

(1) Complete the development and appraisal of "Bawangling National Nature Reserve Implementation Plan" by 2016, and submit it to the State Forestry Administration for approval in order to obtain financial support. The Implementation Plan aims to upgrade 5 km of patrol trails, build ecological monitoring stations, expand and upgrade current exhibition and education rooms, and upgrade the facilities and equipment of the monitoring stations by 2020.

Indicator and outcome: Status of investment and construction of BNNR's second master plan by 2020.
Leading organization: BNNRMO.
Budget: 11.66 million yuan, budgeted within BNNR's master plan (Table 5.1).
Priority level: III.
Source of funding: Hainan Department of Finance, budgeted within BNNR's master plan.

Table 5.1. Costs for improving infrastructure at BNNR.

Item	Amount (Y)	Notes
1.5.1 Patrol trail upgrade	850,000 (1,700,000/km × 5 km)	
1.5.2 Ecological monitoring stations	1,000,000 (200,000 × 5 stations)	
1.5.3 Meteorological monitoring stations	900,000 (300,000 × 3 stations)	
1.5.4 Hydrological monitoring stations	600,000 (200,000 × 3 stations)	
1.5.5 Wildlife monitoring equipment	500,000	
1.5.6 Educational facility	3,160,000	
1.5.7 Educational materials	17,970,000	Lighting, sound, office furniture, computers, broadcasting equipment, multi-media equipment, educational vehicles etc.
1.5.8 Electricity and communications	2,090,000	
1.5.9 Facilities for staff living quarters	16,850,000	Plumbing, office supplies, etc.
1.5.10 Other	1,920,000	Management, piloting, supervision
Total	**11,660,000**	

Table 5.2. Construction budget for Hainan Gibbon Research and Monitoring Centre.

Item	Amount (Y)	Notes
1.6.1 Construction of office buildings	3,000,000 (3,000/m^2 × 1,000 m^2)	Priority level: III
1.6.2 Standard scientific equipment	500,000	Priority level: II
1.6.3 Construction of wildlife rescue station	750,000 (2,500/m^2 × 300 m^2)	Priority level: III
1.6.4 Animal enclosures	640,000 (800/m^2 × 800 m^2)	Priority level: III
1.6.5 Equipment	500,000	Priority level: II (office equipment, vehicle, wildlife monitoring and tracking equipment)
Total	**5,390,000**	

Table 5.3. Estimated running cost of Hainan Gibbon Research and Monitoring Centre.

Item	Amount (Y/year)	Notes
1.6.6 Staff salary (including all legal benefits)	600,000 (50,000/month per person × 12 months/year per person × 10 people)	Priority level: II
1.6.7 Utilities	120,000 (10,000/month × 12 months/year)	
1.6.8 Transportation (fuel and maintenance of staff motorcycles)	70,000	
1.6.9 Vehicle fuel and maintenance	240,000 (10,000/month per vehicle × 2 vehicles × 12 months/year)	
1.6.10 Daily office expenses	120,000 (10,000/month × 12 months/year)	
1.6.11 Research and monitoring projects	300,000	
Total	**1,450,000**	

Action 1.6 Establish Hainan Gibbon Research and Monitoring Centre

Objective: Targeting limitation VI (lack of mechanisms for information sharing or effective communication) and limitation VIII (low management and monitoring skills), establish a Hainan Gibbon Research and Monitoring Centre.

Activities: Form a working team of 10 staff, and acquire land to construct the main building and wildlife rescue station of the centre (2,000 m^2).

Indicator and outcome: Working team in place, and infrastructure and facilities for centre completed by 2020.

Leading organization: BNNRMO.

Budget: A construction budget of 5.39 million yuan (Table 5.2); estimated running cost for salaries, activities, and management is 1.45 million yuan per year at full capacity, which should be included in the annual fiscal budget (Table 5.3). Total investment is 6.84 million yuan; budget for Priority Level II actions is 2.45 million yuan (equipment and running costs of centre); budget for Priority Level III actions is

4.39 million yuan (construction of centre). Costs of construction and equipment are already budgeted within BNNR's master plan.
Source of funding: Hainan Department of Finance; partly budgeted in BNNR's master plan.

Action 1.7 Build capacity for patrolling and law enforcement
Objective: Targeting limitation VIII (low management and monitoring skills), ensure fair wages and benefits of staff, and improve work safety by providing training in law enforcement.
Activities:
(1) In 2016, increase financial support for patrolling and law enforcement in BNNR's annual fiscal budget.
(2) In 2016-2017, set standards for patrolling and law enforcement, including patrol routes, work procedures and standardized data sheets, and develop and introduce a digital patrolling and law enforcement system.
(3) In 2017-2018, provide training for patrolling and law enforcement staff, and develop patrolling and law enforcement guidelines.
(4) In 2018-2019, establish a platform for sharing patrolling and law enforcement data.
Indicator and outcome: Patrolling and law enforcement guidelines, work procedures and standards, and patrolling and law enforcement platform developed.
Leading organization: BNNRMO.
Supporting organizations: BFB, Bawangling Forest Police.
Budget: 300,000 yuan per year (total of 1.5 million yuan over five years), gradually increase input (equipment for law enforcement and fieldwork).
Priority level: I.
Source of funding: Hainan Department of Finance.

Action 1.8 Establish Hainan Gibbon Conservation Committee
Objective: Targeting limitation VI (lack of mechanisms for information sharing or effective communication), establish a Hainan Gibbon Conservation Working Group and a Hainan Gibbon Scientific Advisory Board to enhance science-based conservation, collaboration and effectiveness of management through improved communication. The working group should meet regularly to discuss work plans and update work progress, and with regular production and dissemination of newsletters to ensure transparency and promote gibbon conservation. Experts from the Chinese Primatological Society and other professional organizations will be invited to form an advisory board, to help authorities develop guidelines and plans for Hainan gibbon monitoring and research, evaluate and integrate monitoring and research results, and facilitate the application of these results for conservation.
Activities: Effective communication and cooperation between authorities and experts is a key to effective protection of the Hainan gibbon. Establishing a working group and scientific advisory board can therefore facilitate the implementation of conservation actions, and ensure that relevant information is circulated effectively.

Table 5.4. Estimated cost for Hainan Gibbon Conservation Committee.

Item	Amount (Y)
Operation expenses	60,000
Meetings (including transport and subsistence)	300,000
Printing and publicity	40,000
Total	**400,000**

The working group should be divided into three functional groups: leadership, executive, and consultative (advisory board). The leadership and executive groups comprise personnel associated with the implementation of the action plan, and the advisory board comprises Chinese and international experts. Together, these functional groups will enhance research and management of the Hainan gibbon at an international level, and will promote awareness and support in the international community.

(1) In 2015, form all three functional groups within the Hainan Gibbon Conservation Working Group, appointing personnel to coordinate and arrange key activities.
(2) Hold annual meetings of the Hainan Gibbon Conservation Working Group, to evaluate work progress over the previous year and plan work for the next year; hold additional smaller-scale meetings for specific conservation actions; produce annual reports; Scientific Advisory Board also oversees and provides technical advice for all activities conducted by the Research and Monitoring Centre.

Indicator and outcome: Hainan Gibbon Conservation Committee established by 2017, to provide guidance and support to Hainan gibbon conservation.
Leading organization: HFB.
Supporting organizations: BNNRMO, research institutes, NGOs.
Budget: 400,000 yuan per year (total of 2 million yuan over five years) (Table 5.4).
Priority level: III.
Source of funding: Hainan Department of Finance.

Action 1.9 Develop Emergency Response Plan for the Hainan gibbon

Objective: Targeting limitation VII (lack of Emergency Response Plan), identify specific actions to respond to any unpredictable, catastrophic events that may jeopardise the surviving BNNR gibbon population, such as forest fire, extreme climate events, or disease epidemic. Response actions may include food provisioning, satellite collar tracking, disease control, vaccination, ex-situ translocation, or captive breeding. Identification of appropriate responses to emergency events must also be associated with development of approval and implementation mechanisms for these responses, and provisioning of necessary manpower and financial support for such actions.

Activities:

(1) In 2015–2016, simulate various climate change scenarios and extreme climate events, and analyze the risks and impacts of these scenarios. Convene a workshop to discuss the Hainan Gibbon Emergency Response Plan, inviting Chinese and

international experts, and subsequently develop the Hainan Gibbon Emergency Response Plan.

(2) In 2017–2018, confirm and approve all details of the Hainan Gibbon Emergency Response Plan with the relevant authorities, including approval and implementation mechanisms.

(3) After 2019, update (and approve) the Hainan Gibbon Emergency Response Plan every year to be in line with the latest scientific thinking.

Indicator and outcome: Approved Emergency Response Plan, with specific population/environmental indicators that act as triggering points for the plan included in the daily monitoring routine of the reserve.

Leading organization: ZSL.

Supporting organizations: BNNRMO, Chinese Academy of Forestry, other organizations.

Budget: Total of 2 million yuan for Phase I.

Source of funding: National-level scientific research funding, public sector.

5.2 Research and Monitoring Projects

Action 2.1 Investigate impacts of human activities such as NTFP collection and illegal hunting

Objective: Targeting threat I (serious human disturbance and dependence of surrounding communities on forest resources), evaluate the status of natural resource utilization and illegal hunting, and their impacts on wildlife.

Activities:

(1) Study on NTFP collection activities: Through community interviews, market research and research on criminal cases, investigate the spatial pattern and magnitude of different types of NTFP collection in the reserve, the economic value and percentage of local income provided by collected NTFPs and the general characteristics of NTFP collectors, and evaluate the impacts of these activities on the Hainan gibbon.

(2) Study on illegal hunting: Through interviews with hunters, research and analysis of forest crime cases, characterize target species and determine the spatial and temporal patterns and magnitude of local hunting, the economic values of target species, the income contribution provided by hunting and the general characteristics of hunters, and evaluate the impacts of hunting activities on the Hainan gibbon.

(3) Other activities: Determine the likely impact on the Hainan gibbon of illegal logging, fire, and tourism.

Indicator and outcome: Study reports.

Leading organization: ZSL, BNNRMO.

Supporting organizations: BFB, Bawangling Forest Police, local government departments, Chinese Academy of Forestry, Hainan University.

Budget: Total of 1 million yuan.

Priority level: III.

Source of funding: National-level scientific research funding.

Action 2.2 Establish an integrated digital monitoring system

Objective: Targeting limitation VIII (low management and monitoring skills), set up a digital monitoring system for the Hainan gibbon population and its habitat within BNNR to improve current monitoring.

Action 2.2.1 Establish digital monitoring system to track human disturbance and Hainan gibbon movement in real time

Objectives: Establish standardized field patrol protocols, develop digital monitoring system for BNNR and its associated research and conservation programmes, analyze human disturbance patterns within Hainan gibbon group home ranges, and monitor movements of gibbon groups.

Activities:

(1) In 2016, introduce digital patrol system, including set-up, configuration and staff training.
(2) In 2017, design an integrated digitalized monitoring system for BNNR and plan for its set-up.

1. Standardize survey, monitoring and law enforcement plan for BNNR

Create a management plan that links four levels of governance connecting BNNRMO, the sub management office, station, and site, and that covers surveys, patrols, monitoring, and law enforcement activities. Clarify the information that each management site is required to collect, manage reserve activities at the respective level, and collate all relevant information in a centralized system at BNNRMO.

2. Digitize data management

Managers collect GPS points, images, audio and video recordings using advanced personal digital assistants (PDAs), record relevant information during routine patrols, and upload data to a central data management centre in real-time or when internet connection is available. This will increase management timeliness and relay vital information to reserve directors or law enforcement agencies. Managers will regularly download survey, patrol, monitoring, and law enforcement data. A centralized information system will visualize the activities of monitoring team members, and analyze data on wildlife distribution, vegetation phenology, human disturbance and poaching within the reserve, and will rapidly generate reports on survey, patrol, monitoring, and law enforcement activities.

3. Building the system

Each management site will be equipped with 2-5 PDAs; each management station will be equipped with two desktop computers; each management sub-station will be equipped with one desktop server, two desktop computers, one laptop computer; a central control centre will be established at BNNRMO, equipped with one desktop server, four desktop computers, two laptop computers, one 4 × 3 m monitor screen, and broadband internet connection with 10M bandwidth and static IP.

4. Training

Collaboration with scientific research institutions will support design for monitoring

Table 5.5. Budget for establishing a digitized monitoring system.

Item	Amount (Y)
Training	100,000
Expert consultancy fees	50,000
System development	400,000
Equipment and computers	250,000
Total	**800,000**

projects, patrol routes and law enforcement plans, including what data to collect and management protocols, and will provide staff with necessary training. Reserve staff and management personnel will be regularly provided with technical training to increase management capacity, data analysis skills and science-based decision making, to achieve standardized, digitized, and scientific field monitoring in the reserve.

Indicator and outcome: Regular (monthly, quarterly, or annual) reports on standardized patrol protocols, digital monitoring system, human disturbance patterns and Hainan gibbon activity.

Leading organization: BNNRMO.

Supporting organizations: Chinese Academy of Forestry, scientific research institutions.

Budget: Total of 800,000 yuan (Table 5.5).

Priority level: I.

Source of funding: National-level scientific research funding, public sector.

Action 2.2.2 Establish digitized monitoring system for Hainan gibbon groups and their habitat

Objectives: Using Geographical Information Systems (GIS), Remote Sensing (RS), Global Positioning Systems (GPS), automated field monitoring equipment, and 3D visualization techniques, and incorporating the new digitized patrol system outlined in Action 2.2.1, establish a digitized monitoring system focusing on the Hainan gibbon and its habitat. The system will become a platform for managing monitoring efforts and databases, performing data analysis and tracking gibbon groups, and will better coordinated and connected to visualize, digitize, and share information on Hainan gibbon monitoring and management.

Activities:

(1) In 2017, design and prepare automated and 3D visualization monitoring system.

(2) In 2018, develop and test system, and train staff.

Indicator and outcome: By 2019, digitized monitoring system fully operational, all equipment functioning to maximum capacity, providing highly accurate and comprehensive data for managers and researchers. Promote the digitization of management of protected areas, using this system as an example.

Leading organization: BNNRMO.

Supporting organizations: Chinese Academy of Forestry, ZSL.

Budget: Estimated investment of 5.7 million yuan (Table 5.6).

Table 5.6. Budget for Digital Monitoring System.

No.	Project	Amount (Y)	Notes
	Construction	**5,500,000**	
1	Facilities	(2,000,000)	Monitoring centre, computer lab, monitoring equipment, install tower (?)
2	Equipment purchase	(1,600,000)	4 forest fire monitoring sites, 10 wildlife visual/camera trapping sites, 20 sets of wildlife monitoring equipment, 10 sets of vegetation field data collection equipment, central control system, office supplies, computer accessories.
3	Supporting equipment	(300,000)	Electricity, cables.
4	Technical support	(800,000)	Monitoring center centralization system, data processing system
二	**Other**	**500,000**	Consultancy fees for design, assessment, management, construction supervision, and bidding
三	**Set up**	**300,000**	
四	**Maintenance**	**200,000**	40,000 yuan per year
	Total	**5,700,000**	

Priority level: II.
Source of funding: National-level scientific research funding, public sector.

Action 2.3 Systematic study of Hainan gibbon biology, ecology and habitat use
Objective: Targeting limitation IX (insufficient knowledge), conduct research on Hainan gibbon biology, ecology and habitat use.
Activities:

(1) **Studies on population status and spatial distribution**
Based on data collected from interview surveys in Bawangling, Diaoluoshan, Jianfengling, Jiaxi, Limushan, Wuzhishan and Yinggeling and data on vegetation cover across Hainan, identify areas outside known gibbon distribution with high potential of gibbon survival, and conduct new gibbon field surveys using acoustic monitoring and bioacoustic technologies.

(2) **Studies on gibbon habitat**
Research the vegetation, hydrology, climate, soil conditions, and other environmental parameters associated with current Hainan gibbon distribution, and analyze the impact of different ecological factors on gibbon habitat selection and behaviour, including moving, feeding and selection of sleeping sites. Using species distribution models, evaluate habitat suitability across BNNR and surrounding mountainous regions, identify the key factors that determine habitat suitability, analyze the ecological characteristics of optimal, suitable and sub-optimal areas of gibbon habitat, and use these results to produce a habitat distribution map to inform habitat restoration planning.

Table 5.7. Budget for gibbon and habitat studies.

Item	Amount (Y)
Population survey (community interview, field survey)	1,000,000
Habitat study	1,500,000
Reproductive behaviour study	600,000
Phenology study of food plants	600,000
Total	**3,700,000**

(3) **Studies on reproductive behaviour**

Investigate courtship, pair formation, mating, male replacement and parenting behaviours of the Hainan gibbon, as well as survival and development of young gibbons, and identify factors regulating and limiting population growth.

(4) **Studies on habitat phenology**

Hainan gibbons feed on different food plants during different seasons, and have different degrees of dependency on various foods. Therefore, it is important to carry out phenological research on major gibbon food plant species, including on different species at the same site, and on the same species at different sites (varying ecological conditions).

The above studies can be conducted simultaneously.

Indicator and outcome: Study reports.

Leading organization: BNNRMO.

Supporting organizations: Nature reserves, ZSL, KFBG, Hainan University.

Priority level: II.

Budget: Total of 3.7 million yuan (Table 5.7).

Source of funding: National-level scientific research funding, public sector.

Action 2.4 Explore bioacoustic technologies and drones (unmanned aerial vehicles or UAVs) as new monitoring techniques

Objective: Targeting limitation VIII (low management and monitoring skills), explore the application and development of new monitoring techniques.

Activities:

(1) In 2015, conduct bioacoustic experiments (playback and passive acoustic monitoring) and design workplan and procedures for other sites.

(2) In 2015–2016, conduct field survey (Action 2.3) with the help of bioacoustic technologies, and trial the effectiveness and practicality of using UAVs to record and monitor gibbon activities.

(3) After 2017, incorporate these new techniques into daily monitoring work.

Indicator and outcome: Study and evaluation reports.

Leading organization: BNNRMO.

Supporting organizations: ZSL, KFBG, Chinese Academy of Forestry.

Budget: Bioacoustic experiments = 500,000 yuan, drones = 3 million yuan (in 2016); total of 3.5 million yuan.

Priority level: II.

Table 5.8. Budget for monitoring system of human activities.

Item	Amount (Y)
50 infrared cameras with GPS	60,000 (2,000 yuan each × 30)
CCTV monitoring system	140,000
Construction of checkpoints	1,100,000
Operation	500,000 (100,000 per year)
Other materials	200,000
Total	**2,000,000**

Source of funding: National-level scientific research funding, public sector.

Action 2.5 Establish Hainan gibbon individual identification profiles

Objective: Targeting limitation VIII (low management and monitoring skills), develop individual identification guide and identification profiles for all known gibbons.

Activities:

(1) In 2016, develop individual gibbon identification profiles using written descriptions, visual and audio data and genetic samples, supported with facial recognition software, acoustic analysis and DNA analysis techniques, and update these profiles regularly.

(2) In 2017, develop an individual identification guide that is accurate, user-friendly, and open for public use.

Indicator and outcome: Individual identification profiles to be completed in 2016, and individual identification guide to be completed and put into use in 2017.

Leading organization: BNNRMO.

Supporting organizations: Chinese Academy of Forestry, ZSL, KFBG.

Budget: Total of 500,000 yuan.

Priority level: II.

Source of funding: National-level scientific research funding, public sector.

5.3 Conservation and Management Projects

Action 3.1 Establish automated monitoring system for human activities and registration system for people entering the reserve

Objective: Targeting threat I (serious human disturbance and dependence of surrounding communities on forest resources), establish a system to control and closely monitor all human activities (collection of NTFPs and poaching) inside BNNR by requiring registration to enter the reserve.

Activities:

(1) In 2016, set up checkpoints at major traffic junctions, put into place a registration system for people entering and leaving the reserve, and inform them about critical gibbon areas within BNNR.

(2) In 2017, install an automated monitoring system in key areas with standard cameras and infrared cameras.

Indicator and outcome: Reduction of human activities and illegal activities,

registration records, human activities records.
Leading organization: BNNRMO.
Supporting organizations: Chinese Academy of Forestry.
Budget: Total of 2 million yuan (Table 5.8).
Priority level: I.
Source of funding: Hainan Department of Finance.

Action 3.2 Enhance protection of core gibbon habitat
Objective: Targeting threat I (serious human disturbance), improve the protection of core gibbon habitat.
Activities:
(1) Conduct new field research using vegetation plots within gibbon home ranges, and incorporating environmental variables such as landscape, vegetation type, vegetation characteristics, dominant species, and levels of human disturbance, to understand Hainan gibbon habitat characteristics and requirements and identify the boundary of core gibbon habitat at BNNR.
(2) Clearer marking of core zone gibbon habitat, and establish an information system including boundary markers, conservation education signage, and warnings against illegal behaviour.
(3) Promote the importance of protecting core gibbon habitat in communities around the reserve, through distribution of pamphlets and other printed material.
Indicator and outcome: Establishment of signage system, reduced human activities in core gibbon habitat.
Leading organization: BNNRMO.
Supporting organizations: KFBG.
Budget: Total of 500,000 yuan (Table 5.9).
Priority level: I.
Source of funding: Hainan Department of Finance.

5.4 Habitat Restoration Projects

Action 4.1 Restore degraded habitats
Objective: Targeting threat II (serious fragmentation of gibbon habitat), increase the geographic extent, quality and connectivity of current gibbon habitat at BNNR.

Table 5.9. Budget for core zone habitat conservation.

Item	Amount (Y)
Research and monitoring	150,000
Signage system	250,000
Design and printing of public outreach materials	100,000
Total	**500,000**

Table 5.10. Budget for habitat restoration.

Item	Amount (Y)
Nursery construction	10,000
Nursery operation	1,500,000 (30,000 per year)
Drafting and approving the restoration plan	400,000
Seedling planting and maintenance	500,000 (100,000 per year)
Evaluation of outcomes	100,000
Total	**2,600,000**

Activities: Establish a nursery of 0.5 km^2 near Dongsi or Nanchahe monitoring stations to provide seedlings required for habitat restoration. Select priority habitat restoration area(s) of at least 20 km^2 (low-elevation areas directly connected with current gibbon habitat) and plant native tree and liana species (include preferred and other gibbon food species, and species used for gibbon activity and sleeping) on the basis of action 2.3. Additional area(s) of secondary forest should also be planted with gibbon food plants, and pine plantation within BNNR should be planted with broadleaf species.

(1) In 2016–2017, select priority areas and plant species for restoration using results of action 2.3, develop the "Bawangling Gibbon Habitat Restoration Plan", establish native seedling nursery, and start clearing exotic pines (permission required from HFB). The impacts of soil alkalinity in pine plantations should be taken into consideration during habitat restoration.

(2) In 2017–2020, tree planting and regular evaluation (every six months).

Indicator and outcome: Completion of "Bawangling Gibbon Habitat Restoration Plan" before 2017, and completed planting of native seedlings by 2019 with survival rate of >80%.

Leading organization: BNNRMO.

Supporting organizations: KFBG, ZSL.

Budget: Total budget of 2.6 million yuan for Phase I (Table 5.10).

Priority level: I.

Source of funding: Hainan Department of Finance, public sector.

Action 4.2 Construct ecological corridors

Objective: Targeting threat II (serious fragmentation of gibbon habitat), increase the connectivity of current and potential gibbon habitat by establishing canopy corridors and wildlife habitat corridors.

Activities:

(1) **Establish arboreal migration corridors for gibbons**

Construct three 200 metre-long canopy corridors along Dongganxian Road and Dongwulu Road (potentially near the 3 km marker) to facilitate movement/dispersal of gibbons and other arboreal animals, using man-made rope and bamboo structures and through planting of large trees and woody lianas 50 metres on both sides of the road. Planting of food trees could increase utilization of these migration corridors.

Table 5.11. Budget for ecological corridor construction (Phase I).

Item	Amount (Y)
Construction of canopy migration corridors	1,730,000
Construction of habitat corridors	360,000
Wildlife attraction points	100,000
Monitoring centre and station	780,000
Plant nursery	240,000
Information signage	90,000
Other	350,000
Total	**3,650,000**

(2) **Establish animal habitat corridors**

Within 100 m on both sides of Dongganxian Road, enhance gibbon habitat quality and facilitate natural forest restoration by removing plantations (especially exotic pines) and planting native broadleaf species. Put signs up along the road for drivers to reduce speed and to not use their horns.

(3) **Wildlife attraction points**

Construct ten water or salt ponds within the animal habitat corridors to increase natural movement and dispersal of animals, and place artificial bird nests on mature trees around these ponds to attract birds.

Indicator and outcome: Completion of "Bawangling Ecological Corridor Construction Plan", and complete implementation of this plan by 2020.
Leading organization: BNNRMO.
Supporting organizations: KFBG, ZSL.
Budget: Total of 3.65 million yuan (Table 5.11).
Priority level: II.
Source of funding: National-level scientific research funding, public sector.

5.5 Community Co-Management, Development and Environmental Education

Action 5.1 Establish trial sites for community co-management

Objective: Targeting limitation VI (lack of mechanisms for information-sharing or effective communication) and limitation X (low public awareness of conservation), explore ways to achieve both nature protection and local economic development.
Activities:

(1) **Initial discussion of co-management goals with key stakeholders**

Conduct community outreach to introduce community-based natural resource management, and reach a consensus on co-management goals through interactive discussions on natural resource protection and sustainable use.

(2) **Establish co-management mechanism**

Decide on co-management area, types of natural resources, and communities to be involved in the co-management programme through discussions with representatives of key stakeholder groups, and establish a co-management mechanism.

(3) **Conduct survey on natural resource utilization in co-management area**
Conduct socio-economic survey to understand types, quantities, distribution, utilization and management status of natural resources used by local communities, and identify major challenges in sustainable management.

(4) **Develop protection and development plan for natural resources**
Analyze status of natural resource use, limitations to economic/livelihood development, main conflict areas, and possible solutions. Define co-management area into different functional areas, and develop management plans for these areas to achieve sustainable development. Discuss sustainable use of natural resources around BNNR, and establish appropriate management mechanisms.

(5) **Provide co-management training**
Invite experts to provide training and field guidance on co-management, including learning tours and field visits to learn from other successful scenarios.

Indicator and outcome: Programme reports for outreach, training, workshop activities and natural resource use survey, and natural resource protection/development plans.
Leading organization: BNNRMO.
Supporting organizations: BFB, local governments, FFI, KFBG.
Budget: Total budget of 2.85 million yuan (Table 5.12).
Source of funding: Hainan Department of Finance, public sector.

Action 5.2 Enhance public environmental and conservation awareness

Objective: Targeting limitation X (low public awareness of conservation), promote Hainan gibbon as Hainan's ecological logo.

Education and economic status are low in communities around BNNR, with low conservation awareness or motivation for nature conservation, resulting in a need to promote biodiversity conservation among these communities. By promoting the Hainan gibbon as Hainan's ecological logo, conservation awareness of the species can be quickly improved, which will also help promote eco-tourism in Hainan. Raising public awareness is also a critical step to increase protection efforts from the Central Government. Activities such as gibbon adoption and name nomination can act as publicity and fundraising tools.

Activities: Conduct publicity campaigns for the Hainan gibbon in primary and secondary schools and universities around Hainan, including activities such as exhibitions, talks, art contests and wildlife conservation volunteer activities. Invite experts to give talks about environmental and species protection and Hainanese biodiversity. Produce and distribute promotional materials to publicize ecological and

Table 5.12. Budget for community co-management programme.

Item	Amount (Y)
Outreach and training	750,000 (150,000 per year)
Operation cost of co-management committee	1,000,000 (200,000 per year)
Salary	600,000 (120,000 per year)
Survey and planning	500,000
Total	**2,850,000**

environmental knowledge, laws and regulations. Make use of newspapers, radio, television, internet and social media to increase public education. Conduct community outreach (e.g. put up posters) in communities around BNNR to promote the awareness of relevant laws and regulations, and encourage community engagement in wildlife protection and education activities.

(1) In 2016, organize and conduct promotional activities on school and university campuses across Hainan in collaboration with NGOs that are interested in local biodiversity conservation. Form a "Wildlife Volunteer Team" to carry out awareness-raising activities in communities around BNNR.
(2) In 2017–2020, produce a range of promotional materials about Hainan gibbon conservation and Hainan's natural environment, promote these issues through different types of media, and establish a media-reserve-volunteer interactive platform.

Indicator and outcome: Activity reports, promotional materials, media coverage.
Leading organization: BNNRMO.
Supporting organizations: Hainan University, Hainan Normal University, China Primate Specialist Group, KFBG, ZSL, FFI.
Budget: 400,000 yuan per year, with a total budget of 2 million yuan.
Priority level: II.
Source of funding: Public sector.

Action 5.3 Develop agroforestry, provide technical training, certify products, and develop market channels

Objective: Targeting threat I (serious human disturbance and dependence of surrounding communities on BNNR's forest resources), develop agroforestry outside the reserve boundary as an alternative livelihood, provide an agroforestry development plan appropriate to local ecological conditions and biodiversity and the status of local agriculture and economic development, and provide appropriate training and financial support to promote the adoption of sustainable development. Consider the possibility of small-scale economic activities involving local community members (e.g. bee-keeping, medicinal herb planting) in the forest understory of the experimental zone of BNNR.

Activities:

(1) In 2017–2018, conduct an agroforestry feasibility study and develop a project plan.
(2) In 2018–2020, conduct agroforestry demonstrations and training, provide financial support, conduct publicity activities and quality control, and develop market channels.

1. Agroforestry feasibility study

Employ a relevant research institute to conduct an agroforestry feasibility study. Make appropriate development plans sensitive to local ecological conditions and biodiversity and the status of local agriculture and economic development, including required facilities, management measures, technical support and financial resources. The plan should aim for sustainable development that minimizes the risk of future

market changes and fluctuations.

2. Agroforestry demonstration project and vocational training

Invite relevant external experts to give training to local farmers on agricultural methods that can improve their level of production and economic income, and that incorporate both traditional processing methods and product commercialization.

3. Provide farmers with necessary financial assistance / loans / materials / equipment

Provide necessary financial assistance to farmers, including grants and loans. Required materials, such as seeds and fertilizers, should be provided free of charge or at production cost; if special equipment is needed it should also be provided free of charge or rented at a low cost.

4. Develop market channels

In order to ensure market sales of agricultural products, and to achieve sustainable development, it will be necessary to provide market analysis, publicity and promotion, quality control, strategic planning and other technical support services.

Indicator and outcome: Agroforestry feasibility study report, agroforestry development plan, agricultural production reports.

Leading organization: BNNRMO.

Supporting organizations: Kunming Institute of Botany, Southwest Forestry University.

Budget: Total budget of 11.55 million yuan (Table 5.13).

Priority level: III.

Source of funding: National-level scientific research funding, public sector.

Table 5.13. Budget for agroforestry development.

Item	Amount (Y)
Feasibility study	300,000
Demonstration project	500,000
Publicity and training	750,000 (150,000 per year)
Financial assistance	8,000,000
Materials and equipment	2,000,000
Total	**11,550,000**

第六章　资金预算与保障措施

一、资金预算摘要

表 6.1 保护行动预算一览表

行　动	预算金额（万元）	优先性等级	投资渠道
目标 1：完善保护法制、保护区建设，加强部门管护能力			
行动 1.1 增加编制、健全机构，并逐步引进专业技术人才	95 满编后每年投入	I	省财政
行动 1.2 理顺管理体制	10	II	省财政
行动 1.3 争取日常经费投入	100	II	省财政
行动 1.4 颁布《海南霸王岭国家自然保护区管理条例》	10	II	省财政
行动 1.5 完善保护区基础设施建设	1166	III	省财政
行动 1.6 组建科研监测中心			
- 1.6.1 办公楼建筑工程	300	III	省财政
- 1.6.2 常规科研设备	50	II	省财政
- 1.6.3 野生动物救护站建筑工程	75	III	省财政
- 1.6.4 笼舍	64	III	省财政
- 1.6.5 设备	50	II	省财政
- 1.6.6 事业费	145 组建完成后每年投入	II	省财政
行动 1.7 巡护与执法能力建设	150	I	省财政
行动 1.8 组建海南长臂猿保护工作委员会	200	III	省财政
行动 1.9 编写《海南长臂猿应急预案》	200	II	国家项目、社会团体
目标 2：加强科研与监测水平			
行动 2.1 调查评估林副产品采集及盗猎等人为活动对长臂猿的影响	100	III	国家项目
行动 2.2 建立数字化综合监控与分析体系			
- 2.2.1 建立数字化巡护系统	80	I	国家项目、社会团体
- 2.2.2 建立数字化监测系统	570	II	国家项目、社会团体
行动 2.3 系统开展长臂猿生物生态学和栖息地特征调查研究	370	II	国家项目、社会团体
行动 2.4 开展生物声学实验和无人机遥测新监测技术探索	350	II	国家项目、社会团体
行动 2.5 建立海南长臂猿个体户籍档案管理体系	50	II	国家项目、社会团体

目标 3：加强日常巡护和保护管理			
行动 3.1 建立自动人为活动监测体系，对入区人员实施登记管理	200	I	省财政
行动 3.2 现有核心栖息地保护工程	50	I	省财政
目标 4：增加长臂猿栖息地的面积、质量和连通性			
行动 4.1 退化栖息地改造工程	260	I	省财政、社会团体
行动 4.2 生态廊道建设	365	II	省财政、国家项目
目标 5：加强社区公管，促进社区经济发展，加强公众环境教育			
行动 5.1 周边社区自然资源共管试点	285	II	省财政、社会团体
行动 5.2 加强公众环境教育与意识培养	200	II	社会团体
行动 5.3 发展混农林业，提供相关技能培训，开拓销售渠道	1155	III	国家项目、社会团体
行动共 21 项	共 6,650 万元 优先性等级 I：共 835 万元 优先性等级 II：共 2755 万元 优先性等级 III：共 3060 万元		

二、资金预算依据

1. 国家林业局计资司《关于规范国家级自然保护区总体规划和建设程序有关问题的通知》（[2000]64 号）
2. 国家林业局颁发的《自然保护区工程项目建设标准》（试行）2002 年
3. 国家林业局《自然保护区工程设计规范》2004 年
4. 国家和海南省的相关政策法规、规划（实施方案）文本及建设标准
5. 现行市场价格

三、资金筹措

1. 积极争取国家物种保护项目资金：海南省有着独特的岛屿生态系统与生物多样性，应积极争取国家野生动物调查和保护项目的资金，和自然保护区的基本建设和能力建设资金。

2. 积极争取各级财政投入：保护、科研、监测、宣教等建设投资主要依靠国家和地方政府预算内拨款。除积极争取国家级保护区建设工程资金和中央财政补助项目资金外，当地县级政府要将海南长臂猿保护纳入当地国民经济和社会发展规划，保护和管理所需资金列入当地政府的年度财政预算予以安排落实，层层落实，确保稳定的资金来源。

3. 积极争取国家和海南省科研项目经费：做好海南长臂猿的科研项目立项工作，积极争取国家和省内各类科研经费支持。

4. 全社会募集资金：与社会团体和非政府组织密切联系及合作，积极争取国际、国内合作项目，动员公众拓展资金渠道。

5. 整合项目资金：整合天然林保护、退耕还林、生态公益林等国家重点生

态保护工程以及森林防火体系建设、森林生态效益补偿资金。

四、保障措施

1. **组织保障**

各级政府应切实按照有关程序，遵循精简、统一、高效的原则，建立健全管护机构，对保护行动的实施全程监管。各县、乡级有关部门应配合与支持霸王岭国家级保护区管理局的工作。

2. **政策保障**

(1)建立目标责任制。各级政府和管理部门、单位要层层建立目标责任制。

(2)规范建设和管理。严格按照国家基础建设的有关法律法规，认真做好项目的建设和管理；严格执行国家基础建设程序，按规划立项，按项目进行动态管理，按设计组织施工，按进度安排建设资金，按成效进行考核。

(3)建立和完善质量监督体系。严格按照国家颁布的标准组织设计和施工，实行监理制度，每年对建设情况进行现场检查、考核和评估，确保质量。

(4)定期交流机制。通过海南长臂猿保护工作委员会的年会，单位之间就保护行动的执行情况进行汇报，且就需要协调解决的问题进行讨论。

3. **资金保障**

海南长臂猿保护是公益事业，需多渠道筹集保护资金。首先应积极争取国家和地方各级财政投入；其次要整合各类项目资金，优先进行海南长臂猿的保护；第三要积极争取国际组织资金援助、鼓励企业和个人参与海南长臂猿各项保护建设投资。

海南长臂猿保护资金采用报账制度，对资金来源、使用、节余及成本控制等作出详细规划。项目建设资金单独记账，单独核算，专款专用，严禁挪作他用。财务要接受项目管理机构、审计部门的检查、监督和审计。

4. **科技与人才保障**

(1)各级政府要重视与海南长臂猿保护相关的科学研究与人才培养，保护科研成果，建设信息服务和技术交流平台。

(2)依托现有保护区、科研院（所）、高等院校等，充分利用其现有科研设施设备及相关人员，加强合作，为海南长臂猿保护工作提供科技支撑。

(3)加强人才培养，保护区和相关科研单位建立合作关系，有针对性地对保护区人员进行专业技能培训，为保护区培养本土的保护科研力量。

5. **宣传保障**

海南长臂猿保护是一项社会性、群众性、公益性工作，需要社会各界的关注和参与，把加强宣传、提高全社会保护意识作为一项重要工作，发挥各种自然保护组织、协会和社团在宣传方面的作用，调动社会各界参与野生动物保护事业。充分利用网络、广播、电视、报刊、杂志等多种形式，宣传海南长臂猿保护的重要意义。

6. 监督与评估保障

(1)**建立监督机制，保障保护行动的落实**

首先保护区管理局在实施保护行动计划上须进行自我监督，其次是通过海南长臂猿保护工作委员会监督行动计划的执行情况。同时，通过电视、电影、广播、互联网等各种媒体，加大宣传力度，宣传海南长臂猿保护的重要性、紧迫性与保护管理现状，让公众充分认识保护野生动物是每个公民的义务，赋予

公众知情权、参与权与监督权。

(2)建立评估体系，保障保护管理工作的科学性

依托科研院校，充分利用现有科研设施设备及相关人员，加强合作，建立可量化的海南长臂猿保护、管理、科研等指标体系。通过对指标完成率的统计分析，不断进行保护管理措施的执行、评估和改进等，并积极推广先进适用的科研、科技成果，逐步健全海南长臂猿的管护制度、提高管护质量、完善管护体系。

Chapter 6 Budget and Justification

6.1 Budget Summary

Table 6.1. Budget for proposed actions.

Actions	Estimated Budget (Y)	Priority Level	Source of Funding
Target 1: Regulations, infrastructure and capacity building			
Action 1.1 Increase staff capacity and introduce professional and technical personnel	950,000; increase input each year after fully staffed	I	Hainan Department of Finance
Action 1.2 Improve institutional management	100,000	II	Hainan Department of Finance
Action 1.3 Increase funding for daily reserve operations	1,000,000	II	Hainan Department of Finance
Action 1.4 Issue "Bawangling National Nature Reserve Management Regulations"	100,000	II	Hainan Department of Finance
Action 1.5 Improve infrastructure at BNNR	11,660,000	III	Hainan Department of Finance
Action 1.6 Establish Hainan Gibbon Research and Monitoring Centre			
- 1.6.1 Construction of office buildings	3,000,000	III	Hainan Department of Finance
- 1.6.2 Research equipment	500,000	II	Hainan Department of Finance
- 1.6.3 Wildlife rescue facility	750,000	III	Hainan Department of Finance
- 1.6.4 Captive facilities	640,000	III	Hainan Department of Finance
- 1.6.5 Equipment	500,000	II	Hainan Department of Finance
- 1.6.6 Running costs	1,450,000; increase input each year after completion	II	Hainan Department of Finance
Action 1.7 Build capacity for patrolling and law enforcement	1,500,000	I	Hainan Department of Finance
Action 1.8 Establish Hainan Gibbon Conservation Committee	2,000,000	III	Hainan Department of Finance
Action 1.9 Develop an Emergency Response Plan for the Hainan gibbon	2,000,000	II	National-level project, public sector
Target 2: Improve scientific research and monitoring			
Action 2.1 Investigate impacts of NTFP collection and illegal hunting	1,000,000	III	National-level project
Action 2.2 Establish integrated digital monitoring and data analysis system			
- 2.2.1 Establish digital patrol system	800,000	I	National-level project, public sector

- 2.2.2 Establish digital monitoring system	5,700,000	II	National-level project, public sector
Action 2.3 Study gibbon biology, ecology and habitat use	3,700,000	II	National-level project, public sector
Action 2.4 Explore bioacoustic technologies and UAVs as new monitoring techniques	3,500,000	II	National-level project, public sector
Action 2.5 Establish Hainan gibbon individual identification profiles	500,000	II	National-level project, public sector
Target 3: Improve regular monitoring and conservation management			
Action 3.1 Establish automated monitoring system for human activities and registration system for people entering the reserve	2,000,000	I	Hainan Department of Finance
Action 3.2 Enhance protection of core gibbon habitat	500,000	I	Hainan Department of Finance
Target 4: Increase the extent, quality and connectivity of gibbon habitat			
Action 4.1 Restoration of degraded habitat	2,600,000	I	Hainan Department of Finance, public sector
Action 4.2 Construct ecological corridors	3,650,000	II	Hainan Department of Finance, National-level scientific research funding
Target 5: Increase community co-management, development and environmental education			
Action 5.1 Establish trial sites for community co-management	2,850,000	II	Hainan Department of Finance, public sector
Action 5.2 Enhance public environmental and conservation awareness	2,000,000	II	Public sector
Action 5.3 Develop agroforestry, provide technical training and develop market channels	11,550,000	III	National-level scientific research funding, public sector
Total: 22 actions	Total: 66,500,000 yuan Priority Level I: 8,350,000 yuan Priority Level II: 27,550,000 yuan Priority Level III: 30,600,000 yuan		

6.2 Basis for Budget Estimation

(1) Secretary for Financial Planning, State Forestry Administration: "Notice on Issues Related to the Regulations on National Reserve Master Planning and Construction Procedures" (No. [2000] 64).
(2) State Forestry Administration: "Standards for Nature Reserve Construction" (trial), 2002.
(3) State Forestry Administration: "Design Specification for Nature Reserve Construction", 2004.

(4) Relevant policies, regulations, master plans, implementation plans and construction standards (national and provincial levels).
(5) Prices used in budget calculations are based on the average costs of respective items sourced locally in China.

6.3 Sources of Funding

(1) **Actively seek national project funding for species conservation**
Hainan is a unique island ecosystem and with globally important endemic biodiversity, and so relevant authorities and institutions should actively seek national funding for wildlife surveys and conservation projects on Hainan, as well as funding for nature reserve infrastructure development and capacity building.
(2) **Actively seek financial investment from all government levels**
Funding for environmental protection, research, monitoring and education now relies heavily on budget allocations from central and local governments. In addition to actively seeking project grants for national protected areas from the Ministry of Finance, relevant provincial, county and township governments should also incorporate Hainan gibbon conservation into economic and social development plans, and include the funding required for Hainan gibbon conservation and management in local government annual budgets to ensure stability of funding.
(3) **Actively seek funding for national and provincial scientific research projects**
The relevant authorities and institutions should actively seek national and provincial funding for scientific research projects on the Hainan gibbon.
(4) **Raise funds from the general public**
The relevant authorities and institutions should work closely with NGOs to develop national and international cooperation projects, and expand the source of funding to include the general public.
(5) **Integration of project funds**
Funding should also be obtained from ecological protection programmes such as the Natural Forests Protection Scheme, Grain-for-Green and Ecological Forests, as well as forest fire prevention schemes and ecological compensation funds for species protection.

6.4 Assurance

(1) **Institutional assurance**
Governments at all levels should implement and monitor Hainan gibbon conservation activities in accordance with relevant procedures, ensure streamlined, centralized, and efficient management, and designate a responsible authority to oversee the implementation of the conservation actions. The relevant county and township governments should work with BNNR to improve reserve management.
(2) **Policy assurance**
1. Designate appropriate governmental departments and units to be held accountable at each level of governance.
2. Standardize construction protocols and management. Strictly following appropriate national regulations and procedures, manage projects dynamically, construct following planned timelines, allocate funding based on progress, and assess progress based on results.

3. Establish a quality control procedure. Annual on-site inspection and infrastructure evaluation should be conducted, with financial inspection and audits for all ongoing projects to ensure construction quality.

4. Hold regular meetings. Through annual meetings of the Hainan gibbon conservation working group, organizations should communicate with each other regarding any challenges in implementing conservation actions and problem-solve collaboratively.

(3) **Funding assurance**

Hainan gibbon conservation is also a public responsibility that requires more channels to raise funds. First, financial input should be increased from different levels of government. Second, various types of project funds should be integrated to prioritize the protection of the Hainan gibbon. Third, financial support should be sought actively from overseas and from the local private sector and private donors and individuals.

Funding for Hainan gibbon conservation actions should be carefully managed. The source of funding, purpose, remaining amount as well as regulating the prices of supplies should be planned carefully. Funding designated for each action should not be used for other purposes. Finances should be monitored and audited by relevant departments.

(4) **Technology and expertise assurance**

Authorities should acknowledge and follow the recommendations of scientific research, and should increase capacity and strengthen cooperation to provide scientific and technological support for Hainan gibbon conservation.

1. All levels of government should emphasize the importance of capacity building for personnel involved in Hainan gibbon conservation, conservation science research, and creating an information transfer platform.

2. With support from nature reserves, scientific institutions, and academia, fully utilize available resources and relevant personnel, increase collaboration, and provide a scientific evidence-base for Hainan gibbon conservation.

3. Increase capacity building through establishing collaboration between reserves and scientific institutions, and through targeted training sessions on specific skills and technique for reserve staff, enabling nature reserves to better conduct conservation and research.

(5) **Publicity assurance**

Hainan gibbon conservation is a social responsibility that requires the attention and participation of all sectors of society. More efforts should be made to raise public conservation awareness, and to make use of publicity efforts from NGOs and other associations and societies to mobilize the public to participate in wildlife protection. The internet, social media, television, newspapers, and magazines should also all be used to publicize the importance of Hainan gibbon conservation.

(6) **Monitoring and evaluation assurance**

1. Establish supervision systems to ensure that key conservation activities are implemented effectively and in a timely manner. Authorities should have an internal monitoring mechanism in place that is subject to periodical evaluation by other stakeholders and experts. Meanwhile, public awareness should also be increased through television, radio, the internet and other media, to increase public understanding of species protection as an obligation of every citizen, empowering citizens with the rights to transparent information, to participate, and to supervise.

2. Establish an evaluation mechanism, ensure conservation work is science-based. With support from scientific institutions, fully utilize available resources and relevant personnel, increase collaboration, and establish a quantifiable conservation, management, and research evaluation scheme for the Hainan gibbon. Constantly improve the implementation, management, and amendment of conservation interventions, while incorporating new technologies and latest research results, to further develop Hainan gibbon conservation policies, increase conservation effectiveness, and complete the management system.

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保护行动一览表

目标 1：完善海南长臂猿保护法制与建设，加强部门管护能力，完善多部门合作机制	行动分期
行动 1.1 增加编制、健全机构，并逐步引进专业技术人才	I
行动 1.2 理顺管理体制	I
行动 1.3 争取日常经费投入	I
行动 1.4 颁布《海南霸王岭国家自然保护区管理条例》	I
行动 1.5 完善保护区基础设施建设	I，II，III
行动 1.6 组建科研监测中心	I，II
行动 1.7 巡护与执法能力建设	I，II
行动 1.8 组建海南长臂猿保护工作委员会	I
行动 1.9 编写《海南长臂猿应急预案》	II，III
目标 2：加强科研与监测水平	
行动 2.1 调查评估林副产品采集及盗猎等人为活动对长臂猿的影响	I，II
行动 2.2 建立数字化监测体系	I，II
行动 2.3 系统开展长臂猿生物生态学和栖息地特征调查研究	I，II
行动 2.4 开展生物声学实验和无人机遥测新监测技术探索	I，II，III
行动 2.5 建立海南长臂猿个体户籍档案管理体系	I
目标 3：加强日常巡护和保护管理	
行动 3.1 建立自动人为活动监测体系，对入区人员实施登记管理	I，II
行动 3.2 建立数字化巡护体系，实时掌握长臂猿人为干扰活动和种群动态	I，II，III
行动 3.3 现有核心栖息地保护工程	I
目标 4：增加栖息地的面积、质量和连通性	
行动 4.1 退化栖息地改造工程	I，II
行动 4.2 生态廊道建设	I，II
目标 5：加强社区共管，促进社区经济发展，加强公众环境教育	
行动 5.1 周边社区自然资源共管试点	I
行动 5.2 加强公众环境教育与意识培养	I，II，III
行动 5.3 发展混农林业，提供相关技能培训，开拓销售渠道	I，II，III
行动共 22 项	

I：2015–2020 年；II：2021–2025 年；III：2026–2035 年

Summary of Actions

GOAL	PHASE
Goal 1: Improve regulations and infrastructure for Hainan gibbon protection, increase capacity of reserve staff, enhance collaboration between stakeholders	
Action 1.1 Increase staff capacity and introduce professional / technical personnel	I
Action 1.2 Improve institutional management	I
Action 1.3 Increase funding for daily reserve operations	I
Action 1.4 Issue “Bawangling National Nature Reserve Management Regulations”	I
Action 1.5 Improve infrastructure of BNNR	I, II, III
Action 1.6 Establish the Hainan Gibbon Research and Monitoring Centre	I, II
Action 1.7 Build capacity for patrolling and law enforcement	I, II
Action 1.8 Establish Hainan Gibbon Conservation Committee	I
Action 1.9 Develop an Emergency Response Plan for the Hainan gibbon	II, III
Goal 2：Enhance research and monitoring skills	
Action 2.1 Investigate impacts of human activities such as NTFP collection and illegal hunting on the Hainan gibbon	I, II
Action 2.2 Establish an integrated digital monitoring system	I, II
Action 2.3 Study gibbon biology, ecology, and habitat use	I, II
Action 2.4 Explore bioacoustic technologies and UAVs as new monitoring techniques	I, II, III
Action 2.5 Establish Hainan gibbon individual identification profiles	I
Goal 3：Strengthen reserve monitoring and management	
Action 3.1 Establish automated monitoring system for human activities and registration system for people entering the reserve	I, II
Action 3.2 Establish digital patrol system for monitoring gibbon and human activity	I, II, III
Goal 4：Increase habitat coverage, quality and connectivity	
Action 4.1 Enhance protection of core gibbon habitat	I
Action 4.2 Restore degraded habitat	I, II
Action 4.3 Construct ecological corridors	I, II
Goal 5：Increase community co-management, development and environmental education	
Action 5.1 Establish trial sites for community co-management	I
Action 5.2 Enhance public environmental and conservation awareness	I, II, III
Action 5.3 Develop agroforestry, provide technical training and develop market channels	I, II, III
A total of 22 actions	

Phase I: 2015–2019; Phase II: 2020–2024; Phase III: 2025–2034.