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**The Impact of Conservation Policy on Attitudes towards the Environment:
A case study on Hainan Island, China**

By

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**A report submitted in partial fulfilment of the requirements for
the MSc in Environmental Technology**

September 2006

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The Impact of Conservation Policy on Attitudes towards the Environment: A case study on Hainan Island, China

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ABSTRACT

External policy interventions aimed at the conservation of natural resources frequently meet the opposition of local people whom they negatively affect. The success of these interventions, however, relies on the cooperation of local people. To facilitate their cooperation, it is necessary to grasp their attitudes.

This study assessed local attitudes towards the environment and towards conservation policy in villages adjacent to Yinggeling and Bawangling Nature Reserves in the central mountain regions of Hainan Island, China, using Rapid Rural Appraisals and questionnaire-based interview surveys. The policy interventions investigated were the establishment of the nature reserves, as well as bans on hunting and logging.

Results suggest that although respondents were familiar with the concept of conservation and aware of the causes and - to some extent - the consequences of deforestation, they had negative attitudes towards the logging ban. In contrast, people tended to be ignorant about the abundance of wildlife and indifferent towards the hunting ban.

It was found that perceptions were influenced by people's livelihoods, which have mainly been shaped by somewhat inconsistent policies aiming for environmental conservation and economic development. Thus, while the introduction of rubber was found to have created an alternative opportunity to logging and hunting, its resulting demand for land has caused conflicts with the logging ban.

Whereas public awareness of the recently established Yinggeling Nature Reserve was low, in Bawangling, attitudes towards the nature reserve (established 1980) were rather negative because of the exclusion of the local population. The author recommends increasing community education and participation, enhancing incentives for conservation, and improving enforcement of conservation policy.

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1. INTRODUCTION

1.1. Background

In recent decades, hundreds of millions of hectares of tropical forests have been converted to other land uses, representing an annual deforestation rate of 0.9% (Barraclough and Ghimire, 2000). Not only do tropical forests play a complex role in the heat and water balance of the earth's surface on a global level (Whitmore, 1984), they also provide important ecosystem services on a local scale, such as the regulation of climate, water, and soil (Furze et al., 1996), and offer income opportunities to local people (Hunter et al., 2003). In addition, the degradation of tropical forests is accompanied by the extinction of many species of flora and fauna (Barraclough and Ghimire, 2000).

Tropical deforestation is mostly linked to changing economic opportunities and policies, as well as to region-specific modes of agricultural expansion, wood extraction, and infrastructure extension. While no universal policy for controlling tropical deforestation can be conceived (Geist and Lambin, 2002), protected areas have played a major role in conservation in the past four decades. They are, however, often characterised by biological and socio-political dilemmas due to conflicts between conservation goals and local livelihood strategies (Southworth et al., 2006). Therefore, perceptions and attitudes of local residents need to be studied to identify these conflicting interests and recognise possible solutions (Xu et al., 2006). A key question is that of the extent to which the distribution of costs and benefits can ensure the support of local communities for conservation initiatives. Since perceived costs and benefits are crucial in conservation success, it is of utmost importance to determine local awareness and attitudes of conservation (Gillingham and Lee, 1999).

1.2. Aims and Objectives

My hypothesis is that conservation policy has a negative impact on environmental conservation because it does not offer local people incentives to reduce their exploitation of natural resources, which will be reflected in their attitudes towards these policy interventions.

The aim of this study is to gain insight into the impact of conservation policy interventions on local attitudes towards the conservation of natural resources, using Yinggeling and Bawangling Nature Reserves in China as case-studies. The policy interventions to be investigated are the establishment of the nature reserves and the bans on logging and hunting.

My objectives, therefore, are to:

1. Investigate local attitudes towards the conservation of protected species – in particular of Hainan’s protected pheasants and partridges - and of the forest. This includes an analysis of:
 - a. The perceived value of protected species and the forest.
 - b. Awareness of the hunting and logging ban.
 - c. Attitudes towards these bans and their implementation.
2. Investigate local attitudes towards the nature reserves, including:
 - a. Awareness of the nature reserves and their purpose
 - b. Attitudes towards the nature reserves
 - c. Perceived costs and benefits from the nature reserves
 - d. Awareness of the planned upgrade of Yinggeling nature reserve, and attitudes towards this upgrade
3. Link attitudes towards environmental conservation with attitudes towards policy interventions and, if suitable, with socio-economic factors.
4. Assess differences between responses from Yinggeling and Bawangling nature reserves
5. If appropriate, make recommendations regarding incentives for local people to support these policy interventions, with an emphasis on the upgrade of Yinggeling nature reserve.

2. LITERATURE REVIEW

2.1. The Impact of Policy on Conservation in China

Policy interventions in many different areas can have important impacts on conservation (Barracough and Ghimire, 2000).

In China, agricultural policy has been particularly significant. Land reform has characterised rural China since the founding of the People's Republic in 1949. During the 1950s, all land was confiscated from landlords and rich farmers and mainly distributed to local landless and near-landless farmers, although remote areas were allocated to state-owned firms. In the late 1950s, land was transferred to collectives, and in the late 1970s land was again privatised with the introduction of the household responsibility system (Zhang et al., 2000). Under this system, farmland is owned by village collectives, which extend lease contracts to individual households. These can use, sub-lease and transfer the land, but they cannot sell it (OECD, 2005).

Moreover, since the 1950s, the national government of China has introduced a series of development policies that have affected the environment. One of these was the introduction of rubber (*Hevea brasiliensis*) as a major agricultural crop (Xu et al., 2005). In addition, natural resource extraction has been heavily influenced by policies regulating pricing and trade, which often discouraged the sustainable management of natural resources (Ghimire, 1994).

Environmental policy itself has evidently had a considerable impact on conservation. The environment is managed under the Chinese constitution and a series of laws, including the Wild Animal Conservation Law and the Forest Law (Xu et al., 1999). Thus, it has been illegal to harvest protected wildlife since 1989 (Chinadaily, 1988), a ban which was reinforced by the Law on Gun Control in 1996 (Guo, 2006), and the logging of natural forests was prohibited nation-wide in 1998 (Zaizhi, 2001).

All these policies, however, are not systematic and complete, policies from different areas often having conflicting aims. In addition, there is a paucity of regulations on administration and enforcement (NEPA, 1994).

2.2. Protected Areas in China

China's first nature reserve was set up in 1956. The subsequent increase in the number and area of nature reserves is outlined in figure 1. Until 1979, protected areas were designated centrally, excluding the participation of local governments and communities. Between 1979 and 1991, the central government determined a quota of protected area designations for provincial and county governments, with little regard to local conditions. Thus, new protected areas were funded and administered locally, but many protected areas existed only on paper. The central governments selected national protected areas from candidates of provincial protected areas recommended by local governments. After 1992, legislation was introduced to strengthen local governments, and an official designation procedure for protected areas was adopted (Jim and Xu, 2004). There are now a total of 2194 nature reserves in China covering 15% of the country's territory (IUCN, 2006a) – the majority of which are managed by local governments (Liu et al., 2003). However, China's legislative framework for protected areas has not kept pace with these developments (IUCN, 2006a).

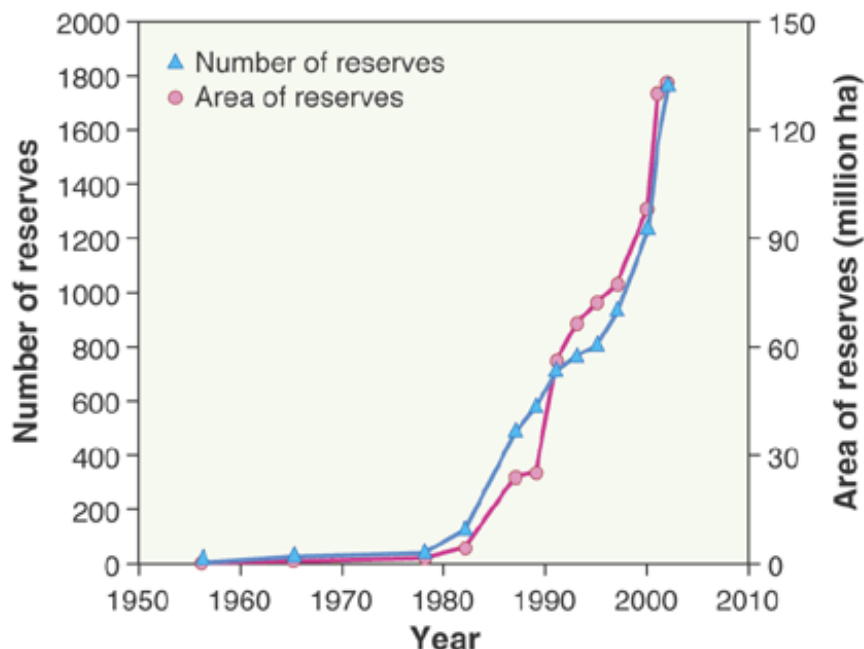


Fig. 1: Growth of nature reserves in China, 1956-2002, by number of sites and total area (Liu et al., 2003). The number of protected areas has increased to 1757 in 2002, accounting for 13.2% of the total area. The government aims to increase the number of reserves to 1800 in 2010 and 2500 by 2050 (Xu et al., 2006).

Protected areas in China suffer from three main shortcomings. First, the central government only provides them with limited financial support (Liu et al., 2003). In 1997, 87% of nature reserves had no recurrent funding (Jim and Xu, 2003). Without adequate government funding, reserves are actually encouraged to be self-sufficient and exploit the reserve's resources (Jim and Xu, 2002b, 2003). Thus, at least 80% of Chinese reserves have engaged in profit-oriented activities, damaging the reserve (Jim and Xu, 2003).

Second, at least one in three Chinese protected areas lacks a management agency and staff (Jim and Xu, 2004). Therefore, they are mere paper parks (Jim and Xu, 2003). Similarly, serious deficiencies still exist in designation procedures (Jim and Xu, 2004), and a third of protected areas have no clear boundaries (Liu et al., 2003).

Third, 60 million people – mainly farmers – live inside and around Chinese nature reserves. They usually rely on natural resources for their subsistence (Jim and Xu, 2003). People-park conflicts due to the exclusion of local people from the decision-making processes for the establishment and management of the protected area are widespread (Jim and Xu, 2004). This “fines and fences” approach has been found to contribute to environmental degradation (Wells et al., 1992).

The strategy currently preferred for easing pressures on biodiversity conservation in nature reserves in China is to try to improve economic opportunities outside of the reserves and to raise the income levels of people living in the neighbourhood. This strategy, however, is not without problems. Higher incomes, for example, could add to pressure on the resources of a reserve, and social hostility to the reserve may grow as the economic damage caused by pests from reserves rises with higher valued agriculture. Likewise, as economic productivity per hectare rises outside the reserve, the view that the reserve involves an economic waste of natural resources or land may spread (Tisdell and Xiang, 1996).

China is now formulating its first Protected Areas Law, which will likely have profound implications for every aspect of protected areas designation, planning and

management, as well as for the communities living in and around protected areas (IUCN, 2006a).

Few studies, however, have been published on local responses towards environmental conservation in China (Jim and Xu, 2002a). In Shimentai Nature Reserve, Guangdong Province (Jim and Xu 2002b), and in Wolong Nature Reserve, Sichuan Province (Xu et al., 2006), local people were found to have scant knowledge of the reserve. While in Shimentai, respondents had negative perceptions of the nature reserve, in Wolong these were generally positive.

2.3. Case-study background

2.3.1. Hainan Island

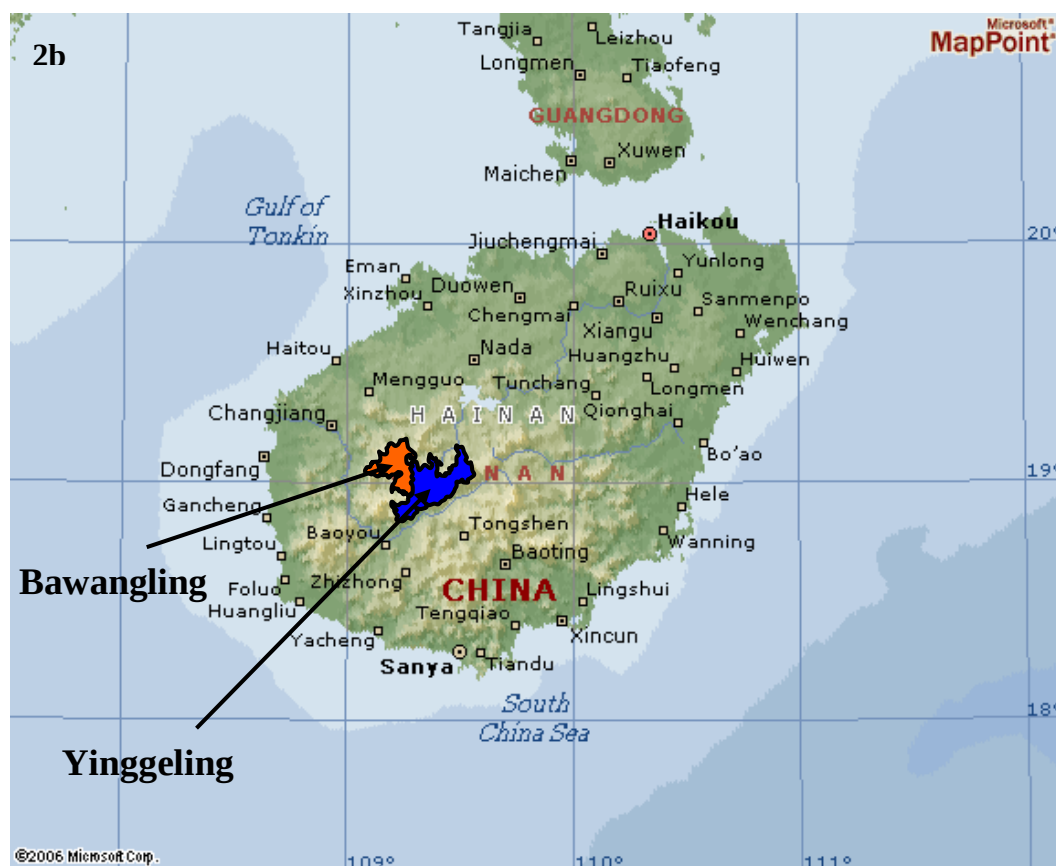
Hainan (fig. 2a) is an island of 33,920 km² located about 30 km south of mainland China (Wikipedia, 2006). Until recently, it was one of the least developed provinces of China (Umezaki et al., 2005). The island supports extensive monsoon forests in its interior uplands, which are home to many endemic forms of wildlife (WWF, 2001). Its forests have, however, been heavily affected by deforestation. While in the 1940s, the area of natural forest was estimated at up to 17,000 km², this had declined to below 3,000 km² by the 1990s (Birdlife International, 2006). Deforestation in Hainan was mainly caused by logging to meet timber demand from outside the region (Zhang, 2000), agricultural land encroachment, and residential and industrial expansion (Zhang et al., 2000), with changes in forest size linked closely to population growth and socio-economic development (Umezaki et al., 2005).

Since it is widely believed that overall environmental deterioration is due to the loss of the rain forest in Hainan, restrictions have been imposed on its logging. A quota of allowable felling was set in 1984, and has been gradually reduced since then (Zhang et al., 2000). In 1994, Hainan became the first province in China to implement a ban on logging the rain forest (Hunter et al., 2003). Enforcement is carried out by the Hainan forestry department, which has an office under the control of the local

government in each town (pers. comm. Liang Wei). The Hainan forestry department is also in charge of nature reserve management (pers. comm. John Fellowes).



Fig. 2: a) Map of China indicating Hainan Island. b) Map of Hainan indicating Bawangling Nature Reserve in red, and Yinggeling Nature Reserve in blue (MSN Encarta, 2006).



Due to difficulties in accessibility, the central mountain ranges of Hainan Island have been protected comparatively well (Zhang, 2000). The people inhabiting this region

are the Li and the Miao minorities. These are amongst the poorest on the island (Hunter et al., 2003). The enforcement of government policy was found to be a fundamental trigger of transformations in communities studied in Wuzhishan Nature Reserve (located to the south-east of Yinggeling Nature Reserve in figure 2b). This included conservation policy which affected people's daily subsistence behaviour and development policy which initiated changes in the food production system toward the market economy. Transformations in land use, resource management and social organisation followed (Umezaki et al., 2005).

2.3.2. Bawangling Nature Reserve

Bawangling Nature Reserve (fig. 2b) was established as a provincial nature reserve in 1980, with the main aim of conserving the world's most endangered ape, the Hainan Gibbon *Hylobates hainanus*, and its habitat. It was upgraded to the status of national nature reserve in 1988, and expanded in 2001. Since entry into the nature reserve was prohibited, severe conflicts with the neighbouring communities ensued. The population of these communities amounted to 26490 people (in 2004), mostly of Li and Miao ethnicities. In 2004, as part of a project to introduce co-management to the nature reserve, the international non-governmental organisation FFI, together with KFBG (Kadoorie Farm and Botanical Gardens - a Hong Kong-based conservation organisation) undertook a range of workshops and participatory rural appraisals in these communities (FFI China Programme, 2005). Their conclusions regarding natural resource use in the communities include the following:

- Hunting was found to have been common before the hunting ban and the confiscation of guns. Inhabitants reported that animals decreased in 1999, partly because the forest was cut down. People also claimed they now preferred spending time planting rubber and hunted only when an order for a specific animal was placed.
- Logging occurred for the construction and renovation of houses and to build coffins. Since 1998-1999, people have been required to pay for licenses to fell trees.

- A variety of non-timber forest products are collected in the forest – generally outside the nature reserve
- Approximately 2000 kg of dry firewood are collected per family each year.
- Cattle is herded in the forest

In addition, people were reported to value the environment, but, because it restricted their economic development, had less favourable opinions of the nature reserve. Their knowledge of the nature reserve was found to be limited, most people not being aware of the boundaries of the nature reserve.

2.3.3. Yinggeling Nature Reserve

Yinggeling is the largest remaining primary rainforest of Hainan (Ng and Chan, 2001), extending over 250 km² (Hainan Daily, 2005), and is the watershed of the two largest river systems in Hainan (Ng and Chan, 2004). The area is inhabited by over 18000 people, most of which are of Li or Miao ethnicity, living in more than 100 villages. In 2003, Yinggeling became a provincial nature reserve. Apart from the employment of local farmers to report logging near their villages, the nature reserve is currently only a paper park. The exact boundaries have not been defined yet, but will be positioned to have a minimal impact on local inhabitants. As all Chinese nature reserves, Yinggeling will be divided into a core zone, where access is prohibited, a buffer zone, where only scientific research is legal, and an experimental zone, where a number of activities, such as education, tourism, and scientific research are permitted. Yinggeling is planned to be upgraded to a national nature reserve around 2007-2008 (pers. comm. Dr Bosco Chan, Dr John Fellowes, Dr Liang Wei). The Hainan Forestry Department plans to set up 6 stations in the nature reserve, each with 5 or 6 forest guards (Hainan Daily, 2005). KFBG will assist the nature reserve logistically and financially. Local people will not receive any direct compensation, with the exception of salaries for nature reserve staff, but KFBG and the Hainan Forestry Department hope to provide alternative livelihoods and improve living standards (pers. comm. Bosco Chan, Dr John Fellowes, Dr Liang Wei).

2.3.4. The case-study species

According to Dr Liang Wei, there are 5 species of galliformes in Hainan, the details of which are presented in table 1. The other two case-study species are a box turtle and a tree species - the scented rosewood (table 1).

common name	Latin name	distribution	major threats	IUCN red list category	China red data category
Hainan partridge	<i>Arborophila ardens</i>	Hainan	habitat loss, hunting	vulnerable	endangered
silver pheasant	<i>Lophura nycthemera</i>	global	N/A	least concern	N/A
grey peacock pheasant	<i>Polyplectron bicalcaratum</i>	global	habitat loss, hunting	least concern	rare
Chinese francolin	<i>Francolinus pintadeanus</i>	global	N/A	least concern	N/A
red jungle fowl	<i>Gallus gallus</i>	global	habitat loss, hunting	least concern	vulnerable
three-striped box turtle	<i>Cuora trifasciata</i>	China, Lao PDR, Vietnam	hunting	critically endangered	critically endangered
scented rosewood	<i>Dalbergia odorifera</i>	Hainan	logging for timber	vulnerable	critically endangered

Table 1: five galliforme species, a protected turtle and a protected tree species were used as case-studies. The sub-species of the silver pheasant endemic to Hainan is *Lophura nycthemera whiteheadi*, and the endemic sub-species of the grey peacock pheasant in Hainan is *Polyplectron bicalcaratum katsumatae*, which some people consider a full species. The sub-species of the red jungle fowl found in Hainan is the tokinese red jungle fowl *Gallus gallus jabouillei*, which also exists in other Asian countries. The Hainan partridge is also known as the Hainan hill partridge, scented rosewood is also known as fragrant rosewood, and alternative common names for the three-striped box turtle are three-banded and three-lined box turtle (CBIC, 2001, IUCN, 2006b).

3. METHODS

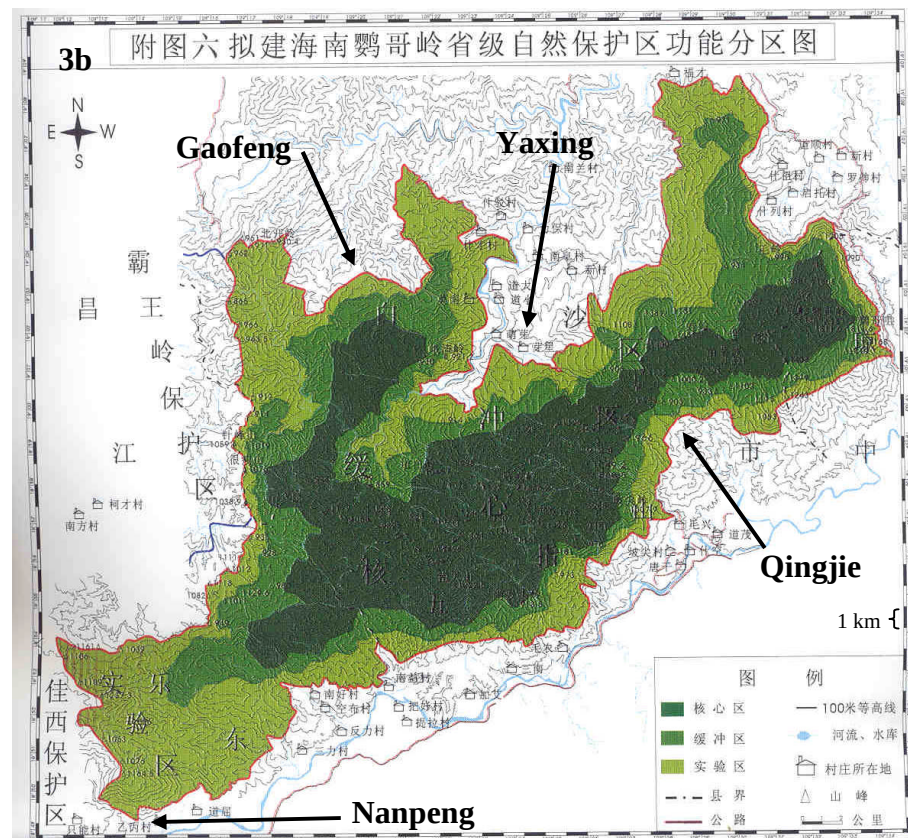
3.1. The Case-Study Villages

Four of the six villages suggested by Mr Su from the Hainan Forestry Department were used as case-studies for Yinggeling Nature Reserve. These were Qingjie, in Wuzhishan County, Nanpeng, in Ledong County, and Yaxing and Gaofeng, both in Baisha County (Fig. 3b). The two villages omitted were Bulun, in Wuzhishan County, where the local government objected to the study, and Hongwei, in Baisha County, which was excluded due to time constraints. In addition, as suggested by Dr Liang Wei from Hainan Normal University, three villages adjacent to Bawangling Nature Reserve were surveyed. These were Miaocun, Xinqing and Xinfeng, all in Baisha County (Fig. 3a). However, since Xinqing and Xinfeng really function as one community, they were regarded as a single village in this study.

Information was gathered through semi-structured interviews of external key informants, and field-work in villages around the nature reserves, which consisted of questionnaire-based interview surveys, semi-structured interviews of internal key informants, informal group interviews, and some typical Rapid Rural Appraisal methods, namely community maps, transect walks, and scoring exercises. Field-work was carried out between mid May and early July 2006. Each of these villages was studied for four to seven days with the help of one or two students from Hainan Normal University. In addition, in Yaxing and Gaofeng, the village leaders organised a villager to accompany us to the different households in the village and assist in translation. In the villages surrounding Yinggeling Nature Reserve, we lived with the village leaders, whilst in the villages adjacent to Bawangling Nature Reserve, we stayed with the school principal in Xinqing/Xinfeng. A typical schedule for field-work in one village is presented in table 2.



Fig 3: Maps of **a)** Bawangling Nature Reserve (FFI China Programme, 2005) and **b)** Yinggeling Nature Reserve (Hainan Forestry Department, 2003), with the approximate location of the case-study villages. The experimental, buffer and core zones are indicated by increasingly darker shades of green.



Day 1-2	• Semi-structured interview of the village head • Transect walk • Community map • Informal group interview
Day 2-6	• Questionnaire-based interview survey of 20 villagers, plus in-depth key informant interviews – mainly during the day • Informal group interviews – mainly during meals • Scoring exercises – usually in the evenings • Semi-structured interviews of village elders – towards the beginning of the week • Semi-structured interview of the forest guard – towards the end of the week
Day 6-7	• Presenting information back to some of the villagers for confirmation

Table 2: a typical field-work schedule in one village.

3.2. Questionnaire-based interview surveys

Surveys are a relatively rapid process of collecting quantitative information from people (Furze et al., 1996). In general, the majority of questions are closed questions, which are more consistent and more comparable, as well as less demanding to interviewees. Although conducting interviews face-to-face is a time-consuming process, this is necessary where the target population has low levels of literacy (Salant and Dillman, 1994), as was the case in the villages surveyed.

In each of the villages surrounding Yinggeling Nature Reserve, 20 random villagers were interviewed, in Xinqing/Xinfeng 15 people were surveyed, and in Miaocun, 10. An interview (Appendix 1) typically took 20 to 30 minutes, depending on how knowledgeable and communicative the respondents were.

First, I introduced myself as a student from England, explained that the purpose of the survey was to study the villagers' relationship with the environment - thus providing a sufficient justification of my questions regarding hunting and logging, but without biasing respondents - and asked for permission to interview people. Whilst in Yaxing and Gaofeng, where I was accompanied by a local, most people accepted to be interviewed, this was not the case in the other villages, where the majority of people I approached refused. In particular, women were reluctant to be interviewed in Nanpeng and in the villages by Bawangling Nature Reserve, where I was accompanied by male research assistants, and elderly people often refused on the grounds that their language skills were insufficient. Therefore, although I aimed at

interviewing a cross-section of the adult population in each village, this was not always possible.

Those willing to be interviewed were first informally asked about their socio-economic background, which included their occupation, level of education, and age. In addition, wealth was assessed by enquiring about the possession of a number of wealth indicators, the value of which was estimated by asking a number of respondents about their value in each village. The main wealth indicator was the type of house respondents owned, with minor indicators consisting of industrial goods, the ownership of which is a symbol of wealth in rural Chinese society (Umezaki et al., 2005). The sum of the values of these possessions thus provided an approximation of a respondent's wealth. Other potential wealth indicators - such as the area of land owned or the number of household members working in town - proved unreliable because the quality of land and the amount of money external household members contributed largely varied. Similarly, household size proved difficult to assess as, while sometimes people not living in the house were seen as household members, at other times people living in the same house were not seen as part of one household.

The second part of the interview was concerned with local knowledge, perceptions and attitudes towards the environment. Respondents were shown 10 pictures of game birds (Appendix 2), five of which can be found in Hainan Island, and asked which ones they recognised. As most people were not familiar with the names of these birds in Mandarin Chinese, we refrained from asking for these. A recognition score was calculated as shown in table 3. Likewise, people were tested on their recognition of the Three-striped Box Turtle and the Scented Rosewood, and a total knowledge score was calculated.

For each species:	Points awarded
Correctly recognised as present/absent, with certainty	+ 2
Correctly recognised as present/absent, but with uncertainty	+ 1
Uncertain whether present/absent	0
Incorrectly recognised as present/absent, with uncertainty	- 1
Incorrectly recognised as present/absent, but with certainty	- 2

Table 3: The recognition score is the sum of points awarded for each of the 10 galliformes, the turtle and the Scented Rosewood.

To discern local perceptions regarding the abundance of these species, people were asked how common they were and when they had last seen them. Based on their answers, birds last seen less than one year ago were categorised as very common, birds last seen within 1-3 years were common, those last seen 4-10 years ago were rare, and those not seen for more than ten years were very rare. I also asked whether people knew if any of these species existed outside of Hainan Island.

Similarly, people were questioned regarding their perceived past abundance of these species, as well as of big trees and the forest area. Next, I enquired about the perceived reason for this change in abundance, their attitudes towards this change in abundance, and the reason for their attitude. When people named more than one reason, they were asked to select which they thought was the most important.

In addition, respondents were questioned regarding their perceived hunting and logging behaviour, as well as regarding their perceived future abundance of the game birds and the forest area, the perceived reasons for this future increase or decrease, their attitudes towards it, and an explanation for their attitude. Moreover, it was asked whether the interviewees were aware of the impact of rubber plantations on wild animals and plants

The third part of the interview was on the subject of conservation policy. Respondents' knowledge of the logging and hunting bans, of the nature reserve, and of future plans for the nature reserve were assessed. Besides, people were asked about their perceived reasons for these policy interventions, their perceived effectiveness of these interventions, and their attitudes towards them, including an explanation for their attitudes. Finally, respondents were interviewed about how they would manage their local environment.

3.3. Semi-structured interviews

Semi-structured interviews - based on open-ended questions - are an efficient way of collecting qualitative data. They are flexible in that additional questions can arise

during the interview, complex subjects can be clarified, and important issues can be revealed (Livesey, 1995).

In order to obtain background information on Yinggeling Nature Reserve and the challenges it faces - in particular regarding conflicts between the conservation and extraction of natural resources and attempts to resolve these – as well as to obtain advice on field-work preparation and operation, semi-structured interviews were carried out prior to field-work. Informants included members of KFBG, members of the Hainan Forestry Department, and members of the Biology Department of Hainan Normal University. In addition, in-depth follow-up interviews with Dr Liang Wei from Hainan Normal University subsequent to field-work provided further insight into local practices and conservation problems.

In each village, the village leader was interviewed to obtain background information on his village, including demographic variables, livelihoods, and conservation policy. Furthermore, village elders were interviewed regarding environmental change around their village, as well as changes in the villagers' behaviour and attitudes. I further interviewed the forest guard of each village about his role and achievements, and his attitudes towards forest conservation. The village leaders of Damai and Zhibao, two villages close to Miaocun and Xinqing/Xinfeng, were also interviewed on the subject of Bawangling Nature Reserve.

In addition, when respondents during the questionnaire-based interviews proved communicative and knowledgeable, additional questions were added to their interviews in order to obtain, confirm or clarify background information, in particular regarding past and present hunting and logging habits.

3.4. Rapid Rural Appraisal

Rapid Rural Appraisal (RRA) is an approach developed in the 1970s to overcome time and cost factors in rural research processes. As opposed to earlier approaches, RRA sought to put people first by increasing participation, thereby including

marginalised people (Furze et al., 1996). Other characteristic principles of RRA include: triangulation, where information is obtained through a variety of sources or methodologies, optimal ignorance, where only prioritised issues are studied in depth, and flexibility, allowing methods to be adapted to the local circumstances (Chambers, 1997). Methods commonly used include space-related methods such as transects or maps, time-related methods such as time-lines, seasonal diagrams and daily activity schedules, and relation methods, for example diagrams, rankings, and scorings – all with a strong emphasis on visual methods (Kumar, 2001).

For this project, the pilot study in Qingjie revealed that many of the visual and participatory methods were inappropriate. The reason for this was the low level of education of many of the village members, which meant they were reluctant to take part in any visual exercises where they had to read or hold a pen to draw or write. In addition, many people were only available at night when illumination was often inadequate, and frequent rain made working outdoors difficult. Finally, due to time constraints and difficulties of getting groups of people together for these exercises, as well as due to language barriers, these methods proved too ambitious.

Therefore, I found I could more efficiently obtain background information through informal interviews of groups of villagers – mainly during meals. Topics covered by these interviews regarded the population of the village, its geographical and economical situation, land and natural resource use, time use, the history of the village, its inhabitants and its environment, and conservation policy. Furthermore, a map was usually drawn by the village head or another key informant, preferably in the company of others who could point out any mistakes, and those present were asked about village organisation and land use, demographic variables, and historical changes. A transect walk was also undertaken to obtain information about general orientation, village organisation and land use, and to encourage introductions to some of the villagers.

The scoring exercise (Appendix 3) regarding the impacts of conservation policy was usually successful. It was generally conducted in groups of 6 to 12 men or women, since women were more likely to express their opinions if in exclusively female company, and this group size would allow all members of the group to be heard whilst

providing maximum coverage of the village population (Lindlof, 1995). Xinqing/Xinfeng was the only village where this exercise was accomplished with three different groups – two male and two female. In Nanpeng, it was only successful with one group of men, but in the other villages, it was achieved with both one group of men and one of women. Participants were first told that the aim of this exercise was for me to understand the impacts of the logging and the hunting ban. They were then shown cards with picture representing various impacts from the logging and hunting ban, and in the villages next to Bawangling Nature Reserve, from exclusion from the nature reserve, on the villagers themselves, on future generations of villagers, on people living elsewhere, and on the environment (table 4). Participants were explained what the pictures meant, were asked whether they agreed each impact applied to their village, and asked whether they could think of any additional impacts. Next, the group was told to distribute 20 cigarettes (for men) or sweets (for women) amongst the pictures, according to the importance of the impacts (fig. 4). All participants were encouraged to contribute in this scoring and agree on the final distribution. Further questions were then asked to understand their choice in scoring. Finally, people were asked how they would ideally manage their local environment.

3.5. Data analysis

Quantitative data was coded and analysed with Microsoft Office Excel 2003 and SPSS 14.0 for Windows, with the level of significance for General Linear Models, Chi-square tests and Spearman correlations at $p < 0.05$.

costs from the logging ban for the villagers:	• limited land for agriculture • fewer trees to build houses • less money from selling trees
costs from the hunting ban for the villagers:	• less food from hunting • less money from hunting • more pests such as mice/wild pigs
costs from exclusion from the nature reserve for the villagers: (only applicable to Bawangling Nature Reserve)	• less access to grazing land • less access to natural resources
benefits from the logging ban for the villagers:	• more water from the forest • more fresh air from the forest • better weather because of the forest • people can see more trees
benefits from the hunting ban for villagers:	• people can see/hear more animals • more insects are eaten by birds
benefits from the hunting and logging ban for future generations:	• can see the forest and animals
benefits from the hunting and logging ban for people living in distant places:	• fresh air and more water from trees
costs and benefits from the hunting and logging ban for the environment:	• more animals and plants



Table 4 (above): The perceived impacts of conservation policy – as mentioned by key informants. Some people thought that the costs for the villagers were also applicable to future generations, for example that people would also have limited agricultural land in the future, but without further specifications found it difficult to distinguish whether these costs were more important for present or future generations. Therefore, these were not included in the scoring exercise.

Fig. 4 (left): an example of a scoring exercise where a group had distributed sweets amongst pictures depicting different impacts.

4. RESULTS

4.1. Background to the Villages

Background information to the six villages surveyed is summarised in table 5. The villages vary in population size, ethnicity, accessibility, wealth and education.

Village	Nature Reserve	Population size	Ethnicity	Journey time to town	Mean wealth	Mean education	Mean age	Sample size
Qingjie	Yinggeling	140	Li	30 min	43900 ± 0	7.55 ± 0.64	34.45 ± 2.56	20 (8)
Nanpeng	Yinggeling	800	Miao	20 min	31553 ± 5320	3.85 ± 0.96	39.3 ± 4.18	20 (6)
Yaxing	Yinggeling	170	Li	2 h	17405 ± 2729	5.25 ± 0.91	37.9 ± 3.86	20 (6)
Gaofeng	Yinggeling	680	Li	3 h	2535 ± 966	4.25 ± 0.77	42.75 ± 3.46	20 (8)
Xinqing/ Xinfeng	Bawangling	330	Li	1 h	12573 ± 4453	2.33 ± 0.63	43.93 ± 5.06	15 (5)
Miaocun	Bawangling	330	Miao	50 min	31360 ± 6614	3.8 ± 1.25	41.1 ± 4.19	10 (2)

Table 5: background information to the villages: The population size is the approximate number of village members including village members not living in the village at the time of the study, and the journey time to the nearest town is the approximate time this journey would take by motorbike in dry weather conditions, according to knowledgeable individuals in the villages. The sample size is that of the questionnaire-based interviews in each village, with the number of women interviewed given in brackets. The mean and standard error of the mean of wealth, education, and age are those of the answers to the questionnaire-based interviews. For the exact number different answers to each question, refer to appendices 4 and 5.

In Yinggeling, as in much of China, economic development has been fairly recent. Villagers said their standard of living started improving with the introduction of market economy around 1987, when each household was allocated its own land. Nonetheless, the villages have only really prospered since farming cash crops such as bananas and rubber and since the construction of roads leading to the villages, which enabled farmers to sell their crops and bring in construction material. While the other villages have received running water and electricity in the past five years, the road to Gaofeng is not yet completed, and the village is not yet connected to the electricity

grid. Most households in Gaofeng do, however, have their own hydro-generator which supply them with electricity during the rain season.

Many inhabitants of Bawangling, though, claim their economic situation has not improved. The inhabitants of Xinqing/Xinfeng were moved from a village higher up in the mountains to their present location in 1971, when the government allocated the land on top of the mountain to them. However, land became limited when the nature reserve was established in 1980 and people were no longer allowed to cultivate this land.

The villages differ significantly in wealth (fig. 5), and the level of wealth significantly increases with the level of education of respondents. A significant interaction between village and education was found (table 6), with the direction of the effect of education differing between villages.

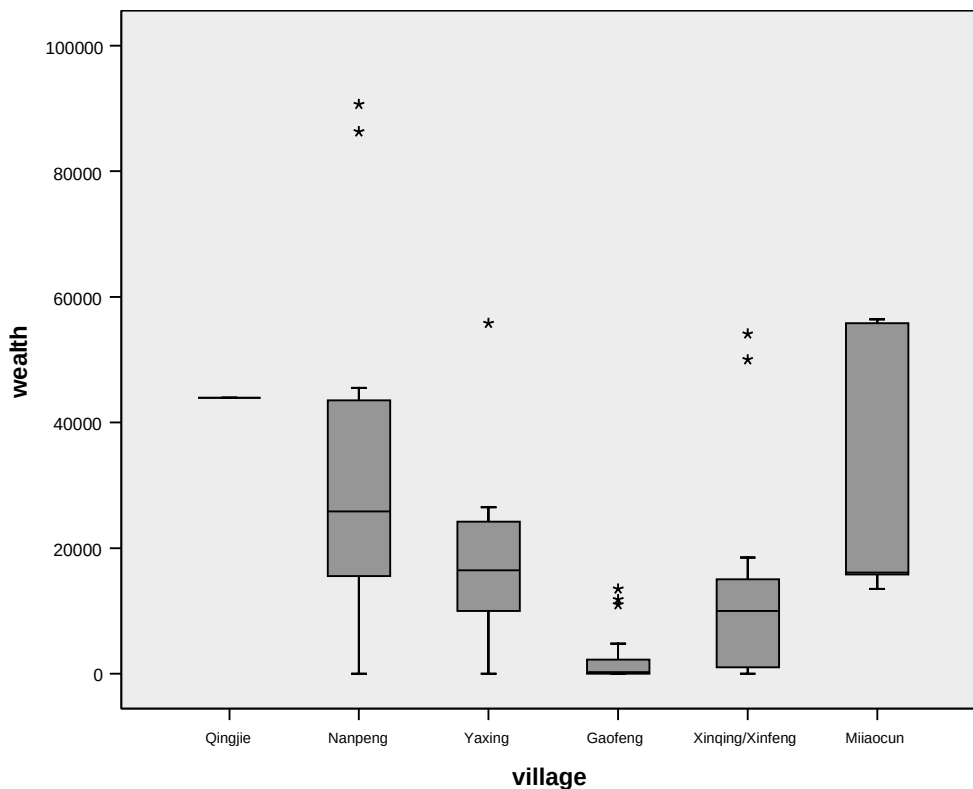


Fig. 5: Wealth estimates, calculated by the total value of the house and a number of industrial goods owned, showed that respondents in Gaofeng were significantly poorer than in the other villages ($B = -20864.891$, $p = 0.009$).

	df	F	Sig.
Corrected Model	11	13.155	0.000
Intercept	1	64.886	0.000
village	5	4.047	0.002
education	1	5.705	0.019
village * education	5	2.957	0.016

Table 6: A General Linear Model of wealth as a function of village and education, with $R^2 = 0.609$ and adjusted $R^2 = 0.562$.

Lack of education was frequently named as being one of the disadvantages of living in the villages. The main problems named were the distance to the schools, as well as the high tuition and boarding fees.

The results of a General Linear Model of education as a function of gender, wealth, age, and nature reserve are shown in table 7. The level of education was found to be significantly higher in men than in women, and in Yinggeling Nature Reserve compared to Bawangling Nature Reserve. In Yinggeling Nature Reserve, the level of education was significantly lower in Nanpeng than in the other villages ($B = -2.937$, $p = 0.011$). In addition, education significantly increased with wealth and decreased with age. Moreover, the interaction between nature reserve and age was significant, because whereas in Yinggeling, age and education were significantly correlated (Spearman's $\rho = -0.468$, $n = 80$, $p < 0.01$), this was not the case in Bawangling.

	df	F	Sig.
Corrected Model	9	8.378	0.000
Intercept	1	30.194	0.000
gender	1	7.220	0.009
Nature Reserve	1	8.658	0.004
Wealth	1	10.442	0.002
Age	1	13.362	0.000
Nature Reserve * village	4	2.568	0.043
Nature Reserve * age	1	4.768	0.031

Table 7: A General Linear Model of education as a function of gender, wealth, age, and nature reserve with $R^2 = 0.442$ and adjusted $R^2 = 0.390$.

The distributions of the gender, age, education and wealth in Yinggeling and Bawangling Nature Reserves are summarised in table 8.

		Yinggeling	Bawangling	% of respondents
gender	male	52	18	66.67
	female	28	7	33.33
age	16-20	11	1	11.43
	21-35	29	10	37.14
	36-50	23	7	28.57
	51-65	12	3	14.29
	66-80	5	4	8.57
education	0	20	8	26.67
	1-3	9	8	16.19
	4-6	19	6	23.81
	7-9	25	2	25.71
	10-12	7	1	7.62
wealth	0-10000	26	10	34.29
	10001-40000	26	9	33.33
	40001-100000	28	6	32.38

Table 8: The distribution of gender, age, education, and wealth of respondents to the questionnaire-based survey in Yinggeling (n=80) and Bawangling (n=25), and as a percentage of all respondents (n=105). The age of respondents ranged from 16 to 80. The level of education of respondents ranged from 0 to 12 years of schooling. Since more educated people were more likely to speak Mandarin and agree to be interviewed, it is likely that overall the level of education does not reflect that of the villages but is biased towards more educated people. Wealth, based on the values of the house and the industrial goods owned by respondents, ranged from 0 RMB (grass house and no industrial goods) to 90650 RMB (about £6020: two-storey brick house and a range of industrial goods).

Knowledge, based on the recognition score calculated from peoples' abilities to correctly identify the case-study species, was found to be significantly lower in women than men, and in Nanpeng ($B=-5.158$, $p=0.023$) and Xinqing/Xinfeng ($B=-4.910$, $p=0.040$) compared to the other villages (table 9). Histograms for male and female recognition scores are presented in figure 6.

	df	F	Sig.
Corrected Model	6	7.123	.000
Intercept	1	46.541	.000
gender	1	13.428	.000
village	5	6.149	.000

Table 9: A General Linear Model of knowledge as a function of gender and village, with $R^2 = 0.304$ and adjusted $R^2 = 0.261$

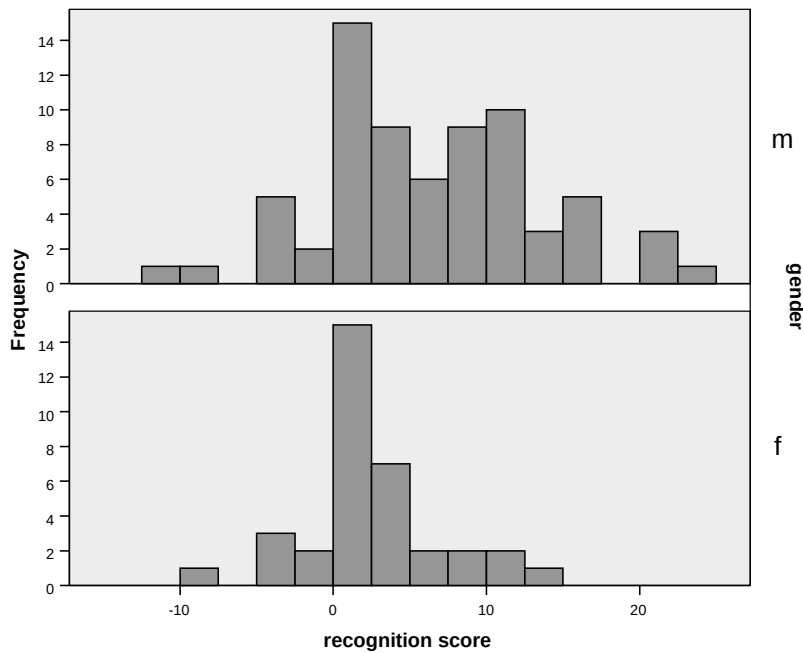


Fig. 6: Histograms of recognition scores of the case-study species for women (below) and men (above).

4.2. Livelihoods

4.2.1. Agriculture

According to village elders, approximately 50 years ago people used to plant cassava, pumpkins and maize, collect wild vegetables and fruits, hunt wild animals such as pheasants, wild pigs, mice and hares, and eat fish and shells from the rivers. The villages were self-sufficient. Swidden agriculture was practiced to plant “shanlan” rice – a traditional rice species which is now still grown for the production of wine.

In all the villages, people now plant two seasons of rice per year. Whereas in other villages rice is mainly farmed for subsistence, in Qingjie it is traded for food and goods. In Qingjie, rubber was planted in 2003, and will be harvested after 6 years when the trees will have matured. In Gaofeng, rubber has been planted since 1998 and harvested since 2005. In Nanpeng and Yaxing, rubber was planted from 1992, and has been harvested since 2000. Some people in Xinqing/Xinfeng started planting rubber in 1995, and in Miaocun in the early 1980s, but a typhoon in 2005 felled many of the

rubber trees around these villages. The government has encouraged growing rubber since 2002 by giving farmers 20 RMB¹ per mu² of land converted to rubber.

The villages also grow fruit trees (mainly bananas, areca, mangoes and lychees), vegetables (mainly cassava, beans and maize). The fruit and vegetables are primarily consumed by the villagers, but if there is a surplus, it is sold. In addition, people keep cows, pigs, chickens, ducks, and dogs for sale.

4.2.2. Hunting

In all the villages, people claim they rarely hunt nowadays because they are too busy with their agricultural work, because they can get more money from rubber than from hunting, and because they can nowadays buy meat and are not required to hunt it. Many young people say they do not have the skills to hunt because they have left the village for several years to attend school or work in town. Some people also say they do not own tools to hunt, although, according to Dr Liang Wei (pers. comm.), many people now still own guns. Some people say they hunt animals only if they see them while working in the fields and plantations or looking after their cows.

In Qingjie, villagers say they reduced hunting around 2000-2001 because animal numbers decreased. Before, the men in Qingjie hunted about 5-6 times a year for two to three days at a time, but most often around the Chinese spring festival in February. Dr Liang Wei (pers. comm.) also highlighted the increase in hunting around the Chinese spring festival, when large quantities of wildlife are given to the local governments. Inhabitants of the other villages say they went hunting whenever they had time. According to some this would be almost daily, especially in the winter when there was less agricultural work. One man in Gaofeng told me that before the hunting ban, young men often went hunting for pleasure, while older men went hunting twice a week for food. According the villagers in Nanpeng, until about 2003, gallinaceous birds were hunted for food, but now their price has gone up from 5 to about 50 RMB per bird, and they are hunted for sale. Usually hunting in Bawangling was for food,

¹ about £1.30

² 0.067 ha

and only for sale when people needed money, if they caught too many animals to eat themselves, or if someone wanted to buy them. Some people kept wild animals as pets and tried to raise them.

	hunting behaviour	incentives for hunting	disincentives for hunting
present	majority hunts little (subsistence/pleasure), minority specialises in hunting (trade/profit)	• profitable: high demand in town • lack of tight control/strict punishment • individuals have hunting habit/skills • APP road facilitates access • free source of food • enjoyment • presents for the spring festival	• rubber as a profitable alternative opportunity • many guns confiscated, hunting illegal • gradual loss of skills • decline in animal abundance • the option to buy farmed meat
past	majority hunted (subsistence/pleasure)	• own food requirement • animals abundant • hunting skills/enjoyment • hunting legal • time: lack of alternative opportunities • presents for the spring festival	• little wild meat sold: poor transport and low price • high cost of bullets

Table 10: The perceived incentives and disincentives for hunting at present and in the past. While for some skilful individuals the opportunity cost of hunting has increased with the price of wild meat and through increased accessibility by APP roads, for most villagers it has decreased. In Bawangling Nature Reserve and Nanpeng, hunting is also limited by the prohibition to enter the nature reserve and government land respectively.

People hunted any animals they came across – mainly with guns. Turtles were caught whenever people found them, and due to their high price they were usually sold. In Yinggeling, wild pigs, turtles, and deer were most valued. The inhabitants of Bawangling said their main prey species before the hunting ban were wild pigs and pheasants. In Gaofeng, people said that they preferred hunting big animals like wild pigs because bullets were expensive and that it was considered a waste to hunt small animals. Therefore, they only shot small animals when they were unsuccessful at hunting bigger ones. In Qingjie and Yaxing, galliformes were trapped. If they died, people ate them themselves, but if they survived, people sold them. Dr Liang Wei informed me that since large mammals nowadays have decreased, villagers most commonly catch frogs, snakes, and galliformes. According to him, most local people only hunt small amounts for pleasure and to cover their own needs, but due to increasing demand from cities, a small number of villagers have specialised in hunting valuable species more frequently. These use roads built by APP (Asia Pulp & Paper)

to access remote areas of the forest. Incentives and disincentives for hunting nowadays and in the past are summarised in table 10.

4.2.3. Logging

As with hunting, people claimed they had no time for logging and that they preferred working in rubber rather than cutting trees. Dr Liang Wei confirmed that people cut few trees illegally because of strict government controls.

In Qingjie, the Scented Rosewood *Dalbergia odorifera* and other valuable big trees used to be common but now there are none left in the wild. Villagers say that outsiders came to buy the trees in 1993-95, so the villagers cut them every day for two years. According to the people in Yaxing, they were cut by outsiders around 1983-85, and in Nanpeng people say they were cut in the late 1980s by the government. In all three villages, people took the seedlings and planted them in their gardens when the Scented Rosewood became rare. They hope to harvest the wood in 20 years.

In winter, when they were less busy with agriculture, people in Qingjie and Yaxing also used to cut trees to sell the wood or trade it for other goods and food. The area around Nanpeng is clearly divided into village and government land, and people have only cut trees from village land. In the villages near Bawangling Nature Reserve, the government employed local people to cut trees for them in the mid-1980s. In Gaofeng, due to the poor condition of the road and the distance, people did not sell any trees.

In all villages, smaller trees were also cut for the construction of houses, tools, and furniture - whenever these were required.

	logging behaviour	incentives for logging	disincentives for logging
present	limited logging for construction	• timber is required to build houses • can usually obtain a permit for limited logging for construction	
	little logging for agricultural land	• agricultural land is limited • rubber is profitable • most people have money to buy rubber trees • the population is rapidly increasing	• logging and fires are illegal and strictly controlled
	no logging for sale		• logging is illegal and easily detected during transport • logging is considered hard work • rubber as a profitable and less strenuous alternative opportunity • decline in abundance of valuable trees
past	logging for construction	• timber required to build houses	
	logging for agricultural land	• traditional swidden agriculture and subsistence farming • logging was legal	• little money to buy rubber trees • poor infrastructure to transport rubber
	logging of valuable trees for sale	• highly profitable • time: lack of alternative opportunities • valuable trees abundant • outsiders came to buy trees • logging was legal	• poor infrastructure to transport trees

Table 11: The perceived incentives and disincentives for logging at present and in the past. In Bawangling Nature Reserve and Nanpeng, the clearing of agricultural land was also limited by the nature reserve and government land respectively, as was the logging of valuable trees.

Until the logging ban came into force, land used to be cleared regularly to plant rubber, and before the introduction of rubber, it used to be cleared for cassava or bananas. The area of land cleared usually corresponded to how much money people had to buy rubber trees or other crops. In addition, approximately up to the introduction of cash crops in Yinggeling, and up to the establishment of the nature reserve in Bawangling, patches of land in the forest were cleared for swidden agriculture, mainly to grow “shanlan” rice and grass. When clearing land, valuable trees were cut for sale, but the rest were burnt. According to Dr Liang Wei (pers. comm.), people now still slowly increase their land by damaging trees that grow around to their rubber land. Incentives and disincentives for logging nowadays and in the past are summarised in table 11.

4.2.4. Other uses of the forest

A common reply to questions regarding natural resource use in the villages near Yinggeling Nature Reserve was the Chinese proverb: “靠山吃山， 靠水吃水”， which means that people who live near the mountains subsist on the mountains, and people who live near water-bodies subsist on these. That is, the villagers consider themselves to rely on the forest. People collect wild mushrooms, wild fruit and vegetables, as well as medicinal plants in the forest. While valuable mushrooms are often sold in the town market, common mushrooms, fruit, vegetables, and medicinal plants are mainly collected for the villagers’ own consumption. In Qingjie, Yaxing and Gaofeng, dry fire-wood is collected in the forest, whilst in Nanpeng most of the fire-wood comes from dead rubber-trees. People also regularly fish and collect shells from the rivers. In Gaofeng people rely particularly heavily on these wild foods to supplement their diets. Additionally, in Gaofeng, rattan is harvested for sale. The grass for the roofs of grass houses is harvested in the forest and villagers regularly enter the forest to look after their cattle.

In the villages near Bawangling Nature Reserve, woods outside of the nature reserve, are nowadays used to collect natural resources and graze cattle. Before the nature reserve was established, the whole forest was used.

4.2.5. Other Sources of Income

All the villagers are farmers, although forest guards and teachers receive a significant additional income from their respective occupations. Moreover, some men go to work in towns during the agricultural off-season, as do some young people in the years after finishing school and before getting married. This is very common in Qingjie, Miaocun and Xinqing/Xinfeng, while in Nanpeng, generally only young women leave the village to work out, and in Gaofeng and Yaxing, few people work in towns. How much money people working in towns send back to their families varies greatly. In general, young people working in towns only send money back in the form of presents or if their families require it. Otherwise, they tend to spend the money on themselves or save up for their own future.

4.3. Conservation Policy

4.3.1. The Hunting and Logging Bans

In Qingjie, the logging and hunting bans and a ban to burn the forest were first introduced around 2000-2001, then enforced more seriously in 2003-2004. People here are not allowed to cut more than 100 trees without a permit from the local bureau of forestry. Burning land is strictly forbidden, as is the hunting of any animals. In Yaxing, hunting, logging and burning the forest was prohibited in 2005, although people may still cut trees with a permit. In Nanpeng, villagers say they are not allowed to enter the forest, and while they are allowed to cut and burn trees on village land, they have not been allowed to cut trees on forest land since the 1980s. They have not been allowed to hunt animals since about 1992, but this has only been enforced since 1997, and more strictly since 2005. According to the village head, 95% of people obey these rules. In Gaofeng, people were allowed to hunt until 1996. People may still cut small trees for houses, but they have not been allowed to clear land since 2003. The inhabitants of Miaocun and Xinqing/Xinfeng are not allowed to hunt and log without a permit – even on their own land. These bans were established in 1993, but have only been gradually enforced. Although according to Dr Liang Wei (pers. comm.) it is illegal to fish, none of the interviewees in the villages were aware of this.

4.3.2. The Nature Reserve

Whereas some villagers in Qingjie and Gaofeng were aware that Yinggeling Nature Reserve was established in 2003, in Yaxing and Nanpeng, people were only aware of its existence since 2005.

Around Yinggeling Nature Reserve, there is one forest guard in each of the villages. His duty is to patrol the forest 25 days a month, and call the provincial forestry bureau if people cut more trees than allowed or if there are fires. In Nanpeng, the forest guard

only goes into the forest two to four times a month to patrol, but is also only paid 400RMB a month, as opposed to 600RMB in the other villages. In Gaofeng, there are two forest guards per village, each being responsible for a different part of the forest. In addition to fires and logging, they also look out for hunting.

In Yaxing and Gaofeng, villagers have been employed as forest guards since 2005, and in Qingjie since 2004, although according to the villagers in the Qingjie, he only patrols twice a month. The forest guard in Nanpeng has had this position since 2003. He has caught people logging several times, and claims that these are outsiders who he suspects to have links with county forestry bureau. He further claims that the other three forest guards in his area do not work, and as he has been threatened, he also wants to quit this job. Nonetheless, he says that without him, all the trees would have been cut, and that it is important to protect the forest for its water-regulating properties. He suggests there should be five to six forest guards in Nanpeng alone.

Bawangling Nature Reserve was established in 1980, but was not well protected at first, so people continued using it until 1992. The reserve was enlarged in 2001, and entry is now strictly forbidden. Before 1992, cattle was kept in the forest, villagers collected their fire-wood in the nature reserve, medicinal plants and mushrooms were gathered for sale, and trees were cut for construction material as well as for swidden agriculture, which was used to grow special grasses that outsiders came to buy. Thus, alternative sources of revenue from selling natural resources from the nature reserve have stopped.

A forest guard in Xinqing/Xinfeng tells me he has had his job since 1992. Every day, two of the five people working in his team patrol the forest. He thinks they have been successful at reducing cutting, hunting, and burning, and he considers this sufficient to protect the forest. However, he does not actually believe the forest should be protected, but that people should clear all the land to plant rubber.

The main differences in hunting and logging habits, as well as the years when conservation policies and rubber were introduced in the villages, are summarised in table 12.

Village	Rubber planted	Past hunting frequency	Logging of valuable trees	Logging and hunting bans	Nature Reserve establishment
Qingjie	2003	5-6 times/year for 2-3 days with guns; trapping year-round	1993-95: cut by villagers for outsiders	Introduced 2000-01, enforced 2003-04	2003 (Forest guard since 2004)
Yaxing	1992	With guns and traps when free	1983-85: cut by outsiders	2005	2005
Nanpeng	1992	With guns when free	late 1980s: cut by government	Hunting ban introduced 1992, enforced strictly 2005. Logging ban on government land since 1980s	2005
Gaofeng	1998	With guns when free	never	Hunting ban 1996. Logging ban 2003	2003 (forest guard since 2005)
Xinqing/Xinfeng	1995	With guns when free	Mid 1980s: cut by villagers for government	Introduced 1993, gradually enforced	1980 (forest guard since 1992, area enlarged 2001)
Miaocun	1980				

Table 12: the villages varied in their hunting and logging habits, and differed in the timing of the introduction of rubber and of the conservation policies. Rubber becomes harvestable 6-8 years after the trees are planted. Men were free to hunt in the winter, when they did not have any agricultural work, as well as after finishing their work during the rest of the year. Many said they hunted almost daily. Besides logging valuable trees, trees were regularly cut for construction and to clear land in all of the villages, whenever required. All of this information is based on what the majority of interviewees said in each of the villages, except the establishment of the nature reserve, where the earliest date people named was used.

4.4. Attitudes towards Conservation

4.4.1. Galliformes as a Case-Study

Details for galliforme recognition, perceived abundance and perceived past change in abundance for each species are summarised in table 13. None of the respondents were aware of whether these birds also existed in other places. The average recognition scores for each of the bird species were found to be significantly correlated with their average perceived abundance scores (Spearman's $\rho=0.900$, $n=5$, $p=0.037$) (fig. 7).

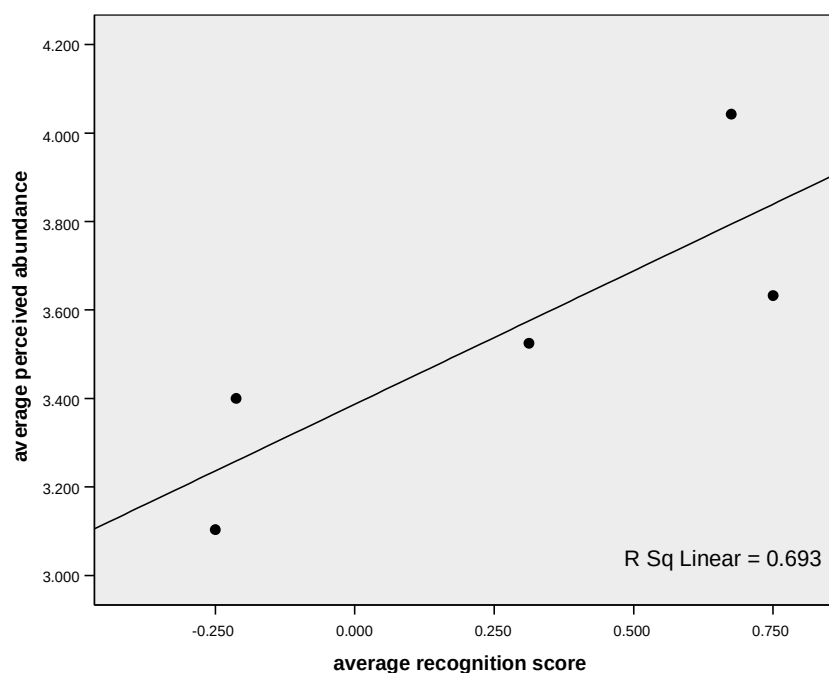


Fig. 7: The average recognition score of all respondents (on a scale of -2 to +2) was found to be significantly correlated with the average perceived abundance of all respondents (on a scale of 1 to 5, with 1 being absent and 5 being very common) for each of the bird species. The peacock pheasant had the lowest average recognition score and average perceived abundance, followed by the Chinese francolin and the partridge. The red jungle fowl had the highest average perceived abundance, and the silver pheasant had the highest average recognition score.

Galliforme species	recognised	common or very common	rare or very rare	past decrease	past increase
Hainan Partridge	52 %	30 %	23 %	23 %	11 %
Silver Pheasant	60 %	37 %	23 %	32 %	11 %
Peacock Pheasant	37 %	13 %	24 %	17 %	8 %
Red Jungle Fowl	62 %	45 %	17 %	28 %	11 %
Chinese Francolin	36 %	19 %	17 %	18 %	10 %

Table 13: Galliforme recognition, perceived abundance, and perceived change in abundance: The percentage of respondents recognising each species (n=105); the percentages of respondents saying each species is “very common” or “common” and the percentage of respondents saying each species is “very rare” or “rare” out of those recognising the species; the percentage of respondents according to which the birds have decreased and the percentage of respondents according to which the birds have increased, out of those recognising the species.

Of the 50 respondents who recognised that the galliformes had decreased, 26 said this was because of hunting, and 27 thought this was bad. Awareness of why game birds had decreased significantly differed with gender ($F=8.585$, $df=1$, $p=0.005$), with men significantly more likely than women to answer it was because of hunting. Also, respondents who thought a decrease was bad were significantly more likely to have lower levels of wealth ($F=6.194$, $df=1$, $p=0.016$). The reasons justifying why a perceived decrease in galliformes is bad, as well as why 6 respondents positively perceived an increase in galliformes, can be found in table 14.

48 respondents predicted the birds would increase in the future, with respondents in Qingjie ($B=-0.567$, $p=0.045$) and Nanpeng ($B=-0.878$, $p=0.007$) significantly less likely to predict an increase ($F=3.489$, $df=5$, $p=0.007$). According to 44 respondents, game birds would increase because of a reduction in hunting, and according to 28 of them this is good. However, 11 interviewees said the birds would decrease in the future, three because of hunting, and six perceive this as bad. The reasons why interviewees prefer a higher future abundance in birds is represented in table 14.

reasons for valuing galliformes:	present	future
beautiful/nice song	11	12
"don't know"	9	9
eat insects	7	7
hunting ban may be lifted	2	0
food	3	3
the expectation of a government reward	1	1
expected revenues from tourism	0	1

Table 14: The frequency of explanations respondents gave for valuing a higher abundance of galliformes at present ($n=33$) and in the future ($n=33$).

4.4.2. The Three-Striped Box Turtle as a Case Study

Recognition of the Three-Striped Box Turtle *Cuora trifasciata* differs significantly between nature reserves ($F=10.147$, $df=1$, $p=0.002$), with 24 out of 80 respondents in

Yinggeling saying it existed or had existed near their village, compared to 17 out of 25 in Bawangling. Out of the total 41 respondents that recognised the turtle, 40 thought it had become rare (7), very rare (25), or extinct (8) in their local environment. The reason for the decrease of the turtle also significantly differed between nature reserves ($F=5.948$, $df=1$, $p=0.020$), with 15 of 17 in Bawangling recognising this was because it was caught, compared to only 9 of 24 in Yinggeling. Of the 12 respondents that thought this decrease was bad, 7 explained that the turtles could provide an important additional income.

4.4.3. Scented Rosewood as a Case-Study

Recognition of the Scented Rosewood *Dalbergia odorifera* significantly differed with villages ($F=8.698$, $df=5$, $p<0.001$), because none of the respondents in Gaofeng ($B=-2.5$, $p<0.001$) identified it. All of the 40 respondents that recognised the Scented Rosewood believed it was rare (3), very rare (16), or had disappeared (21) around their village, and of the 36 that said it had decreased, 31 clarified this was because it was cut. Older people were more likely to think this decrease is bad ($F=5.981$, $df=1$, $p=0.020$). Of the 12 that negatively perceived this decrease, 7 said this was because it had been an important source of income, while 2 said this was because it provided water, and one because it provided fresh air.

While recognition of the game birds was found to be independent of the recognition of the Scented Rosewood and the Three-striped Box Turtle, a significant correlation was found between recognition of the tree and of the turtle (Spearman's $\rho=0.477$, $n=105$, $p<0.001$).

4.4.4. The Perceived State of the Forest

58 (55%) of the respondents said that big trees had decreased, and 53 (50%) that the forest area had decreased, with those aware of the decrease in big trees also significantly more likely to be aware of the decrease in forest area ($\chi^2=49.014$, $df=4$, $p<0.001$). This awareness also significantly depended on village (big trees: $F=8.145$, $df=5$, $p<0.001$; forest area: $F=3.325$, $df=5$, $p=0.009$), with significantly more people

in Yaxing being aware of the decrease in big trees ($B=-0.731$, $p=0.043$). According to 52 respondents, this decrease was due to logging, and according to 31, this decrease was bad. Those recognising the decrease of the forest was due to logging were more likely to be poorer ($F=9.044$, $df=1$, $p=0.004$), and those negatively perceiving this decrease were more likely to be older ($F=6.014$, $df=1$, $p=0.017$). In addition, 8 respondents welcomed a perceived increase in big trees and the forest area. The reasons named for valuing a larger forest are shown in table 15. The 6 respondents that thought a perceived increase in the forest area was bad or a perceived decrease was good explained that a larger forest meant that people had less land available to grow rubber.

While 55 respondents expected the forest area to increase in the future, according to another 14 it would decrease, with men significantly more likely to predict an increase than women ($F=5.208$, $df=1$, $p=0.025$). Although, according to 49 respondents, the forest area would increase because of a reduction in logging, 11 respondents predicted the forest would decrease due to logging. 38 of those predicting an increase thought this was good, and 5 thought this was bad. Likewise, 9 of those predicting a decrease in the forest viewed it negatively, while three viewed it positively. The answers to why people value the forest area are presented in table 15. Those claiming they did not welcome a larger forest again said that people would have less land to grow rubber.

reasons for valuing the forest:	present	future
water	20	23
“don’t know”	8	6
nice sound/scenery	3	7
the availability of trees to cut	4	1
fresh air	2	3
climate	1	1
animals	1	0
the expectation of a government reward	0	1

Table 15: The frequency of explanations respondents gave for valuing a larger forest at present ($n=39$) and in the future ($n=42$).

4.4.5. The Perceived Impact of Rubber on Wild Species:

73% of respondents were aware that there were no or fewer wild plants and animals in the rubber plantations compared to the forest. Only 8 respondents, however, recognised an impact on the overall numbers of wild plants and animals, and only 3 of them thought this effect was substantial.

4.5. Attitudes towards Conservation Policy

4.5.1. Attitudes towards the Hunting Ban

70 (67%) of the respondents to the questionnaire-based interview survey know of the hunting and logging bans. A significant difference between villages was found (table 16), with awareness being significantly lower in Qingjie, Nanpeng, Yaxing, and Xinqing/Xinfeng. Likewise, people knowing of the bans were significantly more educated and knowledgeable, as calculated by the recognition of case-study species.

	B	df	F	Sig.
Corrected Model		7	6.048	0.000
Intercept	1.225	1	413.118	0.000
village		5	4.481	0.001
Qingjie	0.344			0.040
Nanpeng	0.564			0.001
Yaxing	0.380			0.020
Gaofeng	0.053			0.743
Xinqing/Xinfeng	0.107			0.020
Miaocun	0			
education	-0.027	1	5.714	0.019
knowledge	-0.016	1	5.432	0.022

Table 16: A General Linear Model of “awareness of the hunting and logging bans” as a function of village, education and knowledge, with $R^2=0.304$ and adjusted $R^2=0.254$.

10 of the 70 that were aware of the bans thought the hunting ban should be softer, and 4 said they would prefer it to be harsher. 25 realise that its purpose is to protect animals, and 18 say that without the ban, the villagers would hunt more. Yet, 59 of the 105 interviewees say that they would also ban hunting if they could manage their local environment, while 13 would allow hunting again.

In group and key informant interviews, mice and wild pigs were reported to have increased as a result of the hunting ban. Wild pigs are perceived to pose a considerable problem because they destroy crops, and mice because they eat crops. One person thought that the rules should be adjusted: only endangered animals should be protected. Generally, only few people can think of any benefits of the hunting ban. Some people say birds should be protected because they eat insects, for example wild ants in rubber plantations, and some people find the birds aesthetically appealing and would like to preserve them for future generations. However, according to one farmer: “we think it’s a waste if an animal dies naturally”, and several villagers say that eating wild meat is an important part of their culture.

4.5.2. Attitudes towards the Logging Ban

As with the hunting ban, 67% of respondents are aware of the logging ban. 41 of these think the logging ban should be softer, and 4 think it should be harsher. The respondents preferring a softer logging ban were significantly more likely to be older, poorer, and more knowledgeable (table 17). What is more, significant interactions between wealth and age, as well as age and knowledge were found, indicating that the direction of these variables differed.

	df	F	Sig.
Corrected Model	5	3.501	0.007
Intercept	1	17.681	0.000
wealth	1	4.070	0.048
age	1	11.016	0.001
knowledge	1	6.780	0.011
wealth * age	1	7.368	0.009
age * knowledge	1	5.433	0.023

Table 17: A General Linear Model of “attitudes towards the logging ban” as a function of wealth, age, and knowledge, with $R^2=0.215$ and adjusted $R^2=0.153$

31 of the 70 interviewees knowing the bans realise that the purpose of the logging ban is to protect the forest, and 36 said that without the logging ban, people would cut more trees, 26 of them specifying this would be to increase their rubber land. However, 51 of the 105 respondents said they would abolish the logging ban if they were to manage the environment, and only 21 would also ban logging. While no

significant association was found between how people would manage logging and hunting, those saying they would allow logging were more likely to be poorer and more knowledgeable, with the effect of knowledge varying with age (table 18).

	df	F	Sig.
Corrected Model	4	4.777	0.002
Intercept	1	80.876	0.000
knowledge	1	9.479	0.003
age	1	1.292	0.260
wealth	1	12.070	0.001
knowledge * age	1	7.724	0.007

Table 18: A General Linear Model of “whether to allow logging” as a function of knowledge, age, and wealth, with $R^2=0.222$ and adjusted $R^2=0.175$

During group and key informant interviews, many people said they liked the forest scenery, fresh air, water, and climate. A decrease in water due to logging is seen as a serious problem. Other people, however, said they do not think it is bad to cut trees because they grow back naturally. Many people welcome the fact that the forest near the villages has decreased because they earn more money from rubber. They also think rubber trees are as good as the forest for the environment because they regulate climate, water and air. The general opinion is that the forest is so big, it cannot disappear. One man jokingly answered my question regarding the future area of the forest saying that “the forest cannot leave – trees do not have any legs!”. Many do not mind a decrease of the Scented Rosewoods because they have planted them in their villages. People do not think rubber has an impact on animals as it is planted close to the village which animals avoid anyways.

Most people think they should have more land. Young couples that get married cannot obtain any land to plant rubber and have to share their parents’ land. Since the population has increased, there is now a shortage of land. In Qingjie and Miaocun, people generally say they want 10 mu per household (about 200 trees/person). In Yaxing and Xinqing/Xinfeng, however, people generally say they would need 1000 trees/person, and in Gaofeng and Nanpeng 1-2000 trees/person. A few people in Nanpeng, Xinqing/Xinfeng and Gaofeng say they would need more rice land, too, and in Nanpeng more land for vegetables. In Yaxing and Miaocun, there is also concern about the availability of wood for construction. Some people say the primary forest should be protected but that they should be allowed to cut the forest in the valley

where the village is located, while others say they would like to clear it all. One man said people should have more power to decide which land should be protected, planted, and grazed.

In Gaofeng, people complain that while they are not allowed to cut trees, APP is allowed to. In each Qingjie, Yaxing and Nanpeng at least one person said he or she thought the forest would decrease in the future because APP was cutting trees. In Qingjie and Yaxing, people complained that APP has planted trees on their grasslands which they previously used for grazing, and which they are now not allowed to enter anymore.

4.5.3. Attitudes towards the Nature Reserve

Awareness of the nature reserve was significantly higher for more knowledgeable respondents and lower in Yinggeling than Bawangling (table 19), with only 29 of the 80 interviewees knowing about Yinggeling Nature Reserve. In addition, knowledge of Yinggeling Nature Reserve was significantly associated with village, with significantly less people in Qingjie, Nanpeng and Yaxing knowing about the nature reserve, compared to Gaofeng.

	B	df	F	Sig.
Corrected Model		6	21.168	0.000
Intercept	1.115	1	968.874	0.000
knowledge	-.015	1	7.090	0.009
NR		1	46.039	0.000
Yinggeling	0.043			0.747
Bawangling	0			
NR * village		4	20.417	0.000
Yinggeling * Qingjie	0.946			0.000
Yinggeling * Nanpeng	0.723			0.000
Yinggeling * Yaxing	0.550			0.000
Yinggeling * Gaofeng	0			
Bawangling * Xinqing/Xinfeng	0.118			0.410
Bawangling * Miaocun	0			

Table 19: A General Linear Model of “awareness of nature reserve” as a function of knowledge (the recognition score of case-study species), nature reserve, and village within nature reserve, with $R^2=0.564$ and adjusted $R^2=0.538$

In the villages surrounding Yinggeling Nature Reserve, 19 of the 29 respondents knowing about the nature reserve have a positive, and 5 a negative opinion of it. 15 say its aim is to protect both the forest and animals, while another 3 think its aim is only to protect the forest. Only 6 of the 80 interviewees know that the area will become a national nature reserve in the near future.

22 of the 25 surveyed in Bawangling know about the nature reserve. 7 think it is beneficial, while 5 think it is harmful. 6 think its purpose is to protect both animals and the forest, 5 think it only aims to protect animals, and 2 think it only aims to protect the forest.

Group and key informant interviews in Bawangling revealed that attitudes towards the nature reserve are generally negative, despite there having been a publicity campaign. People recognise the air and environment in the nature reserve are good, but think it is a disadvantage to live near it because they have to buy trees for houses, and cannot enter the nature reserve for wild grass, medicinal plants, wild fruit and vegetables, mushrooms, or to graze their cattle. Before the establishment of the nature reserve, people had a contract saying that they could use this land. Therefore, there is a general resentment about this land having been confiscated. Some people say they were told the nature reserve was established to protect gibbons but they do not think these exist near the villages, so they think they should get the land back. The village leaders of Zhibao and Damai, too, told me that they were informed that the purpose of the nature reserve was to protect the gibbons but that the gibbon was worshipped in the villages close to the forest, and therefore not hunted. Big trees, which the gibbons live in, have been cut by the government, not the villagers. Moreover, before hunting ban, local inhabitants rarely hunted in the nature reserve, but more commonly in shrub-land outside the nature reserve. They say the communities would protect the environment themselves, but that they do not agree with the nature reserve because it restricts them from earning money through rubber.

Replies to the questionnaire-based interview survey can be found in appendices 4 and 5. A summary of significant links between socio-economic variables and attitudes towards conservation and conservation policy can be found in appendix 6.

4.6. Perceived Impacts of Conservation Policy:

People say that because of the hunting and logging ban, they are moving away from depending on the forest. They try not to go to the forest but earn money outside by intensifying agriculture on their own land and working in towns.

Impact		Qingjie	Nanpeng	Yaxing	Gaofeng	% of total scores
Cost for villagers	Less agricultural land	xxx	xxx	x	xxx	31.4
Benefit for the environment	More animals and plants	xx	xx	x	x	11.4
Benefits for villagers	More water from trees	x	xx	x	x	11.4
Cost for villagers	More pests (wild pigs, mice)			xx	x	10.7
Benefits for future generations	Can see more animals and trees	x	x	x	x	9.3
Cost for villagers	Less wood for construction			xx		6.4
Benefits for people elsewhere	More fresh air and water			x	x	4.3
Benefits for villagers	Can see/hear more animals				x	3.6
Benefits for villagers	More insects eaten by birds				x	3.6
Cost for villagers	Less income from timber	x		x		2.9
Benefits for villagers	More fresh air from trees	x			x	2.9
Cost for villagers	Less wild meat for consumption	x		x		2.1

Table 20: Results of focus group scoring exercise in Yinggeling, weighing the perceived costs and benefits of the hunting and logging bans: An average score of all the focus groups in a village of up to 3 is denoted by “x”. An average score of 4-6 is indicated by “xx”, and “xxx” refers to an average score of 7-9. The importance of the impact across all groups is shown in the last column, which gives the percentage of the sum of all scores for this impact.

The results of the scoring exercise (appendix 7) in the villages near Yinggeling (table 20) show that costs from the logging ban were generally seen as the most important impacts of conservation policy. Limited agricultural land due to the logging ban was perceived as a particular problem in Qingjie, Nanpeng and Gaofeng, while limited wood for the construction of houses was one of the main impacts in Yaxing, together

with an increase in pest species due to the hunting ban. An increase in water thanks to the logging ban was also given relatively high importance in Nanpeng, and was recognised as a benefit from the logging ban in all the other villages. In addition, benefits for the environment were seen as rather important in Qingjie and Nanpeng. While the reduced income from hunting wild animals, the fact that people could see more trees, and an increased number of trees to regulate the climate were not seen as important impacts of conservation policy in any of the villages, all the other impacts received at least one score in at least one of the villages.

The results of the scoring exercise in the villages near Bawangling (table 21) indicate that, while impacts of the hunting ban were not perceived as having much impact, the exclusion from the nature reserve was perceived as negatively affecting the villagers, because they could no longer keep their cattle there or collect natural resources in the nature reserve. Nonetheless, all but one of the focus groups saw limited land as the most important impact of conservation policy. Limited wood to build houses was also a very important impact in Miaocun, and a minor impact in Xinqing/Xinfeng. However, focus groups in both villages recognised the importance of the logging ban for their water sources, and one focus group in Xinqing/Xinfeng saw benefits to the environment. Benefits for future generations or people living elsewhere were not perceived.

Impact		Xinqing/ Xinfeng	Miaocun	% of total scores
Costs for villagers	Less agricultural land	xxx	xxx	46
Costs for villagers	Less wood for construction	x	xxx	22
Benefits for villagers	More water from trees	x	x	12
Costs for villagers	Less access to natural resources	x	x	8
Costs for villagers	Less access to grazing-land	x		6
Benefit for the environment	More animals and plants	x		2

Table 21: Results of the focus group scoring exercise in Bawangling, weighing the perceived costs and benefits of the hunting and logging bans and of the prohibition to enter the nature reserve: As in table 20, an average score of all the focus groups in a village of up to 3 is denoted by “x”. An average score of 4-6 is indicated by “xx”, and “xxx” refers to an average score of 7-9. The importance of the impact across all groups is shown in the last column, which gives the percentage of the sum of all scores for this impact.

4.7. Other Perceived Costs and Benefits from the Forest

People like living in the villages because they know how to grow things and would not have the survival skills for living in town. They also appreciate the clean mountain water, as well as being close to their cattle in the forest.

The distance to the schools was mentioned as a problem several times, because it keeps children from getting a better education. People also bemoan the bad roads, the distance to markets, and their standard of living. Everybody wants more economic development, and particular emphasis is placed on the condition of houses. People also say they would like someone knowledgeable to come and tell them how to increase their harvest. In Nanpeng, the unreliable tap water supply is a further problem.

5. DISCUSSION

5. 1. Local awareness and attitudes of conservation

A study in Hekou, Yunnan Province, found that the local population did not perceive itself to be negatively affected by deforestation near their village (Barraclough and Ghimire, 2000). Likewise, a study in Shimentai Nature Reserve, Guangdong province, found that conservation was an alien concept to local people (Jim and Xu, 2002b).

In Yinggeling and Bawangling nature reserves, however, it appears that attitudes towards conservation are mixed: On one hand, 58% of respondents aware of the decrease of the forest area viewed it negatively, and 54% of those recognising the decrease in galliformes regretted it. On the other hand, only 30% of those recognising the decrease of the three-striped box turtle and 33% of those recognising the decrease of scented rosewoods thought this was bad, despite almost all those recognising the turtle (98%) and the scented rosewood (90%) saying it had decreased, and 20% and 58% respectively thinking these species were extinct around their villages. This may be due to the fact that the scented rosewood and the tree-striped box turtle were primarily valued as an additional source of income, which, being very rare, has little importance. Moreover, compared to the galliformes, they had higher than expected recognition scores considering their low perceived abundance, which may be due to the fact that they were well known for their high price but also renowned to be very difficult to find.

The forest, was mainly appreciated for its ecosystem services, especially water, which the livelihoods of local populations depend on. People frequently reported droughts and a general decrease in the size of waterways in recent years. The game birds, however, were not so much valued as a source of food as for aesthetic reasons, which may be linked to the fact that people were shown pictures of these birds earlier in the interview. Some respondents valued birds for their usefulness in eating insects, although a third of respondents could not name a reason for valuing a high abundance of galliformes. Moreover, a decrease of the forest area was perceived by 50% of respondents, but a decrease of the galliformes only by between 17% (for the peacock pheasant) and 32% (for the silver pheasant) of those recognising them. This low

awareness of changes in galliforme numbers suggests that animals play a smaller role in people's livelihoods, while the higher awareness of the decrease in the forest area may again be explained by the fact that people have a closer relationship with it.

This bias in awareness is also reflected in people's understanding of their impact on the environment. Only 52% of those recognising a decline in galliformes and 58% of those recognising a decline in the three-striped box turtle suggested it was caused by over-harvesting, compared to a great majority of respondents who understood that the forest (94%) and the scented rosewood (78%) had declined because of logging. In addition, very few respondents (8%) were aware that rubber plantations had an impact on wild plant and animal numbers. This was despite the fact that 73% of respondents said there were less wild plants and animals in their plantations than in the forest. Many people explicitly answered that they thought the animals simply went further into the forest when more rubber was planted. This indicates an important lack of knowledge, as the reduction of the Hainan partridge, for example, is in great part caused by loss of forest habitat (Birdlife International, 2006).

Although this indifference towards animals is confirmed by attitudes regarding the hunting ban, the logging ban was largely rejected. Only 10 of the 70 respondents knowing of the hunting and logging bans wanted the hunting ban to be softer, compared to 41 preferring a softer logging ban. Also, 18 respondents said that without the bans, more people would hunt, compared to 36 who thought that more people would cut trees. Likewise, 59 of the 105 interviewees would ban hunting if they were to manage the environment, and 13 allow hunting, compared to only 21 interviewees who would ban logging, and 51 who would allow it. Thus, the majority of respondents wants to be allowed to fell trees, but few people wish to hunt. The reason for this negative attitude towards the logging ban is that the forest is in direct competition for land with rubber plantations, meaning that people cannot increase their profits from rubber if they are not allowed to cut trees.

Finally, in addition to valuing the environment for their own benefit, people also recognised that its conservation affected others. In the focus group scoring exercises, where perceived benefits of conservation policy received 35% of scores, exactly half of these scores were for impacts perceived to benefit the villagers, and the other half

for perceived benefits for the environment (27%), future generations (16%), and people living in distant places (7%).

5.2. Factors influencing perceptions:

5.2.1. Socio-economic characteristics:

Some perceptions were found to differ with location. Differences in species recognition and in perceived environmental change between villages and nature reserves are likely to reflect differences in abundance of these species at different locations, but may also imply differences in the use of the forest and natural resources in different villages. Differences in knowledge of conservation policy between villages imply differences in enforcement and in communication between villagers, forest guards and local authorities. Unsurprisingly, the inhabitants of Bawangling, were more aware of their nature reserve than those in Yinggeling, with Bawangling Nature Reserve having been established 23 years earlier.

Similarly, important differences between the perceptions of genders were observed. Women were less capable of recognising the pictures of game birds, less likely to know birds had decreased because of hunting, and less likely to predict a future increase in the forest area. The reason for these differences is that men usually hunt, cut trees, and spend time in the forest looking after their cattle, while women tend to do more housework, which gives them less opportunity to observe wildlife.

Perceptions were also linked to age. Those negatively perceiving a decrease of the forest and of scented rosewood were more likely to be older. However, those preferring a softer logging ban were also likely to be older. A probable explanation for this is that older people are more likely to have profited from the sale of scented rosewood, and are more likely to have observed a decrease in environmental services from the forest, and thus have negative perceptions towards the decrease of trees. They have however also noticed the recent economic developments that came with

the increase of rubber, and therefore want to clear more forest land to be able to plant more rubber.

In addition, perceptions could be associated with wealth. Respondents with negative attitudes towards a decrease in galliformes were poorer, which may be due to poorer people depending more on hunting to complement their diets. Moreover, the poorer villagers were also those recognising that the forest had decreased because of logging, preferring a more lenient logging ban, and more likely to say they would allow logging if in charge of managing their environment. This is because they are particularly keen to increase their rubber land to improve their income.

Finally, knowledge and education influenced perceptions. More educated and knowledgeable people were more likely to be familiar with the logging and hunting bans and more knowledgeable people were more likely to be aware of the nature reserves. However, those with negative attitudes towards the logging ban were also more knowledgeable, perhaps because they are more aware of the financial benefits that come with logging. Even though it could be assumed that more knowledgeable people have accumulated their knowledge by spending more time in the forest or being more observant, knowledge did not affect insight into why animals and trees had decreased, or improve attitudes towards the conservation of animals and trees. Instead, knowledgeable people prefer economic development to environmental conservation.

5.2.2. Policy interventions

The indifference towards animals, but the strong feeling towards the forest, are reflected in the livelihoods of the villages surveyed. These have undergone considerable changes in recent years, mainly caused by direct policy interventions, including environmental conservation policy, such as the ban on logging and on hunting, as well as economic development policy, such as the introduction of rubber

as an alternative opportunity to hunting and logging, and the improvement of the transportation infrastructure linking the villages to towns.

Thus, while in the past many villagers hunted to supplement their own diets, most people nowadays hunt very little. The main reason for this is that the opportunity cost of hunting has increased as people are able to make more profit from working in rubber plantations. In addition, since the villages have become less isolated with the extension of the road network, more people have left the villages to work or attend schools in towns, which has led to a loss of the hunting skills amongst the younger generations. This improvement in transportation also means that more goods are traded with outsiders, including farmed meat, reducing the demand for wild meat. Finally, the hunting ban and the confiscation of guns have contributed to the reduction of hunting by the majority of the population, although they are probably not enforced strictly enough to be a major cause of this reduction. It should be noted, however, that despite most people rarely hunting nowadays, some villagers have focused on hunting. This, again, can be linked to the improved transportation infrastructure, as people are more easily able to travel higher up into the mountains to hunt, often along roads built by APP, and to towns, where they can obtain a high price for wild meat. Thus, whereas before the introduction of rubber and the hunting ban, most people depended on wildlife, this is not the case anymore. Therefore, changes in the abundance of animals do not greatly affect the villagers. They often do not see an important requirement to protect animals, but do not have negative attitudes towards the hunting ban, as it does not restrict their livelihoods.

According to the participants of the focus group scoring exercises, the perceived impacts of the logging ban (79% of scores) outweigh those of the hunting ban (14% of scores). Local relationships with the forest, however, are more complex than those with animals. People cut trees for three main reasons: the construction of houses, the sale of valuable trees, and the increase of agricultural land. The logging of valuable trees, however, has decreased, its opportunity cost having increased. This is mainly because of the logging ban, which is rigorously enforced, but also because of the introduction of rubber as a profitable and less strenuous activity, as well as the fact that most valuable trees have already been cut. Thus, while in the past people supplemented their income through the sale of valuable trees, they now generally no

longer directly profit from the forest. In contrast, the policy introducing rubber to the villages has created a demand for more agricultural land – the reason the logging ban is perceived so negatively. The logging ban is in conflict with economic development through rubber, giving villagers little reason to value the forest. In the scoring exercises, focus groups gave 80% of the scores they distributed amongst the impacts regarding logging to costs of the logging ban, whilst only 20% were given to its benefits, namely the water and fresh air villagers obtain from the forest.

Thus, a variety of interacting factors have affected livelihoods. It is not always easy to pin-point which of these factors has had the largest impact, and is thus most likely to have affected attitudes towards conservation. Whereas the logging ban has played an important role in protecting the environment, it has created resentment amongst the local population on the grounds that it restricted their economic development. In the villages surveyed, the impact of economic development linked to the cultivation of rubber was particularly important, and most villagers attributed their changes in life-style to the introduction of rubber, although some elderly people thought that conservation policy had an important impact. To really assess to which extent changes in livelihoods and attitudes were caused by conservation policy, further studies should ideally be carried out in villages where conservation policy has not been imposed, all other variables remaining similar, and findings should be compared.

5.3. Nature reserve management:

While 88% of those interviewed in Bawangling knew about the nature reserve, only 36% of those in Yinggeling were aware of it. This low awareness is, to some extent, due to the fact that people in Yinggeling have not yet experienced the negative impacts of the nature reserve directly. Therefore, Yinggeling Nature Reserve was generally viewed as positive (66%), as opposed to Bawangling Nature Reserve (32%). Bawangling Nature Reserve has created resistance amongst local populations because it excludes these from areas previously used for natural resource extraction and agriculture, and people would nowadays use much of this land for the cultivation of

rubber, had the nature reserve not restricted them. In the focus group discussions, 14% of scores were given to costs occurring through exclusion from the nature reserve, namely not being able to use it for natural resource collection (8%) and exclusion from grazing lands (6%). However, the limited agricultural land received an overwhelming 68% of scores, compared to only 41% in Yinggeling. Participants in Bawangling do not perceive themselves to be affected by the hunting ban at all, which received 20% of scores in Yinggeing, and no benefits for future generations or people living elsewhere are perceived in Bawangling. This indicates that, compared to Yinggeling, people have more distant life-styles from the forest, and are more profit-oriented. Perceptions towards conservation are inferior to those in Yinggeling, with people being largely indifferent to the environment, except for negative attitudes where it restricts them.

6. RECOMMENDATIONS

6.1. Nature reserve implementation and enforcement of bans

6.1.1. Community education and participation

Education is often seen as an initial step to improving attitudes towards conservation (Xu et al., 2006). However, according to Liu et al. (2003), conservation education in Chinese nature reserves has not been very effective. In Yinggeling and Bawangling, this was certainly true: public awareness of environmental decline, its underlying causes and its consequences were poor, with the result that understanding of the purposes of conservation policy was limited. Moreover, people were generally unaware of the uniqueness of their environment and the species living in it, or, in Yinggeling, that it was under any special protection status. Only 6 out of 80 interviewees in Yinggeling were aware of its future upgrade to national nature reserve. This highlights a lack of communication with the reserve management, not even all the forest guards being aware of Yinggeling Nature Reserve.

An improvement in education levels could also help the nature reserve reduce population pressure. In a study of Shimentai Nature Reserve, Guangdong Province, a rise in education and the availability of external opportunities caused an increasing proportion of young people to work outside the nature reserve (Jim and Xu, 2002b). Similar trends can be observed in Hainan, where many young people leave the mountains to work or attend school in towns, and upon returning are not familiar with the forest, and do not take up natural resource exploitation. In Wolong Nature Reserve, Sichuan province, where the local population had increased mainly because of high birth rates, moving older people out of the nature reserve was found to be costly and socially difficult. However, a youth-only move was suggested to be more effective because youth emigrants would establish families outside the reserve and reduce total births. Young people were also more willing to move out, especially if they received higher education elsewhere (Liu et al., 1999). Whilst no evidence of such permanent emigration was observed in Hainan, this may be one solution to solving the shortage of agricultural land in the future.

Lack of participation in decision-making for reserve management has been identified as another important factor shaping attitudes towards conservation (Gillingham and Lee, 1999). While plans for the co-management of Bawangling Nature Reserve have been outlined for 2005-07 (FFI China Programme, 2005), none of the interviewees in Bawangling appeared to be aware of this. In Yinggeling, the participation of local communities should be encouraged to explore possible solutions to sustainable development compatible with nature reserve management goals (Yudong, 2001), and to assure improved attitudes towards the nature reserve in the future.

6.1.2. Incentives for conservation

To ensure greater cooperation and mitigate conflicts between nature reserve management and local communities, it is necessary to provide local people with incentives for conservation (Southworth, 2006), for example by offering alternative incomes and increasing incomes (Jim and Xu, 2002b). In Yinggeling and Bawangling, any alternative opportunities would have to be more profitable than rubber, though, for people to adopt them. Other potential incentives in Yinggeling and Bawangling are subsidised education and transportation to school, as concerns over school fees and the distances to the schools were often voiced by the villagers. Locals should perhaps also be allowed to cut trees on their own land, providing this is for their own use, and permits to cut a limited number of trees for the construction of houses should be free of charge in all the villages. All these factors would decrease disapproval of conservation policy. Furthermore, to avoid the resentment which arose with the establishment of Bawangling Nature Reserve, the nature reserve zones allowing access to different areas of the nature reserve should be adapted to allow local uses of the forest and of natural resources. For example, the collection of wild fruits, vegetables, and mushrooms does not have any considerable environmental implications (pers. comm. Dr Liang Wei) and should therefore be allowed.

However, the hypothesis that an increased income for local communities necessarily leads to improved conservation remains debatable. A recent analysis by the Biodiversity Conservation Network of 39 projects across Asia found that the

association between financial benefits and conservation effectiveness is complex and site specific. Although improved incomes were obviously welcomed, an issue raised more urgently was that of protection of people's own interests and livelihoods from damage by wildlife (Worah, 2002). Pest species frequently mentioned in Hainan are wild pigs and mice, increasing wild pig populations being of particular concern in the villages on the northern side of Yinggeling. It may be recommendable for the nature reserve management to control these pest populations. According to Dr Liang Wei (pers. comm.), in Hubei province, the forestry department manages wild pig population by having the army shoot them regularly. This may also be an option in Hainan.

6.1.3. Disincentives for conservation

Successful protection of nature reserves ultimately depends on a mix of incentives and disincentives (Beltran and Phillips, 2000). Disincentives include regulations and their enforcement. One third of respondents were not aware of the hunting and logging bans, which indicates that these were not adequately enforced. In many villages, nobody was responsible for controlling hunting, and the only punishment, if discovered, is that any caught animals are confiscated (pers. comm. Dr Liang Wei). Although, according to the IUCN (2006b), the Hainan partridge is hunted for subsistence use or local trade, it appears that trade actually takes place on a larger scale. According to Dr Liang Wei, hunting for the market is a significant threat for this species, while subsistence hunting by locals is inconsequential. Therefore, a control of the market may be required, and stricter controls around the spring festival, when more animals are hunted, may be recommendable. What is more, over-fishing, which does not appear to be controlled at all, threatens many aquatic species (pers. comm. Dr Liang Wei), and hence requires managing.

There further appears to be a lack of enforcement of the logging ban because the forest guards do not patrol as required, and do not have the necessary authority to actually stop people from logging. Thus, more than one forest guard should be

employed in each village, their activities should be monitored, and more power should be granted to them.

6.1.4. Further impacts on conservation

It should also be noted that some drawbacks of rubber may arise in the future. First, some environmental concerns are associated with rubber, including an increase of rodent pests, the pollution of water sources due to an increased use of pesticides and fertilisers, and increased soil erosion and reduced run-off control (O'Brien, 1998). Since virtually all rubber plantations are monocultures without any under-storey, these plantations have an adverse impact on biodiversity. Moreover, rubber imported by China is nowadays cheaper than the rubber it produces. Furthermore, China's production of synthetic rubber has risen (Tisdell and Xiang, 1996). This raises questions regarding the long term sustainability of growing rubber as the only cash crop in this region.

Likewise, the roads built by APP reportedly facilitate access to remote parts of the forest for hunting and logging. According to Dr Liang Wei (pers. comm.), these roads may actually pose a more serious environmental problem than the APP plantations themselves. Between 1997 and 2003, APP has planted 63,530 ha of mainly eucalyptus in Hainan, 80% of which was planted on "collectively-owned" land and "farm land allocated to households" (Barr and Cossalter, 2004). It is strongly recommended that the policy giving APP the right to do this is altered, since it is viewed with incomprehension and opposition of local people, and that some of these roads are closed off from public access again.

6.2. Further research

Despite emphasising that my research was for purely academic purposes, and avoiding sensitive issues such as present illegal hunting and logging behaviour, some

of the problems inherent to surveys (Furze et al., 1996) could not be avoided in this study: many people were suspicious of the survey and answered strategically. The reason for this was that many people were afraid of admitting they did not agree with government policy and they wanted to look innocent with regard to the present law and therefore did not admit they had ever hunted or logged. Their fear seemed to be justified: when travelling between villages, I met a man from another village I had studied three weeks earlier, and he told me that, after my departure, local authorities had arrived in the village and scolded people for telling me about any costs incurred through conservation policy. In addition, language barriers may have introduced some bias into the study, as all communication went through at least one translator, and in some villages, where few people spoke Mandarin, interviews required further translations into the local language. In addition, having different research assistants in each village has probably introduced some bias, in particular because these research assistants differed in age and gender. Finally, due to time constraints, it was not possible to spend more than a week in each village. With more time, the villagers may have become more trusting, and the study could have been undertaken in more depth. One possibility of overcoming difficulties associated with trust and languages in this study would be to train local teachers to undertake the surveys, as Jim and Xu (2002a) have done in Shimentai Nature Reserve.

7. SUMMARY AND CONCLUSIONS

In light of the planned upgrade of Yinggeling Nature Reserve to national status, this study was undertaken to assess how local attitudes towards conservation were affected by conservation policy.

Attitudes were found to be in part influenced by the socio-economic background of people, but mainly by the benefits they could obtain from different species. Since the main source of income in the villages is rubber, a shortage of rubber-land due to the logging ban resulted in negative attitudes towards the logging ban, despite a relatively high awareness of the decline in trees and their ecosystem services.

However, as hunting levels had generally decreased, public awareness of animals was rather poor, and local people tended to be indifferent towards animals and the hunting ban. Likewise, despite being aware of their scarcity, people were unconcerned about critically endangered species, which they do not regularly benefit from.

In Bawangling, attitudes towards the nature reserve were negative because the local population had been excluded from lands they previously used for both agriculture and natural resource extraction. Since Yinggeling is so far only a “paper park”, awareness of the nature reserve was rather poor. It is recommended that, with its upgrade, community participation and education are encouraged, and that enforcement is strengthened.

Broadly speaking, to avoid conflicting policies, it is advisable that policies consistently aim for sustainable development, and that responsibilities at different levels of government are clearly allocated, in particular regarding enforcement.

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APPENDIX 1:

Questionnaire-based household interviews

1. socio-economic characteristics

1. gender:
2. age:
3. education:
4. occupation:
5. spouse's occupation:
6. wealth:
 - a. type (and price) of house
 - b. possession (and price) of energy-consuming machines (*motorbike, tractor, ploughing machine, TV, VCD/DVD player, satellite dish, stereo system, electrical cooker, phone, mobile*)

2. attitudes towards protected animals

1. **birds:**
 - a) Which of these birds live in your area?
 - b) Do you know if they only live in Hainan or also in other provinces and countries?
 - c) How often do you see each of these and when have you last seen them?
 - d) Were there more or less of these birds in the past? Why?
 - e) How good or bad do you think it is that they have increased/decreased? Why?
 - f) Do you think wild birds or farmed birds taste better?
 - g) How often have people had to hunt these birds to obtain food? How many birds?
 - h) How often have people had to hunt these birds to supplement their income? How many birds?
 - i) Do you think there will be more or less of these birds here in the future? Why?
 - j) How good or bad do you think it is if there will be more/less? Why?
2. **turtle:**
 - a) Does/did this turtle exist in this area?
 - b) How often do you see one and when have you last seen one?
 - c) Were there more or less of these turtles in the past? Why?
 - d) How good or bad do you think it is that they have increased/decreased? Why?

3. attitudes towards the forest

1. *Scented Rosewood:*

- a) Does/did this tree exist in this area?
- b) How often do you see one, and when have you last seen one?
- c) Were there more or less of these trees in the past? Why?
- d) How good or bad do you think it is that they have increased/decreased? Why?

2. *logging:*

- a) Were there more or less big trees here in the past? Why?
- b) Was the area of the natural forest smaller or larger in the past? Why?
- c) How good or bad do you think this increase/decrease is?
- d) How often have people had to cut trees to build houses? How many trees?
- e) How often have people had to cut trees to supplement their income? How many trees?
- f) How often have people had to enlarge their land and by how much? How have people used this land?
- g) Do you think the area of the natural forest will increase or decrease in the future? Why?
- h) How good or bad do you think this increase/decrease is? Why?

3. *rubber plantations:*

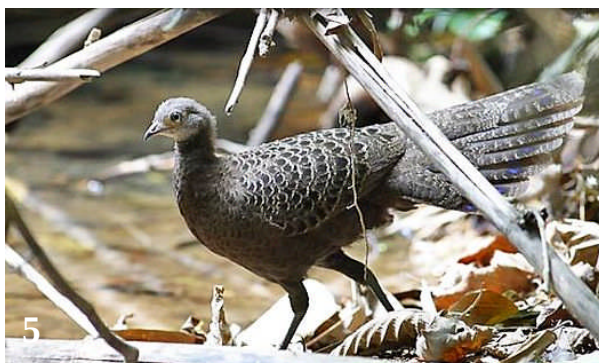
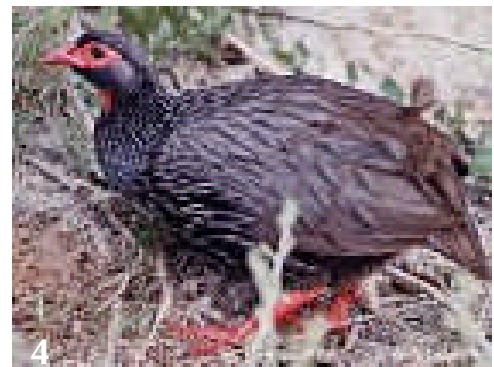
- a) Are there more or less wild animals and plants in rubber plantations than in the forest?
- b) How much does this affect the number of wild animals and plants here?

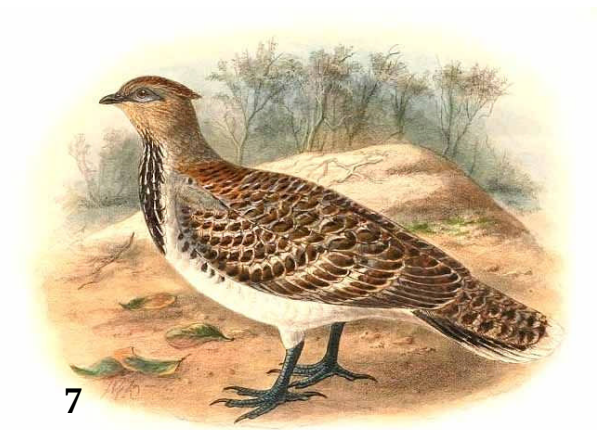
4. attitudes towards the hunting and logging ban and the nature reserve:

- a) Are there any restrictions on people's use of trees and animals, or can people use them as they please? What are these restrictions?
- b) Why do you think each of these rules was established?
- c) If these rules did not exist, what would be different here now?
- d) Would you prefer it if each of these rules were harsher or softer? Why?
- e) Is there a nature reserve nearby? Where? Since when? What is its purpose? How good or bad do you think it is that there is the nature reserve? Why?
- f) Do you know about any future plans for the area? What do you expect will change?
- g) If you could manage the environment in this area, what would you do? Why?

Do you have any questions to ask us? - Thanks for your time!

APPENDIX 2: The picture cards





References:

1. Random from: <http://www.gbwf.org/>
2. **Hainan partridge – *Arborophila ardens***
<http://www.oiseaux.net/photos/john.gerrard.keulemans/torqueole.de.hainan.1.html>
3. Random from:
<http://www.oiseaux.net/photos/john.gerrard.keulemans/photos.5.html>
4. Random from: <http://www.camacdonald.com/birding/Sampler1-PheasantsGrouseTragopansTurkeys.htm>
6. **Red jungle fowl – *Gallus gallus jabouillei***
<http://www.ilpollaiodelre.com/polli.htm>
5. **grey peacock pheasant – *Polyplectron bicalcaratum***
http://orientalbirdimages.org/images/data/grey_peacockpheasant_dcc.jpg
7. Random from:
<http://www.oiseaux.net/photos/john.gerrard.keulemans/photos.5.html>
8. Random from: <http://www.gbwf.org/>
9. **Silver pheasant – *Lophura nycthemera***
<http://www.gbwf.org/pheasants/silver03.html>
10. **Chinese Francolin – *Francolinus pintadeanus***
<http://www.zyworld.com/NAKARIN/plate29partridges.htm>
11. **Three-lined box turtle – *Cuora trifasciata***
<http://www.hku.hk/ecology/porcupine/por28/28-glance-turtle.htm>
12. **Scented Rosewood – *Dalbergia odorifera***
http://www.biflora.org/abc_sea/d_plants/plant01d/plant_1d.html

APPENDIX 3: The Scoring exercise

The aim of this meeting is to find out what the impacts of the logging and the hunting bans are.

First, I would like to know what the harms from the logging ban are for the people living in this village. I have thought of a few – could you please tell me whether these apply to you? (*show cards with pictures*):

- limited land for agriculture and rubber
- fewer trees to build houses
- less money from selling trees

Can you think of any more harms from the logging ban for the people here?

Next, benefits from the logging ban for the people living in this village:

- more water from the forest
- more fresh air from the forest
- better weather because of the forest
- people can see more trees

harms from the hunting ban for the people living in this village:

- less food from hunting
- less money from hunting
- more pests such as mice/wild pigs

benefits from the hunting ban for the people living in this village:

- people can see/hear more animals
- more insects are eaten by birds

Now I would like to know what the harms or benefits from the hunting and logging ban are for the people that will live in this village in the future, for example your children and grandchildren:

- can see the forest and animals

the harms and benefits from the hunting and logging ban for people that live in distant places, for example in Haikou or Beijing:

- fresh air and more water from trees

Finally, the harms and benefits from the hunting and logging ban for the environment including wild animals and plants:

- more animals and plants

Do you understand each picture? *Quickly re-explain what each means.*

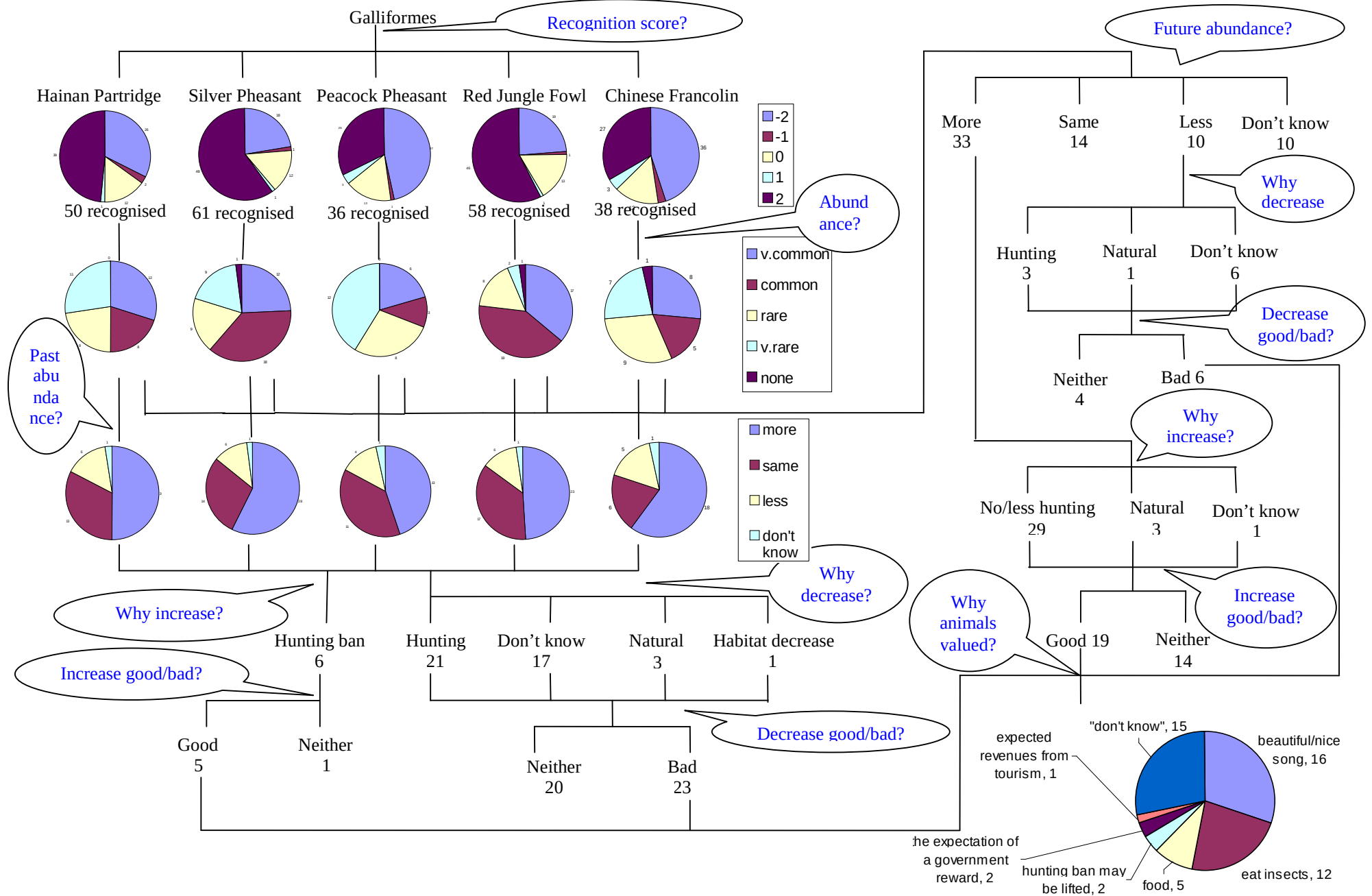
Now I would like to know how important each of these impacts are. I have got 20 cigarettes (*men*) / sweets (*women*) here. Please, altogether, distribute these amongst these pictures according to how important you think each harm or benefit is.

Do you all agree with this decision?

Where unclear, ask more questions about these impacts and their importance.

If you could manage the environment in this area, what would you do? Why?

APPENDIX 4: Replies to the interviews in Yinggeling Nature Reserve



Three-striped Box Turtle

Recognition?

Yes
24

No
56

Abundance?

Common
1

Rare
4

Very rare
13

None
6

Past
abundance?

More
19

Same
2

Don't know
3

Why decrease?

Caught
10

Natural
1

Don't know
8

Decrease
good/bad?

Good
1

Neither
14

Bad
4

Why
good/bad?

Don't know
1

Less money
2

Eat insects
1

Don't know
1

More in rubber
than forest?

Wild species

None
34

Less
28

Same
6

More
1

Don't know
11

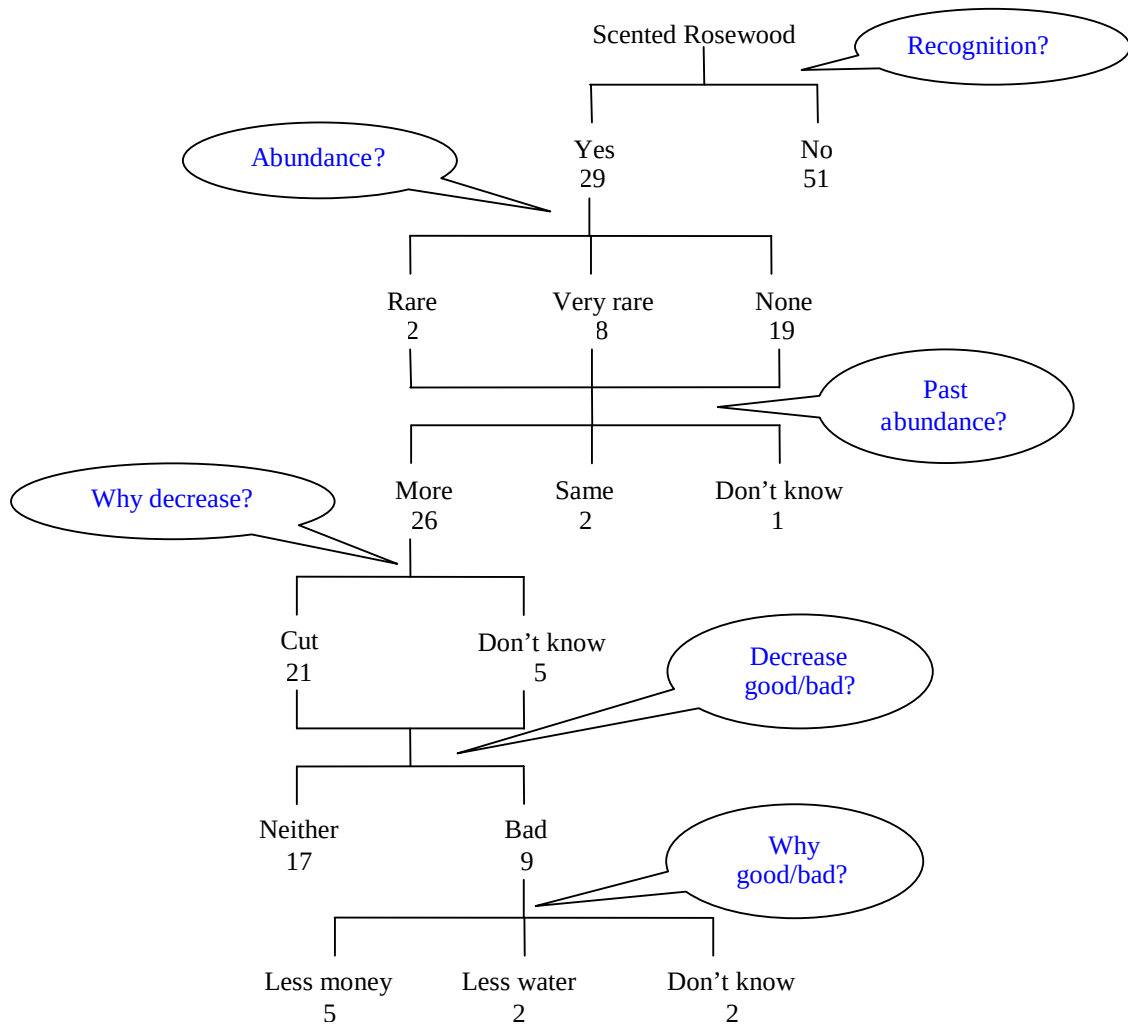
Effect on
wild species
abundance?

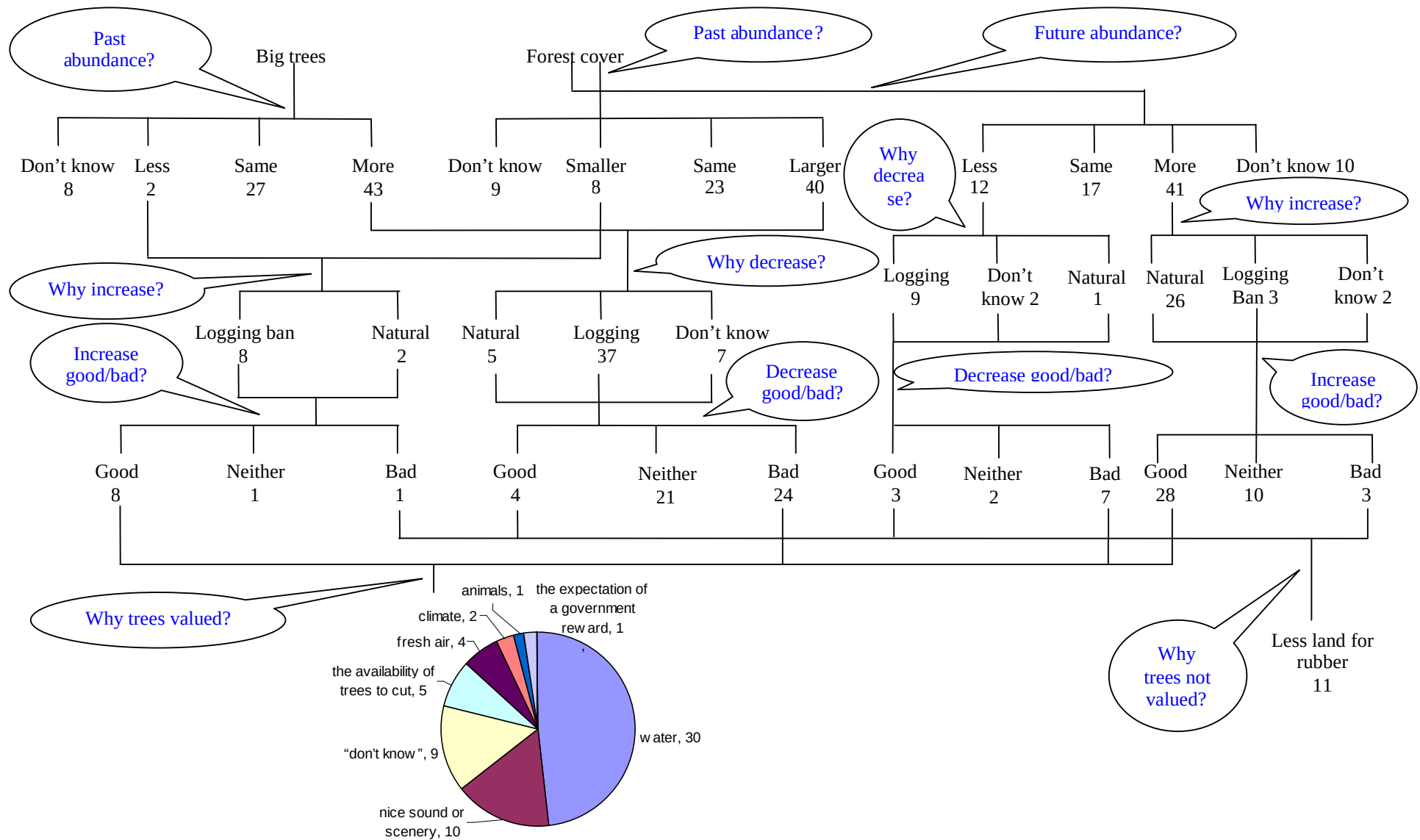
None
51

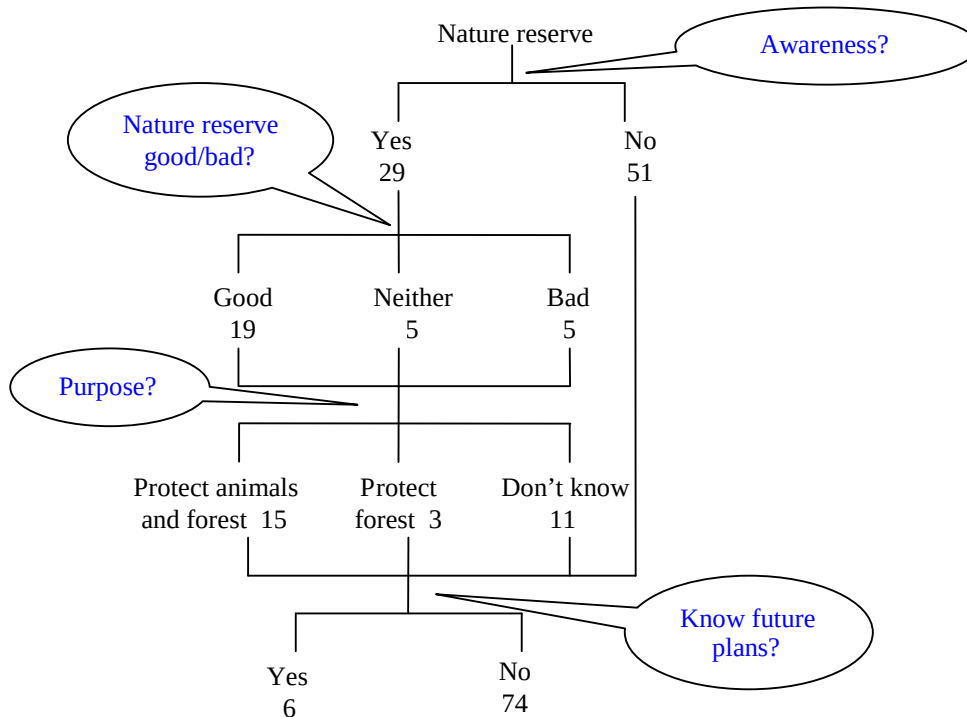
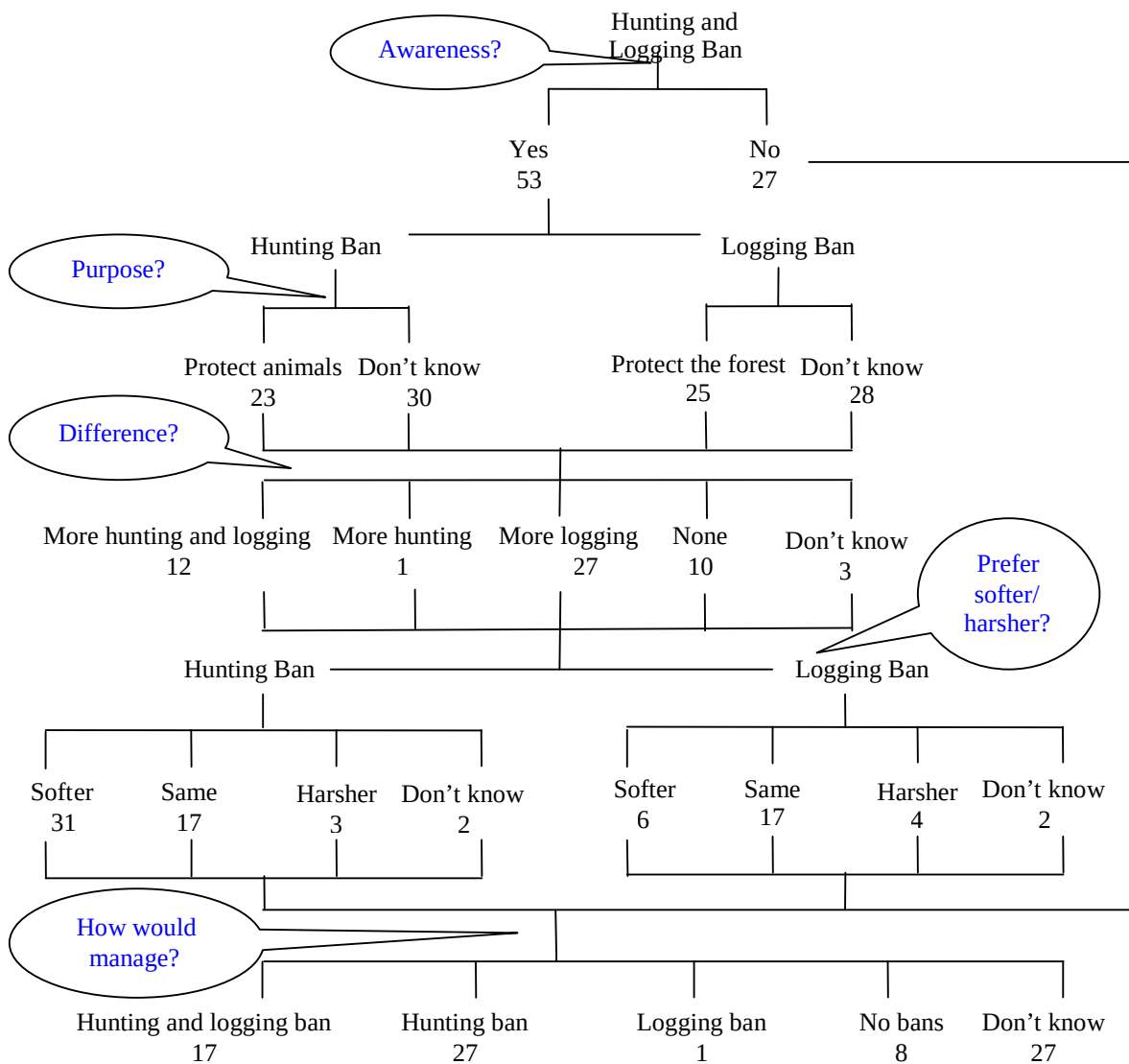
Some
5

Large
3

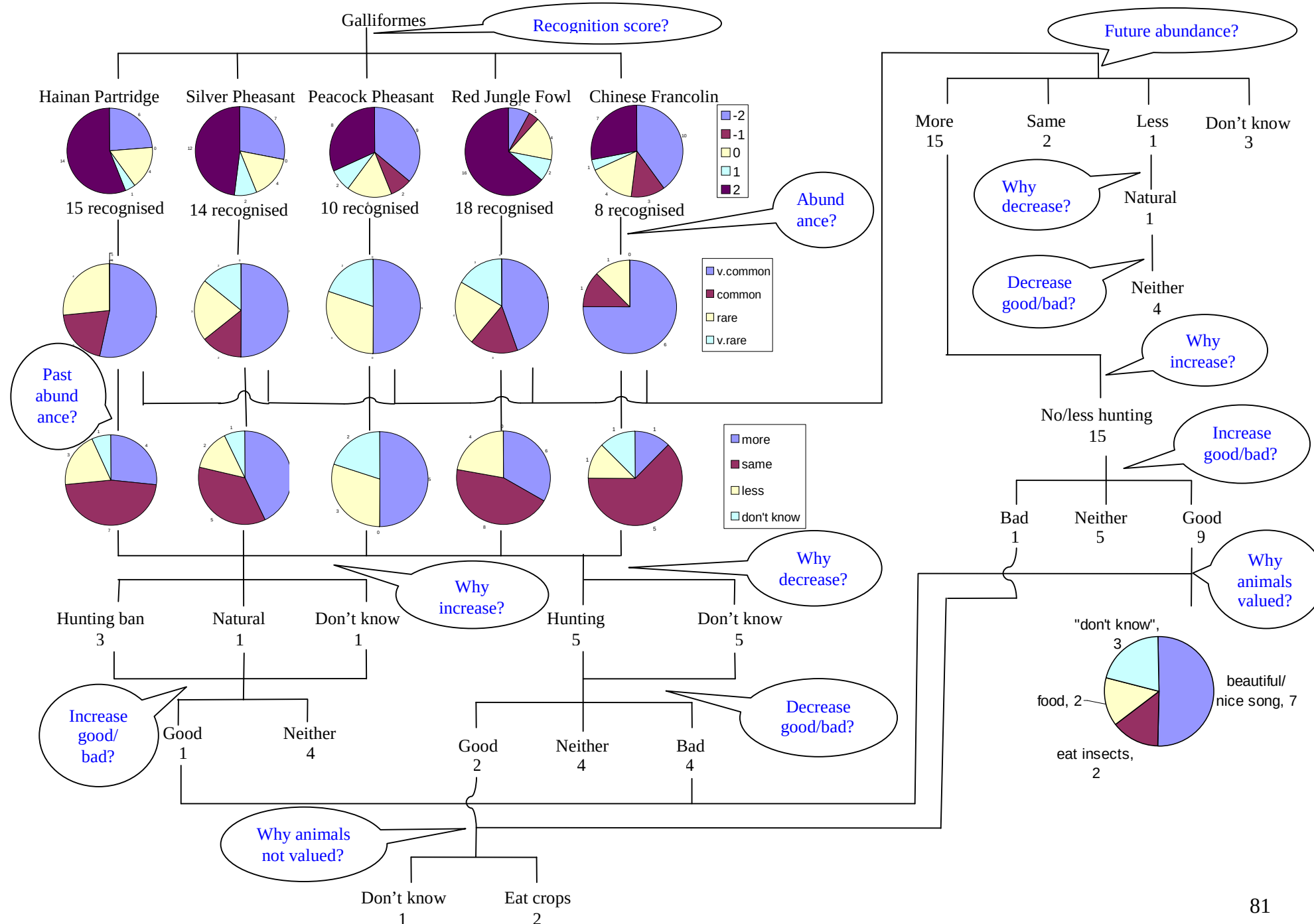
Don't know
3

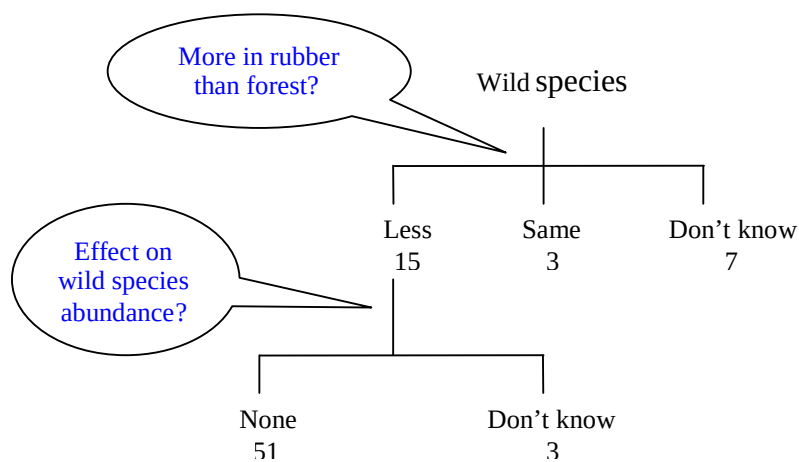
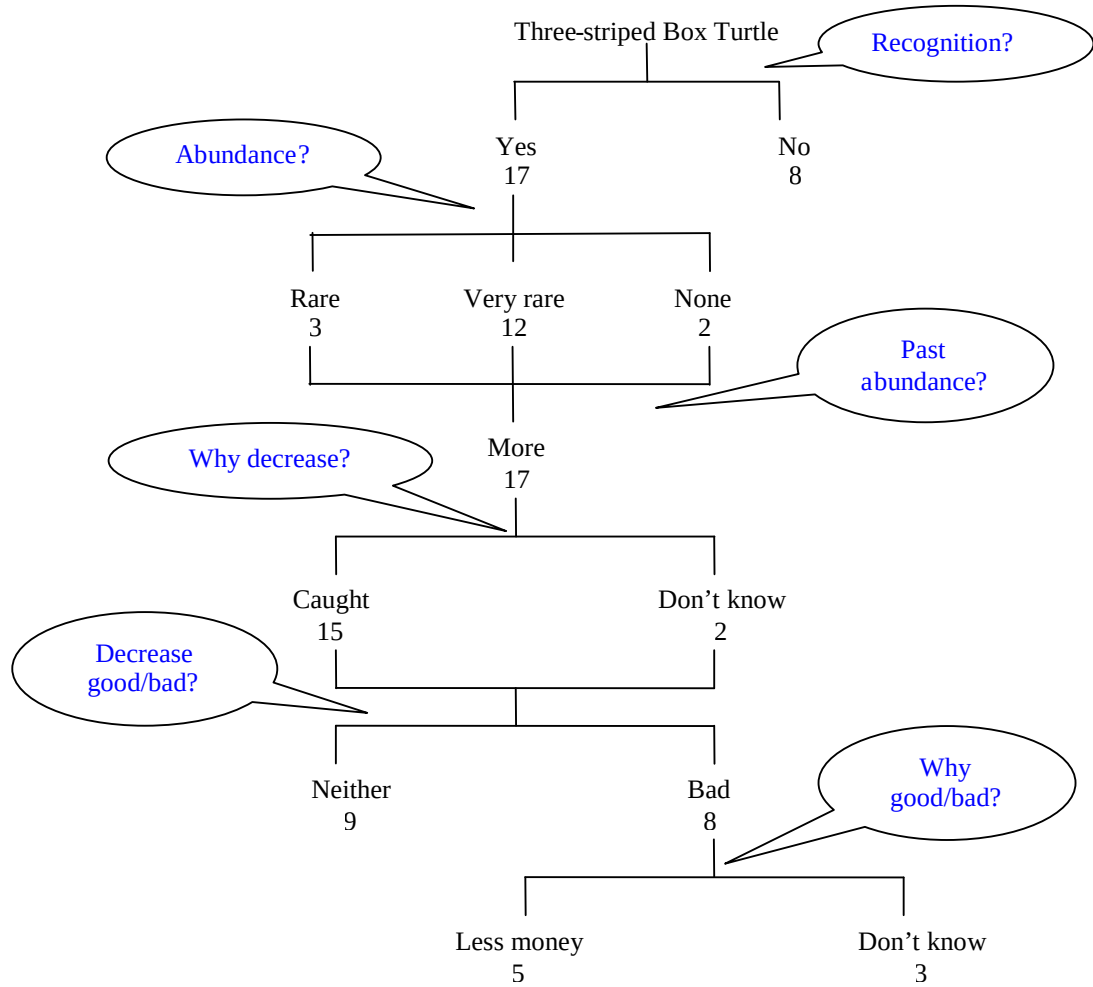


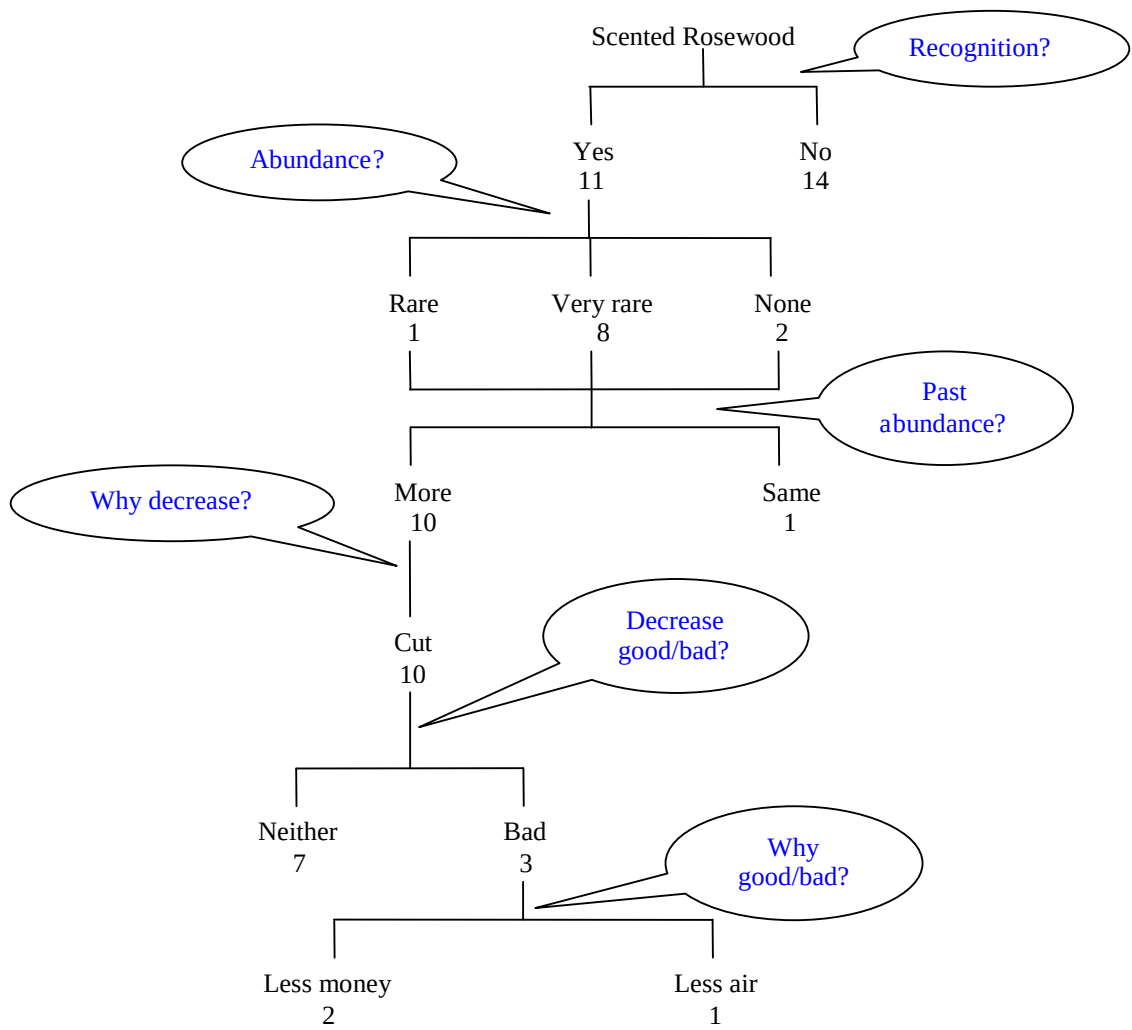


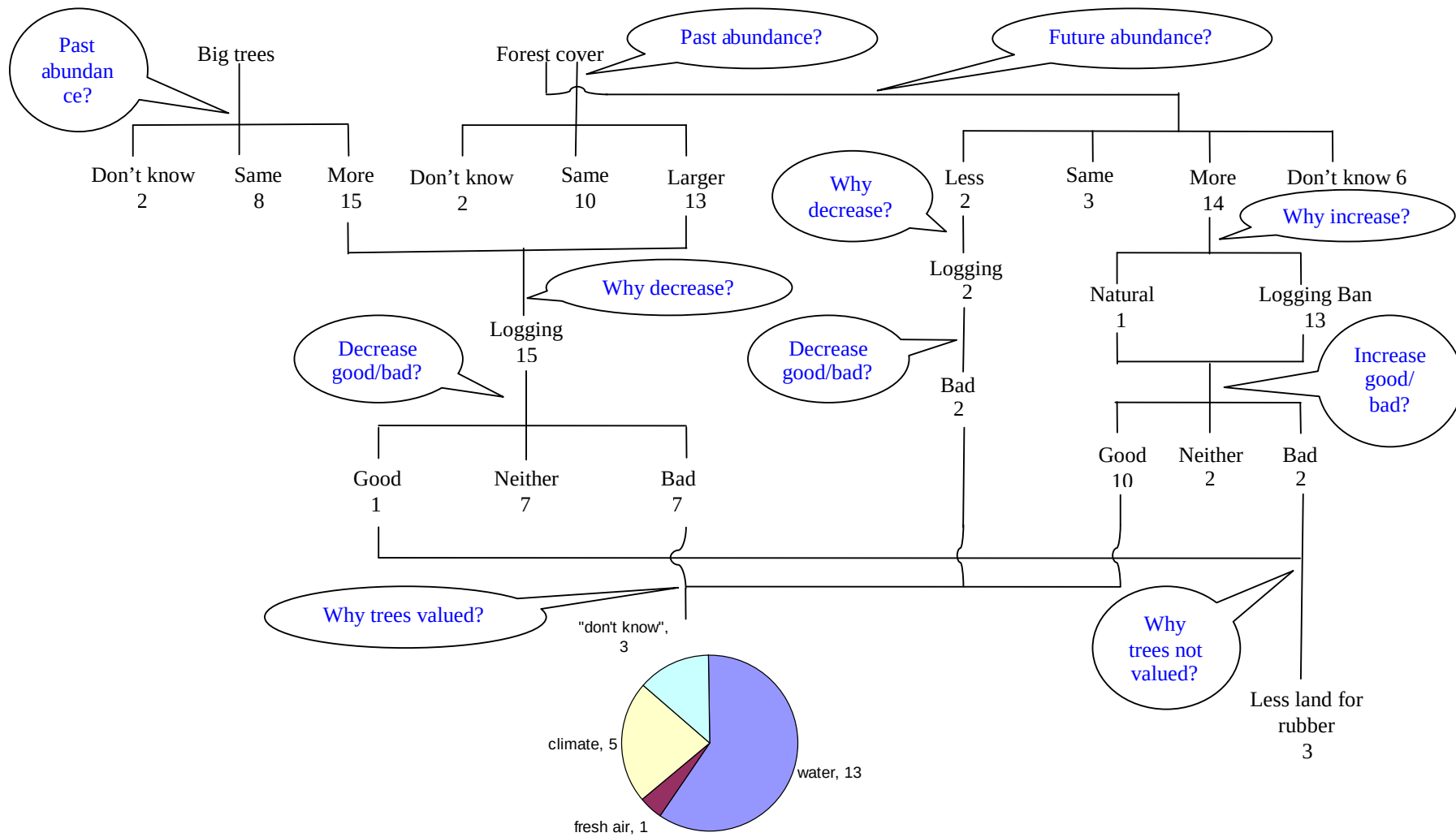


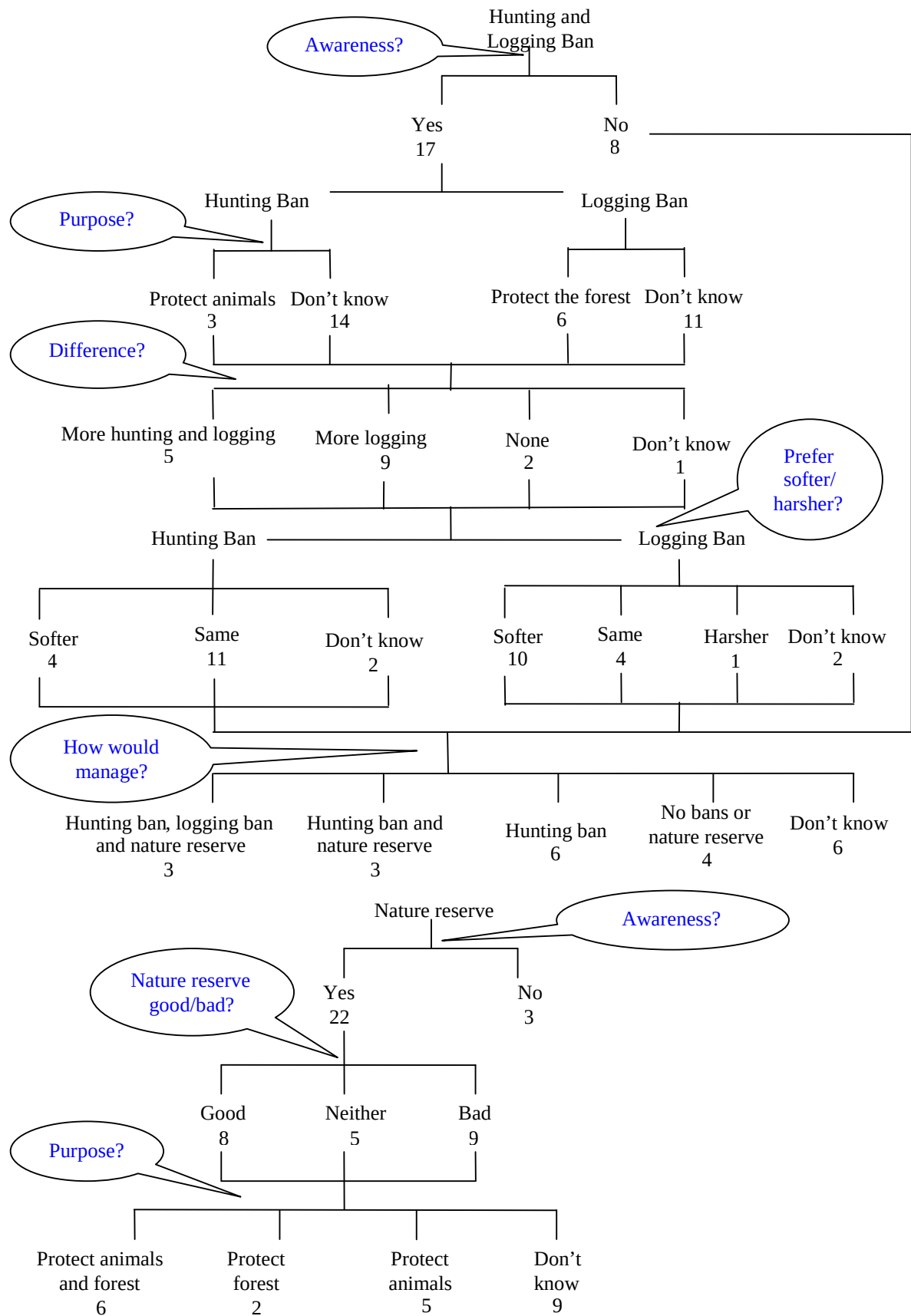
APPENDIX 5: Replies to the interviews in Bawangling Nature Reserve











APPENDIX 6: Significant links between socio-economic variables and knowledge, perceptions and attitudes towards galliformes, the Three-banded Box Turtle, Scented Rosewood, and the forest, as well as towards the logging and hunting bans and the nature reserves. Significant interactions and any non-significant links were not included in the table.

	galliformes				turtle		scented rosewood		forest			
	recognition?	why decrease?	attitude towards decrease?	future abundance?	recognition?	why decrease?	recognition?	attitude towards decrease?	awareness of decrease?	why decrease?	attitude towards decrease?	future abundance?
nature reserve					F=10.147 df=1 p=0.002	F=5.948 df=1 p=0.020						
village	F=3.990 df=5 p=0.002			F=3.489 df=5 p=0.007			F=8.698 df=5 p<0.001		F=3.325 df=5 p=0.009			
gender	F=10.681 df=1 p=0.001	F=6.194 df=1 p=0.016										F=5.208 df=1 p=0.025
age								F=5.981 df=1 p=0.020			F=6.014 df=1 p=0.017	
wealth			F=6.194 df=1 p=0.016							F=9.044 df=1 p=0.004		

	hunting/ logging bans	logging ban		nature reserve
	knowledge?	attitudes?	allow logging?	knowledge?
nature reserve				F=46.039 df=1 p=0.000
village	F=4.481 df=5 p=0.001			F=20.417 df=4 p=0.000
age		F=11.016 df=1 p=0.001		
education	F=5.714 df=1 p=0.019			
wealth		F=4.070 df=1 p=0.048	F=12.070 df=1 p=0.001	
knowledge	F=5.432 df=1 p=0.022	F=6.780 df=1 p=0.011	F= 9.479 df=1 p=0.003	F=7.090 df=1 p=0.009

APPENDIX 7: the perceived impacts of conservation policy, as scored by 12 focus groups, which were asked to distribute 20 sweets or cigarettes amongst these impacts.

		Qingjie men	Qingjie women	Nanpeng men	Yaxing men	Yaxing women	Gaofeng men	Gaofeng women	Xinqing/ Xinfeng men	Xinqing/ Xinfeng women	Xinqing/ Xinfeng women	Miaocun men	Miaocun women
harms from logging ban for the village	less agricultural land	11	5	9	2	3	9	5	8	11	9	6	12
	less wood for construction	0	0	0	5	4	0	0	3	4	0	7	8
	less income from timber	3	0	0	1	0	0	0	0	0	0	0	0
benefits from logging ban for the village	more water from trees	0	6	5	3	0	0	2	0	4	4	4	0
	more fresh air from trees	0	2	0	0	0	0	2	0	0	0	0	0
	better climate due to trees	0	0	0	0	0	0	0	0	0	0	0	0
	can see more trees	0	0	0	0	0	0	0	0	0	0	0	0
harms from hunting ban for the village	less wild meat for consumption	1	0	0	0	0	0	2	0	0	0	0	0
	less income from wild meat	0	0	0	0	0	0	0	0	0	0	0	0
	more pests (wild pigs, mice)	0	0	0	5	5	2	3	0	0	0	0	0
benefits from hunting ban for the village	can see/hear more animals	0	0	0	0	0	2	3	0	0	0	0	0
	more insects eaten by birds	0	0	0	0	3	0	2	0	0	0	0	0
benefits for future generations	can see more animals and trees	3	2	2	0	2	4	0	0	0	0	0	0
benefits for people elsewhere	more fresh air and water	0	0	0	1	3	2	0	0	0	0	0	0
benefits for the environment	more animals and plants	2	5	4	3	0	1	1	4	0	2	0	0
harms from exclusion from the nature reserve	less access to grazing land								5	1	0	0	0
	less access to natural resources								0	0	5	3	0