

**IMPERIAL COLLEGE OF SCIENCE, TECHNOLOGY AND
MEDICINE**

**Faculty of Life Sciences
University of London**

Department of Environmental Science and Technology

Turtles & Tourism, Perceptions & Pawi

Perceptions of natural resources and the effect of
ecotourism, in Grande Riviere, Trinidad.

By

Kerry Waylen

A report submitted in partial fulfilment of the requirements for the MSc

September 2005

DECLARATION OF OWN WORK

I declare that this thesis “Turtles & Tourism, Perceptions & Pawi: Perceptions of natural resources and the effect of ecotourism, in Grande Riviere, Trinidad” is entirely my own work and that where any material could be construed as the work of others, it is fully cited and referenced, and/or with appropriate acknowledgements given.

Signature:

Name of student: Kerry Ann Waylen

Name of Supervisor: Dr. E.J. Milner-Gulland

AUTHORISATION TO HOLD ELECTRONIC COPY OF MSc THESIS

Thesis title: Turtles & Tourism, Perceptions & Pawi: Perceptions of natural resources and the effect of ecotourism, in Grande Riviere, Trinidad.

Author: Kerry Ann Waylen

I hereby assign to Imperial College London, Department of Environmental Science and Technology the right to hold an electronic copy of the thesis identified above and any supplemental tables, illustrations, appendices or other information submitted therewith (the "thesis") in all forms and media, effective when and if the thesis is accepted by the College. This authorisation includes the right to adapt the presentation of the thesis abstract for use in conjunction with computer systems and programs, including reproduction or publication in machine-readable form and incorporation in electronic retrieval systems. Access to the thesis will be limited to ET MSc teaching staff and students and the can be extended to other College staff and students by permission of the ET MSc Course Director/Examiners Board.

Signed: _____ Name printed: KERRY ANN WAYLEN

Date: _____

ABSTRACT

It is important to know if ecotourism affects perceptions of natural resources and conservation, as this can be an important determinant of conservation behaviour. This study used the social science tools of RRA and questionnaire-based interviews to investigate the effect of a turtle ecotourism programme in the village of Grande Riviere, Trinidad. Understanding perceptions was also relevant to the conservation of a critically endangered hunted bird, the Trinidad Piping Guan or 'Pawi' (*Pipile pipile*), as this village is one of the few sites where it can be found.

The results show that ecotourism does affect perceptions. Natural resources are used and appreciated by most households and the concept of conservation is widely supported, but there is more concern for turtle conservation than for other animals, such as Pawi. Also, the receipt of benefits from ecotourism (through employment in hotels) was linked with both increased concern and better knowledge of natural resources.

Education also has some effect on perceptions: there is a high awareness of Pawi in Grande Riviere, which is probably due to past public education campaigns, and a higher level of education was linked to a better knowledge of natural resources. Socioeconomic factors and household involvement with hunting also affect knowledge and attitudes to natural resources. This suggests that both ecotourism and education, if appropriately planned, can be useful tools for creating a positive attitude to conservation.

However, this study also indicates that the attitudes and behaviours may not be related as expected. Although hunting was commonly considered the main problem for wild animals (including the Pawi), hunting and the consumption of wild meat were popular and widespread activities. Further research is needed to investigate the link between attitudes and behaviours, and the problems caused by non-subsistence use of wild meat.

Ecotourism may be a useful tool in the conservation of the Pawi at Grande Riviere, although any development must be carefully controlled and planned. Further research is needed to assess uses and perceptions of natural resources elsewhere in the Pawi's range.

ACKNOWLEDGEMENTS

I would like to thank my supervisor, Dr. E.J. Milner-Gulland, for her support, enthusiasm and patience with numerous questions. I am also grateful for the enthusiasm and support of Dr. Philip McGowan, of the World Pheasant Association.

I am indebted to the assistance of many people in Trinidad. I am very grateful for the assistance and tea parties provided by Mrs. Margaret Cooper and Professor John Cooper, of the University of the West Indies (UWI), and the advice of other members of the 'Pawi Study Group'. I am indebted to all those who took time to assist me with my work in Grande Riviere, particularly Miss Srishti Mohais, Miss Kerrie Naranjit and Miss Alesha Naranjit. I would also like to thank the owners of the house used in Grande Riviere.

I am very grateful to the University of the West Indies for accepting me as a visiting student and for the use of its facilities. I would like to acknowledge the help provided by the staff at UWI, in particular, the collaboration of Dr. Veerle Van den Eynden, the supervision of Dr. Adrian Hailey and the assistance of Mr. Winston Johnstone at the Herbarium. The work of Aidan Keane and Beth Stoker of the BP funded 'Project Pawi' was also helpful. I am grateful for the assistance of many people in the Forestry Division (especially Mr. David Boodoo and the Wildlife Section), Dr. Howard Nelson and Mr. Kenneth Fournillier at Asa Wright, the staff of the Emperor Valley Zoo, Ms. Sara McIntosh and the Caribbean Natural Resources Institute (CANARI), Ms. Suzanne Livingstone (University of Glasgow) and Dr. David Harrison (London Metropolitan University).

I would also like to thank all the people of Grande Riviere, for their interest and friendship, who made this study both possible and meaningful. I especially appreciated the assistance of the staff at the Grande Riviere Anglican Primary school, and the kindness of Mr. Len Peters, Mr. Nicholas Alexander and Mr. Kevin Muhammad of the Grande Riviere Nature Tour Guides Association and Grande Riviere Tourism Development Organisation.

This study was part-funded by Natural Environment Research Council (NERC) Studentship NER/S/M/2004/12798, and the use of a house in Grande Riviere was supported by World Pheasant Association, through the Pawi Study Group.

ACRONYMS & ABBREVIATIONS

CANARI	Caribbean Natural Resources Institute
CARICOM	Caribbean Community
CITES	Convention on International Trade in Endangered Species
CBC	Community-Based Conservation
CBET	Community Based Ecotourism
CREP	Caribbean Regional Environmental Programme
CSG	Cracid Specialist Group
df	Degrees of Freedom
EMA	Environmental Management Authority (Trinidad)
ESA	Environmentally Sensitive Area
ESS	Environmentally Sensitive Species
GLM	General Linear Model
GREAT	Grande Riviere Environmental Action Trust
GRNTA	Grande Riviere Nature Tour-guide Association
GRTDO	Grande Riviere Tourism Development Organisation
IISD	International Institute of Sustainable Development
IUCN	International Union for Conservation Nature and Natural Resources - World Conservation Union
IUCN/SSC	Species Survival Commission of the World Conservation Union
NGO	Non-Governmental Organisation
PRA	Participatory Rural Appraisal
RRA	Rapid Rural Appraisal
RUAF	Resource Centre on Urban Agriculture and Forestry
RoTT	Republic of Trinidad and Tobago
TT\$	Trinidad and Tobago Dollar (approximately TT\$10:GB£1)
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
WPA	World Pheasant Association

CONTENTS

Abstract	iii
Acknowledgements	iv
Acronyms & Abbreviations	v
1 INTRODUCTION.....	1
1.1 Perceptions and conservation	1
1.2 People and conservation	1
1.3 Study site and species	2
1.4 Research approach	3
1.5 Research aims	3
2 PEOPLE AND CONSERVATION	4
2.1 Perceptions affect conservation	4
2.2 Uses and perceptions	5
2.3 Community based conservation.....	6
2.4 Ecotourism	7
2.5 Effect on perceptions	8
2.6 Perceptions in Trinidad.....	9
3 BACKGROUND	11
3.1 Grande Riviere, Trinidad	11
3.1.1 Ecology and biodiversity	11
3.1.2 Society and economy.....	13
3.1.3 Environmental Management and Legislation	17
3.2 Pawi.....	20
3.2.1 Taxonomy	20
3.2.2 Biology and Ecology	21
3.2.3 Population and threats	22
3.2.4 Pawi Conservation.....	23
4 METHODS	27
4.1 Rationale for methodology	27
4.1.1 RRA	27
4.1.2 Questionnaire-structured interviews	29
4.1.3 Combining RRA and questionnaire surveys	30
4.2 Application to objectives	32
4.3 Practice of methodology	33
4.3.1 RRA.....	33
4.3.2 Questionnaire.....	36
4.4 Data analysis	40
4.5 Health and safety	40

5 RESULTS.....	41
5.1 Local context.....	41
5.1.1 Village description.....	41
5.1.2 Sample population.....	41
5.1.3 Livelihoods and wealth	42
5.1.4 Socioeconomic factors	43
5.2 Perceptions of natural resources and conservation.....	44
5.2.1 Uses of local natural resources.....	44
5.2.2 Knowledge and attitudes to natural resources.....	50
5.3 Effects of ecotourism on perceptions	56
5.3.1 Perceptions of ecotourism	56
5.3.2 Comparison of Pawi and turtles	57
5.3.3 Association with ecotourism	60
5.4 Limitations	62
6 DISCUSSION AND ANALYSIS	63
6.1 Local perceptions and uses of natural resources	63
6.1.1 Uses of natural resources.....	63
6.1.2 Hunting and wild meat	63
6.1.3 Perceptions and behaviour.....	64
6.1.4 Knowledge and attitudes towards natural resources	64
6.1.5 Perceptions of Pawi.....	66
6.2 Factors affecting perceptions.....	66
6.2.1 Socioeconomic characteristics	66
6.2.2 The effect of ecotourism.....	69
6.3 Recommendations.....	71
6.3.1 Using ecotourism to change perceptions.....	71
6.3.2 Promote participation	72
6.3.3 Use education to influence perceptions.....	73
6.3.4 Address preferences for wild meat.....	73
6.3.5 Research on ecotourism, perceptions, and behaviour	74
6.3.6 Implications for Pawi conservation.....	74
7 CONCLUSIONS	76
REFERENCES.....	78
APPENDICES	87
Appendix I.....	87
Appendix II	89
Appendix III	93
Appendix IV.....	95
Appendix V	96
Appendix VI.....	97

Appendix VII	98
Appendix VIII	99
Appendix IX	100
Appendix X	103

LIST OF FIGURES

Figure 1.1	15
Figure 1.2	21
Figure 5.1	42
Figure 5.2	42
Figure 5.3	48
Figure 5.4	50
Figure 5.5	51
Figure 5.6	53
Figure 5.7	54
Figure 5.8	60

LIST OF TABLES

Table 4.1	29
Table 4.2	31
Table 4.3	32
Table 4.4	33
Table 5.1	43
Table 5.2	44
Table 5.3	45
Table 5.4	46
Table 5.5	47
Table 5.6	47
Table 5.7	48
Table 5.8	49
Table 5.9	51
Table 5.10	52
Table 5.11	55
Table 5.12	55
Table 5.13	56
Table 5.14	56
Table 5.15	57
Table 5.16	58
Table 5.17	59
Table 5.18	61

1 INTRODUCTION

Changing perceptions is an important step in promoting action that promotes conservation. This study uses social research to investigate how ecotourism, a popular form of community based conservation, affects perceptions of natural resources at the village of Grande Riviere in Trinidad. This has important implications for the applicability of community based conservation projects, and is also relevant to the conservation of a local endangered bird called the Pawi (*Pipile pipile*).

1.1 Perceptions and conservation

Attitudes are an important predictor of behaviours, although the relationship is complex (Azjen & Fishbein, 1977; Martinez & Scicchitano, 1998). This means that changing attitudes to natural resources can be an important way of encouraging the success of some conservation projects (Kiss, 2004). Attitude change is likely to be especially important when other mechanisms for changing behaviour, such as regulation, are likely to be ineffective (as, for example, is often the case with the consumption of bushmeat; Milner-Gulland & Bennett, 2003).

It is therefore useful to know what influences attitudes. It is known that education can help (e.g. Tisdell & Wilson, 2004) but this requires investment and has limitations. Other initiatives are often associated with conservation, and their usefulness may depend on their ability to change attitudes. One of these approaches is greater involvement of local people in conservation of their natural resources, as described below.

1.2 People and conservation

It has long been recognised that traditional methods of conservation, which exclude human activities, have been unsatisfactory (Pimbert & Pretty, 1995). Many conservation problems occur where livelihoods are also an issue of concern, so methods that provide incentives for stakeholders to conserve, allowing both conservation and development, have become increasingly popular (Hutton & Leader-Williams, 2003).

The term used to describe efforts to involve local people in the conservation of their local resources, which often involves some type of enterprise designed to promote both development and conservation, is 'community based conservation' (CBC). A

particularly popular form of CBC project is ‘ecotourism’, where payment from nature tourists creates the incentive to conserve. However, ecotourism projects often fail to meet their expectations, for complex reasons (Krüger, 2005).

One of the assumptions sometimes made about CBC or ecotourism is that it will change the local population’s perceptions of natural resources (e.g. Sekercioglu, 2002). However, it is not clear whether this occurs, and existing evidence is contradictory (e.g. Bauer, 2003; Stem et al., 2003). To determine how ecotourism may be useful for conservation it is therefore important to identify if it affects perceptions.

1.3 Study site and species

The village of Grande Riviere, on the East coast of Trinidad is a focal point of tourism for the critically endangered leatherback turtle (*Dermochelys coriacea*) (IUCN, 2004). It is one of two villages in Trinidad with a successful turtle community-based conservation programme, where previously turtles were killed. Members of the local community act as tourguides and patrol for turtles nesting on the beach (Harrison, 2005).

The village is also important for the study of the Trinidad Piping Guan or ‘Pawi’ (*Pipile pipile*), as it is one of the few sites where it can be relatively easily and reliably sighted (Hayes, 2002). The Pawi is a critically endangered galliform, and the only species endemic to Trinidad (Birdlife International, 2005; Brooks et al., 1998). Illegal hunting is thought to have been an important reason for its decline, but the socioeconomic context is poorly understood (James & Hislop, 1997). Grande Riviere has been the base for several studies of Pawi biology and ecology. This village has had high exposure to researchers and visitors interested in the Pawi and Turtles, so perceptions here may represent a regional ‘high point’ in environmental awareness.

The comparison of perceptions of Pawi and turtles, and of those involved with ecotourism and those that are not, provides an opportunity to investigate the effect of ecotourism on perceptions. Investigation of perceptions is also relevant to the Pawi, to understand the context of its decline, and because attitude change may be one of only effective means of tackling problems of over-hunting.

1.4 Research approach

A broad understanding of natural resource use and perceptions in the village is necessary to fully understand the effect of tourism on perceptions, and perceptions relevant to Pawi. This information should be related to socio-economic attributes in order that results and recommendations can be appropriately linked to social groups.

The techniques of social science will be applied to collect this data reliably and efficiently. Participatory approaches are used where possible, not only to best understand local perceptions (Mukherjee, 1993), but also to build local capacity (so any related conservation projects best involve and benefit local people), and to encourage participation and enthusiasm in any future research and conservation programmes (Kapila & Lyon, 2000).

1.5 Research aims

This study aims to elicit data that contributes to the understanding of the effects of ecotourism upon perceptions, and the conservation of the endangered Pawi. Social research at Grande Riviere will be used a) to investigate local perceptions of natural resources and their conservation, with especial regard to wild meat and hunting, b) to investigate the effect of ecotourism on perceptions of natural resources. These aims will be addressed with the following research questions.

1) What are local uses and perceptions of natural resources?

- a) What is the importance and extent of use of local natural resources (especially hunting and wild meat consumption)?
- b) What are knowledge and attitudes to local natural resources and conservation, especially towards hunting and hunted animals?
- c) What is the extent of knowledge, and attitudes towards Pawi?

2) What factors affect perceptions?

- a) What are local perceptions of ecotourism?
- b) Do links to ecotourism (e.g. hotel work, guiding) affect perceptions of natural resources and conservation?
- c) How do knowledge and attitudes of the Pawi compare to that of turtles?
- d) Are these perceptions linked to use or other socioeconomic factors?

2 PEOPLE AND CONSERVATION

Although the conservation of biodiversity traditionally excluded recognition of human needs, in the past decades it has become increasingly important to value and involve people in the conservation of biological resources. This chapter outlines the importance of local attitudes for natural resource conservation, and the efforts and issues involved in including communities in conservation. Illustrative examples are often drawn from the study of wild meat ('bushmeat') harvesting, as this is relevant to natural resource management at the study site (and an important issue for natural resource management worldwide; Robinson & Bennett, 2000).

2.1 Perceptions affect conservation

If people hold positive attitudes to conservation, local conservation initiatives are more likely to succeed. This is because attitudes are a significant predictor of behaviour (Ajzen & Fishbein, 1977), even though the relationship between environmental attitudes and behaviours is complex (e.g. Martinez & Scicchitano, 1998). Any project that influences attitudes therefore makes important contribution to changing local behaviour: indeed, Kiss (2004) considered positive attitudes essential for the success of some conservation projects.

It is important that care is taken to influence perceptions of specific issues, not just the general concept of conservation: attitudes that seem supportive of conservation may disguise objections or incompatibilities with particular projects. For example, Alexander (2000) found that many local people recognised the values of a Belizean sanctuary conserving black howler monkeys (*Alouatta nigra*), but they were dissatisfied with its operations and management, and so threatened to withdraw support for it. Similar attitudes were found near a game reserve in Tanzania (Gillingham & Lee, 1999) and a national park in Nigeria (Ite, 1996b). Detailed and careful assessment of perceptions is therefore important (Costarelli & Colloca, 2004).

Attitude change is an especially important aim when other conservation approaches are unlikely to succeed. For example the enforcement of conservation regulations may be unfeasible, or it may be difficult to provide incentives to stop ecological destructive practices. If these practices supply a premium product, development may increase affordability and demand, so exacerbating the situation (Milner-Gulland & Mace,

1998). These difficulties are often evident when attempting limit the unsustainable harvesting of wild meat (Cowlshaw et al., 2005b), which is a threat to wildlife in many countries. In this case the increased demand can exacerbate over-hunting, even driving species to extinction (as has happened with at least one species of bat in the South Pacific; e.g. Mickleburgh et al., 1992). Changing attitudes seems one of the only ways of negating or preventing this effect.

2.2 Uses and perceptions

Education is considered an important way of creating positive perceptions of natural resources and their conservation: for example, public education about tree kangaroos increased support for their conservation in Australia (Tisdell & Wilson, 2004) and the type of education received affected college student conservation attitudes in the USA (Caro et al., 2003). Holmes (2003) showed that a park's outreach programme was linked to more positive local attitudes and sustainable resource use. However, education does not always have this positive effect (e.g. Brossard et al., 2005) and can require a considerable investment of resources.

Fortunately, education is not be the only way of achieving positive perceptions of natural resources: many communities have a positive perception of their surrounding natural resources without outside interference or 'education'. This appreciation or knowledge is usually linked to the sustainable use of natural resources. For example, indigenous people in Alaska practice sustainable gull egg harvesting, and have a sophisticated understanding of the gull's biology (Hunn et al., 2003), and the traditions of Kenyan farmers in Bungoma district contribute to the conservation of their botany (Lado, 2004). Traditional ecological knowledge (TEK) can even assist and inform professional natural resource managers (Donovan & Puri, 2004).

However, it is dangerous to assume that all communities use their natural resources sustainably 'the myth of the ecologically noble savage' (Alvard, 1993; Low, 1996). Unsustainable practices are especially likely when resource has vulnerable biology, the population is large, has high rates of migration, or a short history of coexistence with their surroundings (as is the case in Trinidad) (Smith & Wishnie, 2000). Other practices are sustainable only until exposed to outside economic and political pressures (Milner-Gulland & Mace, 1998). This can be illustrated by considering the hunting of wild

meat, which is a common activity in tropical rain forests worldwide. Traditional hunting practices can be sustainable (Wadley & Colfer, 2004) but are often not (e.g. Apaza et al., 2002), or remain at sustainable levels only until a community is exposed to incentives to hunt commercially for a market economy (Ayres et al., 1991). Other communities may have positive attitudes to conservation but lack an opportunity to act on them: for example, the rural poor in Nigeria are ‘environmentally rational’ but are constrained by circumstances from behaving accordingly (Chokor, 2004). The local use of natural resources may therefore need amendment or assistance to allow it be sustainable.

Study of resource use and perceptions indicates that allowing use of natural resources can be linked with positive attitudes towards those resources, although unrestricted use of natural resource is clearly not always appropriate for conservation. It also suggests that communities’ ecological knowledge can be useful in designing and managing conservation projects (Becker & Ghimire, 2003).

2.3 Community based conservation

Traditional approaches to conservation did not recognise the value of including local knowledge and allowing local uses of natural resources for conservation. In the past decades it has been recognised that these traditional methods of conservation, that are usually designed by outsiders and exclude local human activities, have been unsatisfactory in meeting conservation objectives (Pimbert & Pretty, 1995). Although ‘protectionism’ has a role to play in conservation, it often fails precisely because it does not incorporate local knowledge, allow local uses, or address the economic pressures leading to resource degradation (discussed in more detail by Milner-Gulland & Mace, 1998). Protectionist approaches are also ethically dubious, for they often involve practices such as removing people from their land, or suppressing traditional practices (Edwards, 1997). Now, the knowledge, uses and customs of local people are valued for their ability to help meet conservation objectives (Moller et al., 2004), and in their own right (Russell, 2003). Failure to work with, or even acknowledge local people can even be counter-productive if it causes resentment (Western, 1994). Therefore, there has been an increasing emphasis on approaches that involve local ‘participation’: informing, consulting, involving and collaborating with people in the conservation of their natural resources.

Many of the areas with the greatest threats to biodiversity are coincident with the greatest problems of poverty, leading to a search for measures that can address both issues (Adams et al., 2004). It has become clear that projects involving better participation can not only help conservation but also contribute to local livelihoods (Russell, 2003). Linking conservation and development promises to create incentives for sustainable use, whilst benefiting stakeholders and not requiring the expensive inputs necessary to enforce protectionist approaches (Hutton & Leader-Williams, 2003). Many new approaches which adopt this ethos, are called 'community-based conservation' (CBC). These aim to protect traditional sustainable resource uses, or set up new development projects or enterprises, so as to reduce the incentives for ecological destructive practices (Milner-Gulland & Mace, 1998).

2.4 Ecotourism

Those CBC enterprises that involve non-consumptive nature tourism are called 'ecotourism', or if they emphasise local economic participation 'community based ecotourism (CBET)' (Brandon, 1996). Ecotourism describes a tourism enterprise that aims to be economically, socially and environmentally sustainable: this is usually agreed to involve: 1) minimal impacts on the visited sites (both social and physical); 2) educating tourists at the site; 3) maximum economic participation by local people (Wunder, 2000). In addition to educating visitors, it is sometimes assumed that CBC or ecotourism will 'educate locals' and/or result in a change in local attitudes (e.g. Sekercioglu, 2002). If use is linked to positive perceptions, it should be expected that those benefiting from these projects will have the most positive perceptions of conservation.

In 2002, the growth of ecotourism was estimated to be two or three times above that of the whole sector (Piore, 2002). Ecotourism approaches are particularly popular because they promise to be a relatively cheap method of development and conservation, depending on existing infrastructure (Cater & Goodall, 1997). The income from visiting nature tourists is supposed to provide the incentive for conservation, as they pay for access to the natural resource and for associated products and services, such as arts and crafts, food or even accommodation (e.g. Wilson & Tisdell, 2001).

However, ecotourism is not a ‘universal panacea’ for conservation problems (Krüger, 2005) and the aims of most ecotourism projects are probably rarely fully achieved (Brandon, 1996; Cater & Goodall, 1997). This is also true for all CBC projects (Berkes, 2004). Kiss (2004) reviewed CBET and found that many of its objectives were poorly met, if at all, for various reasons. For example, the economic benefits of projects often required long-term subsidisation and produced only modest, unevenly distributed benefits, whilst attempts to promote immediate local control of the project (instead of a salary receiving role) were usually inadvisable, and the aims of development and conservation often conflicted. When there are so many limitations and uncertainties about ecotourism, determining if it can produce the important effect of changing local perceptions will help to establish its usefulness and applicability as a tool for conservation.

2.5 Effect on perceptions

It is not clear whether any CBC programme that successfully promotes conservation activities does so solely through providing economic imperatives, or whether attitudes towards natural resources and conservation are also affected. There is some evidence that CBC projects can change perceptions of natural resources: for example, in Waza National Park, Cameroon, local attitudes to conservation were linked to perceived benefits from the conserved resources (Bauer, 2003). Similarly, in Nepal the level of support for conservation areas was associated with the participation in activities and benefits associated with those areas (Mehta & Heinen, 2001). In Belize, attitudes towards a community baboon sanctuary were mixed, due to failings of the project, but most residents recognised the value of the sanctuary and its possible benefits for the local community (Alexander, 2000).

The evidence for the effects of ecotourism projects is mixed. A review of ecotourism with indigenous groups in an Ecuadorian Amazonian reserve concluded that a group’s degree of specialism in tourism was linked to increased ‘environmental awareness’ (Wunder, 2000). There is also evidence that attitudes are linked to individual benefits from these projects. For example, Sekhar (2003) found benefits from conservation increased support for conservation at Sariska Tiger Reserve, India, and Gillingham (1999) showed that access to meat from a community wildlife management project in Selous Game Reserve, Tanzania, was linked to the degree of support for that project.

However, other studies have not found ecotourism to affect attitudes. For example, Walpole & Goodwin (2001) studied residents of Komodo Park, Indonesia, and found that receipt of economic benefits from ecotourism affected attitudes towards tourism, but not towards conservation. Stem et al. (2003) found that employment in tourism in Costa Rica had encouraged the abandonment of agricultural land (so lessening forest degradation) but it had not affected attitudes to conservation (although indirect benefits from tourism and education did change attitudes). The contradictions of the existing evidence mean more research is needed on the link between ecotourism and perceptions.

If ecotourism has affected attitudes in Grande Riviere, it may result in a higher awareness of conservation for those benefiting from it, and/or more concern for the leatherback turtle than the Pawi or other wild animals. Quantifying the individual benefits from ecotourism is a difficult process beyond the scope of this study, but indicators of benefits, through employment with hotels or other tourist can be used.

2.6 Perceptions in Trinidad

In Trinidad many wild animals (including Pawi) are considered at threat from hunting (section 3.1.1.5). However, efforts to conserve them have rarely taken into account the knowledge or attitudes of ordinary Trinidadians (section 3.1.3). In 1972 French (1992) considered popular opinion was that birds 'don't count' as wildlife, and that a general apathy and ignorance of the law was shared even by politicians. However, more recent studies suggest that attitudes towards the environment, and the importance of its protection, may vary widely between different social groups, and may be affected by use of natural resources (Barran, 1999; Nelson, 2004). A survey of 630 persons across Trinidad by Nelson (2004) indicated that knowledge and attitudes to biodiversity were affected by education, income, gender and ethnicity. For example, people with a rural location or a high interaction with nature often had lower knowledge scores and were less supportive of efforts to protect natural resources. Although respondents were generally supportive of conservation (mean score 0.67 on a scale of 0-1) they generally had a low knowledge of natural resources and a utilitarian attitude towards them. The public's perceptions of natural resources may therefore be quite different to those of Trinidad's formally educated 'policy elite', and this has contributed to past failures in conservation management (Leach & Fairhead, 2001).

Uses of natural resources include medicine, craft, fruits, vegetables, wild meat, recreation and timber (e.g. Cooper & Bacon, 1981; De-Light & Thomas, 2005; Seaforth et al., 1983). Natural resources also provide services such as watershed protection. However, there are probably very few households whose survival is totally dependent on the direct consumption of forest natural resources (Barran, 1999). Because of this, and because of a relatively short coexistence with their environment (De-Light & Thomas, 2005), a strong appreciation and understanding of conserving natural resources is not necessarily expected (section 2.2).

However some uses of natural resources are valued: though not important for subsistence, the sport of hunting is widespread in Trinidad, and wild meat is a consumed by all sectors of society (Asibey, 1984). It is especially popular in Creole cookery, and any animal 'large enough to catch and tasty enough to eat' will be hunted (De-Light & Thomas, 2005). Game-species range from manicou (*Didelphis marsupialis*) to iguana (*Iguana iguana*), with deer (*Mazama americana*) and agouti (*Dasyprocta agouti*) especially favoured by hunters in the northern range (Barran, 1999). (Barran's ecological and sociological surveys also found clear evidence that hunting extended beyond the catch and season limits officially proscribed by the Wildlife Section.)

The literature suggests that general public perceptions may not strongly value conservation, although use and socioeconomic factors may have an effect. If public perceptions do not strongly value conservation, but they can be influenced by ecotourism, it may be a useful tool for tackling problems of Pawi conservation and hunting in Trinidad and beyond.

3 BACKGROUND

3.1 Grande Riviere, Trinidad

This chapter describes the various aspects of Trinidad's society and environmental management, the context for a more focused description of the Grande Riviere. Accordingly, description of Trinidad is followed by a 'local' description of the village of Grande Riviere and the northeast region.

3.1.1 Ecology and biodiversity

3.1.1.1 Biogeography and climate

The island of Trinidad is about 80.5 km long by 59 km wide, and at 10.5°N, 61.5°W is the most southerly in the Caribbean (George Philip & Son, 2000; ITTO, 2003). Unlike other Caribbean islands, it lies on the South American continental shelf (connected as recently as 1,500 years ago). It is only 11 miles northeast of Venezuela so is influenced by the Orinoco and South Equatorial currents (Dinerstein & Olson, 1995).

It has a tropical climate, receiving 2500-2800mm^{yr}⁻¹ average annual rainfall and temperatures that vary from 30-34°C in the daytime to 21° at night. There is a distinct rainy season from late May until December, and humidity varies from about 50%-90% between these two seasons (CREP, 2002).

3.1.1.2 Local biogeography

The village of Grande Riviere is located on the coast of northeast Trinidad, in the ward of Toco, the County of St. David (10°49'N 61°02'W). Grande Riviere is 60 kilometres from Sangre Grande and more than 100 kilometres from Port of Spain via a winding coastal road: as the penultimate village on this road it is considered relatively remote.

The Pawi's present range falls within the top northeast corner of Trinidad, where mountains stretch on an East-West axis (the 'Northern Range'). The mountains reach heights above 900m and are essentially the eastern end of the coastal Cordillera of Venezuela (Liddle, 1946). Ninety percent of the ground has a gradient greater than twenty percent, causing landslides in the east. The extensive coastline in this area is mostly comprised of a mix of beaches and rocky cliffs with offshore reefs (Government of the Republic of Trinidad and Tobago, 2005).

3.1.1.3 *Description of biodiversity*

Trinidad's habitats and ecology are similar to equatorial South America: like the adjacent mainland it is classified in the Orinoco bioregion. The relatively recent separation from the mainland means there are more species but fewer endemics per unit area than on other Caribbean islands. For example, there are approximately 2,500 species of plant, 100 species of mammal, 85 species of reptile and 30 species of amphibian (including the endemic golden tree frog *Phyllodytes auratus*) (Armstrong, 2001; Kenny et al., 1997). There are over 400 species of bird, of which the only endemic is the Pawi (Ffrench, 1992).

3.1.1.4 *Local biodiversity*

In the northeast forests are typically dominated by *Mora excelsa*, with marsh grasslands where the feet of the Northern Range joins the Aripo Savannah. There have been extensive past clearances for plantation, so some forest is secondary or disturbed (Armstrong, 2001). However, the relative remoteness of the northeast means it is regarded as an important area for fauna, especially those species hunted for wild meat (e.g. Bacon & Ffrench, 1972).

The leatherback turtle (*Dermochelys coriacea*) nests at most beaches in the coastal areas (CREP, 2002) and reaches the highest densities at the relatively small beach at Grande Riviere (James & Fournillier, 1993). It is a critically endangered species for which hunting is a significant threat (Sarti, 2000). (For brevity the use of 'turtle' in this study refers to this species, unless otherwise stated.)

3.1.1.5 *Threats to biodiversity*

Trinidad's forest areas are chiefly threatened by slash and burn agriculture, and clearance for plantations. Tourism development, recreational use and firewood gathering also threaten the dry forest (Dinerstein & Olson, 1995). Some areas are extensively mined, whilst roads open reserves to illegal squatters that clear and occupy areas (Armstrong, 2001): although 48% of the land area is classified as forest cover, the true extent is probably much less (CARICOM/FAO/ODA, 1993).

The loss of forest cover has obvious implications for the status of its dependent fauna, but many animals are also threatened by hunting. As nearly all large and medium sized

animals are hunted, this is considered to be a significant threat by several commentators (e.g. Lambie, 1987). For example, Bacon & French (1972) considered that hunting ‘must be stopped’ to prevent the elimination of game animals from reserves, and hunter interviews in Barran (1999) indicate a high hunting pressure. Indeed, nearly 90% of hunters interviewed in Barran (1999) thought game levels were lower than 5 years previously. However there is little data on any game-species’ population or the effects of various threats.

3.1.1.6 Local threats to biodiversity

The main threats to the fauna and flora of this region are probably habitat loss and hunting (CREP, 2002). On the lower slopes agricultural activities are slowly replacing forests, whilst slash and burn agriculture has exacerbated forest fires on the slopes and ridges, leading to large areas of secondary growth (Armstrong, 2001). In addition, strip mining for sand and gravel has degraded large areas of forest in the southern foothills, though not near Grande Riviere (ITTO, 2003).

Hunting in this area has been considered an important threat to fauna, at least by some parties, for several decades: for example CREP (2002) described hunting in this area as ‘extensive’ and reported that even non-game animals were threatened. Bacon & French (1972) considered that without more effort to stop hunting in the Northern Range wildlife sanctuary there was ‘no doubt’ that game animals would soon ‘disappear’. They stated that the common game species were considered over-hunted, and some were already considered rare.

3.1.2 Society and economy

3.1.2.1 Social history

Trinidad is an English speaking parliamentary democracy that used to be a British colony. It has a diverse cultural and ethnic background: Amerindians, Caribs, Spanish, French, British, Africans and Indians have influenced its makeup, together with small groups of black American soldiers, a few Portuguese, Chinese, Syrians and Jews (DeLight & Thomas, 2005). The population is now fairly stable at about 1.3 million and dominated by a mix of Afro-Trinidadians (39.6%) and Indo-Trinidadians (40.3%), and the main religions are Christianity and Hinduism (TIDCO, 2001b; UNDP, 2003) Racial concerns are subtle, but Afro-Trinidadians are slightly more likely to be discriminated

against (Coppin & Olsen, 1998) and they have some concern about the increasing power of Indo-Trinidadians (De-Light & Thomas, 2005). Women are widely discriminated against: for example, only four years ago female earnings were 45% of male (Olsen & Coppin, 2001).

Popular culture, including the famous yearly carnival, is based upon this ‘melting pot’ of different cultures, though in recent years the USA has been increasingly influential. The pace of life is notoriously laid back and ‘liming’ (hanging out, socialising) is a national past time. Over the past few decades violent crime has increased significantly and is a popular concern, although by international standards levels are low (De-Light & Thomas, 2005).

3.1.2.2 Economy and standards of living

The unit of currency is the Trinidad and Tobago Dollar (TT\$), whose exchange rate is approximately TT\$10: GB£1. The production of oil and gas (and more recently liquefied petroleum gas) has been the most important source of revenue for Trinidad since the early 1970s, giving it one of the highest standards of living in the Caribbean: mean GDP reached US\$9,430 in 2002 (UNDP, 2003). However, the quick benefits from oil have encouraged declining agricultural production, economic inefficiency and corruption, and made the economy vulnerable to recessions caused by falling oil prices (De-Light & Thomas, 2005). The economy has diversified into areas such as manufacturing, finance, services and tourism (TIDCO, 2001a) but is still far from balanced, and the importance of tourism for the economy is relatively small compared to other Caribbean countries (Dixon et al., 2001).

Trinidad has the highest literacy rate of the Caribbean (95.8% of adults) and reached the HDI¹ rank of 54 in 2002 (UNDP, 2003), but there are still many problems. For example, in 2000 ten percent of the population lacked access to an improved water source, and thirteen percent were considered undernourished (UNDP, 2003). Problems are especially acute in remote rural areas. However, Trinidad is ambitious to improve living standards: ‘Vision 2020’ is a joint government and private sector project to reach developed nation status by 2020 (De-Light & Thomas, 2005).

¹ Human Development Index

3.1.2.3 *Local community characteristics*

The northeast area encompasses 15 communities between Matura and Matelot (figure 1.1). Census data in 1990 recorded approximately 7,400 people living in this region, and between one and three percent of the population squatting (T&T Population Census, 1990 in CREP, 2002). The 2000 Census for Grande Riviere records 298 people in Grande Riviere, in 116 households. The data also indicate a slightly female biased sex ratio (162 female: 136 male). As for the whole of the northeast, the majority of the population is Afro-Caribbean (274 persons) with the remainder Indo-Caribbean (4) or mixed race (20).



Figure 1.1. Location of Matura National Park in the northeast corner of Trinidad. Notable towns and villages represented by circles. Adapted from www.toco.interconnection.org

This is a poor region in relation to Trinidad as a whole: in 1990 about 76% of the population was estimated to live below the poverty line (CREP, 2002). The main types of employment are government labouring jobs, fishing, farming, teaching and self-employed micro-enterprise, and the use of natural resources is probably an important aspect of the well being of only the poorest households (Barran, 1999). However, in Brasso Seco (a village in the west of the Northern Range) the average value of hunted game has been estimated at TT\$4000 per household (Driver & Kravastsky, 1998). Most of the population has had a primary school education and is literate, but there is no local to large shops or banks, public transport is poor, and the level of access to facilities such

as electricity and piped water is generally lower than in urban areas (for example only 45% of households were reported to have water piped into their homes).

Harrison (2005) estimated that 80 persons were employed in tourism in Grande Riviere: a much larger portion of the community than for the area as a whole. Other significant occupations include work on the roads, in CEPEP (Community-based Environmental Protection and Enhancement Programme), in URP (Unemployed Relief Programme) and in agriculture (producing crops such as peppers, paw-paw or tomatoes).

3.1.2.4 Community based organisations

CREP (2002) lists 70 organisations in the northeast, and notes that the environmental ones are amongst the most active, especially the ‘The Toco Foundation’ (which works throughout the northeast) ‘Stakeholders against destruction for Toco’ (SAD for Toco) and the ‘Matura to Matelot Network’ (M2M) which brings together various community organisations and interests.

In Grande Riviere there are three organisations concerned with the environment: Grande Riviere Environmental Action Trust (GREAT), Grande Riviere Nature Tour-Guide Association (GRNTA) and Grande Riviere Tourism Development Organisation (GRTDO). GREAT is now mostly defunct, due to personal conflicts, but GRTDO and GREAT are very much active (especially with regard to the turtle guiding programme), and comprised of similar members (Onwuka, 2004). Other community groups in Grande Riviere include a village council, women’s group, an Anglican primary school, a football group and various church groups (Anglican, Seventh Day Adventist, Baptist and Roman Catholic). The village council and women’s group do not appear to play a very active part in the community (pers.obs.).

3.1.2.5 Tourism activities

Most visitors prefer to visit the north on day trips from the Port of Spain area, as Matura and beyond is considered ‘off the beaten track’ (De-Light & Thomas, 2005). They come to watch turtles, and for guided tours of the scenic landscape and water-features, whilst a few visit Galera Lighthouse and Toco folk museum (CREP, 2002).

Grande Riviere has the most tourist development of any village in this area (pers.obs.). There are two hotels next to the beach (‘Mount Plaisir’ and ‘Le Grande Almandier’,

open since 1993 and 2000 respectively) and a third just constructed. The hotels emphasize an eco-friendly image (e.g. Anon, 2005). There are also a small number of guesthouses and bed and breakfast places in the village that together cater for small-scale national and international tourism. As previously noted, tourism is an important employer in the village: Harrison (2005) describes its extent and effects in the village. As well as providing work in the hotels as waitresses, chefs and housekeepers, villagers have also been involved in the construction, souvenir sales, taxi work and other occasional miscellany, and turtle tour-guide operations. Between 2001 and 2003 approximately 4000 tourists per year stayed in the village (Harrison, 2005). Many come to Grande Riviere to see the Leatherback turtles laying their eggs (the beach is relatively small but has the highest density of turtles in Trinidad): there are many more tourists during the egg laying seasons, and far more visitors than at other parts of the northeast (De-Light & Thomas, 2005). However, some tourists come for other reasons (for example, many tourists come around carnival time and at New Year) so it is impossible to know exactly how important the turtles are for the viability of the tourism sector at Grande Riviere.

Onwuka (2004) investigated the impacts of participating in the turtle guiding operation at Grande Riviere. She found the financial benefits to tour-guides were generally low and irregular (estimated at TT\$1500-2000 in 2004), but involvement in the operation granted access to training and contact with a wide diversity of people. In the wider community, much of the financial benefits from the visitors went to the owners of hotels, but benefits also accrued to hotel/guesthouse employees, and those selling food or arts and crafts. In 2005 there were about nine guides, each working approximately three or four nights per week, and each earning up to TT\$250 per week (L.Peters, pers.comm.).

3.1.3 Environmental Management and Legislation

3.1.3.1 Forestry and wildlife management

In the early 20th century the colonial powers embarked upon a system of forest reservation for timber production: creating forest reserves, and then denoting part of these as game sanctuaries where all hunting was prohibited (Cooper & Bacon, 1981). Since 1960 the reserves have accounted for about 45% of the land area (Mootoosingh, 1979). In addition, since 1987 a number of 'prohibited areas' (including one near

Grande Riviere) have been created, where no entry is allowed at certain times of year, to decrease fire risks and protect nesting animals (ITTO, 2003).

Ultimate responsibility for conservation and the environment lies with the Ministry of Public Utilities and the Environment. Within this Ministry, the Forestry Division is responsible for the management of wildlife sanctuaries, forest reserves and declared prohibited areas (Government of the Republic of Trinidad and Tobago, 2005). There are several sections of the Forestry Division: for example, the National Parks section oversees all state lands that have been designated national parks, whilst the Games and Wildlife Section regulates hunting, conducts wildlife research and implements CITES and Ramsar conventions (UNEP, 1996). This section is responsible for the annual six month ban (the other six months are commonly referred to as ‘the open season’) and any temporary restrictions.

3.1.3.2 Local management of forest and fauna

There has been concern for some aspects of the Northern Range’s resources since the early 20th century. By 1935 there were two large forest reserves in the north-east, at St. David and Matura, and 936 ha of forest designated as Game Sanctuary (UNEP, 1996). In 1972 the Northern Range Reforestation Project (NRRP) was started in the western area to combat flooding, erosion and landslides, by developing nursery techniques, soil and water conservation and reforestation of degraded lands (ITTO, 2003). In October 2004, a Matura national park was created (figure 1.1), and declared an ESA. The management plan for this ESA is currently in development, but it is clear that it may have significant implications for Grande Riviere, which is situated at one of only two access points.

3.1.3.3 Local conservation of turtles

Until 1989 the slaughter of turtles on north-east coasts was a ‘common occurrence’ and the consumption of turtle meat, eggs and blood was culturally entrenched (James & Fournillier, 1993). However, there are now two beaches in the Northern Range known for the protection of their nesting leatherback turtles, one of which is at Grande Riviere. At these beaches consumption of turtle meats is now rare (Harrison, 2005). The beaches are managed by the forestry department in collaboration with the local

community based organisations: in Grande Riviere, the local partner organisation is GRNTA (CREP, 2002). Between 6pm and 6am access to the beach is prohibited without the purchase of a permit (costing TT\$5/£0.50). Villagers do not require a permit but must abide by its conditions. One of the conditions of the permit is that visitors must be accompanied by an authorised guide or forestry official (which costs TT\$10 for nationals and TT\$40 for non-nationals). The authorised guides are members of GRNTA, and are allowed to pre-purchase permits in order to facilitate access by short-stay tourists. This allows GRNTA to have monopoly control over access to the beach, and for its tour-guides receive compensation for their work (Onwuka, 2004).

The collaboration of Forestry Division and the example of turtle management at Matura beach has been important to the survival of the operation at Grande Riviere. However, the commitment and initiative of local people has been key the factor allowing its instigation and relative success: similar schemes elsewhere in Trinidad (e.g. at Fishing Pond beach) have failed (James & Fournillier, 1993).

3.1.3.4 Local conservation education and campaigns

The awareness raising adverts and features on turtles, Pawi and other wildlife broadcast in the national media (section 3.2.4.1) will have also been received in the Northeast and Grande Riviere regions. However, poor signal reception and lower incomes may mean that the campaigns have had less penetration in these areas. The Toco Foundation broadcasts the community radio station 'Radio Toco' across the northeast, and includes slots on wildlife information and conservation (De-Light & Thomas, 2005). It is influential in this region, especially where it is the only signal that it can be received! It often broadcasts information about the leatherback turtles, especially at the start of the laying season, and more rarely broadcasts on the Pawi.

The Forestry Division is responsible for organising various educational activities (often in schools). The last education campaign for the Pawi was for one year 1997-1998 (see section 3.2.4.1). On 20th July 2005 a new Pawi Poster was unveiled, which is hoped to mark the start of a new long-term education campaign for the Pawi, through the collaboration of Asa Wright, the EMA and the Forestry Division.

3.1.3.5 Problems with conservation management

There are various problems with Trinidad's institutional framework for environmental management (CREP, 2002): recommendations include better integration, less concern with timber extraction, increased local participation, better resourcing and better enforcement (Armstrong, 2001). Several attempts to improve the situation through proposing a national parks system failed (e.g. Thelen & Faizool, 1980), but in 1995 an integrated management institution, the 'Environmental Management Authority' was set up (Leach & Fairhead, 2001). This allowed designation of animals needing special protection as 'Environmentally Sensitive Species' (ESSs), and sites needing development control as 'Environmentally Sensitive Areas' (ESAs).

3.1.3.6 International commitments

Trinidad is party to several international and regional conventions relevant to conservation. These include the Convention on Biological Diversity, 1992 (CBD) and the Convention on International Trade in Endangered Species, 1973 (CITES). It has 16 species in Appendix I and 169 species in Appendix II (UNEP-WCMC, 2005). It is also a member of some regional environmental movements and organisations, such as the Caribbean Conservation Association, 1967 (CCA); the Caribbean Environment Programme, 1981 (CEP) and its Specially Protected Areas and Wildlife Protocol, 1990 (SPA-W) and the Latin America Network for Technical Co-operation in National Parks, Protected Areas and Wildlife (LAN-NPPAW) (UNEP, 1996).

3.2 Pawi

3.2.1 Taxonomy

The Trinidad Piping Guan *Pipile pipile* (Jacquin, 1784) is known locally as 'Pawi'. Guans are large, mostly arboreal birds belonging to the Cracidae (Brooks et al., 1998). Although several members of the Cracidae are found across Central and South America, only the Pawi is found on Trinidad, where it is the only endemic bird.

This taxonomic group has been subject to various revisions since its discovery (past sources may refer to *Aburria* instead of *Pipile*), and this has included debate over whether the Pawi should be awarded the status of species instead of a sub-species of *Pipile cumanensis* found on the mainland. It is currently classified as a full species (del

Hoyo & Motis, 2004) but this has not always been the case in the past (e.g. Vaurie, 1967) and the genus *Pipile* still requires review (Brooks & Strahl, 1998).

3.2.2 Biology and Ecology

Relatively little is known about Pawi biology or ecology, although some basic information is being obtained from a captive bird at the Emperor Valley Zoo in Port of Spain (J.Cooper, pers.comm.). Unknown aspects of its behaviour are assumed to be similar to its congeners on the mainland.

It is a medium sized turkey-like bird about 69 cm high, with a body that is mostly blackish-brown with faint blue-purplish gloss, except for extensive white tips to the wing-coverts (figure 1.2). It has red legs, a dark crest with whitish streaks, a pale blue cere and basal bill, and moderate flight power. It is apparently sexually monomorphic in both size and plumage. It calls with a thin piping voice, and it may also make a rattling *whirr* sound with its wings when displaying (ffrench, 1992).



Figure 1.2. The Trinidad Piping Guan *Pipile pipile*, known locally as 'Pawi'. Birdlife International, 2004.

The Pawi is assumed to be monogamous, as are most guans (Connolly & Seutin, 1999). However it forages gregariously: flocks of up to 50 have been reported by older hunters interviewed before 1972, though this may be an exaggeration (ffrench, 1992). It is frugivorous, and although it is most easily observed foraging on the ground, it is a largely arboreal species, and mainly feeds on trees in the forest interior (Alexander, 2002). It inhabits primary and secondary lowland and montane forests, and can even be found foraging in cultivated lands near forests such as overgrown coffee, cocoa and citrus plantations: they do not appear to be disturbed by human noise and traffic. It is most often found at elevations of 400-900m, but ventures as far as 50m (Alexander, 2002; ffrench, 1992).

Its range is presently only the remoter portions of Northern Range montane forest (James & Hislop, 1997), but it is regularly and reliably seen in the forests close to the village of Grande Riviere, on the North Coast. This suggests the Pawi may be philopatric, but more practically, has also led to several past studies of the Pawi focusing on this location.

3.2.3 Population and threats

3.2.3.1 Population status

There is little concrete data on the population status of the Pawi, or on the relative impacts of different threats. It is widely agreed that the species was once more numerous and widely distributed on the island. As early as 1894 a decline was noted (del Hoyo & Motis, 2004), but interviews by James & Hislop (James & Hislop) indicate the bird was still widespread in the 1940s. Now there are probably about 200 birds in the wild: more than 70 but certainly less than 1000 (Brooks & Strahl, 2000). The situation is probably not improving: during the most recent surveys by F. Hayes and S. Temple, a sample of 300 point counts in the region resulted in only 3 encounters (Hayes, 2002).

3.2.3.2 Habitat loss

At present there is only about 250km² of suitable habitat remaining, of which 150km² is in the core area of the eastern Northern Range (del Hoyo & Motis, 2004). Intensive timber extraction and conversion to plantations are chiefly responsible for the loss of primary forest habitat in the South and the foothills of the Northern Range (del Hoyo & Motis, 2004). In the 1980s a very small population was thought to remain in the Southern Range (James & Hislop, 1988), but it is now known only in remote areas of the eastern Northern Range, although this may be sub-optimal habitat (del Hoyo & Motis, 2004).

3.2.3.3 Hunting

Hunting is generally considered the primary threat to the Pawi now that its range has been reduced. This is supported by the disappearance of Pawi from areas that seem ideal habitat but are accessible to humans, theoretical considerations, and some local opinion. Even the first reported decline, in 1894, was attributed to hunting (del Hoyo &

Motis, 2004). This is not surprising if we believe the testimony of old hunters who recall shooting 8-10 birds per outing in the Southern Range, and competing to shoot as many as possible birds in a flock (James & Hislop, 1997). An analysis of *Pipile* harvest levels by Brooks (1999) concluded most species (including the Pawi) were probably harvested above sustainable levels. Many believe that eliminating hunting will allow population numbers to rise (e.g. Temple, 1999).

3.2.4 Pawi Conservation

3.2.4.1 Conservation programmes

James & Hislop (1997) describe in detail efforts to educate and involve Trinidadians in Pawi conservation through an education programme run by the Wildlife Section in the early 1980s. In collaboration with educational organisations, articles and posters were delivered to schools, students and teachers were given lectures and field trips, whilst a museum specimen and lecture was given to hunters groups. The National Parks Section was given resource material to use in an ‘Environmental Bus Education Campaign’, and the Post Office issued stamps on endangered species that included the Pawi. The Pointe-a-Pierre Wildfowl Trust also tried to increase public awareness of the Pawi’s status through personal contact, calendars and postcards.

However, James and Hislop suggest that the single most significant effort was a television advert shown in 1985. Tobago and Trinidad Television allowed 30 seconds every night for a few months to display a slide of the museum specimen with a voiceover describing its status. This led to an ‘overwhelming’ response, in which teachers and the public requested information, and at least one recreational hunter immediately stopped hunting the Pawi. A wildlife film of the Pawi in its natural habitat was later shown, but to a lesser response: James and Hislop suggest that the lack of information that accompanied this footage was to blame.

Most recently, the National Parks section of the Forestry Division organised a conservation education campaign in North Eastern Trinidad, that lasted one year, from summer 1997 until summer 1998 (Butler, 1998). This was based upon the educational strategy ‘Promoting Protection through Pride’ developed by the RARE Centre for Tropical Conservation, and used the Pawi as a flagship species around which activities were focused with school, community and church groups. Fact sheets, posters,

billboards, bumper stickers, costumes and songs were all used to inform and generate pride in the species. Comparison of a questionnaire administered before and after the survey suggests the campaign was effective: for example, knowledge that the Pawi is a 'type of bird' increased from 49% to 76% (Butler, 1998). Although Temple (1999) considered that this campaign was 'too little too late', and targeted the wrong audiences for immediate impact, this apparent effect is encouraging for the future feasibility of any education programmes.

Most recently Birdlife International (2005) noted that a Pawi ecotourism initiative at Grande Riviere provided local 'financial support' and helped to develop a sense of 'collective responsibility'. However this statement, based upon a 1998 reference, does not reflect the current extent of such efforts in Grande Riviere, which are very minor and usually involve external tour-guides (L.Peters, pers.comm.; pers.obs.). Although captive breeding was recommended for the Pawi in the 1990s, no action has been taken and the priorities of in-situ conservation should probably take precedence (Connolly & Seutin, 1999).

3.2.4.2 *Attitudes towards Pawi*

Interviews with hunters in James & Hislop (1997) suggest that over 25 years ago Pawi was shot for sport, but recently it has been hunted more by commercial poachers to eat whilst hunting more profitable species. This is similar to Connolly and Seutin (1999) who note that Pawi meat is 'not prized' but is caught opportunistically when hunting for more profitable mammals.

James & Hislop also reported that most of those who ate Pawi claimed to dislike its taste and texture. However, Alexander (2002) reported that most local people were 'well aware' of Pawi as a 'favourite' target for hunters and a 'desirable' food: some men interviewed displayed an enthusiastic attitude towards hunting it, and shared their favourite recipes for Pawi. However, Alexander also mentions that the caretakers of the study site used at Grande Riviere had a protective attitude towards the bird. Local attitudes to Pawi and its importance as food are therefore not at all clear.

The Pawi's gregarious habits may encourage the impression that it is numerous and prevent concern for it. However, a 1997-1998 education campaign focused on the Pawi (see section 3.2.4.1) may have increased knowledge and interest in the Pawi: a

questionnaire administered before and after this campaign indicated knowledge of Pawi and its habitat had increased (Butler, 1998). In February 2004 a one day survey of local Pawi knowledge was conducted by UWI students, and concluded there was high local awareness of Pawi (Roopchand et al., 2004). All those with jobs in Pawi habitat had seen it, but the majority (82%) thought the Pawi population was in decline, citing hunting and habitat destruction as the two main causes. However, as this survey was based on responses from pedestrians in Montevideo and individuals associated with conservation initiatives in Grande Riviere, the knowledge and views presented cannot be considered representative of people in the Pawi's range.

3.2.4.3 National legislation

The Pawi has been protected from hunting under Trinidadian law since the 1963 Conservation of Wildlife Act (James & Hislop, 1988, 1997; Temple, 1999). Most of the Pawi's range falls within Forest Reserves but this has little effect on the Pawi's protection. The Matura ESA designated in October 2004 covers a significant portion of the Pawi's range (figure 1.1) and its management plans (currently in preparation) could significantly impact Pawi conservation. In July the EMA also designated the Pawi as an ESS (Republic of Trinidad and Tobago, 2005), which will increase its level of legal protection. However, as noted in section 3.1.3, legislation for conservation is largely un-enforced. The provision and enforcement of laws protecting the Pawi has long been considered a problem: for example in 1972 French stated that education would take 'too long' to affect hunters' attitudes, so the Pawi would be eliminated unless a suitable reserve was created and the law enforced.

3.2.4.4 International recognition

Several international organisations have highlighted the species as a cause for concern and a priority for conservation action. It is listed as the second most endangered Cracid in the IUCN/SSC Cracid Action Plan 2000-2004 (Brooks & Strahl, 2000), and has been classed as 'critically endangered' by the World Conservation Union (IUCN) since 1994 (Birdlife International, 2004). It is also listed in CITES Appendix I, prohibiting its international trade (UNEP-WCMC, 2005), and the Northern Range has been designated an 'Alliance for Zero Extinction site' because the Pawi's presence is limited to this region (Alliance for Zero Extinction, 2003).

3.2.4.5 *Recommendations for conservation*

All relevant sources note that hunting is the primary threat to the Pawi and recommend that it should cease as soon as possible, usually through creating and enforcement of protected areas. For example, James & Hislop (1997) recommend the creation of protected areas in key regions of the Northern and Southern Ranges. They also recommended enforcement action should be coupled with localised educational programmes (for locals and public officials), and an intensive one-year study of Pawi. Education and local involvement are also recommended by (Armstrong, 2001; Bacon & French, 1972). Better general control of wildlife management would also help the Pawi, but this would require the relevant sections of the Forestry Division to be given much more personnel, training and resources (Leach & Fairhead, 2001). As long ago as the 1970s it was noted that efforts to stop hunting would fail without public support (Bacon & French, 1972), and it is now widely recognised that more effective conservation needs better involvement of local Trinidadians (Armstrong, 2001). Similar recommendations are made by Birdlife International (2005) and the action plans of the IUCN/SSC Cracid Specialist Group (Brooks & Strahl, 2000).

Brooks & Strahl (2000) suggest that ecotourism may be a suitable means for conserving Cracid species, whilst providing income to local people and encouraging their conservation of the birds. They suggest rotating visits between sites to strike a balance between involving the local people and avoiding undue disruption in one area. The suitability of ecotourism relies on more conditions than Brooks & Strahl describe (section 2.4). However, an existing turtle ecotourism operation (section 3.1.3.3) suggests that this may be a feasible consideration for Pawi, at least in Grande Riviere. Also, birdwatchers are theoretically good targets for ecotourism, as they are generally highly committed and relatively affluent (Sekercioglu, 2002). It is therefore useful to consider the suitability of ecotourism for Pawi conservation.

Investigation of the link between ecotourism and perceptions of natural resources, turtles and conservation is therefore relevant to future conservation efforts for the Pawi, as well as investigation of the effects of ecotourism.

4 METHODS

4.1 Rationale for methodology

This survey used a combination of Rapid Rural Appraisal (RRA) techniques and questionnaire-based interviews. This allowed the collection of both qualitative and quantitative data on the perceptions of natural resources and their conservation. The principles of RRA, questionnaire-based interviews and their combination are outlined, followed by the details of their practical application for this project.

4.1.1 RRA

4.1.1.1 Principles of RRA

In the 1970s, it was recognised that high-level policy development was failing to solve the problems of many people of the developing world: a better understanding of real-life situations and attitudes was required. Information was collected inflexibly (e.g. with questionnaires) and did not involve much participation from stakeholders (Theis & Grady, 1991). However, the traditional anthropological methods for understanding communities were very time consuming and did not always result in the collection of directly applicable information (Bernard, 2002).

The need for efficient but participatory collection of data about local problems and situations resulted in the development of ‘Rapid Rural Appraisal’ (RRA). This is a semi-structured community learning experience that is intensive, systematic but flexible (Theis & Grady, 1991). It can be used to quickly collect information for problem analysis, feasibility studies, project prioritisation, project design and evaluation. It is now applied to both developed and developing countries, and both urban and rural areas. It has been adapted for nearly any situation or research question, from gender studies (e.g. Mukherjee, 1993) to farming system management (e.g. Girara & Abela Peasants Associations, 1991).

The terms RRA and PRA are sometimes used interchangeably. However Participatory Rural Appraisal (PRA) is actually a specific form of RRA that developed from the late 1980s onwards. As the name suggests, PRA has a stronger emphasis on local participation, ownership and empowerment. Better participation means more local knowledge is elicited and the more likely a community will sustain involvement with a

project to make it a success (Mukherjee, 1993). The benefits of participation are even recognised beyond the NGO and aid agency sector, such as for commercial tourism (Hunter & Green, 1995). It has been specifically recommended for natural resource planning in the Caribbean (Geoghegan et al., 2004).

However, training local people and complete community involvement can be resource and time consuming, at least in the short to medium term. Therefore, PRA can require more immediate investment than RRA, and the approach must be chosen as appropriate to the situation and available resources. For example, RRA is often used to extract local knowledge that helps to inform outside agencies such as universities or aid organisations needing information for project design and management, whilst PRA would aim for local people to take control of the process (Kapila & Lyon, 1994).

Given the time and scope restrictions of this research, the approach was primarily that of RRA. However, efforts were made to make the research as participatory as possible, through feedback to all contacted, consultation with the local environmental groups on research findings, and wide distribution of results.

4.1.1.2 Features of RRA

RRA is used to collect social science data in a manner that is structured but flexible enough to allow hypotheses to evolve (Chambers, 1992). Although there is no definitive procedure for RRA research, it always has a number of key features, outlined in table 4.1.

RRA is usually carried out with a group of between 3 and 15 people from the community, to allow discussion without loss of clarity (Scoones & McCracken, 1989). Groups can be formed from pre-existing community groups or *de novo*, in which case care should be taken that participants are comfortable working together, perhaps by ensuring similar social status, or the same gender. Repeating the same exercises with different groups helps to validate RRA findings (triangulation), so the RRA research team usually works with at least three groups. Other ways to triangulate are the use of complementary exercises probing one topic, and the multiple perspectives of the research team. However, this team should not be so large that it becomes overwhelming: usually two or three researchers are sufficient. The role of the researcher is that of a moderator or facilitator, who must explain the issue and

encourage relaxed discussion to which all individuals to contribute, and focus the debate without imposing opinions (Pretty et al., 1995).

Table 4.1. Key features of RRA and PRA, adapted from Kapila & Lyon (1994).

Feature	Notes
1. Cross-checking or Triangulation	Helps to increase reliability and decrease bias a) multidisciplinary team b) ask different sources for same information c) ask one source for information in different ways d) present information back
2. On-the-spot analysis	Allows flexibility and feedback
3. Learning by experience	Techniques must be practiced
4. Flexibility and adaptability	Hypotheses and activities may change
5. Diagrams and Visualisation	Intuitive and easy to understand activities
6. Informal interviewing	Can lead to more structured interviews
7. Participation	Especially true for PRA

The process and methods used are unique to every situation, and will probably continue to evolve over time (Mukherjee, 1993). Nevertheless, there are certain techniques and exercises (a ‘toolkit’) that have been successfully adapted to many situations. Choosing, combining and adapting these tools is important for appropriately and reliably investigating a problem and cross checking data (Kapila & Lyon, 1994). Commonly used tools include semi-structured interview, group interviews, case studies, timelines, maps, transect walks, season diagrams, ranking, scoring, activity budgets, flow charts and venn diagrams. Also, data from these activities should be supplemented by review of primary and secondary data review and direct observations (K. Lorenzen, pers.comm.). Tools used in this study are described in the application of the methodology (section 4.3.1.1).

4.1.2 Questionnaire-structured interviews

Questionnaires can be used to collect data on knowledge, opinions, behaviours and personal attributes. They have been used to collect social data for over a century (Saunders et al., 2003). As they require people to respond to exactly the same set of

questions, data from different individuals can be directly comparable and may be subjected to quantitative analysis (Saunders et al., 2003).

Questionnaires can be administered in several ways, such as by post or over the phone. Each method has advantages and disadvantages and must be chosen in accordance with research aims and situation (Saunders et al., 2003). One such method is an interview, a 'purposeful discussion' between two or more people (Kahn & Cannell, 1957). Although relatively expensive, face-to-face contact can provide a high level of response, avoid respondent self-selection, and to allow for clarification of questions and probing of responses. Face to face contact is particularly useful for building trust and allowing sensitive issues to be explored.

A potential disadvantage of face-to-face interviews is the opportunity for interviewer moods and opinions to bias the delivery and interpretation of the questionnaire, so affecting data validity. If different interviewers deliver the same questionnaire, this also poses a particular problem for reliability, so as few interviewers as possible should be used, and all should be well trained in the delivery of the questionnaire (Saunders et al., 2003).

Interviews are 'unstructured' or 'structured' according to how closely the interviewer adheres to certain topics or questions. Structured questions allow quantitative and comparable data to be elicited, if they are carefully phrased to be non-biasing and easily comprehended. If these set questions are asked in specified ways (as per a questionnaire) but also allow opportunity for open answers and discussion on some topics, an interview is considered 'semi-structured' (Saunders et al., 2003). As this approach promises to elicit both reliable structured data and additional qualitative data, it was used for this study.

4.1.3 Combining RRA and questionnaire surveys

The combination of PRA/RRA and questionnaire based methodology is an established technique for relatively quickly and flexibly eliciting socio-economic information relevant to certain issues. Both methods of research have different advantages and disadvantages, but combining them can emphasis the strengths of each. Table 4.2 lists the positive attributes of research that apply to each type of research, demonstrating how the two techniques are complementary.

The use of two approaches also allows the same issue to be approached in different ways, so increasing the reliability of data elicited. This triangulation is especially important when sensitive issues are investigated.

Table 4.2. Desirable attributes for social science research, and their applicability to questionnaire based research and PRA/RRA research. *=Not applicable, **=Somewhat applicable, ***=Very applicable. Adapted from Kapila & Lyon (1994) and Kühl (2003).

Desirable attribute	Questionnaire	PRA/RRA
• Suitable for poorly understood situations?	*	***
• Methods adaptable?	*	***
• Suitable for sensitive issues?	***	*
• Participation encouraged?	*	***PRA/**RRA
• Awareness of issue encouraged?	**	***
• Data with context and breadth?	*	***
• Data focused on issue?	***	**
• Data collection internally triangulated?	*	***
• Representative sampling?	***	**
• Low level of expertise required?	**	*
• Data collection quick?	**	***
• Data analysis quick?	*	***
• Data qualitative?	**	***
• Data quantitative?	***	*

In addition to triangulation, there are a couple of specific uses of the ‘combination methodology’. Firstly, RRA findings can inform questionnaire rationale and design: for example, irrelevant concepts can be removed from the survey, and local words for wild animals used (Kapila & Lyon, 1994). Secondly, the RRA activity of wealth ranking can be particularly useful in guiding questionnaire research, to ensure that sampling is stratified by all wealth categories (or any other household identifier chosen) (K.Lorenzen, pers.comm.). In addition, time spent in a community during the RRA phase can help local acceptance and interest in participating in the questionnaire survey. Therefore, questionnaire surveys are normally not started until after RRA outputs are collected.

The usefulness of the combination methodology to investigations of natural resource use is well demonstrated by Ite (1996a). In this work a combination of RRA, household questionnaire surveys, focus group discussions and guided interviews was successfully used to investigate community perceptions of a local protected area, and identify the factors affecting the level of support for it. The combination methodology has also been used to investigate incentives for Saiga antelope hunting (Kühl, 2003), so the framework is evidently a sensible way to investigate the Pawi, natural resource and conservation perceptions.

4.2 Application to objectives

Both RRA and the semi-structured interviews are appropriate for probing a wide range of issues, but have different strengths (above). Therefore, the interviews were used for focused investigation of the research questions and the links between personal attributes and perceptions, whilst the RRA was used to provide more data of a more general and qualitative type, to establish a context for the investigation. The research questions targeted by each phase are listed in table 4.3. The RRA phase also aimed to provide data to guide the design of the questionnaire and household sampling.

Table 4.3. The research questions (concise form –for explanation see Introduction) and the methodology components used to answer them. ● provides data on this issue, ○ indirectly relevant/provides some data on this issue.

Research question topics	RRA	Interview
1) What are local uses and perceptions of natural resources?		
a) What is the importance and extent of use of local natural resources (especially hunting and wild meat consumption)?	●	●
b) What are knowledge and attitudes to local natural resources and conservation, especially towards hunting and hunted animals?	○	●
c) What is the extent of knowledge, and attitudes towards Pawi?	●	●
2) What factors affect perceptions?		
a) What are local perceptions of ecotourism?	○	●
b) Do links to ecotourism (e.g. hotel work, guiding) affect perceptions of natural resources and conservation?	-	●
c) How do knowledge and attitudes to the Pawi compare to that of turtles?	-	●
d) Are these perceptions linked to use or other socioeconomic factors?	-	●

4.3 Practice of methodology

Research was conducted over 9 weeks between the 20th May and 22nd July 2005. During this period, members of the research team had ‘part-time’ residence in an old plantation house some way up a trail from the village centre. Research assistants were three female Trinidadian UWI students voluntarily affiliated with the Pawi Group. Two training sessions and role-play ensured that this core team was competent in the principles and techniques of RRA and questionnaire-based interviewing. During RRA sessions Dr. Veerle Van den Eynden from UWI was also present and lead some group activities, due to shared topics of research interest. For interviews, one research assistant was always present.

4.3.1 RRA

4.3.1.1 RRA activities

Different activities were conducted with each group, to cover a range of topics and to respond to varying group interests. The activities carried out by each group, and their order, are listed in table 4.4.

Table 4.4 The activities, in order, performed by each RRA focus group. NR=Natural Resources, WR=wealth ranking, TL=timeline. CEPEP is name of local unemployment project group.

Activity	Group 1 (women)	Group 2 (Cultural club men)	Group 3 (CEPEP) (mixed)	Group 4 (Children) (mixed)
1 TL village, TL tourism	Yes	Yes	Yes	-
2.1 Map land types, NR	Yes	Yes	Yes	-
2.2 NR uses, importance of land/ use	Yes	Yes	Yes	Yes
2.3 NR timeline	Yes	-	Yes	-
2.4 Species importance for timber and hunting use categories.	-	-	Yes	-
2.5 NR use seasonality	-	Yes	-	-
3 Sources of food	Yes	-	-	Yes
4.1 Marking livelihoods (guides, crafts, hotel).	Yes	Yes	-	-
4.2 Livelihood ranking	-	-	Yes	-
4.3 Wealth ranking	Yes	Failed	Yes	-
5 Discussion on wild animal conservation	-	Yes	-	-

More details on the principles and details of each activity may be found in sources such as Kapila & Lyon (1994) and de Zeeuw (2004). The use of piles of beans to show importance was generally well received, so was used as a component of several activities (although group 2 had a slight tendency to spread the beans equally between whatever categories were under consideration)

Activity 1 Timeline. A general village timeline was conducted with all adult groups, as this was felt to be a relatively easy and straightforward exercise to encourage discussion and set the context for later activities. Towards the end of this exercise, participants were specifically queried on tourism related events (e.g. hotel openings, number of visitors). This exercise was also useful for comparing the extent of village knowledge held by each group.

Activity 2.1 Mapping land types. Mapping of land types used a large piece of brown paper on which were drawn some basic features of topography in the area surrounding Grande Riviere (rivers, roads, coastline, large hill peaks). The groups were asked to name different land cover types, and then to indicate on the map where these are found.

Activity 2.2 Uses and importance of land types. The importance of each land type for village wellbeing was then scored using 100 beans divided between the different types. The group was asked to name all uses of each land type. Uses and land types were written on cards. Participants were then asked to score the importance of each land type for each use category, by dividing 100 beans between the land type cards.

Activity 2.3 Natural resources timeline. The group was asked to describe how the extent, condition and use of natural resources around Grande Riviere had changed with time.

Activity 2.4 Importance of different species for timber and hunting use categories. The group was asked to list the most important species used in each category, to a maximum of 10, and then distribute 100 beans between them to express their relative importance. An extra category for all other remaining taxa was included, and its importance scored relative to the 100 score for the listed taxa.

Activity 2.5 Seasonality of natural resources and their use. The group was asked to describe how the uses given in exercise B2 varied over the year. A year was marked as a grid, with seasons added, to facilitate data collection.

Activity 3 Sources of food. Participants were asked to list the different ways food could be obtained (e.g. bought from a shop, collected from the wild). They were then asked to list different categories of food-type (e.g. beans, cereals). For each type they must divide 100 beans (or state percentages) to show the importance of each food source.

Activity 4.1 Frequency of certain livelihoods. A map of roads and households was prepared by the project team before the session. Participants were asked to mark with coloured pens where people with certain occupations lived (e.g. tour-guides).

Activity 4.2 Livelihood ranking. Participants were asked to list the different occupations possible for people from the village. These were written on cards, and the participants asked to move the cards until they were in order of desirability.

Activity 4.3 Wealth ranking. Participants were asked to rank the houses on the map according to how ‘well-off’ or comfortable the household was, by sorting cards into as many categories as wanted, or marking on the map. Two groups reluctantly sorted houses into just two piles, and were unable to give indicators of what made some people ‘more comfortable’ than others, apart from ‘generosity’. The third group refused to sort the cards, saying there were no differences and appearances were deceptive (‘a man in a hotel might have a lot but it is all tied up in his business’), probably due to one group member owning a guesthouse whilst other members were his friends and relatives. The failure to rank may also be due to the use of traditional values for poverty (inability to eat, etc), by which standards no-one is poor (Onwuka, 2004).

Activity 5 Discussion on wild animal conservation. This was considered an appropriate end to the session, if participants were interested and enough time remained.

4.3.1.2 RRA group selection

Three group sessions with adults were held between 11th and 14th June. Each session lasted about three hours. Participants were selected from pre-existing groups, to ensure they would feel comfortable together. The first group consisted of four women,

approached from recommendations made by the leader of the village Woman's Group. The second group was four members, all male, of the band and cultural club 'Roots and Branches'. The third group consisted of one man and two women from the local unemployment project 'CEPEP'. All participants in RRA sessions were offered drinks and snacks in accordance with Trinidadian customs of hospitality.

A fourth group session was held on 7th July with six children, all boys, aged between 9 and 13, from the Standard Four year group of Grande Riviere Anglican primary school. This was supplemented by an activity sheet (appendix 1) designed to probe perceptions of animals and tourists, and filled out by four children aged eight, parallel to the group activities. A final session with members of the Grande Riviere Nature Tour Guides Association allowed for feedback of data collected, clarification and discussion.

4.3.2 Questionnaire

4.3.2.1 Questionnaire design

The final questionnaire (appendix 2) was designed to incorporate the range of research questions in table 4.3. It was prepared after initial RRA data had been collected, and incorporated comments from the Pawi Study Group and my supervisor. It was refined by a pilot study, which was important in highlighting a unclear picture used in question 1, which was replaced for the final survey.

In addition to the research objectives, there are many considerations affecting the design of a useful questionnaire. A questionnaire must be easily understood, whilst eliciting data that is valid (reflects the true situation) and reliable (consistently reproducible). These considerations affected all aspects of questionnaire design, from question phrasing to presentation. They are summarised below but greater detail is presented in Cochran (1977) and Saunders et al (2003).

The first consideration was the format of the questions, which can be 'open' (any response permitted) or 'closed' (response is limited to a choice from a predetermined list or scale). Although closed questions are easily recorded and analysed (especially if pre-coded), their limited response options risk biasing or limiting answers, and so they are only suitable when the full range of answers to a question is already known and can be easily categorised (Saunders et al., 2003). For this questionnaire, open format questions were therefore chosen. Some of these answers were then coded upon entry

into a data sheet, to allow statistical analysis. Although many questions were open, examples often had to be given when questions were explained (e.g. examples of threats to wildlife for question 12). When this was done, care was taken to list more than one example and interrogate answers that then matched what we had just said.

Question wording was also important. Questions were designed to be simple and clear whilst avoiding bias, through neutral phrasing and presentation (for example ‘How much...?’ was preferable to ‘Is enough ...?’). Questions order was designed to be clear and to maintain the interest and confidence of the interviewee. To do this, the first questions were easy and clearly relevant (i.e. on attributes and behaviours), followed by more complex questions (i.e. on opinions) and finally sensitive or personal questions (i.e. on occupation and education). However, the effect of question order on responses was also considered (for example, opinions on the value of conservation may be more inflated if an interviewee has already answered numerous questions on endangered species). Accordingly, this survey had three sections: A) on knowledge and use of natural resources; B) on knowledge and opinions of conservation; and C) on personal characteristics.

Although the questionnaire had to be of sufficient length to allow sufficient detail to be collected, if overlong it could produce ‘low quality’ responses as the respondent grew bored or impatient (Cochran, 1977). Therefore, the survey was intended to take about thirty minutes to complete (no interview lasted longer than one hour). Finally, questionnaire layout could also affect perceptions of clarity and length, so a clear, consistent and familiar style was used to help guide the respondent and maintain interest in the interview. Filtering questions and linking phrases also helped easy and logical progression through the document.

4.3.2.2 Question details

The first question asked respondents to identify and name eight local species pictured in colour on a laminated card (appendix 3). The use of comparable picture cards to assess wildlife knowledge has been successfully demonstrated with children by Balmford et al. (2002) and with adults by Cuthbertson et al. (2005). Local names (not scientific) were required, and the level of detail required for a correct answer varied according to the subject and the intended level of difficulty (answers shown in appendix 3). As well as

eliciting knowledge of local natural resources, the pilot test showed this was an interesting and easy ‘icebreaker’ for respondents. The remaining questions of section A test the extent of wild food consumption and recipes for it, the frequency of wild meat consumption, preference for wild meat, and other uses of wild things. The presence of tour-guides or hunters in the household was noted, and the reasons for hunting. Question 6 was the most difficult, more so than indicated by the pilot study. It asked respondents to assess the household benefits from local natural resources, and from local wild natural resources: this usually required extensive explanation, which introduced the possibility of bias. Due to nature of the question and the uncertainty of some answers, data elicited was considered ordinal.

Section B tested for opinions on the Trinidad’s efforts for conservation, and ideas of what was endangered and why (examples of threats to wildlife frequently needed explanation and where examples had to be given care was taken to give many possibilities).

Section C elicited personal data on both the respondent and the members of his/her household. In addition, because no reliable wealth ranking had been produced from the RRA exercise, the presence/absence of 14 household attributes was recorded, which generated a wealth score to act as a wealth proxy. These attributes had been chosen from official 2000 census data as those significantly varying with household income (appendix 4).

4.3.2.3 Pilot

A pilot questionnaire was used to test the comprehension, phrasing, sensitivity, and length of the questionnaire, to ensure interviewer approach was clear, non-leading and consistent.

The pilot population should be as similar as possible to the target population, so the village of Lopinot was selected, due to its rural character and location within Northern Range. Five questionnaires were administered to houses deliberately chosen by appearances to represent poorer and richer members of the community. In response to this pilot, the phrasing of some questions was altered, and the interviewer’s use of certain expanding or explanatory phrases was standardised.

4.3.2.4 *Sampling*

A random sampling technique was used, as this best allowed a representative sample of the village. The sample was not stratified by wealth, as wealth ranking was found inappropriate by some villagers in RRA sessions. It was not stratified by occupation as the same sessions indicated that there was high variation in the type and extent of involvement in tourism and other industries, and disagreement over exactly which households were involved.

Households were randomly selected, by numbering houses on a pre-drawn map, and then randomly drawing numbers. Houses were visited in the order drawn. Unavailable households were revisited at least three times, over both weekend and weekdays. If a target household was not available for interview, the next nearest house to the right was then approached (hilly terrain prohibited constant movement as dictated by continually drawing random numbers).

Over June and July 2005 the questionnaire was administered to 52 households in the village of Grande Riviere. This is roughly equivalent to half the total number of households in Grande Riviere (a precise total is not available).

4.3.2.5 *Interview approach*

The questionnaire focused on an entire household as the unit of response (except for question 3 on meat preference), based on respondents' normal interpretation of this term, and taking care that those temporarily living or working away from the house were included (as consistent with Bernard, 2002). Usually the interview was conducted with only one member of the household, or a few members, rarely was a whole household present. Interviews were conducted in the respondent's house, veranda or garden, and lasted on average 40 minutes, plus social niceties.

The interview was conducted by myself and my research assistant, with the lead usually taken by me, or whoever was most appropriate (usually when one person took the notes the other led conversation onto the next question). In only three instances was the conversation mostly led by the research assistant because of difficulties with language. Only two attempts to interview a household met with near-direct refusals, although some targeted households were never interviewed as the members were rarely in or available. All interviews were introduced with an introduction emphasising links with

UWI, to minimise biases from perceived links with officialdom or interest in Pawi. The anonymity of the questionnaire (and house selection, if appropriate) was also explained. Interviews were conducted on a voluntary basis, and an information sheet about myself, the project and the Pawi Study Group was given out at the end.

4.4 Data analysis

Questionnaire data were stored, coded and presented with Microsoft Excel. SPSS 11 was used for all statistical analysis (SPSS Inc., 2001). Parametric tests were used where possible, using suitably transformed data where necessary. Non-parametric tests were used if data violated the assumptions of parametric statistical models (Healey, 1999). General Linear Model ANOVAs (GLM) were used for multivariate analysis, although data may have violated requirements e.g. homogeneity of variance. All statistical tests were two tailed with critical probability value of 0.05. Test significance values quoted in tables are represented through the star system, as follows: ‘***’=P<0.001, ‘**’=P<0.01, ‘*’=P<0.05, and ‘NS’=Non-significant (P≥0.05). Sample size or degrees of freedom (‘df’) are given where appropriate, and Mann-Whitney U tests are followed by (n₁, n₂) to indicate the number of observations in each group.

4.5 Health and safety

Crime in Trinidad has become a significant consideration for both locals and visitors: for example, Brooks & Strahl (1998) note that ‘some areas are quite dangerous to work in, especially if one is not Trinidadian’. In addition sexist attitudes can make some situations particularly unsuitable for women (De-Light & Thomas, 2005). There were also health hazards: the rural situation of the house meant biting animals, including bats and venomous snakes, were found in and around the house. Therefore, all stays in the village were made in pairs, and trip details were left with the Pawi Study Group, and a risk assessment was used to assess and mitigate risks before work began.

5 RESULTS

5.1 Local context

5.1.1 Village description

RRA sessions provided useful data on perceptions of the village and its past development. Timelines indicated that groups had similar knowledge of events such as shop and school closures, but varying perceptions of some changes, such as population trends over the past decades (appendix 5). There was a general feeling that a past decline in village prosperity had been reversed in the last 10-15 years, with more employment opportunities and amenities (telephone, water, and electricity) becoming available to the majority.

A village map was produced by the research team and refined by comments from villagers in the RRA sessions (appendix 6). RRA participants also used to the map to indicate the approximate extent and distribution of households involved with selected livelihoods. There appeared to be no ‘neighbourhoods’ of certain types or classes of households.

5.1.2 Sample population

The questionnaire survey sampled 52 households (nearly half the population total). The number of people living in each house ranged from 1 to 11, mean 3.4 ± 0.31 , which is similar to the regional mean of 3.7 in the 1990 census. Although the sample sex ratio is slightly female biased (27:25 female: male) and census data indicated the population ratio in 2000 was male biased (136:162) this is not a statistically significant difference (χ^2 , $df=1$, $\chi^2=0.828$, $p=0.363$). The age of respondents ranges from 15 to 82. However, the sample is slightly biased to older people: comparison of sample and census age classes indicates a bias to those aged over 60 (χ^2 , $df=3$, $\chi^2=10.97$, $p=0.012$; figure 5.). The majority of respondents had always lived in the village, although some had moved in (e.g. upon marriage) and several had spent a period in a town.

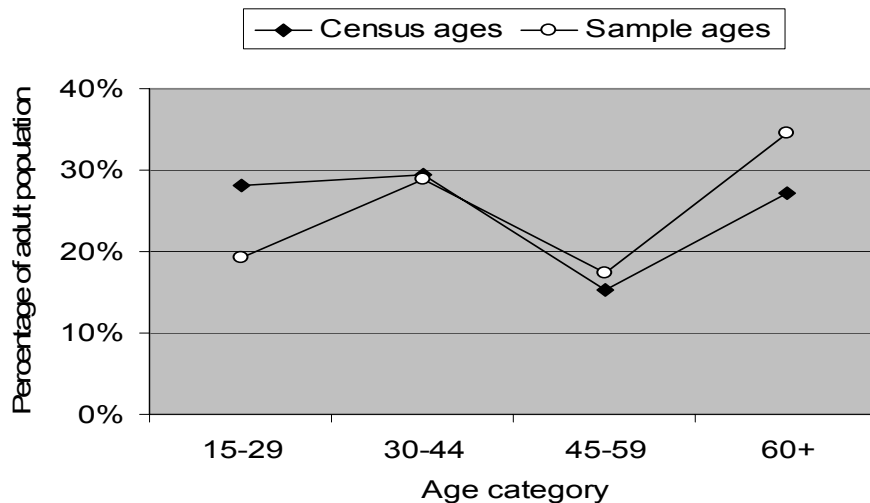


Figure 5.1 The proportion of respondents from each age class, compared to the proportion indicated by census data.

5.1.3 Livelihoods and wealth

The majority of people surveyed (26) had attended some level of post-primary education, and nearly as many had attended only primary school (24). Only two respondents had any higher levels of education. Fourteen respondents were retired, and nine were unemployed, with a high proportion of the remainder having agricultural ('gardening') or labouring jobs. Figure 5.2 shows the distribution of the primary occupations, but it should be noted that many respondents had secondary occupations (such as gardening or tour guiding). However, there was no association between guide jobs and other occupations, and no other significant associations between occupations were noted.

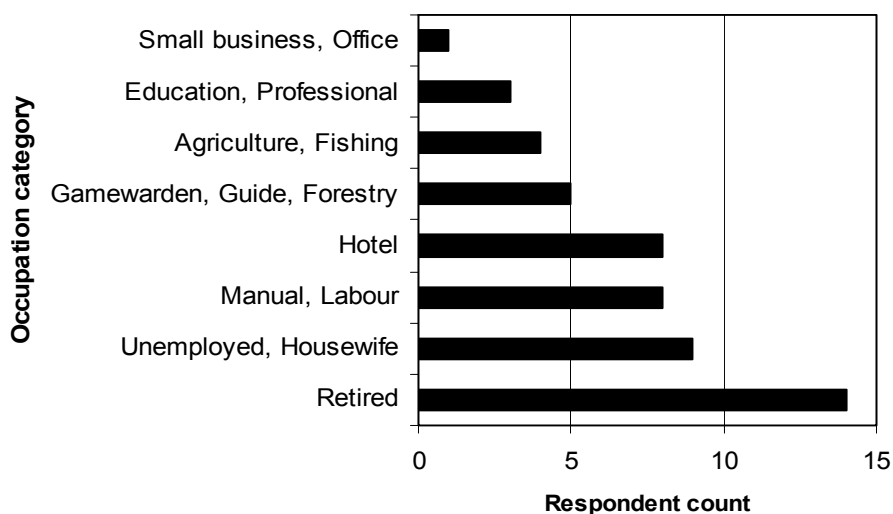


Figure 5.2. The primary occupations of respondents. Occupations categorised by skill and genre.

The third RRA group listed and ranked the various livelihood options available in the village (table 5.1). They indicate that a particular association between a part-time occupation and other occupations is unlikely as many people pursue these activities in their spare time. Reliable income, high pay and control over work were features of highly rated occupations: therefore, part-time occupations were not highly rated, and tour-guiding was not considered an occupation as pay was so low.

Table 5.1 Livelihood options available in the village, and their relative desirability, as produced by RRA group 3 (un-triangulated as produced by only one group). 'pt'=part-time

Job	Rank	Notes
Teacher	1	People in these occupations may also do part-time jobs at the weekends as supplement or hobby.
Road worker	2	
Shop worker	3	Non-manual occupations are desirable, but less so than being reliably highly paid (so road working is more desirable than hotel work).
Hotels	4	
Craft	=5	All self-employed occupations are desirable because have control over own work.
Gardening on own land	=5	
Security Guard	6	
PT fishing	= 7	Usually all pt-jobs practiced together.
PT hunting	= 7	Less desirable as produce unreliable and low income.
PT forestry	= 7	

The wealth score followed a near-normal range, between 2 to 14, with certain attributes characteristic of poorer households (for example, 92% households had a radio, but only 15% had a vacuum-cleaner). Wealth score varies significantly according to the primary occupations of respondents (Kruskal-Wallis, $df=7$, $\chi^2=14.11$, $p=0.049$; appendix 7). However, as multiple occupations are typically pursued between all members of a household, the occupations of primary respondents are not assumed to predict household wealth.

5.1.4 Socioeconomic factors

There is some co-variation in the socio-economic factors of questionnaire respondents: the strongest confounding effect is between age and education (table 5.2). This is not surprising, as younger people were more likely to have reached higher levels of education (attending secondary school was rare two generations ago), so education is assumed to be the fundamental factor, where both appear to effect other variables. Wealth also covaries with age and education (table 5.2).

Table 5.2 The socioeconomic factors relating to respondents and their households, and their associations. Spearman rank, Mann-Whitney U, and Kruskal-Wallis used as appropriate. N=52 for all tests, except for age versus occupation, for which retirees are excluded and N=38. Group sizes for genders: 27,25; df=7 for effect of occupation on wealth.

	Gender	Age	Education	Wealth	Occupation
Age	NS				
Education	NS*	$R_s = -0.679$ ***			
Wealth	NS	$R_s = -0.279$ *	$R_s = 0.349$ **		
Occupation	NA	NS	NS	$\chi^2 = 14.113$ *	
T in village	NS	NS	NS	NS	NS

5.2 Perceptions of natural resources and conservation

The uses of natural resources are described, with especial attention given to hunting and wild meat consumption, to show the context within which any Pawi hunting occurs. Knowledge and attitudes towards natural resources are then described, together with general awareness of Pawi, but more consideration pertaining to the Pawi is given in section 5.3.2.

5.2.1 Uses of local natural resources

5.2.1.1 *The variety of uses and their importance*

Villagers in Grande Riviere derive a variety of benefits from their natural surroundings. RRA sessions revealed a variety of land types were perceived in and around the village, and those listed were affected by gender: men described different types of estates, whilst women described different types of garden near the house, reflecting the relative allocation of their attention and effort. ‘Garden’ is a term for private agricultural land or estate, and ‘bush’ seems to be used variably to describe forest or estate. The meaning of ‘wild’ is not commonly understood or used, except to refer to hunted animals as ‘wild meat’. The land-type considered most important for well-being was ‘houses’, indicating that natural benefits were considered less important than land for building, but next largest score was afforded to private estate/gardens, due to the produce it provides for householders (table 5.3).

Table 5.3 The various land types listed by each group, and their importance for village well-being. If land type not listed by group ‘-’ shown. Average calculated from only adult RRA sessions.

	Group 1	Group 2	Group 3	Average	Children
Forest	5	12.5	17	16	39
Watershed reserve	-	12.5	-	-	-
Estate/bush	4	-	14	19	30
Agricultural land	-	12.5	-	-	-
Abandoned estate	-	12.5	-	-	-
Gov estate	-	12.5	-	-	-
Gardens/Private estate	31	12.5	-	22	-
Backyard	14	-	4	-	-
Floweryard	3	-	-	-	-
Houses	23	12.5	43	26	-
Rivers	-	-	0	0	5
Sea	20	12.5	22	18	14
Beach	-	-	-	-	12
Total	100	100	100	100	100

The production of crops and food for the house continues year round, although there is some seasonality in tourism, timber sales and hunting (at least officially). Fishing was perceived as relatively unimportant compared to other villages in the region. The third group listed some species taken for timber and hunting, but work with children revealed a huge amount of knowledge about the various species fished and hunted (although the boys listed relatively few bush medicine plants, perhaps again indicating a gender difference in knowledge). A variety of uses, including hunting and tourism was described for each land type (for details of hunting see section 5.2.1.2, tourism see section 5.3.1, for details of uses and the importance of different land types, see appendix 8).

The survey revealed that ‘bush’ (herbal) medicine is a particularly important use of natural resources for most households (n=43): much fewer used natural materials for craft and decoration (n=11) or local wood for timber or construction (n=2). The use of driftwood or shells to decorate a house was considered so ordinary as to hardly be worth mentioning. However, the use of bush medicine was usually strongly supported and appreciated. It was collected from the bush and prized species were grown in the flower garden or back yard. Some people would take bush medicine before consulting a doctor, especially for common ailments, and many (especially women) were able to list several useful plants (for plants and uses, see appendix 9).

5.2.1.2 *Hunting and wild meat*

Discussion of hunting during RRA revealed it to be a common and accepted past-time, and about one third (n=17) of surveyed households contained one member or more who hunted. Hunting was invariably done by men, typically heading into the bush for one or two days, perhaps at the weekend, or catching game whilst working on their estates. (In contrast, those who hunt for a living spend nearly all their time in the forest: however, there are probably few such persons in Grande Riviere and none were identified by this study.) Hunting occurred wherever suitable prey could be found: for example, in addition to premeditated hunting expeditions, offhand remarks reveal many respondents would catch iguanas foolish enough to enter the backyard, whilst vacant plots of land in the village often had signs warning against trespassing, squatting and hunting. However, forest and/or estate land remained the most important type of land for hunting, as indicated by all RRA sessions (table 5.4).

Table 5.4 The importance of different land types for hunting, as given by each RRA group by dividing beans between land type categories, and triangulated (mean score) for each category. Average calculated from only adult RRA sessions. °Children considered the trapping of any wild animal (e.g. fishing, catching crab) as animals, adult groups did not.

	Group 1	Group 2	Group 3	Average	Children
Forest	55	20	75	54	41
Watershed reserve	-	13	-	-	-
Estate/bush	24	-	25	31	24
Agricultural land	-	14	-	-	-
Abandoned estate	-	10	-	-	-
Gov estate	-	21	-	-	-
Gardens/Private estate	21	17	-	13	0
Backyard	0	-	0	-	-
Floweryard	0	-	-	-	-
Houses	-	-	-	-	-
Rivers	-	-	0	0	12°
Sea	0	5	0	2	20°
Beach	-	-	-	-	3°
Total	100	100	100	100	100

Several species of wild animal were listed as hunted during RRA sessions, but a few were most important (table 5.5). Pawi was not considered a desirable meat, nor an important animal to hunt: but it was suggested that hunters staying the forest might catch it to eat whilst hunting. In discussions on wild meat, respondents stated they had eaten Pawi a ‘long time ago’. Many spoke of it being seen in or not all, although one boy in the RRA group claimed to have eaten it.

Table 5.5 The species named as hunted during RRA with group 3 and children, with group 3 ranking the importance of the most important species out of 100, using beans. 'NA' =not applicable (species not considered important by adult group). Names taken from Bacon & French (1972).

	Hunted Animal	Latin name	Importance score
Most important	Agouti	<i>Dasyprocta agouti</i>	20
	Lappe	<i>Agouti paca</i>	20
	Tattoo	<i>Dasypus novemcinctus</i>	20
	Wild hog	<i>Tayassu tajuca</i>	20
	Deer	<i>Mazama Americana</i>	10
	Manicou	<i>Didelphis marsupialis</i>	7
	Iguana	<i>Iguana iguana</i>	3
			/100
Remainder	Porcupine, Anteater/ Matapel	<i>Cuendu prehensilis</i> <i>Tamandua longicaudata</i>	5
Others named by children	Mountain dove	<i>Geotrygon linearis</i>	NA
	Pawi	<i>Pipile pipile</i>	NA
	Squirrel	<i>Sciurus granatensis</i>	NA
	Tiger cat (ocelot)	<i>Felis pardalis</i>	NA
	Wild dog	<i>Lutra enudris</i>	NA

Eighty-five percent of survey respondents ate wild meat, and their most frequently eaten and favourite wild meats (table 5.6) are similar to those rated important for hunting. Discussion on meat and the ways to obtain it gave hunting an importance of 30/100 (women) and 59/100 (children), although the wild was not considered an important source of any other food types. However, most survey respondents did not get to eat meat very often: although four people claimed to eat their favourite wild meat once or twice a week, as many claimed to eat it less than once per year: the most common reply was something less than once per month but more than once per year.

Table 5.6 The species cited as most often eaten in response to the question 'what are the three most often eaten [wild meats]?' (Not all respondents named three animals.) and the animal named when asked 'what is your favourite kind of wild meat?' Two of those eating wild meat (n=44) expressed no preference for any type of wild meat.

	Most often eaten?	Favourite animal
Agouti	36	8
Deer	23	11
Lappe	15	6
Manicou	15	3
Tattoo	15	7
Iguana	11	6
Boar	2	0
Fish	1	0
Pelican	1	0
Turtle	1	2
Wild hog	1	0

There is a very strong preference for wild meat over domestic meat (only two people preferred their favourite domestic meat to wild meat). However, wild meat’s popularity may be due in part to its rarity: ‘different’ and ‘rarity’ were cited as reasons for preferring it (**Error! Reference source not found.**), and many answers concerned with taste may have been rationalising a preference based on rarity and/or cultural habit. Its cultural importance and/or traditional value is also indicated by the recipes given for wild meat: even those that did not eat wild meat invariably knew that it was cooked with coconut milk and a special combination of local seasonings.

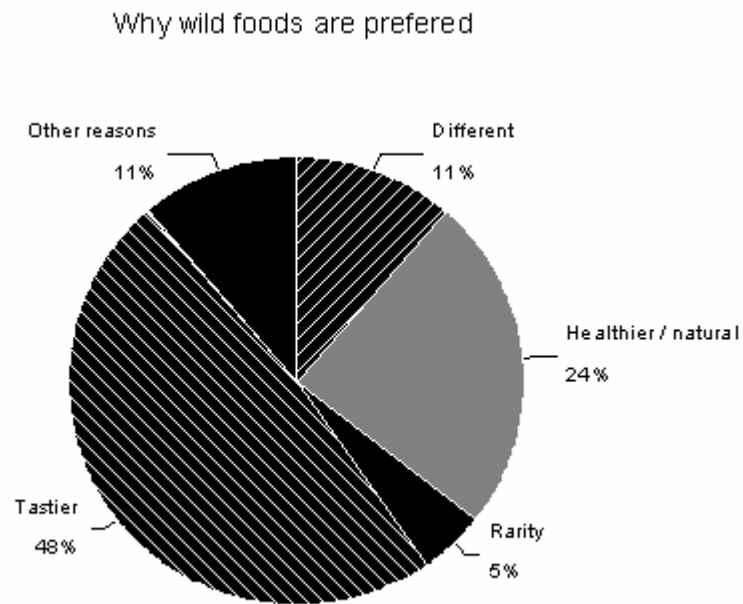


Figure 5.3 The reasons given for preferring wild meat in response to the question 'why do you eat wild foods [meats]?'

The popularity of hunting and willingness to discuss it is reflected by the reasons given for hunting: the majority of respondents said that sport or social/cultural reasons were the primary reason they went hunting (table 5.7). However, on requesting other reasons, all admitted that meat to eat was also a reason (and some (n=8) meat to sell).

Table 5.7 The primary reasons given for going hunting, as given by respondents in households containing one or more hunter.

Primary reason for hunting	Count of response
Social	1
Tradition/ culture	1
Meat to sell	2
Meat to eat	3
Sport/ exercise	9

Discussion about the price of wild meat also suggests that meat cannot be an insignificant by-product of hunting: prices were widely agreed to have drastically increased in the last 10 years and now be very expensive (a whole agouti might cost TT\$200, or maniocou TT\$50/pound).

Several respondents linked the price increase to the increasing rarity of wild meat species. This is reflected by a widespread perception that hunting is a significant threat to wild animals: when asked to think of threatened species, the most frequent reason for thinking named animals as threatened was ‘hunting’. Similarly, over half of respondents named hunting as the biggest problem for all wildlife (table 5.10), and the many of the issues recommended for conservation attention relate to hunting or measures to combat it such as law enforcement or wildlife sanctuaries (figure 5.8).

5.2.1.3 *Links with socioeconomic factors*

Those consuming wild meat were significantly older than those that did not: however, out of those that did consume wild meat, younger and wealthier people ate wild meat more often, and wealthier households were more likely to contain hunters (table 5.8).

Table 5.8 The links between socio-economic factors and variables relating to hunting and wild meat consumption. Spearman Rank, Mann-Whitney U, and Chi² tests used as appropriate. N=52 for all tests, group sizes used for categorical variables: hunting in household (18, 33); consume wild meat (44, 8).

	Hunting in household	Consume wild meat	Meat preference	Frequency of consumption
Gender	N/A	NS	NS	NS
Age	NS	Z=-2.258 *	NS	R _s =0.330 *
Time in village	NS	NS	NS	NS
Education	NS	NS*	NS	NS
Occupation	NS	NS	NS	NS
Wealth	Z=-3.187 **	Z=-2.578 **	NS	NS

5.2.2 Knowledge and attitudes to natural resources

5.2.2.1 Knowledge of natural resources and conservation

Respondent knowledge of natural resources was primarily indicated by the knowledge score (calculated from question 1). The range of scores (6 to 16) obtained show a significant variation in respondents' ability to recognise and name natural species (figure 5.5).

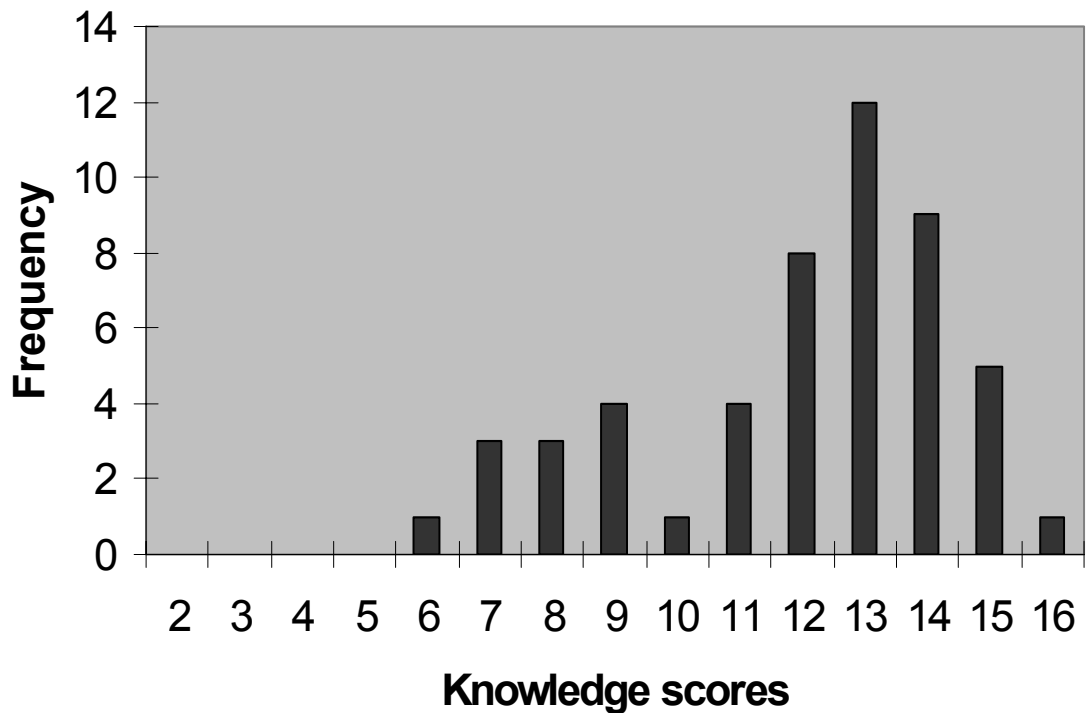


Figure 5.4 The range of respondent knowledge scores, calculated from answers to question 1: maximum possible score is 16.

There was generally a high awareness of local projects and activities for conservation, especially of ecotourism and hunting bans (table 5.9). However, many were unclear of the details of the projects or their operation. For example, discussion revealed many were unclear about the times during which the hunting ban applied. There was also confusion over the range of methods through which the conservation information is supplied: many thought there might be activities at school, but were unclear if anything was broadcast to television or radio (wildlife documentaries were also considered educational) and many thought education and information was aimed mainly at the tourguides 'on the beach'.

Table 5.9 Summary of the answers to question 12a 'Has this been tried in this area?'. Generally, correct answers were for: ecotourism 'yes', protected areas 'no' (unless Matura ESA or description of other specific scheme given; hunting bans 'yes'; education 'yes'.

	Correct	Incorrect	Don't Know
Ecotourism	52	0	0
Protected Areas	45	3	4
Hunting Bans	52	0	0
Education	41	7	4

When asked if they knew of endangered species, a significant minority did not name anything (two people stated they did not know, whilst eight people thought that no animals were endangered) and of the remainder, only 13 respondents could think of three or more animals. Those species named are shown in figure 5.6.

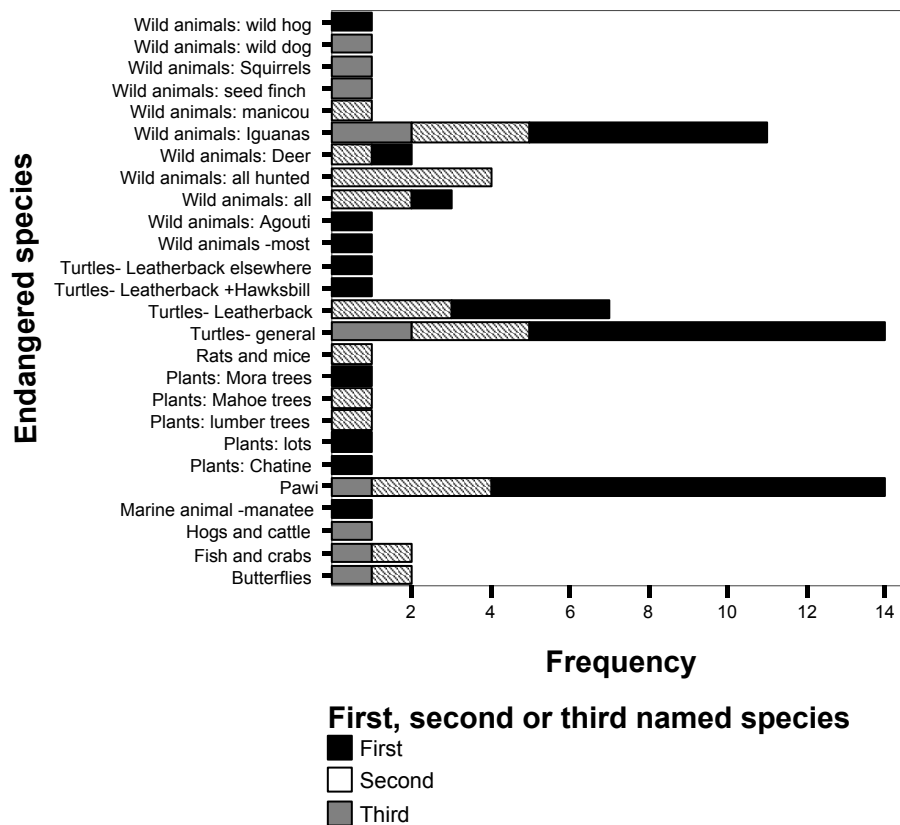


Figure 5.5 The species named in response to question 10 'Can you think of any Trini plants or animals that are endangered (not many left)?'

There is a clear bias towards recalling animal species, especially turtles and Pawi (figure 5.6). The most frequent reason given for considering species endangered was 'see less' but for wild animals 'hunting' was also common. One respondent perceptively suggested the price of wild meat indicated how rare it had become. Some plants were

considered rare because of the decline in agriculture and timber production, illustrating how Trinidadian views on conservation and wildlife can differ from the western norm. Similarly, when asked of the main threats to wild animals, hunting (n=25) was named significantly more than other threats (Kolmogorov-Smirnov, N=52, Z=2.786, p<0.001; table 5.10).

Table 5.10 Responses to question 10 ‘What do you think is the biggest threat to wildlife in this area?’.

Biggest threat	Count of answer
Dogs (eating eggs, killing animals)	2
Life in the wild (harsh life, wild carnivores)	2
Fires	3
Forest clearance	3
Don’t know	3
No significant threats	7
Hunting general/illegal	26
outsiders	5
for a living	1

5.2.2.2 *Awareness of Pawi*

The majority of respondents were able to identify (n=45) and name Pawi (n=42). Many spoke of it with pride in its presence at Grande Riviere. Those that confidently identified it often volunteered additional observations on it: for example many noted that in the past more Pawi were seen (though it is not clear whether this is based on direct observations or hearsay), and others believed they knew Pawi’s nesting habits and areas (e.g. ‘on the ground, between vines). Several respondents thought there were two types of Pawi, the second with a red head and called ‘king Pawi’. This may be a confusion with the turkey vulture *Cathartes aura*, which is similarly sized, black with a red head.

RRA group discussion of the Pawi revealed that although participants knew of the Pawi and interest in it, they did not know why the Pawi was ‘so special’ when they considered many birds to be also be rare. This indicates that education programs have not yet managed to convey the Pawi’s endemic status. Discussion with children indicated that they too were familiar with both Pawi and Leatherback turtles, and those filling in activity sheets were able to draw pictures of both. (Although pictures made of leatherbacks are a little more distinctive than the generic birds produced for Pawi, this may reflect Pawi’s more subtle distinguishing features.)

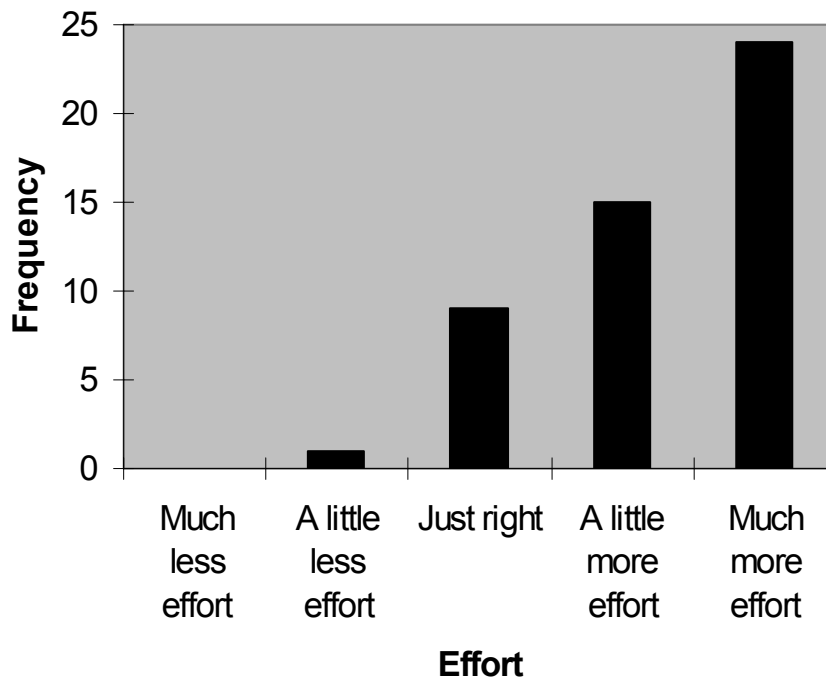


Figure 5.6 The distribution of answers (n=49) to question 9 'Is Trinidad putting the right amount of effort into conserving its plants and animals?'

5.2.2.3 *Attitudes towards natural resources and conservation*

All households valued their natural resources, and most also valued the component that is wild. The ratings of benefits from natural resources ('natural-rating') varied between 30 and 100, and of wild natural resources (wild-rating) between 0 and 66 (median wild rating approximately one third of the natural rating). The natural-rating was positively correlated with knowledge score (Spearman rank, N=48, $R_s=0.288$, $p=0.047$).

Most households also valued conservation: the majority of respondents thought more or much more effort should be put into conservation (figure 5.7). This question often elicited quite vehemently supportive views. However, views on what conservation should focus on were less clear: there were a large range of responses, of varying sense (figure 5.8), and 'don't know' was the largest single category (n=19).

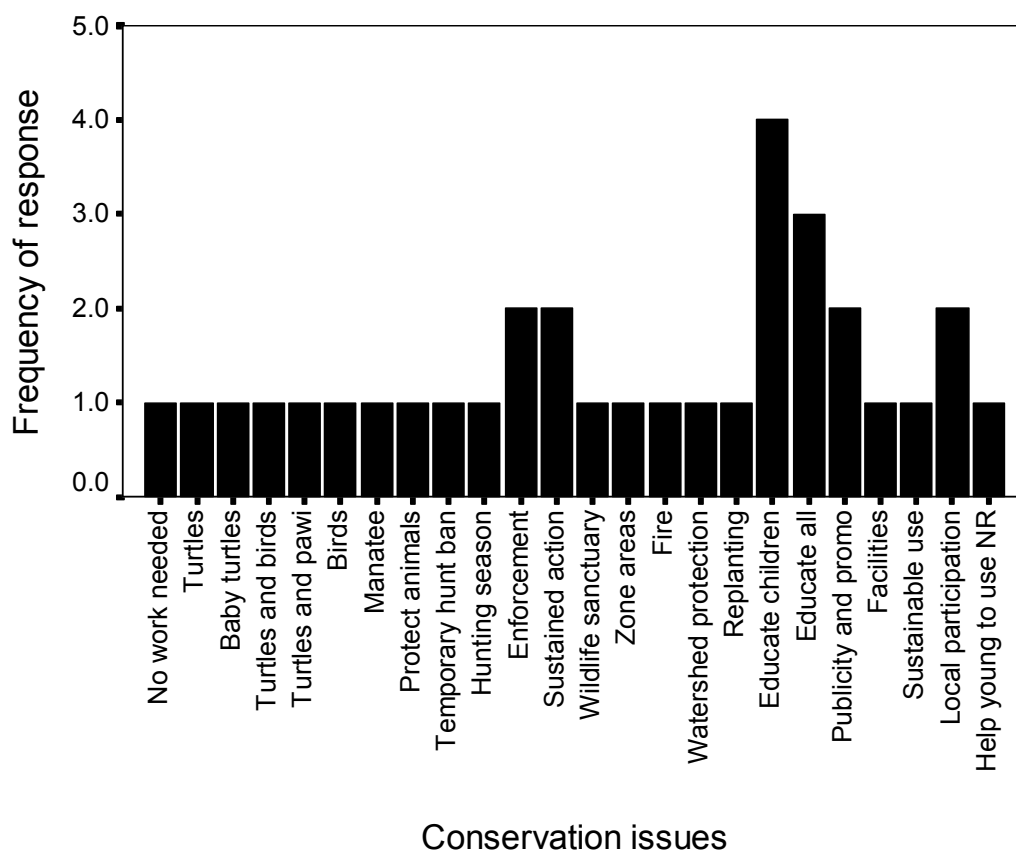


Figure 5.7 The range of issues cited in response to question 13 ‘Are there any species or issues you think need more attention [for conservation]?’ . ‘Don’t know’ responses not shown (n=19).

5.2.2.4 *Links with socioeconomic factors*

Univariate tests indicated knowledge scores were slightly higher in male respondents, and those who were younger, with a higher level of education and wealthier, and conservation effort was rated more highly in respondents that were male and wealthier. They also suggested that some uses of natural resources are linked with perceptions: households that hunted or used bush medicine had respondents that more highly rated benefits from wild natural resources, and hunting households were also associated with higher knowledge scores (table 5.11). Awareness of conservation projects, or rating of natural and wild benefits were not linked with any socioeconomic factors (appendix 10)

Multivariate tests indicated education was the most important influence on knowledge score, together with hunting and wealth, the interaction between wealth and education, and wealth and hunting was also significant, suggesting a reinforcing effect (table 5.12a). In contrast, only gender affects conservation effort (table 5.12b). R^2 values indicate that these factors explain much of the variance in these scores.

Table 5.11 The effect of various household activities using natural resources on respondents' ratings of the importance of natural resources for their household (question 6). Mann-Whitney U test used to assess differences. Numbers in brackets indicate group sizes.

Household activity	Knowledge score	Rating of wild resources
Hunting (18, 34)	Z=3.323 *	Z=2.102 *
Bush medicine (43, 9)	NS	Z=2.578 *
Consume wild foods (48, 4)	NS	NS
Use timber (2,50)	NS	NS
Wild craft for house (11,41)	NS	NS

Table 5.12 Multivariate analysis using GLM, selected outputs shown. Factors selected from results of univariate tests, which also indicate the direction of test (appendix 10). F-values shown to three significant figures. a) The effect of gender, wealth, education and hunting on knowledge score, N=52, b) The effect of wealth and gender and their interaction on Trinidad's conservation effort rating, N=50.

a) Dependent variable: knowledge score

$R^2=0.926$, Adjusted $R^2=0.805$

	df	Mean Sq.	F	Significance value
Corrected Model	31	9.53	7.64	***
Intercept	31	3100	2490	***
Wealth	12	5.02	4.03	**
Gender	1	0.80	0.64	NS
Education	3	20.6	16.5	***
Hunting	1	13.2	10.6	**
Wealth*Education	8	6.09	4.89	**
Wealth*Hunting	4	4.61	3.70	*

b) Dependent variable: conservation effort

$R^2=0.555$, Adjusted $R^2=0.273$

	df	Mean Sq.	F	Significance value
Corrected model	19	0.995	1.97	*
Intercept	1	696	1380	***
Gender	1	5.077	10.0	**
Wealth	11	0.721	1.43	NS
Wealth*Gender	7	0.595	1.18	NS

5.3 Effects of ecotourism on perceptions

5.3.1 Perceptions of ecotourism

All three groups cited tourism as a significant land use, without prompting or suggestion. The beach was the most important land type for tourism, because of turtle watching and bathing, although the forest and estate land was also an important for treks, waterfalls and bird-watching (table 5.13). Timeline exercises showed that tourism was agreed to have greatly increased in the last decade, but the dating of its emergence differed between groups (and its rise was mirrored by a perceived increase in employment prospects for the village; see Appendix 5). It is now an important part of village life (and an important employer: 10 respondents and 19 households surveyed were employed by hotels).

Table 5.13 The importance of various land types for tourism, as given by each RRA group by dividing beans between land type categories, and triangulated (mean score) for each category.

	Group 1	Group 2	Group 3	Average
Forest	29	17	25	29
Watershed reserve	-	17	-	-
Estate/bush	26	-	0	15
Agricultural land	-	9	-	-
Abandoned estate	-	0	-	-
Gov estate	-	9	-	-
Gardens/Private estate	0	-	-	0
Backyard	0	-	-	-
Floweryard	0	-	-	-
Houses	-	-	-	0
Rivers	-	-	-	0
Sea	45	48	75	56
Beach	-	-	-	-
Total	100	100	100	100

The majority of respondents thought ecotourism helped conservation, but regardless of this view, there was an overwhelming level of support for it (table 5.14)

Table 5.14 Respondents views on whether ecotourism helps to conserve animals ('does it work?'), and whether they support ecotourism in the village ('support it?').

	Does it work?	Support it?
No	9	0
Partially	8	1
Yes	31	51
Don't know	4	0

5.3.2 Comparison of Pawi and turtles

5.3.2.1 Knowledge of Pawi and Turtles

Knowledge of Pawi is associated with knowledge of other natural resources: those who correctly named Pawi had better than average knowledge of the other tested picture cards (score computed excluding points for Pawi, Mann-Whitney U (42, 20), $Z=3.381$, $p=0.001$). However, the same relationship was not significant for turtles (score computed excluding points for turtles, Mann-Whitney U (41, 11), $Z=1.671$, $p=0.095$). Knowledge of Pawi and turtles is significantly associated: all of those who recognised Pawi had also recognised turtle (Chi^2 , $\text{df}=1$, $\chi^2=6.56$, $p=0.010$). However there is no association between those who could name Pawi and turtles: several respondents did not name the leatherback turtle but did name the Pawi ($n=7$) and vice versa ($n=6$) (Chi^2 , $\text{df}=1$, $\chi^2=2.36$, $p=0.104$; see appendix 3 for names accepted).

Significantly more survey respondents recognise the leatherback turtle than the Pawi ($\chi^2=36.76$, $\text{df}=1$, $p=0.001$). However, a higher proportion of those who did recognise it the animal were able to name the Pawi ($\chi^2=4.781$, $\text{df}=1$, $p=0.021$). In fact, the proportion naming Pawi was higher than of any other species tested, even common ones (table 5.15). This suggests that knowledge of turtles may come from direct observation (as they are on the beach they are more easily observed), whilst formal education is more responsible for the knowledge of Pawi.

Table 5.15 The number of respondents recognising and correctly naming Pawi, leatherback turtle and agouti as selected comparator, pictured in question 1 (appendix 2 and appendix 3). The names accepted are specific not generic (e.g. 'leatherback turtle' not 'turtle') and are given in appendix 3.

	Pawi	Turtle	Agouti
Number recognising	45	51	51
Number correctly naming	42	41	37
Proportion correctly naming	0.93	0.80	0.73

5.3.2.2 Conservation of Pawi and Turtles

When asked to name endangered species (question 10) the leatherback turtle was named ($n=23$) significantly more often than Pawi ($n=14$) ($\chi^2=6.315$, $\text{df}=1$, $p=0.012$). Similarly, when asked what species or issues required more attention, conserving the Pawi was not

mentioned once, although one respondent suggested Pawi and turtles, and four thought turtle conservation was the main priority.

The reasons for thinking turtles endangered were wide ranging, but hunting was not mentioned: the most popular reason was observing dogs and/or corbeau² consuming the eggs (n=7), and a few said they had learnt about it through working as a tourguide (n=3). Knowledge of its protected status, and certain behaviours (following lights into drains and digging up other turtles' eggs) was also cited.

There was generally a high awareness of the presence of activities for local Pawi and turtle conservation. However, respondents were better informed about turtles: there were significantly more correct answers concerning hunting bans, education and ecotourism for turtles than Pawi (table 5.16). Although many people were aware of education campaigns for both Pawi and turtles, the efforts for turtles were much more prominent: recollections of Pawi education were typically limited to broadcasts on Radio Toco and a tentative suggestion of activities in schools.

Table 5.16 The distribution of answers concerning awareness of the presence or absence of efforts to locally conserve Pawi and turtles (question 12). DK=don't know. Hunting ban applies year round to Pawi, year-round to leatherback turtles and seasonally to other turtles. Difference between Pawi and turtles scores tested using Chi². °Responses 'Pawi' and 'all birds' treated as one category for comparison with turtle score.

	Pawi		Turtles		Difference?
Protected areas?	Correct (none)	47	Correct (yes)	44	NS
	Incorrect (yes)	5	Incorrect (none)	8	
Hunting bans?	Correct (yes)	46	Correct (some)	37	$\chi^2=13.497$ ***
	Partially correct	2	Partially correct	13	
	Incorrect (no)	4	Incorrect (no)	2	
Education activities?	Yes	30	Yes	44	$\chi^2=15.867$ ***
	No	21	No	7	
	DK	1	DK	1	
Ecotourism activities?	Yes [°] (Pawi)	28	Yes	51	$\chi^2=17.816$ ***
	(all birds)	16			
	No	5	No	1	
	DK	3	DK	0	

² 'Corbeau' is the local name for the Black Vulture (*Coragyps atratus*).

When the Pawi was quoted as endangered, the reasons given for thinking this were balanced between seeing less, friends saying they see less, and knowledge that the Pawi has been hunted. One respondent mentioned they had learnt this working at a hotel and another because of the Pawi Study Group's interest! When mentioned, both RRA participants and survey respondents agreed the Pawi was rare, and seen less often than in the past. Hunting (both past and present) was considered the reason for its rarity. Although there was widespread concern for the Pawi, a couple of respondents considered the Pawi able to 'look after itself' by hiding from humans in the 'high' (remote) forest. RRA group 2 pointed out that bans are hard to enforce, and respect for the law is not encouraged by other laws that seem 'silly' (for example agouti can be hunted as pests, but cannot be eaten). They considered that conservation of the Pawi needs both more incentives and better enforcement of the law.

5.3.2.3 *Links with socio-economic factors*

Those naming Pawi or turtles had significantly higher use scores (Mann-Whitney U, (42,10), $Z=3.113$, $p=0.002$; (41, 11) $Z=2.227$, $p=0.026$). However, the perceived benefits from natural resources were not linked to knowledge of Pawi, turtles and their conservation. As knowledge of Pawi (but not turtle) is linked with higher knowledge scores, personal characteristics are associated with Pawi naming vary as for knowledge scores (those naming Pawi are more likely to be more educated, younger and wealthier.

Table 5.17 The link between personal characteristics and correct identification of Pawi and turtles in the first question of the questionnaire. Age, time in village, education and wealth score tested with Mann-Whitney U, sex and occupation tested with χ^2 . Group sizes for Pawi observations (42, 10), and for turtles (42, 11).

	Pawi	Turtles
Gender	NS	NS
Age	$Z=-2.892$, **	NS
Time in village	NS	NS
Education	$Z=2.862$, **	NS
Occupation	NS	NS
Wealth score	$Z=2.582$, **	NS

5.3.3 Association with ecotourism

5.3.3.1 Effect of ecotourism on perceptions

The data collected provided two indicators of direct benefits received from association with ecotourism: work as a tourguide, and work in a hotel. A minority of respondents were tourguides (n=9) or were in the household of tourguide ('tourguide-household') (n=12) whilst slightly more respondents worked in hotels (n=10), or were from a household with person(s) who worked in a hotel 'hotel-household' (n=19, of which 4 also have a tourguide). Because other members of a household influenced responses directly or indirectly, and to allow a larger sample size, household associations were tested. Tourguide-households had significantly higher knowledge than non-tourguide households (Mann-Whitney U, (12,40), $Z=2.133$, $p=0.033$). However, no other variables tested (as for hotel-households, below) were significantly associated with tourguiding. This may be partly due to the small sample size of tourguides.

Hotel-households (as well as hotel workers) (n=19) had significantly higher knowledge scores than other respondents (Mann-Whitney U, (19, 33), $Z=2.010$, $p=0.044$; figure 5.9): this includes higher recognition of Pawi (Chi^2 , $\text{df}=1$, $\chi^2=4.640$, $p=0.031$) but not turtle (Chi^2 , $\text{df}=1$, $\chi^2=0.587$, $p=0.444$).

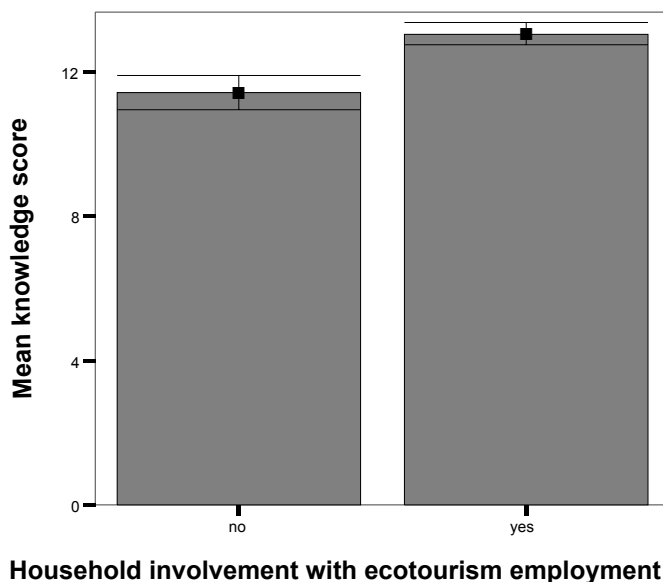


Figure 5.8 The knowledge scores of respondents from households with employment in hotels compared to other households. Error bars represent standard error of the mean.

However, these respondents were more likely than other respondents to think of turtles as threatened species (χ^2 , $df=1$, $\chi^2=13.921$, $p<0.001$), but not Pawi (χ^2 , $df=1$, $\chi^2=1.222$, $p=0.269$). When considering local conservation of the Pawi and turtles, hotel-households did not have significantly better awareness of local conservation measures (education, protected areas, hunting bans or ecotourism). However, it is notable that they all thought ecotourism for birds and/or the Pawi occurred, and all knew there are no protected areas for Pawi (unlike some other respondents). The low frequency of incorrect answers makes the use of χ^2 less suitable for the detection of these differences.

Involvement with hotel employment did not affect perceived benefits from natural resources, nor ratings of the amount of effort that should be put into conservation (Mann-Whitney U, (18, 30), $Z=-0.655$, $p=0.506$; (18, 32), $Z=-0.198$, $p=0.843$).

5.3.3.2 *Links with socioeconomic factors*

Respondents that were hotel workers, or from the household of hotel workers, were likely to be younger and have reached a higher level of education, although when retiree respondents were excluded from analysis, only level of education was linked to hotel association (table 5.18).

Table 5.18 The link between various socioeconomic factors and the presence of hotel employee as the respondent or in the respondent's household. Mann-Whitney U and χ^2 used as appropriate to test differences between groups with and without hotel association. NS=no significant difference between groups. Retirees ($n=9$) excluded to avoid bias to occupation and age associations. Group sizes for the four dependent variables from left to right: (10, 42), (10, 28), (19, 33), (17, 21).

	Hotel -individual		Hotel-household	
	All	Excl retirees	All	Excl retirees
Gender	NS	NS	NS	NS
Age	$Z=-2.032$, *	NS	$Z=-2.794$, **	NS
Time in village	NS	$Z=2.247$, *	NS	NS
Education	$Z=2.248$, *	$Z=-2.654$, *	$Z=-3.409$, **	NS
Occupation	NS	NS	NS	NS
Wealth score	NS	NS	NS	NS

5.4 Limitations

The constraints of time and resources caused pressure to deliver certain data from the RRA phase, when proceeding more slowly and iteratively may have allowed a greater breadth of data collection and allowed the process to be more participative. This would have also allowed some activities to generate data of greater precision: for example, map refinement before occupations were marked on households.

Local perceptions of the researcher and aims may have also influenced the outputs of those involved in both the RRA sessions and questionnaire surveys. For example, the answer to question nine of the survey was probably biased in favour of conservation, as I was obviously interested in this subject. Attitudes to the research were also influenced by pre-exposure to other persons working on Pawi, and previous research in the village (as evidenced by Harrison, 2005; Onwuka, 2004). Equally, researcher bias may also have prompted biased responses, especially if considerable explanation was required. The relative inexperience of the research team may have compounded these problems.

A few older people may have scored lower on the picture based knowledge test because of poor eyesight (although the research team rarely observed this). However, it is impossible to screen applicants on the basis of their visual acuity! Many respondents had trouble with the question requiring them to estimate the importance of wild and natural resources for their house, although results from this question do not conflict with attitudes recorded by other surveys in Trinidad (Barran, 1999; Nelson, 2004). Through chance, all children in the class used for RRA were male, which may have introduced a gender bias to the children's data. Survey respondents were slightly old age biased, which may affect dependent conclusions.

This analysis makes use of many separate statistical tests, which increases the chances that a type I error may be made (false rejection of a null hypothesis). Sources such as Rice (1989) argue that a family of tests should be analysed collectively, taking into account the family error rate (which gives the probability of making a type I error for an entire set of comparisons). The Bonferroni correction can adjust the critical p-value for individual pairwise comparisons based upon this error rate. However, it is not clear as to when one should correct for a family error rate, and as all my comparisons were planned, not post hoc, I continue to use my original critical p-value of 0.05.

6 DISCUSSION AND ANALYSIS

6.1 Local perceptions and uses of natural resources

There are several valued uses of local natural resources at Grande Riviere, as well as a high level of knowledge and appreciation for the local environment. This includes a high awareness of Pawi, and could provide a good basis for local conservation projects.

6.1.1 Uses of natural resources

The local natural environment is highly valued by the people of Grande Riviere, even if many its products and services are not essential for subsistence. For example, common uses of local natural resources include agriculture, bush medicine, and hunting. However, wild natural products rarely provide more than a supplemental benefit to households (for example, bush medicines have cultural value, and are used instead of purchased drugs for minor ailments, but are not essential for household survival). This is consistent with findings for the wider Matura area (Barran, 1999) and other rural areas in Trinidad (CREP, 2002).

There is a gender difference in resource use and perceptions of use importance. This may account for gender differences in the knowledge and attitudes to natural resources (section 6.2.1.2). For example, women tend to know more about bush medicine and back yard gardening, whilst men know more about the crop cultivation or hunting: working with just ones of these groups would not reveal the full range of local knowledge and uses.

6.1.2 Hunting and wild meat

Hunting and the consumption of wild meat are widely enjoyed activities, continuing the past popularity of hunting across Trinidad (Asibey, 1984; Bacon & ffrench, 1972; Lambie, 1987). Although hunting is emphatically a male occupation, both men and women enjoy the consumption of wild meat (even though its rarity and/or expense mean it is rarely eaten). This is driven by cultural preference rather than subsistence needs, for hunting is viewed as a recreation or sport, and wild meat is valued as a delicacy. This may explain why hunters come from wealthier households: it is a quite an expensive past-time unless the meat is sold (Barran, 1999).

6.1.3 Perceptions and behaviour

It may seem paradoxical that although wild meat consumption is widespread, the belief that hunting threatens many wild animals is also widespread, especially when wealth is associated with higher levels of knowledge and support for conservation, but also higher likelihood of being a hunter (section 6.2). This indicates that attitudes may not affect behaviours as expected. This may be due partly to dissatisfaction with the specific activities and institutions responsible for conservation management: other studies have found that discontent with the specifics of a conservation project can cause action against that project even if there is agreement with its aims (Alexander, 2000). It may also be due to some unaccounted yet influential factors, for example, in a Tanzanian park the attitudes of locals predict sustainable wood use practices, but several socioeconomic and cultural factors are also important (Holmes, 2003).

More simply, it may mean that professed attitudes do not predict behaviour. This has been found by other studies: for example, Berenguer (2005) found high levels of environmental concern but low levels of pro-environmental behaviour in Spain. The explanation to this apparent irrationality may lie in the theory of common pool resources (CPRs), which predicts that when many people have opportunity to use an open-access resource, collective and individual rationalities diverge, leading to its overuse; the ‘tragedy of the commons’ (Hardin, 1968; Ostrom, 1990). In this situation, an individual may recognise the collective problem that over-hunting can cause, but if he does not know what other hunters are doing, he feels he ‘may as well’ gain as much personal benefit by taking as much as possible whilst he can. This is supported by studies that have found personal attributes such as altruism and conscientiousness to be important predictors of environmentally friendly behaviour (Corbett, 2005; Do Valle, 2005). However, as other studies suggest attitudes can affect environmental behaviour (e.g. Costarelli & Colloca, 2004; Holmes, 2003), although the relationship is complex (e.g. Deyoung, 1993; Martinez & Scicchitano, 1998), conservationists should not be dissuaded from seeking to change attitudes as a means of promoting conservation.

6.1.4 Knowledge and attitudes towards natural resources

This study reveals community members to have a range of knowledge about local species, as is found on a larger scale across Trinidad (Nelson, 2004). Therefore, any conservation measures designed to inform or involve local people must take this into

account. There are several factors contributing to this range in knowledge: hunting, wealth, education and youth (which covary) are also all linked with higher knowledge (section 6.2).

There is also a high level of knowledge of the presence of local conservation activities, especially ecotourism and hunting bans, which are better known as they affect the high profile activities of tourism and wild meat consumption. However, the details of these activities may be very less well known: for example, during conversation, many respondents (especially women) appealed to other household members to work out the dates of the hunting ban. This suggests that the Forestry Division (the relevant authority) has not been effective in publicising regulations for wildlife protection. For those who do know more details about wildlife related policies, they can seem ‘silly’ (i.e. it being legal to kill a pest species but not to eat it). This highlights the need for integration of conservation policy from site-level work to policy making (Wells & McShane, 2004): laws are meaningless if they are not known or respected, or appear to contradict local knowledge.

Regardless of the depth of knowledge of conservation, there is a high level of support for it (although this may have been slightly overstated in response to researcher interests). This is probably linked to the high value, even pride, placed on the local natural environment. Even in third world countries intrinsic values, as well as use values, can inspire positive attitudes towards conservation (Bauer, 2003).

Hunting is widely considered to be a problem (as found by Barran, 1999), probably because the increasing rarity of hunted animals and/or the rising price of wild meats is very noticeable. The precise reasons for the problem are not universally agreed: (some blame non-local hunters, whilst others blame career-hunters) but there is a common recognition for the need to control of hunting (though any suggestion of a permanent ban). The recognition of hunting as a problem, and the support for conservation is encouraging because it is an important predictor of success in any conservation project success (Salafsky et al., 2001) and it predisposes individuals to receive further conservation messages (Caro et al., 2003; Rauwald & Moore, 2002).

6.1.5 Perceptions of Pawi

There was a high level of recognition of Pawi, versus that of other species, on a level at least commensurate with that recorded in the northeast after the last major Pawi education campaign (Butler, 1998). (Levels of Pawi awareness may be quite different elsewhere in the region, where researchers and Pawi are less common; section 3.1.2.5).

Pawi is not a preferred wild meat: most survey respondents had never eaten it (some clearly disliked the thought), and for most of those that had, it was not recently, and left only memories of an unremarkable taste. (However, it must be suspected that if part of wild meat's desirability is due to its 'difference', the Pawi might have novelty value for some.) Measures attempting to temper a cultural preference for Pawi consumption are therefore irrelevant (and morally dubious), although they may be useful for the general conservation of other hunted animals. However, several locals thought that 'career-hunters' who spend most of their time hunting for a living in the forest, who would eat it during hunting trips. Some examples of wild meat consumption show that low levels of off-take can be sustainable (Cowlshaw et al., 2005a). However this is unlikely to be the case with the Pawi: its rarity and vulnerability mean even a small amount of off-take will affect its prospects (Brooks, 1999). Therefore, efforts are needed to influence the behaviour of hunters spending a long time in the forest, to avoid Pawi 'bycatch'.

6.2 Factors affecting perceptions

The perceptions described above are influenced by the ecotourism initiative at Grande Riviere, which has important implications for ecotourism's utility. However, other factors can also influence perceptions, as described below (tour-guiding and ecotourism are described separately from the use of other natural resources).

6.2.1 Socioeconomic characteristics

6.2.1.1 Use of natural resources

Household use of bush medicine or hunting were the only uses of natural resources linked with a greater rating of the benefits of wild resources, though small sample size may have obscured other use effects being detected. The increase in appreciation is consistent with the high values placed on wild meat and hunting, as found by this study and suggested by other sources (Barran, 1999; De-Light & Thomas, 2005). It is not

surprising that hunting is similarly linked with increased knowledge, as it may allow households to learn about natural resources and the scarcity of wild animals firsthand: most hunters interviewed by Barran (1999) considered there were less wild animals than even five years ago. That the interaction of education and hunting has a significant effect on knowledge suggests that observations from hunting may be reinforced by education campaigns (or vice versa).

These findings support the idea that use of natural resources is linked to a better understanding and appreciation of those resources (e.g. Gillingham & Lee, 1999). It reinforces the point that attempts to prohibit local use (a complete or ban hunting) would not only be very difficult, but could be counterproductive, as local people could not only grow resentful against that measure (as in Western, 1994) but could also lose awareness and appreciation for their local surroundings.

6.2.1.2 Gender & Wealth

Lower wealth scores were linked with increased age probably because of pensioners' relative poverty (the state pension is currently TT\$1,150 per month) but also because some professed no need for items such as cars. A link between wealth and increased conservation knowledge (and support) is often found by conservation attitude studies (e.g. Gillingham & Lee, 1999; Infield, 1988; Newmark et al., 1993). In this case it may be because wealthier Trinidadians have higher non-use values of nature (Barran, 1999; Nelson, 2004).

Men have both higher knowledge scores, and higher valuation of the benefits from natural resources, although multivariate analysis suggests this is unimportant compared to other factors. The possibility of a gender effect cannot be ignored, as it is quite common in natural resource studies (e.g. Mehta & Heinen, 2001), and would be consistent with Nelson (2004), who found gender differences in attitudes to conservation across Trinidad. Gender differences are often related to a gender differential in the uses made of natural resources, and this probably explains any such effect in Grande Riviere (section 6.1.1). This emphasises the importance of appreciating local variation in uses and perception when researching and designing CBC (as described by de Zeeuw & Wilbers, 2004), so CBC may best value and adapt to different social groups (Folke, 2004; Mehta & Heinen, 2001).

6.2.1.3 Education

Age and education were strongly associated, so often had similar relationships with perceptions. Education is assumed to be the key factor as Nelson (2004) found more educated Trinidadians placed higher non-use values on wildlife, and one or two generations ago attendance at secondary school was not the norm (De-Light & Thomas, 2005). Level of education is often linked to degree of support for environmental concepts (as recently demonstrated in another developing country by Bodur & Sarigollu (2005)). This social group may be more receptive to the concepts of conservation campaigns as more educated persons in Trinidad place higher non-use values on wildlife (Nelson, 2004).

Public education campaigns also seem to have had an effect. There is a high level of awareness of both turtles and Pawi, so even though education campaigns for Pawi are not well remembered, at least some must have contributed to Pawi knowledge. This is because Pawi is more rarely seen than turtles but equally recognised; proportionally more of those recognising Pawi were able to name it; and knowledge of Pawi is associated with higher knowledge of other tested species, unlike turtles. The association of Pawi knowledge with a high knowledge of other tested species is consistent with the idea that an educational effect is strongest in those who already have some natural resource or conservation awareness (Sapsford, 1998).

Although education may not always effect conservation attitudes in developing countries (as found by Struhsaker et al., 2005), this effect in agreement with developed country studies on education and conservation perspectives (e.g. Caro et al., 2003; Tisdell & Wilson, 2004) and even behaviours (e.g. Burger et al., 2004). Indeed, psychology studies predict that populations with intermediate levels of education (as Trinidadians may be loosely classified) are most receptive to change (e.g. Martinez & Scicchitano, 1998; Zaller, 1993). This suggests that other public conservation education campaigns would be worthwhile, not only in Trinidad, but in other developing or semi-developed countries.

6.2.2 The effect of ecotourism

Ecotourism affects perceptions of those associated with it, and to some extent in the wider community. This is encouraging, as an operation that relies upon economic incentives alone is likely to fail (Kiss, 2004).

6.2.2.1 Effect on the general community

As all respondents fairly frequently cite turtles as a cause for concern, it seems that ecotourism has some effect on perceptions across the community, not just on those involved with ecotourism. This may occur simply because attitudes (such as concern for turtles) are easily adopted across small social networks (Friedkin, 2001). However, individuals may recognise that in a relatively small community such as Grande Riviere, the employment of so many (over a third of households surveyed) is directly or indirectly good for all. Individuals may also hope to directly benefit in the future (a similar effect was found by Alexander (2000), who noted hope of future benefits to contribute to local positive perceptions of a conservation project in Belize).

Other studies have also shown that tourism can influence perceptions across a community: for example, in a study of a tourism destination in Korea, local individuals' perceptions of tourism depended more on their perception of community impacts than individual benefits (Ko & Stewart, 2002). This effect is not focused on by many studies of ecotourism or CBC projects, perhaps because expectations and research are concerned with the relationship between individual perceptions and benefits from these projects. However, it does seem occur in other CBC projects: for example, a survey of local attitudes to a CBC project in Nepal revealed an 'overwhelming majority' had a positive attitude to their local conservation areas (Mehta & Heinen, 2001). This is an important effect because ecotourism is more useful if it has potential to influence perceptions across all members of a community, rather than just the minority who can directly participate in a project.

6.2.2.2 Effect of direct benefits

The receipt of benefits from ecotourism has a positive effect on perceptions. The households of hotel workers have more knowledge of natural resources and concern for conservation, and those of tourguides also have greater knowledge (detection of an effect on appreciation is probably obscured by small sample size).

It is to be expected that tourguides have greater knowledge, because of their job requires it and they may have opportunities to learn through training (Onwuka, 2004). Hotel workers are probably informed and influenced through contact with visitors and observing their activities: hotels are small and friendly enough that staff and customers interact. The results of other studies provide conflicting evidence as to ecotourism's effects on perceptions: Stem et al (2003) found that the effects of direct education more influential, but a comparison of Amazon communities by Wunder (2000) found an increase in 'environmental awareness' proportional to the degree of involvement in ecotourism. This study therefore provides important evidence suggesting that this assumption of ecotourism's effects (e.g. Sekercioglu, 2002) may be achievable, at least in certain situations.

The direct benefits from ecotourism also affect conservation attitudes (as association with hotel work also causes higher levels of concern for turtles). Although there is some evidence that ecotourism is supported regardless of its conservation effects, tourism is also strongly associated with turtles. This benefit-dependent concern is a similar effect to that found by Sekhar (2003), who found that local attitudes towards a protected area in India were linked with benefits received from tourism to that area.

This suggests that ecotourism can cause appreciation and thus concern for conservation efforts, not just the resultant tourism (an appreciation of the 'goose that lays the golden eggs'). In contrast, a study of Komodo National Park in Indonesia by Walpole & Goodwin (2001) found that the economic benefits of tourism affected only attitudes towards tourism, not conservation. Perhaps recognition 'of the goose that lays the golden eggs' occurs only in certain conditions, such as with the provision of education or with high community involvement in the development of ecotourism. The close link between natural resource preservation and enterprise may also be important (as suggested for all CBC projects by Salafsky & Wollenberg, 2000): tourism is clearly perceived to be linked to the turtles at Grande Riviere. Education about turtles may have also played a role in allowing appreciation of conservation as well as tourism. However, if ecotourism can affect perceptions (given certain conditions), it validates some of its claims, and justifies efforts to promote it as a means of influencing local knowledge and attitudes.

As effects on conservation attitudes seem limited to the focal species involved with conservation, so the species involved in ecotourism must closely reflect conservation concerns. In this respect ecotourism or CBC projects that are not focused on certain species, such as the protected area project described by Sekhar (2003), may be more effective in promoting a general conservation ethos. As there are many areas which are 'hotspots' of biodiversity but also threatened (Myers et al., 2000), the usefulness of ecotourism projects that focus on a single species may be limited.

6.3 Recommendations

6.3.1 Using ecotourism to change perceptions

As local positive perceptions are widely agreed to be a key component of any conservation project (e.g. Kiss, 2004), ecotourism is potentially a useful tool for conservation, as it can both influence local attitudes and provide incentives for conservation. It may be a particularly useful tool for tackling conservation problems where other approaches are likely to fail, such as wild meat hunting, and where local development is also desirable.

However, an ecotourism operation is only suitable in certain circumstances, and its success can not be assumed (Krüger, 2005; Wunder, 2000). Therefore development of ecotourism should be preceded by careful assessment of the situation to determine if the situation is suitable, and if so the planning and actions required (Salafsky et al., 2001), taking into account both the biological and social context (Duffus & Dearden, 1990). For example, slow and controlled development is more likely to be successful (Harrison, 2001) and adaptive management, which incorporates monitoring and evaluation will also help to avoid failure (Barrett et al., 2005; Berkes, 2004; Stem et al., 2003).

Local benefits (and thus positive perceptions) are more likely to occur with greater community control of the project (Leader-Williams, 2002). However, for this to be feasible, a community requires a high degree of social organisation, cohesiveness and cooperation ('social capital'), and this is easily depleted by unsuitable management (Jones, 2005). This emphasises the importance of careful planning, appropriate co-management, and building local capacity through participation (Carlsson & Berkes,

2005): the process of Environmental Impact Assessment may be a useful a framework for planning (Hunter & Green, 1995).

Although this study shows ecotourism can influence perceptions of natural resources, other ecotourism or CBC projects have not supported this effect (e.g Stem et al., 2003). This suggests that the effect on perceptions may be context specific. For example, attitudes to conservation may be less positive if a project has socially undesirable effects (e.g. Ko & Stewart, 2002) or the link between incentives and natural resources is less obvious (Salafsky & Wollenberg, 2000). As this effect may be contributor to the success of the conservation project, further research to determine when attitudes will be affected, will allow the best use of ecotourism to promote conservation.

6.3.2 Promote participation

Participation is already a mainstream issue for conservation (e.g. Wells & Brandon, 1992), but this study emphasises its importance, as individual benefits from ecotourism affect perceptions. Therefore, the more widespread participation in ecotourism, the more widespread pro-conservation attitudes will be. To ensure all sectors of a community participate, project components must be suitably designed and targeted: for example, in Nepal, recommendations for the management of medicinal plants were different for different social groups, whom had very different uses and perceptions (Ghimire et al., 2004).

Participation is also important for planning successful conservation: the failure to use and value local knowledge has contributed to past failures of CBC projects (Berkes, 2004). For example in the Caribbean, consultation is still more common than interaction with local communities (Geoghegan et al., 1999), despite the necessary approaches of planning for participatory management being well documented (Krishnarayan et al., 2002). Participation could be promoted through a closer relationship between bodies responsible for conservation (such as government departments), and those that promote participation (such as NGOs). Participation in the 'scientific' aspects of a conservation project, such as the data collection, can also enhance the quality of monitoring possible and ensure local knowledge is used (Sheil & Lawrence, 2004).

6.3.3 Use education to influence perceptions

This study indicates that education can also play an important role in attempts to inform and influence attitudes to natural resources, and it has been recommended as a useful adjunct to ecotourism and other CBC projects (Heinen & Low, 1992; Salafsky et al., 2001). Care must be taken to select appropriate targets and use appropriate methods (considering, for example, in this situation the poorer groups might be appropriate targets, for whom a television campaign would be unsuitable). Changing environmental attitudes is not a straightforward process (Martinez & Scicchitano, 1998). However, studying the practice of other public outreach programmes (such as health campaigns, e.g. Graeff et al., 1993) may be useful, and the application of social science may help to ensure that any such efforts are as efficient and effective as possible.

6.3.4 Address preferences for wild meat

The widely agreed problems caused by hunting (including the decline of the Pawi) serve as a reminder that addressing the problems of wild meat as a subsistence food (Milner-Gulland & Bennett, 2003) should not exclude concern for wild meat that is a preference food. When bushmeat consumption is a preference rather than a necessity, the implications for conservation can be quite different (Wilkie et al., 2005). For example, any reduction in hunting or wild meat consumption will generally not effect livelihoods or impact food security, as is otherwise the case (Fa et al., 2003). Attempts to stop hunting or wild meat consumption are always very difficult (Cowlshaw et al., 2005b), and if they are regarded as a cultural entitlement it can cause resentment, as so be counterproductive (Bell, 1984 in Milner-Gulland & Mace, 1998). Economic development (as aimed for by CBC projects) may result in more disposable income to spend on luxury or preferred goods, such as wild meat, and an increased demand (Milner-Gulland & Mace, 1998). The resulting increase in hunting can even drive species to extinction (e.g. Mickleburgh et al., 1992).

The socioeconomic characteristics of those eating wild meat can inform the design of conservation projects for hunted animals. For example, in this situation, older people are more likely to eat meat, which implies the cultural preference may be weakening in younger generations, perhaps because of the increasing influence of the USA on popular culture (De-Light & Thomas, 2005). However, of those that do eat meat, younger respondents and/or wealthier households are able to eat it more frequently, because they

are more easily able to obtain it. This suggests attempts to modify hunting should be especially directed at this group: fortunately, as younger and wealthier people also have better knowledge of natural resources and concern for their conservation, they are likely to be more amenable to influence by further conservation ideas (Sapsford, 1998).

6.3.5 Research on perceptions and behaviour

This study does not assess the relationship between perceptions and behaviours, but as it indicates that attitudes and concerns may not accord with actions (section 6.1.3) it does highlight that it is an important concern for future conservation research. Changing conservation-related behaviour is known to be difficult (Deyoung, 1993), especially on a large scale (Heinen & Low, 1992). However, as it is the ultimate objective of conservation projects, it is a vital topic of research. Conservationists may need to better embrace the practitioners and concepts of psychology to properly research this topic, and to fully understand the relationship.

6.3.6 Implications for Pawi conservation

People in Grande Riviere were more likely to display pride in the Pawi than express and interest in eating it. The main threat to Pawi now seems to be as ‘bycatch’ from opportunistic hunting during expeditions seeking other animals (section 6.1.5). Therefore, measures that address the general problems caused by hunting will be useful for Pawi conservation. However, an outright ban on hunting would be both difficult to enforce and culturally unacceptable, possibly hindering other efforts for conservation (section 6.3.4). Promoting pro-conservation behaviour through changing perceptions is probably more suitable.

Education is an obvious way of informing and influencing attitudes, and should be continued, taking care to target all social groups. This study shows ecotourism is also a suitable way to promote ‘pro-Pawi’ attitudes, not only in those receiving direct benefits from it, but throughout the community (section 6.2.2). Birds are generally reckoned to be good targets for ecotourism because birdwatchers are relatively affluent and committed (Sekercioglu, 2002), and the Pawi may be a particularly suitable target because it is relatively tolerant of disturbances (Alexander, 2002).

However, as noted above, the success of ecotourism is dependent upon many conditions. Although the existence of turtle ecotourism at Grande Riviere suggests

conditions may be suitable for Pawi ecotourism, any plans for the development of tourism should be carefully assessed (using, for example, the criteria of Salafsky (2001). For example, care must be taken to involve participation across the community, to avoid and mitigate negative impacts from tourism growth, and to build local capacity (perhaps through local involvement in population monitoring as recommended by Moller et al., 2004). Collaboration with NGOs such as the Caribbean Natural Resources Institute (CANARI), involvement with the Matura ESA may provide an opportunity to ensure benefits from tourism are accrued locally. An assessment of the potential for ecotourism at Grande Riviere is beyond the scope of this study, but this study and an analysis of the existing ecotourism operation by Onwuka (2004) could provide a suitable basis from which to consider the potential for Pawi.

Research is also needed to determine use and perceptions of natural resources in other villages in the Pawi's range. As noted in the introduction, Grande Riviere may represent a 'high point' of environmental awareness in this area. The use and perceptions of natural resources, and tourism infrastructure may be quite different outside of this village. Accordingly, in these areas influencing perceptions through education may be more suitable than ecotourism.

7 CONCLUSIONS

This study presents findings that contribute to knowledge of perceptions of natural resources, and the factors that influence them. This informs the debate on the effects of ecotourism on perceptions and also has practical implications for the conservation of Trinidad's natural resources, including the Pawi.

- Natural resources are used and appreciated by most households, and the concept of conservation is widely supported throughout Grande Riviere. Hunting and the consumption of wild meat is a particularly common use of the resources. However, hunting is viewed primarily as a recreational activity, and the consumption of wild meat is relatively infrequent and driven by cultural preference rather than subsistence needs. This highlights the need to address the problems caused by the non-subsistence consumption of wild meat.
- This study provides important evidence that ecotourism can affect knowledge and concern for natural resources. It influences conservation concern across the community, although effects are greater in those benefiting from it. Although ecotourism may not be a suitable solution for every conservation problem it is encouraging that it affects perceptions, as influencing perceptions can be an important way of promoting conservation behaviour. However, as ecotourism may affect concern for only its focal species, it may be less suitable for the conservation of multi-taxa systems.
- Education is also important: level of education received affects perceptions, and education campaigns are probably responsible for knowledge and concern for the Pawi. Household wealth also affects perceptions. This supports the importance of using multiple strategies to support conservation, and ensuring that those strategies are appropriately targeted to conditions and social groups.
- There is some indication that attitudes may not directly predict behaviour: although hunting is commonly considered the main problem for wild animals (including the Pawi), hunting and the consumption of wild meat are popular and widespread activities. Further research is needed to investigate the link between attitudes and behaviours. As changing behaviours is an ultimate requirement for the conservation of any species threatened by human activities (such as the Pawi), this relationship must be better understood.

- In Grande Riviere, the use of ecotourism may be a suitable tool to promote Pawi conservation, as there is already turtle ecotourism, birdwatchers are generally considered good targets for tourism, and the bird is even tolerant of disturbances. However, development of ecotourism must be carefully planned, and ideally combined with approaches that tackle the wider problems caused by hunting. This approach may be less suitable in other areas of the Pawi's range, where further research is required.

REFERENCES

- Adams, W. M., Aveling, R., Brockington, D., Dickson, B., Elliott, J., Hutton, J., Roe, D., Vira, B. and Wolmer, W. (2004). Biodiversity conservation and the eradication of poverty, *Science*, **306**, 1146-1149.
- Alexander, G. D. (2002). Observations of the endangered Trinidad Piping-Guan (*Pipile pipile*), or Pawi, in Northern Trinidad. In *Studies in Trinidad and Tobago Ornithology Honouring Richard Ffrench, Occasional Paper 11*, (Eds, F. E. Hayes and S. A. Temple) Department of Life Sciences, University of West Indies, St. Augustine, pp. 119-130.
- Alexander, S. E. (2000). Resident attitudes towards conservation and black howler monkeys in Belize: the Community Baboon Sanctuary, *Environmental Conservation*, **27**, 341-350.
- Alliance for Zero Extinction (2003). *AZE home page*. www.zeroextinction.org [Accessed 11th May 2005]
- Alvard, M. S. (1993). Testing the Ecologically Noble Savage Hypothesis - Interspecific Prey Choice by Piro Hunters of Amazonian Peru, *Human Ecology*, **21**, 355-387.
- Anon (2005). *Welcome to the Mt. Plaisir State of Mind*, Mt. Plaisir Estate Hotel, Grande Riviere. www.mtplaisir.com [Accessed 5th August 2005]
- Apaza, L., Wilkie, D., Byron, E., Huanca, T., Leonard, W., Perez, E., Reyes-Garcia, V., Vadez, V. and Godoy, R. (2002). Meat prices influence the consumption of wildlife by the Tsimane Amerindians of Bolivia, *Oryx*, **36**, 382-388.
- Armstrong, S. (2001). *Trinidad and Tobago moist forests (NT0171)*, Wildworld WWF Full Report, World Wildlife Fund. http://www.worldwildlife.org/wildworld/profiles/terrestrial/nt/nt0171_full.html [Accessed 3rd May 2005]
- Asibey, E. A. O. (1984). *Economic role of wildlife in Trinidad and Tobago*, Report FAOFO-DP/TRI/79/001, FAO, Rome.
- Ayres, J. M., de Magalhaes Lima, D., de Souza Martins, E. and Barreiros, J. L. K. (1991). On the track of the road: changes in subsistence hunting in a Brazilian Amazonian village. In (Eds, J. G. Robinson and K. H. Redford) *Neotropical Wildlife Use and Conservation*, University of Chicago Press, Chicago, USA, pp. 82-92.
- Azjen, I. and Fishbein, M. (1977). Attitude-behaviour relationships: a theoretical analysis and review of empirical research, *Psychological bulletin*, **84**, 888-914.
- Bacon, P. R. and ffrench, R. P. (Eds.) (1972). *The Wildlife Sanctuaries of Trinidad and Tobago, written by the Wildlife Conservation Committee*, Trinidad & Tobago Ministry of Agriculture, Lands and Fisheries, Port of Spain.
- Balmford, A., Clegg, L., Coulson, T. and Taylor, J. (2002). Why conservationists should heed Pokemon, *Science*, **295**, 2367-2367.
- Barran, A. (1999). *Ecological and socioeconomic issues in the establishment of a National Park in Matura, Trinidad, West Indies*, Thesis submitted for the degree of Master of Philosophy, Department of Zoology, Faculty of Life Sciences, University of the West Indies, St. Augustine.
- Barrett, C. B., Lee, D. R. and McPeak, J. G. (2005). Institutional arrangements for rural poverty reduction and resource conservation, *World Development*, **33**, 193-197.
- Bauer, H. (2003). Local perceptions of Waza National Park, northern Cameroon, *Environmental Conservation*, **30**, 175-181.

- Becker, C. D. and Ghimire, K. (2003). Synergy between traditional ecological knowledge and conservation science supports forest preservation in Ecuador, *Conservation Ecology*, **8**, art. no.-1.
- Berenguer, J., Corraliza, J. A. and Martin, R. (2005). Rural-urban differences in environmental concern, attitudes, and actions, *European Journal of Psychological Assessment*, **21**, 128-138.
- Berkes, F. (2004). Rethinking community-based conservation, *Conservation Biology*, **18**, 621-630.
- Bernard, H. R. (2002). *Research methods in anthropology. Qualitative and quantitative approaches.*, Altamira Press, Oxford.
- Birdlife International (2004). *Pipile pipile*, 2004 IUCN Red List of Threatened Species. <http://www.redlist.org> [Accessed 4th August 2005]
- Birdlife International (2005). *Species factsheet: Pipile pipile*. <http://www.birdlife.net/datazone/species/index.html?action=SpcHTMDetails.asp&sid=87&m=0> [Accessed 3rd August 2005]
- Bodur, M. and Sarigollu, E. (2005). Environmental sensitivity in a developing country, *Environment and Behavior*, **37**, 487-510.
- Brandon, K. (1996). *Ecotourism and conservation : a review of key issues*, Environment Department working papers; no.33. Biodiversity series, World Bank, Washington, D.C. http://www-wds.worldbank.org/servlet/WDS_IBank_Servlet?pcont=details&eid=000178830_98101912361115 [Accessed 7th May 2005]
- Brooks, D. M. (1999). Pipile as a protein source to rural hunters. In (Eds, D. M. Brooks, A. Begazo and F. Olmos) *Biology and Conservation of the Piping Guans (Pipile)*. Publication of the Cracid Specialist Group, Number 1., Cracid Specialist Group, IUCN, pp. 43-50.
- Brooks, D. M., Begazo, A. J. and Olmos, F. (1998). *Biology and Conservation of the Piping Guans (Pipile)*. Publication of the Cracid Specialist Group, Number 1, Cracid Specialist Group, IUCN.
- Brooks, D. M. and Strahl, S. D. (1998). Action Planning for Endangered Piping Guans (Pipile). In (Eds, D. M. Brooks, A. Begazo and F. Olmos) *Biology and Conservation of the Piping Guans (Pipile)*. Publication of the Cracid Specialist Group, Number 1., Cracid Specialist Group, IUCN, pp. 52-59.
- Brooks, D. M. and Strahl, S. D. (Eds.) (2000). *Curassows, Guans and Chachalacas. Status Survey and Conservation Action Plan for Cracids 2000-2004*, IUCN/SSC Cracid Specialist Group, Gland, Switzerland and Cambridge, UK.
- Brossard, D., Lewenstein, B. and Bonney, R. (2005). Scientific knowledge and attitude change: The impact of a citizen science project, *International Journal of Science Education*, **27**, 1099-1121.
- Burger, J., Jeitner, C., Clark, K. and Niles, L. J. (2004). The effect of human activities on migrant shorebirds: successful adaptive management, *Environmental Conservation*, **31**, 283-288.
- Butler, P. (1998). *Promoting Pride in the Pawi. A conservation education campaign for North-East Trinidad*, RARE Centre for Tropical Conservation and Forestry Division, Ministry of Agriculture, Land and Marine Resources, Trinidad and Tobago., Philadelphia.
- CARICOM/FAO/ODA (1993). *National Forestry Action Plan*, CARICOM, Port of Spain, Trinidad.
- Carlsson, L. and Berkes, F. (2005). Co-management: concepts and methodological implications, *Journal of Environmental Management*, **75**, 65-76.

- Caro, T., Mulder, M. B. and Moore, M. (2003). Effects of conservation education on reasons to conserve biological diversity, *Biological Conservation*, **114**, 143-152.
- Cater, E. and Goodall, B. (1997). The need for sustainable tourism. In (Ed, L. France) *The Earthscan Reader in Sustainable Tourism*, Earthscan Publications Limited, London, pp. 85-89.
- Chambers, R. (1992). *Rural appraisal: rapid, relaxed and participatory*, IDS Discussion paper 331.
- Chokor, B. A. (2004). Perception and response to the challenge of poverty and environmental resource degradation in rural Nigeria: Case study from the Niger Delta, *Journal of Environmental Psychology*, **24**, 305-318.
- Cochran, W. G. (1977). *Sampling techniques*, Wiley & Sons Inc., Canada.
- Connolly, V. and Seutin, G. (1999). The how and why of a captive breeding program for the critically endangered Trinidad Piping Guan. In (Eds, D. M. Brooks, A. Begazo and F. Olmos) *Biology and Conservation of the Piping Guans (Pipile)*. *Publication of the Cracid Specialist Group, Number 1.*, Cracid Specialist Group, IUCN, pp. 35-41.
- Cooper, S. G. C. and Bacon, P. R. (Eds.) (1981). *The natural resources of Trinidad and Tobago*, Edward Arnold, London.
- Coppin, A. and Olsen, R. N. (1998). Earnings and Ethnicity in Trinidad and Tobago, *Journal of Development Studies*, **34**, 116-134.
- Corbett, J. B. (2005). Altruism, self-interest, and the reasonable person model of environmentally responsible behavior, *Science Communication*, **26**, 368-389.
- Costarelli, S. and Colloca, P. (2004). The effects of attitudinal ambivalence on pro-environmental behavioural intentions, *Journal of Environmental Psychology*, **24**, 279-288.
- Cowlishaw, G., Mendelson, S. and Rowcliffe, J. M. (2005a). Evidence for post-depletion sustainability in a mature bushmeat market, *Journal of Applied Ecology*, **42**, 460-468.
- Cowlishaw, G., Mendelson, S. and Rowcliffe, J. M. (2005b). Structure and operation of a bushmeat commodity chain in southwestern Ghana, *Conservation Biology*, **19**, 139-149.
- CREP (2002). *Country report for Amenity Area Sites: Trinidad and Tobago*, Prepared by CEAC Solutions Co. Ltd. of Jamaica in association with Ecotech Inc. Ltd., CL Environmental, and Donaldson Edwards Partnership International., Caribbean Regional Environmental Programme.
<http://www.crepnet.net/pdf/Country%20Report%20Trinidad%20and%20Tobago.pdf> [Accessed 4th May 2005]
- Cuthbertson, L., Santry, E., Schofield, L. and Waylen, K. (2005). *Visitor perceptions at Burnham Beeches*, Unpublished consultancy report for the Corporation of London, produced as coursework for MSc Environmental Technology, Ecological Management, London.
- de Zeeuw, H. and Wilbers, J. (2004). *PRA tools for studying urban agriculture and gender*, RUAF, Leusden, The Netherlands.
- del Hoyo and Motis (2004). 'Trinidad Piping Guan' Update Chapter. In (Eds, J. Delacour and D. Amadon) *Currasows and related birds*, Lynx Edicions & The National Museum of Natural History, Barcelona and New York, pp. 342-476.
- De-Light, D. and Thomas, P. (2005). *The Rough Guide to Trinidad and Tobago*, Rough Guides Ltd., London.

- Deyoung, R. (1993). Changing Behavior and Making It Stick - the Conceptualization and Management of Conservation Behavior, *Environment and Behavior*, **25**, 485-505.
- Dinerstein, E. and Olson, D. M. (1995). *A conservation assessment of the terrestrial ecoregions of Latin America and the Caribbean*, World Bank, Washington, D.C.
- Dixon, J., Hamilton, K., Pagiola, S. and Segnestam, L. (2001). *Tourism and the Environment in the Caribbean*, Environmental Economics Series, Environment Department, The World Bank, Washington D.C.
- Do Valle, P. O. (2005). Combining behavioral theories to predict recycling involvement, *Environment and Behavior*, **37**, 364-396.
- Donovan, D. G. and Puri, R. K. (2004). Learning from Traditional Knowledge of Non-timber Forest Products: Penan Benalui and the Autecology of Aquilaria in Indonesian Borneo, *Ecology and Society*, **9**, 3.
- Driver, T. and Kravastsky, A. (1998). *Community Institutions and Natural Resource Management in Brasso Seco -Paria*, A draft report submitted to the Brasso Secco-Paria Tourism Action Committee, June 1998., Human Development Consulting, Trinidad.
- Duffus, D. A. and Dearden, P. (1990). Nonconsumptive Wildlife-Oriented Recreation - a Conceptual-Framework, *Biological Conservation*, **53**, 213-231.
- Edwards, R. (1997). Beware green imperialists, *New Scientist*, **31 May**, 14-15.
- Fa, J. E., Currie, D. and Meeuwig, J. (2003). Bushmeat and food security in the Congo Basin: linkages between wildlife and people's future, *Environmental Conservation*, **30**, 71-78.
- French, R. P. (1992). *A guide to the birds of Trinidad and Tobago*, Christopher Helm, London.
- Folke, C. (2004). Traditional knowledge in social-ecological systems, *Ecology and Society*, **9**, U3-U8.
- Friedkin, N. E. (2001). Norm formation in social influence networks, *Social Networks*, **23**, 167-189.
- Geoghegan, T., Renard, Y. and Brown, N. A. (2004). *Guidelines for Participatory Planning: A Manual for Caribbean Natural Resource Managers and Planners*, Caribbean Natural Resources Institute (CANARI).
- Geoghegan, T., Renard, Y., Brown, N. A. and Krishnarayan, V. (1999). *Evaluation of Caribbean Experiences in Participatory Planning and Management of Marine and Coastal Resources*, Caribbean Natural Resources Institute (CANARI).
- George Philip & Son (2000). *Philip's Great World Atlas*, George Philip Limited, London.
- Ghimire, S. K., McKey, D. and Aumeeruddy-Thomas, Y. (2004). Heterogeneity in ethnoecological knowledge and management of medicinal plants in the Himalayas of Nepal: Implications for conservation, *Ecology and Society*, **9**, U9-U24.
- Gillingham, S. and Lee, P. C. (1999). The impact of wildlife-related benefits on the conservation attitudes of local people around the Selous Game Reserve, Tanzania, *Environmental Conservation*, **26**, 218-228.
- Girara & Abela Peasants Associations (1991). *Farmer Participatory Research in North Omo, Ethiopia*, IIED & Farm Africa, London.
- Government of the Republic of Trinidad and Tobago (2005). *Republic of Trinidad and Tobago Biodiversity Clearing House*. <http://www.trinbagobiodiversity.gov.tt/> [Accessed 3rd August 2005]

- Graeff, J. A., Elder, J. P. and Booth, E. M. (1993). *Communication for health and behavior change: a developing country perspective.*, Jossey-Bass, San Francisco.
- Hardin, G. (1968). The Tragedy of the Commons, *Science*, **162**, 1243-1248.
- Harrison, D. (2001). *Tourism and the less developed world: issues and case studies*, Cabi Publishing, Wallingford.
- Harrison, D. (2005). *Grande Riviere, Trinidad: From Cocoa to Conservation*, 4th-7th September, paper presented at the 2005 Annual Conference of the UK Development Studies Association, Milton Keynes.
- Hayes, F. E. (2002). *Current Research Projects. Status, ecology and behaviour of the endangered Trinidad Piping-Guan (Pipile pipile)*.
www.geocities.com/floyd_hayes/research_piping-guan [Accessed 11th February 2005]
- Healey, J. F. (1999). *Statistics: a tool for social research*, Wadsworth Publishing Company, London.
- Heinen, J. T. and Low, R. S. (1992). Human Behavioral Ecology and Environmental Conservation, *Environmental Conservation*, **19**, 105-116.
- Holmes, C. M. (2003). The influence of protected area outreach on conservation attitudes and resource use patterns: a case study from western Tanzania, *Oryx*, **37**, 305-315.
- Hunn, E. S., Johnson, D. R., Russell, P. N. and Thornton, T. F. (2003). Huna Tlingit traditional environmental knowledge, conservation, and the management of a "wilderness" park, *Current Anthropology*, **44**, S79-S103.
- Hunter, C. and Green, H. (1995). *Tourism and the Environment*, Routledge, London.
- Hutton, J. M. and Leader-Williams, N. (2003). Sustainable use and incentive-driven conservation: realigning human and conservation interests, *Oryx*, **37**, 215-226.
- Infield, M. (1988). Attitudes of a Rural-Community Towards Conservation and a Local Conservation Area in Natal, South-Africa, *Biological Conservation*, **45**, 21-46.
- Ite, U. (1996a). Community perceptions of the Cross River National Park, Nigeria, *Environmental conservation*, **23**, 351-357.
- Ite, U. E. (1996b). Community perceptions of the Cross River National Park, Nigeria, *Environmental Conservation*, **23**, 351-357.
- ITTO (2003). *Achieving the ITTO objective 2000 and sustainable forest management in Trinidad and Tobago*, Thirty-fourth session, International Tropical Timber Council, Panama City, Panama.
- IUCN (2004). *2004 IUCN Red List of Threatened Species*. www.redlist.org [Accessed 23rd March 2005]
- James, C. and Fournillier, K. (1993). *Marine Turtle Management in North-East Trinidad. A successful community based approach towards endangered species conservation.*, CANARI, with Wildlife Section, St Croix, US Virgin Islands.
- James, C. and Hislop, G. (1988). Status and conservation of two cracid species, the Pawi or Trinidad Piping Guan (*Pipile pipile*) and the Cocrico (*Ortalis ruficauda*) in Trinidad and Tobago. In *Second international cracid symposium, Feb-Mar 1988*, Wildlife Section, Forestry Division, Ministry of Food Production, Marine Exploitation, Forestry and the Environment, Caracas, Venezuela.
- James, C. and Hislop, G. (1997). Status and Conservation of the Trinidad Piping Guan or Pawi (*Pipile pipile*). In (Eds, S. D. Strahl, S. Ellis, D. M. Brooks, A. J. Begazo, G. Sedaghatkish and F. Olmos) *The Cracidae. Their Biology and Conservation*, Hancock House, USA & Canada.

- Jones, S. (2005). Community-based ecotourism - The significance of social capital, *Annals of tourism research*, **32**, 303-324.
- Kahn, R. and Cannell, C. (1957). *The Dynamics of Interviewing*, Wiley, New York & Chichester.
- Kapila, S. and Lyon, F. (1994). *People Oriented Research*, Expedition Advisory Centre, Royal Geographical Society, London.
- Kapila, S. and Lyon, F. (2000). *People Oriented Research*, Expedition Advisory Centre, Royal Geographical Society, London.
- Kenny, J., Comeau, P. and Katwaru, L. (1997). *A Survey of Biological Diversity, Trinidad and Tobago*, United Nations Development Programme, Port of Spain.
- Kiss, A. (2004). Is community-based ecotourism a good use of biodiversity conservation funds?, *Trends in Ecology & Evolution*, **19**, 232-237.
- Ko, D. W. and Stewart, W. P. (2002). A structural equation model of residents' attitudes for tourism development, *Tourism Management*, **23**, 521-530.
- Krishnarayan, V., Geoghegan, T. and Renard, Y. (2002). *Assessing Capacity for Participatory Natural Resource Management*, Caribbean Natural Resources Institute (CANARI).
- Krüger, O. (2005). The role of ecotourism in conservation: panacea or Pandora's box?, *Biodiversity and Conservation*, **14**, 579-600.
- Kühl, A. (2003). *Saiga antelope community-based conservation -why and for whom?*, Thesis submitted for the degree of MSc Thesis, Department of Environmental Sciences and Technology, Imperial College, University of London.
- Lado, C. (2004). Sustainable environmental resource utilisation: a case study of farmers' ethnobotanical knowledge and rural change in Bungoma district, Kenya, *Applied Geography*, **24**, 281-302.
- Lambie, I. (1987). Survival is the name of the game, *Naturalist*, **7**, 2.
- Leach, M. and Fairhead, J. (2001). *Science, policy and national parks in Trinidad and Tobago*, Working paper from the project 'Forest Science and Forest Policy: Knowledge, Institutions and Policy Processes'. Institute of Development Studies, Brighton. <http://www.ids.ac.uk/ids/env/PDFs/TrinidadNationalParks.pdf> [Accessed 4th May 2005]
- Leader-Williams, N. (2002). Animal conservation, carbon and sustainability, *Philosophical Transactions of the Royal Society of London Series a-Mathematical Physical and Engineering Sciences*, **360**, 1787-1806.
- Liddle, R. A. (1946). *The geology of Venezuela and Trinidad*, Ithaca, New York.
- Low, B. S. (1996). Behavioral ecology of conservation in traditional societies, *Human Nature-an Interdisciplinary Biosocial Perspective*, **7**, 353-379.
- Martinez, M. D. and Scicchitano, M. J. (1998). Who listens to trash talk? Education and public media effects on recycling behavior, *Social Science Quarterly*, **79**, 287-300.
- Mehta, J. N. and Heinen, J. T. (2001). Does community-based conservation shape favorable attitudes among locals? An empirical study from Nepal, *Environmental Management*, **28**, 165-177.
- Mickleburgh, S. P., Hutson, A. M., Racey, P. A. and Group, I. S. C. S. (1992). *Old World Fruit Bats. An action plan for their conservation*, IUCN, Gland.
- Milner-Gulland, D. E. J. and Mace, R. (1998). *Conservation of biological resources*, Blackwell Science, Oxford.
- Milner-Gulland, E. J. and Bennett, E. L. (2003). Wild meat: the bigger picture, *Trends in Ecology & Evolution*, **18**, 351-357.

- Moller, H., Berkes, F., Lyver, P. O. and Kislalioglu, M. (2004). Combining science and traditional ecological knowledge: Monitoring Populations for co-management, *Ecology and Society*, **9**, U65-U79.
- Mootoosingh, S. N. (1979). *The growth of conservation awareness in Trinidad & Tobago (1765-1979)*, University of West Indies, Department of Zoology, Port of Spain.
- Mukherjee, N. (1993). *Participatory Rural Appraisal, Methodology and Applications*, Concept Publishing Company, New Delhi.
- Myers, N., Mittermeier, R. A., Mittermeier, C. G., da Fonseca, G. A. B. and Kent, J. (2000). Biodiversity hotspots for conservation priorities, *Nature*, **403**, 853-858.
- Nelson, H. (2004). *Tropical forest ecosystems of Trinidad: ecological patterns and public perceptions*, Thesis submitted for the degree of Doctor of Philosophy (Wildlife Ecology and Forestry), University of Wisconsin, Madison.
- Newmark, W. D., Leonard, N. L., Sariko, H. I. and Gamassa, D. G. M. (1993). Conservation Attitudes of Local People Living Adjacent to 5 Protected Areas in Tanzania, *Biological Conservation*, **63**, 177-183.
- Olsen, R. N. and Coppin, A. (2001). The Determinants of Gender Differentials in Income in Trinidad and Tobago, *Journal of Development Studies*, **37**, 3156.
- Onwuka, O. (2004). *Kill nothing but time, take nothing but memories*, Thesis submitted for the degree of Master of Arts, Department of Social Geography, University of Amsterdam.
- Ostrom, E. (1990). *Governing the commons: the evolution of institutions for collective action*, Cambridge University Press, Cambridge.
- Pimbert, M. and Pretty, J. N. (1995). *Parks, people and professionals. Putting participation into protected area management.*, UNRISD Discussion paper no. 57, UNRISD, Geneva.
- Piore, A. (2002). Trouble in Paradise. In *Newsweek*, 22nd-29th July 2002 pp.
- Pretty, J. N., Guijt, I., Scoones, I. and Thompson, J. (1995). *A Trainer's guide for participatory learning and action.*, International Institute for Environment and Development, London.
- Rauwald, K. S. and Moore, C. F. (2002). Environmental attitudes as predictors of policy support across three countries, *Environment and Behavior*, **34**, 709-739.
- Republic of Trinidad and Tobago (2005). *Environmentally Sensitive Species (Pawi) Notice, 2005*, Made under section 41 of the Environmental Management Act, 2000, and under Rules 3, 4 and 5 of the Environmentally Sensitive Species Rules 2001, Environmental Management Authority (EMA), Republic of Trinidad and Tobago, Port of Spain.
- Rice, W. R. (1989). Analysing tables of statistical tests, *Evolution*, **43**, 223-225.
- Robinson, J. G. and Bennett, E. L. (2000). *Hunting for Sustainability in Tropical Forests*, Columbia Press, New York.
- Roopchand, A., Khan, J. and Garcia, G. W. G. (2004). *An assessment of local community knowledge of the Pawi (Pipile pipile); A case study of Grande Riviere and Monte Video communities in North Eastern Trinidad, Republic of Trinidad and Tobago, W.I.*, Draft report, Department of Food Production, Faculty of Science and Agriculture, University of the West Indies, St. Augustine.
- Russell, D. (2003). *Groundwork for Community-Based Conservation: strategies for social research*, Altimera, Oxford.
- Salafsky, N., Cauley, H., Balachander, G., Cordes, B., Parks, J., Margoluis, C., Bhatt, S., Encarnacion, C., Russell, D. and Margoluis, R. (2001). A systematic test of

- an enterprise strategy for community-based biodiversity conservation, *Conservation Biology*, **15**, 1585-1595.
- Salafsky, N. and Wollenberg, E. (2000). Linking livelihoods and conservation: A conceptual framework and scale for assessing the integration of human needs and biodiversity, *World Development*, **28**, 1421-1438.
- Sapsford, R. J. (1998). *Theory and social psychology*, SAGE, London.
- Sarti, M. A. L. (2000). *Dermochelys coriacea*, 2004 IUCN Red List of Threatened Species. www.redlist.org [Accessed 4th August 2005]
- Saunders, M., Lewis, P. and Thornhill, A. (2003). *Research methods for business students*, Pearson Education Limited, Harlow.
- Scoones, I. and McCracken, J. (Eds.) (1989). *Participatory Rapid Rural Appraisal in Wollo: Peasant Association for Natural Resource Management*, IIED & Ethiopian Red Cross Society UMCC-DPP, London.
- Seaforth, C. E., Adams, C. D. and Sylvester, E. (1983). *A guide to the medicinal plants of Trinidad and Tobago*, Commonwealth Secretariat, London.
- Sekercioglu, C. H. (2002). Impacts of birdwatching on human and avian communities, *Environmental Conservation*, **29**, 282-289.
- Sekhar, N. U. (2003). Local people's attitudes towards conservation and wildlife tourism around Sariska Tiger Reserve, India, *Journal of Environmental Management*, **69**, 339-347.
- Sheil, D. and Lawrence, A. (2004). Tropical biologists, local people and conservation: new opportunities for collaboration, *Trends in Ecology & Evolution*, **19**, 634-638.
- Smith, E. A. and Wishnie, M. (2000). Conservation and subsistence in small-scale societies, *Annual Review of Anthropology*, **29**, 493-524.
- SPSS Inc. (2001). SPSS for Windows Release 11.0.0. SPSS Inc., Chicago.
- Stem, C. J., Lassoie, J. P., Lee, D. R., Deshler, D. D. and Schelhas, J. W. (2003). Community participation in ecotourism benefits: The link to conservation practices and perspectives, *Society & Natural Resources*, **16**, 387-413.
- Struhsaker, T. T., Struhsaker, P. J. and Siex, K. S. (2005). Conserving Africa's rain forests: problems in protected areas and possible solutions, *Biological Conservation*, **123**, 45-54.
- Temple, S. A. (1999). The status of *Pipile pipile* in Trinidad. In (Eds, D. M. Brooks, F. Olmos and A. Begazo) *Biology and Conservation of the Piping Guans (Aves: Cracidae)*. *Special Publication No.1*, Cracid Specialist Group, Houston, Texas.
- Theis, J. and Grady, H. (1991). *Participatory rapid appraisal for community development: a training manual based on experiences in the Middle East and North Africa*, IIED / Save the Children Fund, London.
- Thelen, K. D. and Faizool, S. (1980). *Policy for the establishment and management of a national park system in Trinidad and Tobago. Technical document on the establishment of a system of national parks and protected areas*, Forest Division, Ministry of Agriculture, Port of Spain, Trinidad.
- TIDCO (2001a). *The Economy of Trinidad and Tobago*. <http://visittnt.com/General/about/economy.html> [Accessed 8th May 2005]
- TIDCO (2001b). *Trinidad and Tobago - General Information*. <http://visittnt.com/General/about/general.html> [Accessed 8th May 2005]
- Tisdell, C. and Wilson, C. (2004). The public's knowledge of and support for conservation of Australia's tree-kangaroos and other animals, *Biodiversity and Conservation*, **13**, 2339-2359.
- UNDP (2003). *Human Development Report 2003*, Oxford University Press, Oxford.

- UNEP (1996). *Status of Protected Area Systems in the Wider Caribbean Region*, Caribbean Environment Programme CEP Technical Report No.36, The Caribbean Environment Programme, UNEP, Kingston, Jamaica.
<http://www.cep.unep.org/pubs/Techreports/tr36en/index.html> [Accessed 3rd May 2005]
- UNEP-WCMC (2005). *UNEP-WCMC Species Database: CITES-Listed Species*, UNEP-WCMC (World Conservation Monitoring Centre, United Nations Environment Programme). <http://sea.unep-wcmc.org/isdb/CITES/Taxonomy/index.cfm?displaylanguage=eng> [Accessed 11th May 2005]
- Vaurie, C. (1967). Systematic Notes on the Bird Family Cracidae No. 7 The Genus *Pipile*, *American Museum Novitates*, **No 2296**.
- Wadley, R. L. and Colfer, C. J. P. (2004). Sacred forest, hunting, and conservation in West Kalimantan, Indonesia, *Human Ecology*, **32**, 313-338.
- Walpole, M. J. and Goodwin, H. J. (2001). Local attitudes towards conservation and tourism around Komodo National Park, Indonesia, *Environmental conservation*, **28**, 160-166.
- Wells, M. and Brandon, K. (1992). *People and parks: linking protected area management with local communities*, The World Bank/WWF/USAID, Washington D.C.
- Wells, M. and McShane, T. O. (2004). Integrating protected area management with local needs and aspirations, *Ambio*, **33**, 513-519.
- Western, D. (1994). Ecosystem conservation in rural development: the case of Amboseli. In (Eds, D. Western and R. M. Wright) *Natural Connections: Perspectives in Community-based Conservation*, Island Press, Washington D.C.
- Wilkie, D. S., Starkey, M., Abernethy, K., Effa, E. N., Telfer, P. and Godoy, R. (2005). Role of prices and wealth in consumer demand for bushmeat in Gabon, central Africa, *Conservation Biology*, **19**, 268-274.
- Wilson, C. and Tisdell, C. (2001). Sea turtles as a non-consumptive tourism resource especially in Australia, *Tourism Management*, **22**, 279-288.
- Wunder, S. (2000). Ecotourism and economic incentives - an empirical approach, *Ecological Economics*, **32**, 465-479.
- Zaller, J. (1993). The Converse-McGuire model of attitude change and the Gulf war opinion rally, *Political communication and persuasion*, **10**, 369-388.

APPENDIX I

Nature and Tourism Activity Sheet

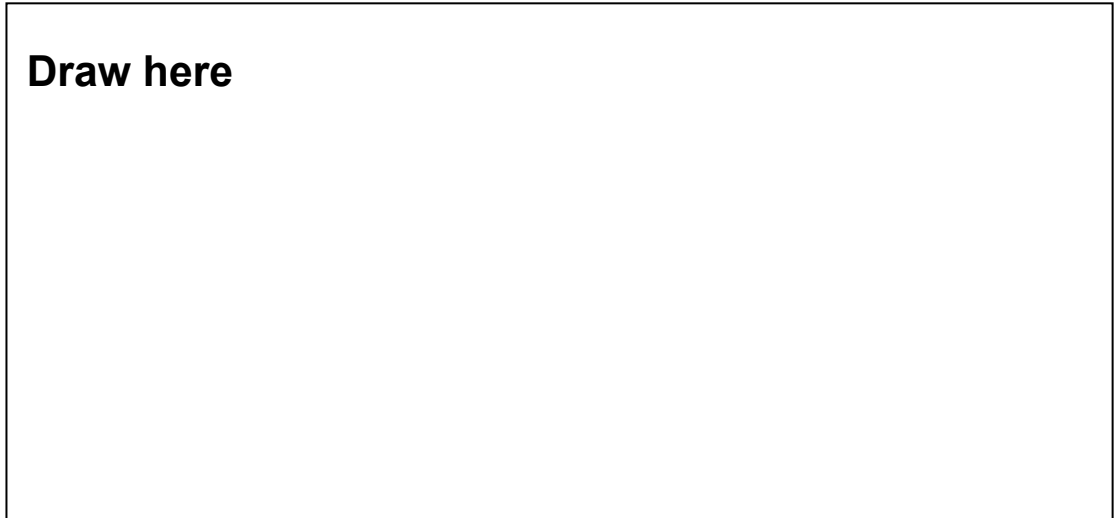
Please write your ideas carefully and clearly

1) What is your favourite animal from Trinidad?

Why is it your favourite? _____

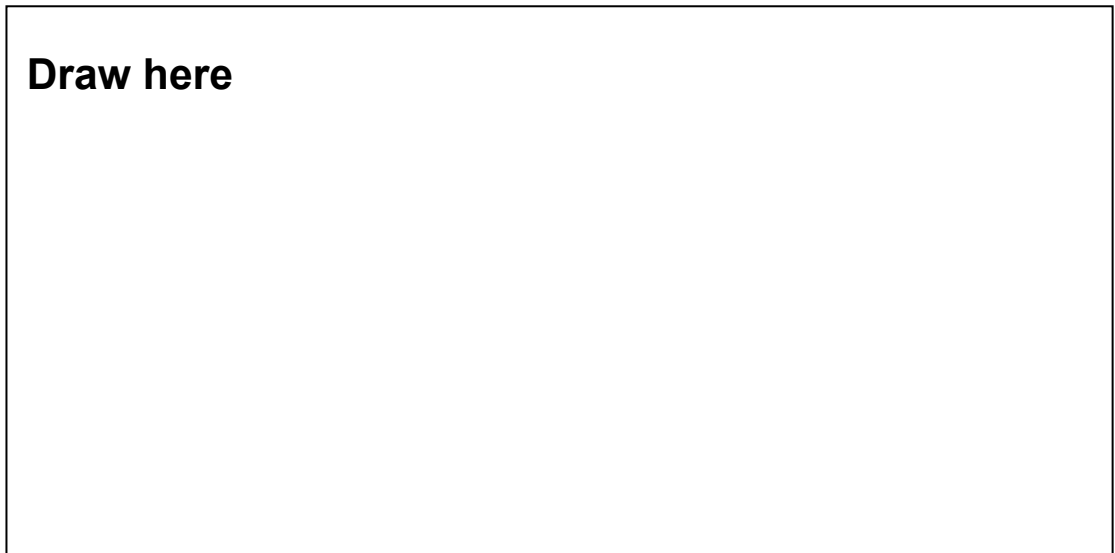
2) Can you draw a “leatherback turtle”?

Draw here

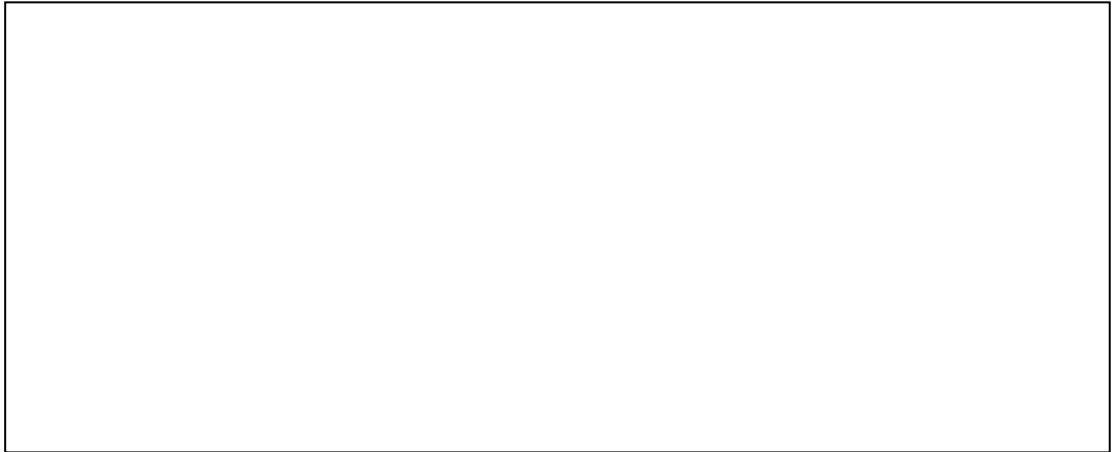


3) Can you draw a “Pawi”?

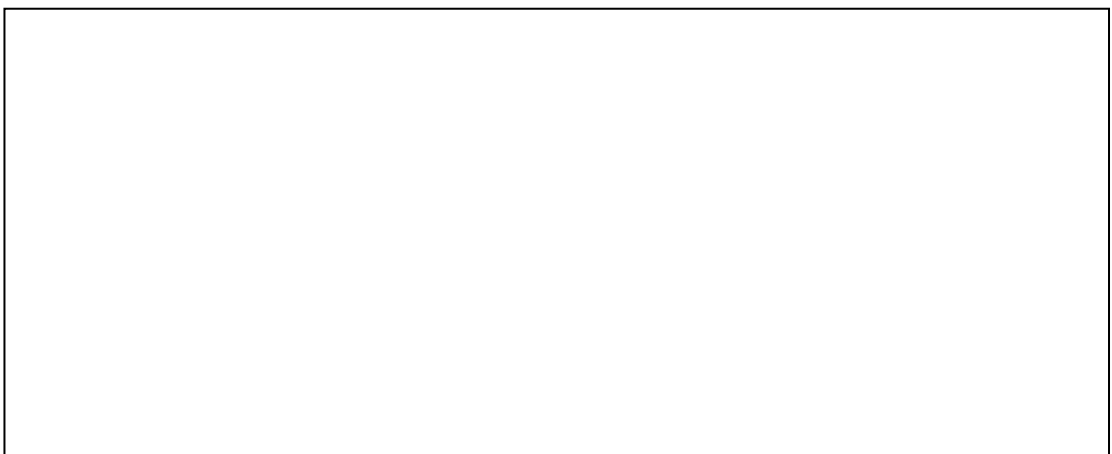
Draw here



**4) Why do visitors come to Grande Riviere?
If you like, you can draw a picture.**



5) What are visitors like? Draw one example and label it.



**Please give this to the teacher when you are finished.
If you have any questions please ask the teacher.**

APPENDIX II

My name is Miss Kerry Waylen, from Britain. I'm a student affiliated with UWI and the Pawi Group, and I'm interested in knowing what you know and think about Trinidad's nature and its conservation.

The questions are quite short, I hope you will enjoy doing them. All data collected is anonymous. Please let me know if you have any questions.....
Thankyou! ☺

A) Nature

1) Look at the 8 pictures of natural things

	1	2	3	4	5	6	7	8
a) Is this found in Trinidad?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Can you name it?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2) a) Do you eat any wild foods?

i) Plants Yes No

3 most often eaten? 1. _____ How obtain? _____
 2. _____ How obtain? _____
 3. _____ How obtain? _____

ii) Animals Yes No

3 most often eaten? 1. _____ How obtain? _____
 2. _____ How obtain? _____
 3. _____ How obtain? _____

b) Why do you eat wild foods? _____

3) a) What is your favourite kind of *wild* meat? _____
 how often do you eat it? _____

b) What is your favourite kind of *domestic* meat? _____
 How often do you eat it? _____

c) Which of these 2 meats do you prefer (if both are freely available)?

Much prefer my domestic meat		Neutral		Much prefer my wild meat
↓	↓	↓	↓	↓
1	2	3	4	5

4) Do you know any recipes for agouti? Specific General No

quenk? Specific General No

turtle? Specific General No

pawi? Specific General No

indian almond? Specific General No

5) Does your household use any parts of wild plants, trees or animals (not to eat)?

Yes No

If yes, what are the three most useful things?

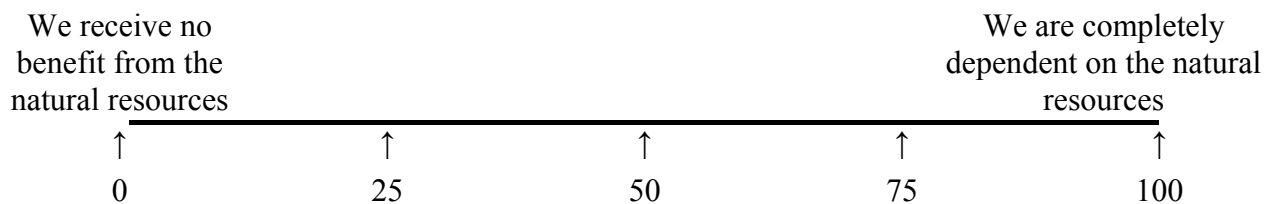
	Item 1	Item 2	Item 3
What is it? a)			
What is it used for (+why not alternatives)? b)			
How often do you use it? c)			
Do you buy it, or get it yourself? d)			

e)

6) a) How much does your household benefit from the natural resources (forests, estates, rivers) in and around this area? *Mark on the line according to the level of benefit*

b) How much of this is due to just wild things (not cultivated or planted). *Mark on the line.*

Benefits can be of any kind (e.g. money, things to use, natural beauty).



7) Do any members hunt Yes No (rank the top 3 reasons)

- a) For sport/exercise
- b) For social reasons/prestige
- c) Meat to eat?
- c) Meat to sell?
- e) Other _____

8) a) Do any members do guiding? Yes No

b) For how many months/year? _____ How often in season? _____

c) Is this fully voluntary or is some income received from it? _____

B) Conservation

- 9) Is Trinidad putting the right amount of effort into conserving its plants and animals?
- | | | | | |
|----------------------------------|--------------------------------------|--------------------------|-----------------------------------|----------------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Should be
much more
effort | Should be a
little more
effort | Just right | Should be a
little less effort | Should be
much less
effort |

- 10) Can you think of any Trini plants or animals that are endangered (not many left)?
1. _____ how do you know? _____
2. _____ how do you know? _____
3. _____ how do you know? _____

- 11) What do you think is the biggest threat to wildlife in this area?
 _____ /None /Don't know

- 12) Here are some projects that can help us to conserve wildlife

	Eco-tourism for wildlife	Protected areas	Bans/limits on killing some species	Awareness campaigns (eg tv radio)
a) Has this been tried in this area?				
b) Have any of these been used to conserve turtles?				
c) Have any of these been used to conserve Pawi?				
d) Do you think it works in this area?				
e) Would you support it in this area?				

Yes/ No/ Dk / Neutral /Some

- 13) Are there any species or issues you think need more attention?
- _____
- _____
- _____

C) You and your home

- 14) What's in your house?
- | | | | |
|-----------------|--------------------------|----------------|--------------------------|
| Sewing machine | <input type="checkbox"/> | Piped water | <input type="checkbox"/> |
| Fridge | <input type="checkbox"/> | Water tank | <input type="checkbox"/> |
| Telephone | <input type="checkbox"/> | Freezer | <input type="checkbox"/> |
| Radio | <input type="checkbox"/> | Car | <input type="checkbox"/> |
| Television | <input type="checkbox"/> | Vacuum | <input type="checkbox"/> |
| Lawn-mower | <input type="checkbox"/> | Oven | <input type="checkbox"/> |
| Washing machine | <input type="checkbox"/> | Video recorder | <input type="checkbox"/> |

15) How long have you lived here? _____

16) Number of people in household adults children
 (Include those who are temporarily working or studying elsewhere)

17) What are the adults'
 a) age b) sex c) level of education? d) primary occupation? e) other occupations?

Interviewee	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
2	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
3	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____
4	<input type="checkbox"/>	<input type="checkbox"/>	_____	_____	_____

☺ Thankyou! ☺

ID _____ Date _____ Time _____ House ID _____ Name _____

APPENDIX III

Picture 1 *Correct answer: Pawi, Piping Guan*



Picture 2 *Correct answer: Leatherback turtle, Caldong*



Picture 3 *Correct answer: Poui*



Picture 4 *Correct answer: Copper rumped humming bird (zing zing, killybwee)*



Picture 5. *Correct answer: Breadfruit, Chatine*



Picture 6. *Correct answer: Crappo*



Picture 7. *Correct answer: Agouti*



Picture 8. *Correct answer: Bois canot*



APPENDIX IV

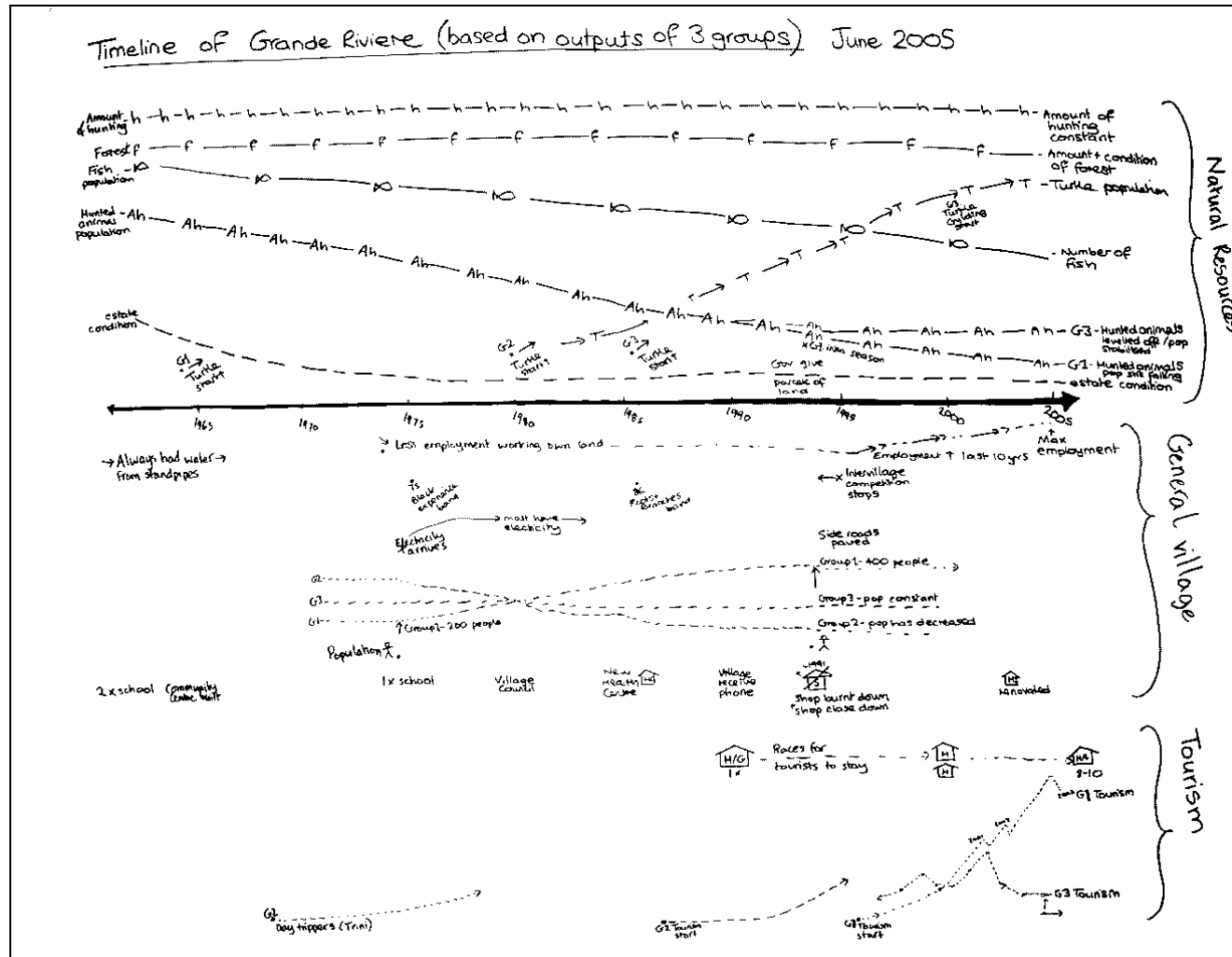
The Government of the Republic of Trinidad and Tobago Ministry of
Planning and Development Central Statistical Office

TABLE 18. PERCENTAGE DISTRIBUTION OF HOUSEHOLDS BY INCOME GROUP OF HOUSEHOLD AND FACILITIES AVAILABLE FOR USE

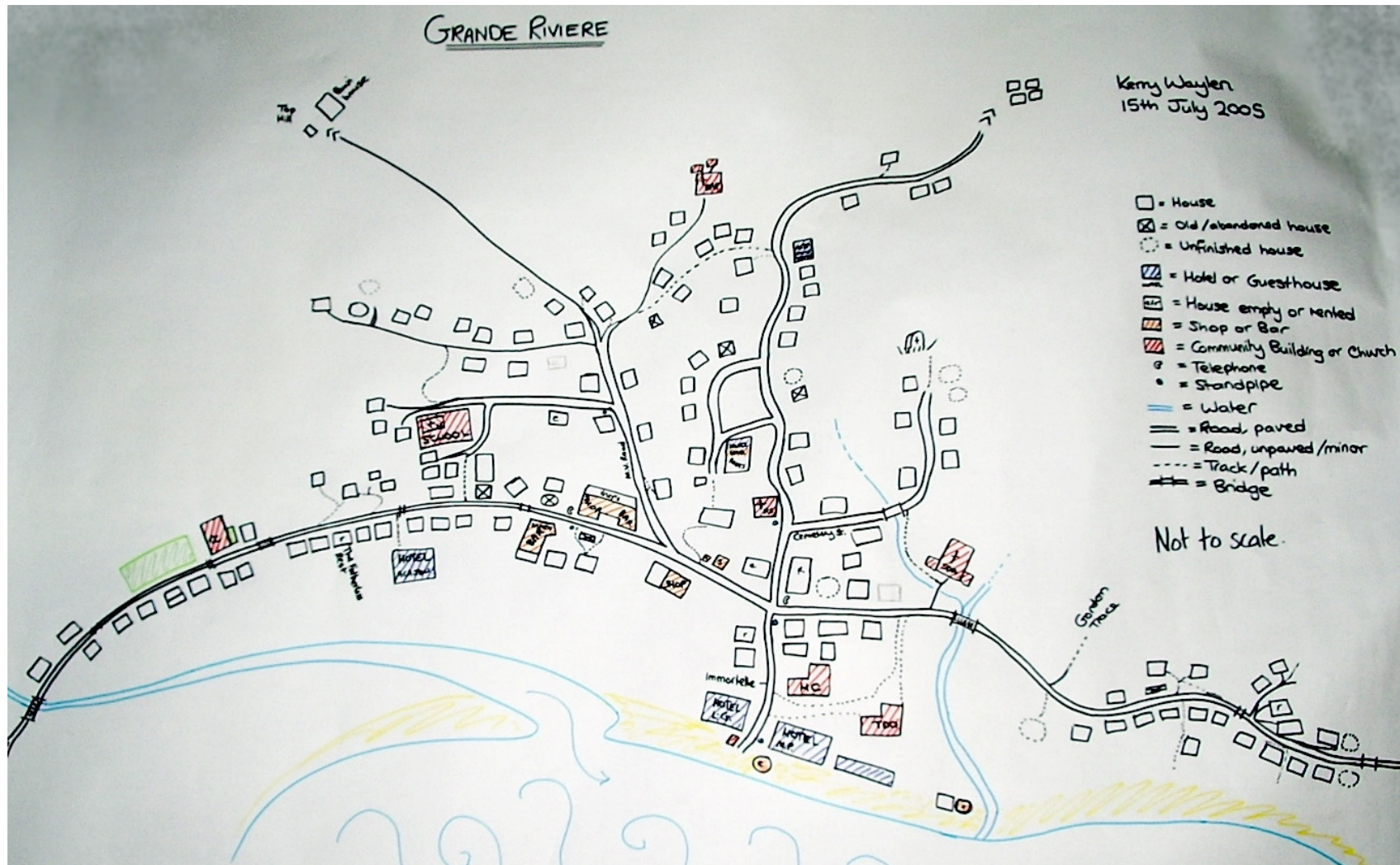
Facilities	0-\$499	\$500-\$999	\$1,000-\$1,999	\$2,000-\$2,999	3,000-\$3,999	\$4,000-\$4,999	\$5,000-\$5,999	\$6,000-\$6,999
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Water piped into dwelling\yard	42.9	50.3	57.3	63.3	68.2	75.1	73.9	85.5
Toilet facility - water borne	37.1	36.2	48.8	61.9	68.2	74.2	87.9	88.5
Electricity	60.0	78.0	0.0	91.6	31.4	96.5	98.7	98.5
Telephone	11.4	25.4	34.0	48.1	55.0	62.9	69.4	77.9
Air condition	1.4	1.1	0.7	1.4	2.2	4.8	2.5	8.4
Stove (electric\gas)	84.3	93.8	96.2	98.6	98.7	98.7	98.7	96.9
Oven	8.6	4.0	4.9	10.5	14.5	21.0	24.2	26.7
Fridge	47.1	62.1	70.9	82.1	89.3	93.0	96.2	93.1
Freezer	5.7	4.5	4.7	14.4	13.8	20.5	24.8	26.0
Radio\Stereo	57.1	72.9	78.3	84.4	86.5	87.3	87.3	86.3
Personal computer	2.9	0.6	0.0	1.2	2.2	3.5	2.5	7.6
Video recorder	11.4	7.3	13.4	22.3	31.4	34.1	44.6	48.1
Television	54.3	59.3	77.6	89.1	92.1	95.2	95.5	96.2
Cable	2.9	2.3	5.1	9.3	14.5	18.8	24.2	27.5
Washing machine	24.3	20.3	25.7	39.5	50.3	62.4	64.3	71.0
Clothes dryer	4.3	0.6	1.1	2.3	5.0	7.9	8.9	21.4
Vacuum cleaner	8.6	6.2	6.3	9.8	15.1	22.7	32.5	32.8
Sewing machine	22.9	19.2	7.6	35.6	39.6	48.0	53.5	58.8
Lawn mower	2.9	2.8	4.3	7.2	7.9	16.6	14.0	16.0
Water tank	28.6	33.9	42.5	55.1	61.9	59.0	70.1	72.5
Motor vehicle	10.0	5.6	11.9	22.6	32.4	43.2	52.9	6.1

	\$7,000-\$7,999	\$8,000-\$8,999	\$9,000-\$9,999	\$10,000-\$10,999	\$11,000-\$11,999	\$12,000-\$12,999	>\$12,999
	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Water piped into dwelling\yard	90.5	91.4	91.3	94.1	93.8	90.9	99.0
Toilet facility - water borne	91.7	94.3	93.5	91.2	96.9	90.9	97.1
Electricity	98.8	100.0	100.0	100.0	96.9	100.0	100.0
Telephone	82.1	85.7	87.0	88.2	90.6	95.5	93.3
Air condition	9.5	7.1	4.3	14.7	6.3	13.6	31.7
Stove (electric\gas)	98.8	98.6	97.8	97.1	100.0	100.0	100.0
Oven	42.9	40.0	58.7	61.8	43.8	54.5	76.0
Fridge	97.6	95.7	97.8	94.1	96.9	100.0	100.0
Freezer	34.5	30.0	39.1	32.4	25.0	31.8	42.3
Radio\Stereo	89.3	97.1	97.8	100.0	90.6	95.5	92.3
Personal computer	9.5	14.3	8.7	23.5	15.6	27.3	45.2
Video recorder	51.2	41.4	52.2	61.8	56.3	54.5	67.3
Television	97.6	100.0	100.0	100.0	93.8	95.5	98.1
Cable	21.4	35.7	41.3	41.2	31.3	45.5	56.7
Washing machine	78.6	80.0	87.0	88.2	78.1	90.9	91.3
Clothes dryer	16.7	20.0	21.7	29.4	15.6	31.8	45.2
Vacuum cleaner	47.6	47.1	41.3	76.5	56.3	63.6	64.4
Sewing machine	54.8	60.0	56.5	79.4	71.9	63.6	63.5
Lawn mower	33.3	15.7	26.1	41.2	21.9	54.5	44.2
Water tank	73.8	64.3	69.6	82.4	78.1	72.7	75.0
Motor vehicle	60.7	62.9	80.4	70.6	81.3	81.8	90.4

APPENDIX V

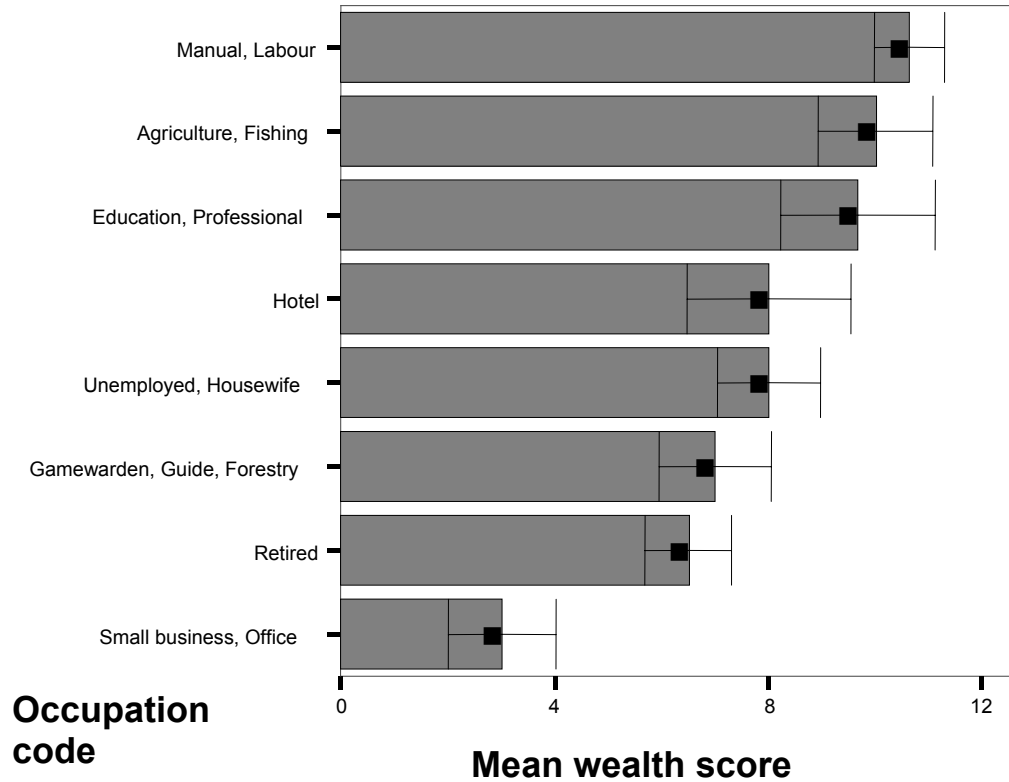


APPENDIX VI



APPENDIX VII

Mean wealth scores (error bars represent standard error of the mean) associated with the categorised primary occupations of respondents.



APPENDIX VIII

Data collected from RRA exercise 2.2, on land types, their uses, and the importance of land types for each use.

1. Among the following land / forest types, which one do you think is most important for the community's well-being (divide 100 beans between land types)

2. List different use categories for each land type

3. For each use category on the cards, value the importance of each land / forest type (using beans)

GROUP 1

	Forest	Estate	Gardens	Backyard	Flower yard	Seashore / beach	Houses	Sum
Overall	5	4	31	14	3	20	23	100
Food	28	0	22	24	0	26	-	100
Timber	29	46	25	0	0	0	-	100
Medicine	36	0	14	18	23	9	-	100
Marketable items	19	25	33	6	0	17	-	100
Hunting	55	24	21	0	0	0	-	100
Tourism	29	26	0	0	0	45	-	100

GROUP 2

	Forest	Abandoned estate	Agricultural land	Private estate	Watershed reserve	Govt estate	Seashore / beach	Houses	Sum
Overall	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	100
Food	5	5	36	25	4	9	16	-	100
Timber	15	28	0	10	23	24	0	-	100
Marketable items	15	4	-	22	4	35	20	-	100
Hunting	20	10	14	17	13	21	5	-	100
Tourism	17	0	9	0	17	9	48	-	100
Water supply	0	0	0	0	100	0	0	-	100
Ganja cultivation	34	33	0	0	33	0	0	-	100
Fishing	0	0	0	0	0	0	100	-	100
Firewood	10	0	0	0	0	0	90	-	100

GROUP 3

	Forest	Estate	Backyard garden	Seashore / beach	Rivers	Houses	Sum
Overall	17	14	4	22	0	43	100
Food	25	25	25	25	-	-	100
Timber	75	25	0	0	-	-	100
Marketable items	25	25	25	25	-	-	100
Hunting	75	25	0	0	-	-	100
Tourism	25	0	0	75	-	-	100
Water	100	0	0	0	-	-	100
Craft	25	25	0	50	-	-	100
Fishing	0	0	0	90	10	-	100

CHILDREN

	Forest	Bush	Sea	Rivers	Beach	Sum
Overall	39	30	14	5	12	100
Food	24	28	38	7	3	100
Hunting (incl. fishing)	41	24	20	12	3	100
Fun / recreation	12	3	30	14	41	100

More uses listed but importance of land types not tested.

APPENDIX IX

Useful plants (not for consumption) as mentioned by villagers of Grande Riviere

Compiled by Srishti Mohais (UWI herbarium) and Kerry Waylen, based on Compton E. Seaforth, C.D. Adams, Y. Sylvester (1983). *A guide to the medicinal plants of Trinidad and Tobago*. London, Commonwealth Secretariat.

Common Name	Latin Name	Uses
Aguma (not Gouma)	<i>Solanum nigrum</i>	Bhagee
Alloes	<i>Aloe vera</i>	For chest pain
Anare	Most likely <i>Geonoma interrupta</i> Possibly <i>Prestoea pubigera</i>	Walking sticks
Belladonna		To make plaster
Black sage	<i>Cordia curassavica</i>	For colds, fever
Blood bush	Unkown. Can be any of: <i>Croton gossypifolius</i> <i>Pterocarpus officinalis</i> <i>Eleutherine bulbosa</i>	Blood purifier
Bois Canot	<i>Cecropia peltata</i>	For colds
Bois Flot	<i>Ochroma pyramidale</i>	
Bura Banday /Badeya root	<i>Roupala montana</i>	Colds and fever
Caimit	<i>Chrysophyllum cainito</i>	Fruit
Carilli/Karailie	Probably same as wild caraili- if not, cultivated sp. is <i>Momordica cochinchinensis</i>	Use leaf for stomach ache
Carpenter Grass	<i>Justicia pectoralis</i>	
Cats Claw	<i>Doxantha unguisati</i>	Prostate problems. Clean blood. Clean bladder
Christmas bush	<i>Chrolaena odorata</i>	For colds
Cocolicka/ Zebafam	<i>Ageratum conyzoides</i>	Boil Root to make a drink
Coconut	<i>Cocos nucifera</i>	Water for eye infections
Corn straw	?	Use in mattress for a firm bed
Deer Bush? Probably deer meat	<i>Centropoon cornutus</i>	As Bhagee. For cooling bath
Dee-tay-payee	?	For eyes

Fever/Lemon Grass	<i>Cymbopogon nardus</i>	For fever. Puts heat in body to help sweat it out
Grater wood	<i>Lantana camara</i>	
Guava	<i>Psidium guajava</i>	Young pods used for diarrhoea
Hog Plum	<i>Spondias mombin</i>	For colds. Bark for coal
Hog plum	<i>Spondias monbin</i>	
Lemon Bud	<i>Citrus limon</i>	Tea for gripe
Mahoe	<i>Sterculia caribea</i>	Inside fibers used to make rope
Mamee Sapote	<i>Pouteria sapota</i>	Used in Chow
Mamoo Vine	<i>Carludovica sp.</i> Or <i>Asplundia rigida</i>	
Moussara	<i>Brosimum alicastrum</i>	Eat as provision
Nutmeg	<i>Myristica fragrans</i>	With vicks and soft candle for fever
Olive	<i>Bontia daphnoides</i>	Cooling, either drawn in water or as tea
Peewa	<i>Bactris gasipaes</i>	Fruit
Pennapiece/ Pain d'epice	<i>Pouteria multiflora</i>	Also used to feed animals Fruit. Looks like pineapple, bears fruit like small bunch of bananas, found near rocks on the beach, has hairs/strings that abrade your tongue if not first peeled off
Pinguin	<i>Bromelia plumieri</i>	For eye's especially baby's when born and get cold in their eyes.
Plantae/ay (=Planten?)	<i>Plantago major (?)</i>	
Plum rose/ Prim Rose	<i>Cyzygium jambos</i>	Fruit
Popeye	Unknown	Blood cooling
Santa maria	<i>Lippia alba</i>	For colds
Shado beni/Bandhanilya	<i>Eryngium foetidum</i>	Colds, root for fever
Shandilay	<i>Leonotis nepetifolia</i>	For colds, cough, fever
Shapot	<i>Lucuma mammosa</i>	Makes Jam and Jelly. Eaten by animals. Inner makes Creole chocolate. Used with bitters and nutmeg mace
Shappona	?	
Shining bush	<i>Peperomia pellucida</i>	Sore throats
Shining bush	<i>Peperomia pellucida</i>	Colds
Sirrio/ Sirro bush	<i>Sambucus simpsonii</i>	Colds
Soo sumba/ sosumba	= <i>Susi (marigold)? Tagetes patula</i>	Boil root for bitter tea, drink before going out
Soursop	<i>Annona muricata</i>	Leaf for cuts/to help sleep
Suggar Apple	<i>Annona squamosa</i>	
Sweet bush? (did they mean sweet broom?)	<i>Scoparia dulcis</i>	

Sweetbroom	<i>Scorparia dulcis</i>	For baby's gripe
Ti marie/Tia maria/ Ti mawi etc.	<i>Mimosa pudica</i>	Boil Root to make a drink
Tonka bean	<i>Dipteryx odorata</i>	
Tref	<i>Aristolochia trilobata</i>	Take if poisoned. For colds
Tref	<i>Aristolochia trilobata</i>	Colds and after poisoning
Vervine	<i>Stachytarpheta jamaicensis</i>	To help mothers produce milk (lactagogue). Make tea.
Water Vine	<i>Uncaria tomentosa</i> or <i>Doliocarpus dentatus</i> or <i>Pinzonia coriacea</i>	Drink from cut stem
Wild Caraili/Karailie	<i>Momordica charantia</i>	Drink for cooling
Wild Coffee	<i>Cassia occidentalis</i>	Help pass/seeds used to make a tea
Wild coffee	<i>Cassia occidentalis</i>	Tea
Wild Senna	<i>Senna alata</i>	Purge
Wild sorrel	<i>Urena lobata</i>	
Wizoo/Brazil Nut	<i>Lecythis zabucajo</i>	To make vase
Wonder of the world	<i>Bryophyllum pinnatum</i>	For everything. Cooling. Purging. Blood pressure. Gas. Ulcers. Eye infections
Worm Grass	<i>Chenopodium ambrosioides</i>	Pounded with salt for worms
Zebapique	<i>Neurolaena lobata</i>	For purging. For cooling. For stomach ache. Soaked in rum for period pain.

Other

Deer horn		Medicine
Seawater	--	Sniff for colds, bathe for joints

Plant with other uses -selected

Jumbie bean	<i>Abrus precatorius</i>	Jewellery
Calabash	<i>Crescentia cujete</i>	Craft
Coconut	<i>Cocos nucifera</i>	Craft
Bachelor Button	<i>Gomphrena globosa</i>	Craft
Bois canot	<i>Cecropia peltata</i>	Craft

APPENDIX X

The links between socioeconomic factors and knowledge and attitudes. Mann-Whitney U used to assess differences between 2 samples, Kruskal-Wallis for K samples, and Spearman Rank used to correlate scores, as appropriate. °Conservation knowledge tested by comparing two groups: one that correctly answered for all four projects in question 12, versus those that did not.

	<i>Knowledge</i>		<i>Attitudes</i>		
	Knowledge score N=52	Project aware° N=52	Natural rating N=48	Wild Rating N=47	Conserv. Effort N=50
Gender	Z=-2.429 **	NS	NS	NS	Z=-3.139 **
Age	R_s=-0.402 **	NS	NS	NS	NS
Time in village	NS	NS	NS	NS	NS
Education	R_s=0.436 **	NS	NS	NS	NS
Occupation	NS	NS	NS	NS	NS
Wealth	R_s=0.386 **	NS	NS	NS	R_s=0.294 **