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Project Pawi: Recovery of the Trinidad Piping-Guan (*Pipile pipile*)

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Grande Riviere has been at the heart of efforts to study the Pawi for many years, and once again played a central role in our project. We are indebted to owners of the Grande Riviere house for their generosity in allowing us to use the site as our base. The team would especially like to thank the guides of the Grande Riviere Nature Tour Guide Association and Mr Guy for their help and friendship.

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Chapter 1: Introduction & Background

The Trinidad piping-guan (*Pipile pipile*), or Pawi as it is locally known, is a highly threatened galliform, endemic to Trinidad. The remaining population is restricted to a small area of the mountainous Northern Range in north-eastern Trinidad (see Figure 1.1).

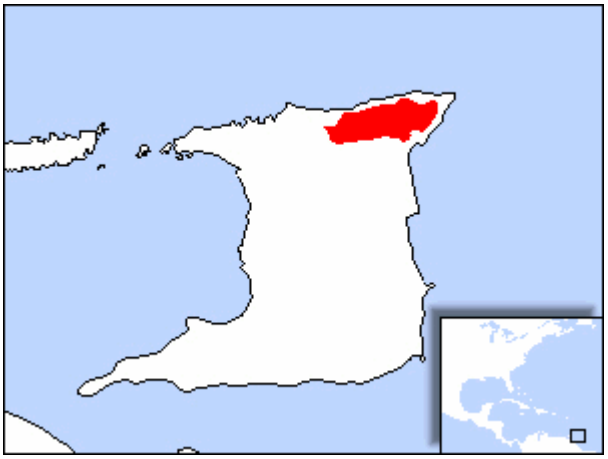

Figure 1.1: The most recent estimate of the remaining extent of the Pawi's distribution in Trinidad. Reproduced from the BirdLife Species Factsheet for the Trinidad Piping-Guan (BirdLife International, 2006)

The Pawi is one of 50 currently recognised species of Cracid (BirdLife International, 2004; Remesen et al, 2006), a family of large, heavy-bodied birds found in the tropical and subtropical forests of the Americas (Delacour & Amandon, 1973).

The taxonomic status of the Pawi is still not settled, with some authors (Delacour & Amadon, 1973; Haverschmidt & Mees, 1994) arguing for *Aburria* and *Pipile* to be treated as a single genus, *Aburria*. The available data is ambiguous, however, with some genetic evidence for the existence of separate genera (Pereira et al, 2002), while other genetic and morphological characteristics suggest a single genus would be more appropriate (Grau et al, 2005).

Where the *Pipile* genus is recognised, there is also disagreement on the number of species it contains. Several authors argue for a single species, the "Common Piping-Guan"

(*Pipile pipile*) (e.g. Hilty & Brown, 1986; Hilty, 2003; Ridgely & Greenfield, 2001) while others divide the genus into four separate species (e.g. Sibley & Monroe 1990, del Hoyo 1994) or some intermediate number (e.g. Delacour & Amadon, 1973).

The lack of taxonomic certainty, however, does not lessen the conservation priority of the Pawi (Brooks et al, 1998). Historical reports indicate that the Pawi was formerly abundant and widespread throughout the Northern Range, the Trinity Hills and several lowland areas (del Hoyo & Motis, 2004). Accounts from the 1940s and 1950s described large groups occurring in many areas of Trinidad, from Guayaguayare in the south to Madamas in the north (James & Hislop, 1997). Today, however, the species is restricted to an area of approximately 150km^2 in the eastern portion of the Northern Range (BirdLife International, 2004). Continuing loss of habitat, in combination with an extremely small population (believed to comprise fewer than 200 individuals) and pressure from illegal hunting, has lead to the Pawi being considered 'Critically Endangered' by the World Conservation Union (IUCN) since 1994 (BirdLife International, 2004).

Several international organisations have highlighted the species as cause for concern. The IUCN/SSC Cracid Action Plan 2000-2004 (Brooks & Strahl, 2000) described *Pipile pipile* as the second most threatened Cracid and an 'Immediate Priority' for conservation action, while the Pawi's presence has resulted in the Northern Range being designated an Alliance for Zero Extinction site (Alliance for Zero Extinction, 2003). The species is also listed in CITES Appendix I (CITES, 2005).

The Pawi was designated as an Environmentally Sensitive Species in 2005, giving the species the highest level of protection available under Trinidadian law. In addition, a large area of the Northern Range between Salybia and Grande Riviere has been protected as the Matura Environmentally Sensitive Area since 2004, covering a significant portion of the Pawi's current range. (see Figure 1.2).

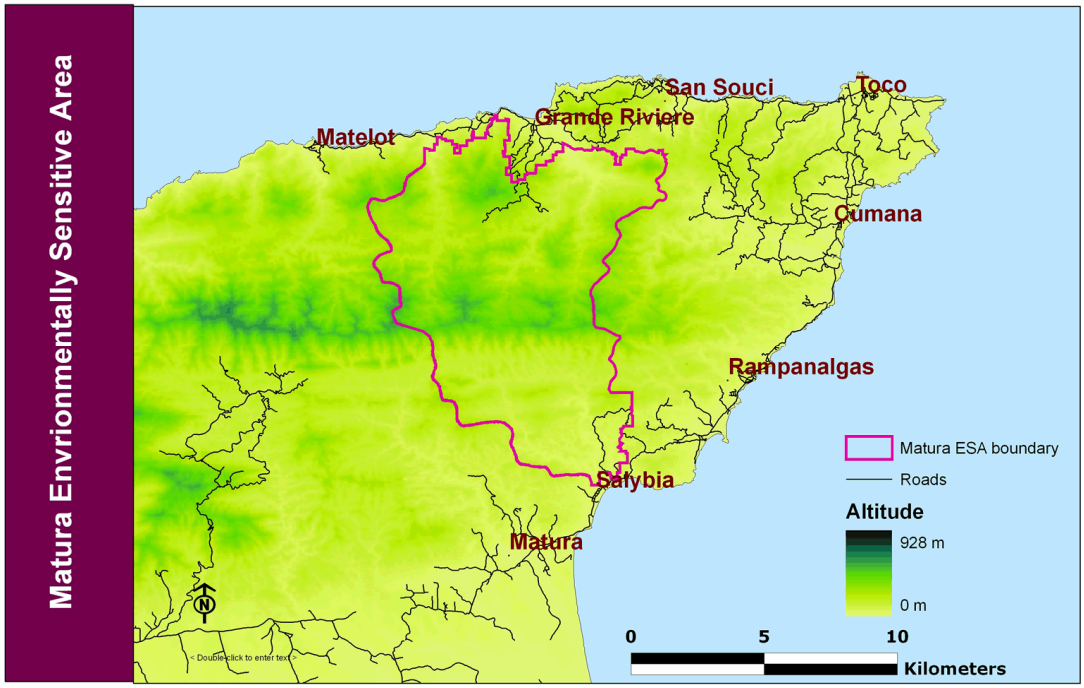

Figure 1.2: Map showing the outline of the Matura Environmentally Sensitive Area in north-eastern Trinidad. Reproduced from the University of the West Indies' Matura National Park Biological Survey website (http://www.sta.uwi.edu/fsa/maturanp/)

Despite its conservation significance, relatively little information has been available about the species' ecology and conservation status. A report by James & Hislop (1988) contained information on its ecology and the threats it faced at that time and, while subsequent status reports have been published (James & Hislop, 1997; Temple, 1998), they have contained few new data. Observational studies in 1989 and 1991 added to knowledge of the Pawi's behaviour in modified habitats (Alexander, 2002) and, more recently, surveys carried out in 1999 (Hayes, 2002) confirmed the species' extreme rarity. Our current understanding of the Pawi's ecology is well reviewed by del Hoyo & Motis (2004) and therefore only briefly summarised here.

The preferred habitat of the Pawi is believed to be primary forest with little human disturbance, although it is also commonly reported from plantations in the Northern Range. Its diet is mainly composed of fruit and seeds and individuals are thought to move over wide areas in search of fruiting plants. The contraction in range and numbers

undergone by the species has apparently been accompanied by behavioural changes. While early accounts referred to large groups, sometimes containing 15-20 individuals and often encountered foraging on the ground, recent sightings tend to be of one or two individuals which are almost exclusively reported from high in the forest canopy. Information on many other aspects of the Pawi's ecology, particularly its breeding behaviour, is very sparse, and remains mostly speculative.

Figure 1.3: A photograph of the Trinidad piping-guan (Pipile pipile), or Pawi, taken near Grande Riviere on 18th June, 2005. Photographer: Aidan Keane.

Chapter 2: Aim & Objectives

Our aim for the project was to gather the necessary data for a recovery plan for the Pawi; to produce protocols and baseline data for a long term, locally run programme of population monitoring; and to transfer the skills to be used in its implementation. This was based, in part, on the agreed priority targets described in Threatened Birds of the World (BirdLife International, 2004).

Our specific objectives, each contributing to the overall aim, are listed below. The chapter or chapters discussing each objective are given in parentheses. Where appropriate, the primary method used to address each objective is also shown. These methods are fully explained in their relevant chapters.

1. To estimate the Pawi's present numbers, providing baseline data against which future trends can be measured. (Distance sampling, Chapter 3)

2. To produce protocols for a monitoring programme in key areas of the Northern Range and put in place specific arrangements for locally run monitoring to continue beyond the initial project period. (Distance sampling, Chapter 3; Focal studies, Chapter 4)

3. To collect data on population density in relation to habitat type and human disturbance, complementing the earlier work of Dr Floyd Hayes, Dr Stanley Temple and Mr Gavin Alexander. (Distance sampling, Chapter 3)

4. To assess the particular importance of hunting, for food and sport, as a threat, in the context of the local culture and economy (Semi-structured interviews, Chapter 5)

5. To produce a recovery plan for the species, identifying key sites and providing specific management recommendations (Chapters 6 & 7)

6. To collect data, if possible, on the species' breeding biology which is currently unknown (Semi-structured interviews, Chapter 5)

7. To publicise our findings in appropriate fora and assist in the preparation of any new and unpublished findings for submission to international peer-reviewed journals (Chapter 6)

As the project progressed, we were forced to revise the focus of these objectives due to the difficulties faced in successfully surveying this species. This, and particularly the problems with the distance sampling approach, is discussed in Chapter 3.

Chapter 3: Distance Sampling

Introduction

The ability to assess populations – both in terms of knowing their absolute size and being able to detect changes in numbers of individuals – is essential to the process of choosing and targeting conservation efforts. The last estimate of the Pawi's population size was made in 1998 when is was thought that 70-200 mature individuals remained, all residing within a maximum area of 260km^2 (BirdLife International, 2004). At the time it was also thought that the population was in ongoing decline due to the effects of illegal hunting and habitat loss (BirdLife International, 2004). A clear conservation priority for this species therefore was to produce updated estimates for its population size and trend and its geographic range.

Many different techniques may be used to survey animal populations, each with its own strengths and weaknesses. In some cases it may be appropriate to attempt to count every individual within a population, an approach known as censusing, but more commonly estimates must be based upon extrapolation from samples (Gregory et al, 2004). In order for extrapolation to be valid, however, sampling designs must avoid potential biases (e.g. due to the effects of habitat variability, sampling at different times of day, differences in ability or experience between observers). This is commonly achieved by standardising the methods used between surveys and individuals, and choosing locations at random or in a stratified manner to give an adequate representation of different habitats (Gregory et al, 2004).

A further problem in surveying populations arises from the fact that not all individuals of the target species are necessarily detected, even if they are in theory within the detection range of the observer. In recognition of this an approach known as distance sampling, which includes line transects and point counts, has been widely adopted in ecology (Bibby et al, 1998). The fundamental concept underlying distance sampling is that of the detection function, which relates the distance of an object from the observer to the

probability that it is detected (Buckland et al, 2001). This can be estimated directly from observation data using software such as DISTANCE (Thomas et al, 2004).

There is already a history of using distance sampling techniques to survey the Pawi. Starting in 1998, Dr Floyd Hayes carried out point counts in the NE portion of the Northern Range (Hayes, 2002). Although their results have never been formally published, they were used for the Pawi's most recent population estimate, and their method was used as the basis for our survey.

Method

Prior to attempting a full survey, we carried out an extensive pilot study in areas which were chosen based upon several factors (see Figure 3.1). We looked specifically for locations where Pawi have been sighted in recent times based upon reports in the published literature and discussions with knowledgeable locals. Our choices were further refined through consultation with a GIS database showing the extent of forest (Nelson, 2004) and consideration of access (e.g. concentrating primarily on public land). Previous studies have suggested that the periods of greatest activity are around dawn and late afternoon so we concentrated our survey effort on these periods.

The Pawi's rarity and the lack of infrastructure in many of the areas where it is believed to persist pose problems for fieldwork. It is most often observed in the forest canopy (James & Hislop, 1988; Alexander, 2002; Hayes, 2002) and can be difficult to detect even when present (Gabrielle Drake, *pers. comm.*) so we chose to use extended point counts lasting 10 minutes to help ensure that individuals are reliably detected when present.

Although point counts often rely on sightings of objects, the same principles can be applied to other detectable cues. For our point counts we therefore supplemented visual contacts by recording vocalisations and wing-drumming when they were detected. To further improve the chances of detecting individuals when they were present we used tape playback of Pawi's piping vocalisation and wing drumming (Alexander, 2002) to

stimulate cryptic individuals to reveal themselves. The pattern of calling and wing-drumming used was chosen to mimic that regularly heard during the early morning at a study site in Grande Riviere.

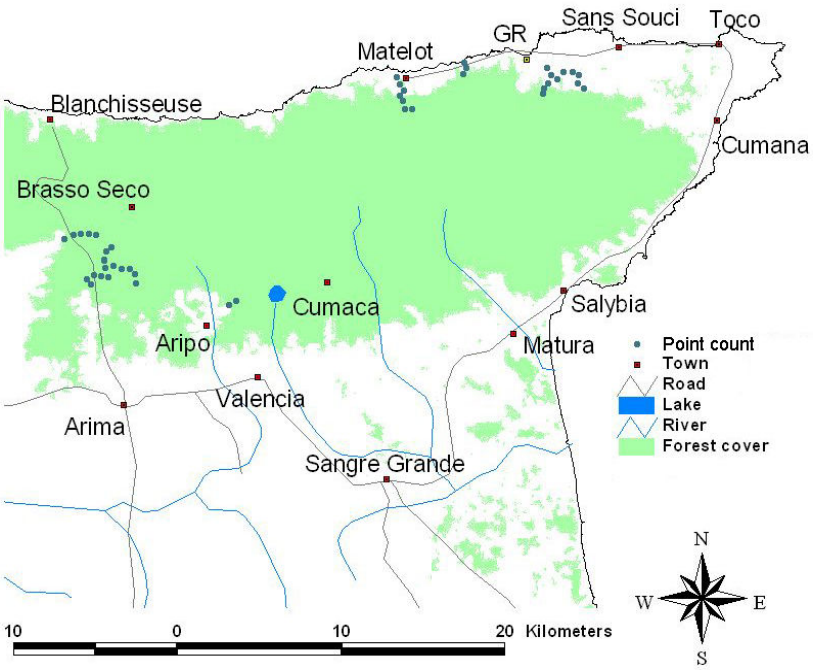

Figure 3.1: Map showing the locations of trial point counts in north eastern Trinidad.

While in the field we worked in groups of 2-3, recording any incidence of detection was on a standard results sheet, along with the details of the location, time, and potential confounding factors such as weather and vegetation type. We also recorded any signs of disturbance and calculated the distance to the nearest roads and settlements as an index of possible human impact. An example of the datasheet is included in Appendix A. The results of our pilot study, discussed in full below, suggested that distance sampling was not suitable for surveying this species and we therefore did not proceed with plans to carry out a full survey.

Results & Discussion

After an extensive pilot study the decision was taken to shift the focus away from this part of our project and devote more time to interviews and observational studies of focal individuals. The pilot included 51 trial points but no Pawi were detected.

There are several issues which render distance sampling unsuitable for surveying or monitoring this species. From our observations of Pawi it is clear that a key assumption of distance sampling – that of perfect detection at zero distance from the observer – does not hold true. The species is cryptic and dwells high in the canopy, rendering it difficult to detect even from directly below unless it is calling. Further complication arises because we do not currently know whether the Pawi's behaviour, including it calling pattern, is subject to seasonal or geographical variations (see also Chapter 4).

Even if these problems could be overcome, the effort needed to produce a statistically meaningful sample size is prohibitively large. The number of point counts that would be likely be necessary to detect a single individual can be predicted if we adopt some simple assumptions, most important being that the observer's position is random with respect to the target objects. Following Green & Young (1993) we model the detection of rare species as a Poisson process:

$$n = -\frac{1}{m}\ln\beta$$

n is the number of samples required, m is the mean population density and β is the acceptable probability of Type II error. Although this formula is designed for quadrat sampling it provides a useful basis for comparisons. Taking BirdLife International's estimates of the remaining population (70-200 mature individuals) and range (260km^2) of the Pawi (BirdLife, 2004) as a starting point, and assuming that any individuals present within a 150m radius circle of the observer were detected via their calling (see Chapter 4 for details of how this figure was arrived at) can be estimated that between 42-120 counts would be needed to detect a single individual with 95% probability. Meaningful inference cannot realistically be drawn from a sample size smaller than n=10 (Bibby et al, 1998) and ideally should be closer to n=40 (Marsden, 1999). It is therefore likely that an absolute minimum of 420 counts would be needed to produce a reliable estimate of the Pawi's population.

The effort required to carry out a single point count is high for the Pawi due to the difficult nature of terrain in the core of its range (see Figure 3.2). Accessing many areas in the heart of the Northern Range requires long, overnight trips but the need to rely on calling to detect the species limits the times when point counts can be carried out to a few hours in the early morning and late afternoon.

Figure 3.2: Photograph illustrating some of the difficulties experienced in moving around the interior of the Northern Range. Photographer: Aidan Keane.

As a result of the problems outlined here it appears that distance sampling would be very costly for a full population survey, and prohibitively so for the repeated counts needed to monitor population trends. We therefore conclude that the technique is not a practical option in this situation given the limited budget available for the conservation of the Pawi.

Chapter 4: Focal Studies at Grande Riviere

Introduction

In tandem with our distance sampling pilot we tested other techniques for studying the Pawi. These trials were intended to assess whether such techniques had the potential for use in long-term studies of the species at key sites.

Our principal study site was a location near the village of Grande Riviere where Pawi have been consistently observed for several years. The area contains a small patch of mature forest but the majority of the land consists of abandoned, regenerating plantation-land, with many cocoa (*Theobroma cacao*) and nutmeg trees (*Myristica fragrans*), and is bounded on one edge by Grande Riviere river. The prevalence of nutmeg, a component of the Pawi's diet (Alexander, 2002; James & Hislop, 1988), is often cited by locals as the reason why the species can be readily observed here. Although the plantation has not been active for decades there have been incidences of small scale clearance and agriculture.

The convenient nature of the site has made it the base for previous studies. In 1989 and 1991 A Glasgow University expedition recorded observations of behaviour and food items, as well as collecting recordings of vocalisations (Alexander, 2002). They also report one of the first documented attempts to capture Pawi for the purpose of fitting radio collars, although their efforts were not successful. Subsequently, a group from the University of the West Indies and the Caribbean Union College collected information on the species' behaviour, including habitat use and vocalisations (Hayes, 2002). Their attempts at capture were again unsuccessful.

A description of each technique trialled, any results gathered and our assessment of its potential is given below.

Call counts

The Pawi is highly cryptic so it is most easily detected by its vocalisations and wing-drumming displays (see Alexander, 2002 for a characterisation of these behaviours). In order to assess their use in studying the Pawi, call counts were conducted on 12 days from early August to early September (see Table 4.1). Observations were taken from regular positions around the Grande Riviere site, recording the time and compass bearing of any calling, wing drumming or visual sightings. Other notable events were also recorded as appropriate. The vocalisation of the Pawi at the site appeared to be confined to the morning during the period of observations and we therefore concentrated our effort around this time. When sufficient observers were available observations were carried out simultaneously at multiple locations. The maximum distance at which a piping vocalisation could be detected was estimated to be approximately 150m using GPS co-ordinates of sighted individuals, although this is likely to be quite variable, and affected by the terrain, weather and topography amongst other factors. Observers were therefore positioned at points 150m apart from one another.

Whenever Pawi were detected during early morning call count we followed up by attempting to make visual contact with the individual(s) after the call count finished (see "Individual Follows" below).

Within the period of observation the Pawi were always active before sunrise (approximately 5.45am), with calling and displaying starting around 5am. Activity ceased around 5.30am on average, and no later than 5.45am during the period in question (see Table 4.1).

Casual observations at the same site earlier in the year (late May and early June) revealed a different pattern in behaviour with individuals being active later in the morning, until approximately 9am. This change suggests that there might be seasonal variation in the Pawi's behaviour at the Grande Riviere site, although further work would be needed to verify and quantify the existence of any apparent patterns.

Date	Obs	Voc	WD	FIRST	LAST	Duration	Voc rate	WD rate	RATIO
07/08	A	29	15	04:50:00	05:25:20	00:35:20	0.82	0.42	0.52
08/08	A	11	1	05:10:00	05:15:40	00:05:40	1.94	0.18	0.09
09/08	A	29	9	04:59:10	05:22:35	00:23:25	1.23	0.38	0.31
10/08	A	4	7	05:04:00	05:22:05	00:18:05	0.22	0.39	1.75
21/08	A	85	6	04:42:00	05:26:05	00:44:05	1.93	0.14	0.07
22/08	A	27	11	04:58:50	05:28:05	00:29:15	0.92	0.38	0.41
22/08	B	42	10	05:10:03	05:34:56	00:24:53	1.68	0.40	0.24
23/08	A	18	3	05:18:00	05:45:00	00:27:00	0.67	0.11	0.17
24/08	A	44	11	04:47:20	05:25:50	00:38:30	1.14	0.29	0.25
24/08	B	40	8	04:55:45	05:25:45	00:30:00	1.33	0.27	0.20
08/09	A	21	8	05:07:40	05:24:30	00:16:50	1.24	0.47	0.38
08/09	B	10	7	05:13:00	05:30:50	00:17:50	0.56	0.39	0.70
09/09	A	10	8	05:11:50	05:25:50	00:14:00	0.71	0.57	0.80
09/09	B	2	0	05:14:00	05:14:55	00:00:55	2.00	0.00	0.00
09/09	C	39	5	05:06:25	05:41:00	00:34:35	1.13	0.14	0.13

Table 4.1: Records of Pawi observations at Grande Riviere site. Obs = observer position (from A-C), Voc = number of piping vocalisations, WD = number of wing drumming displays, FIRST/LAST = time first and last event were recorded respectively, Voc/WD rate = rate of respective events over period of observations, Ratio = WD divided by Voc.

Our observations also suggested that some day-to-day variability in behaviour may be attributable to changes in the weather. Although the apparent effects cannot be quantified using the data collected here, Pawi were seen to stop vocalising or displaying and adopt a position which seemed intended to shelter themselves from the rain.

Piping vocalisations were more numerous than wing drumming displays. No other patterns are discernable in the number or rate of vocalisation and wing drumming displays, nor in the ratio of one to the other.

Observations were taken from multiple locations on four days. Despite the relative proximity of observers the number of piping vocalisations detected varied greatly (e.g. on the 22nd August observer B noted 42 vocalisations but over the same period observer A noted only 27). Some of this difference is explained by the positions of the two observers

relative to the calling Pawi but observer error also contributed. Wing drumming can be heard from a greater distance than piping, so there is less variation in the number of displays decreed between observers. The accuracy of detection was also affected by occasional noise from Grande Riviere village, cockerels crowing, dogs barking and rain and thunder.

The technique shows great promise for the long-term study of Pawi at important sites, particularly if combined with individual follows (see below) and radio-tagging in order to better distinguish the activities of individuals.

It might be possible to estimate the number of individuals vocalising and displaying at a site but our own observations suggest that Pawi do not remain stationary during these early-morning period. Without more information on the species movements, such as might be obtained through radio telemetry studies, individuals can only be distinguished with certainty when they call or display at the same time or when they can be visually located.

Individual follows

On days when Pawi were detected during early morning call counts, we searched the area after calling had finished in an attempt to make visual contact. If the individual(s) were successfully located their movements were followed for as long as possible and their behaviour recorded.

We were able to locate Pawi after the early morning call counts on five occasions. Visual contact could usually only be maintained for a few minutes before the bird flew out of sight. Following Pawi for distances greater than a few meters is impractical due to the difficult terrain of the Northern Range. From these brief sightings no clear pattern could be discerned in the areas where the Pawi was observed, nor in the directions of their arrival or departure.

On one occasion we were able to observe an individual for an uninterrupted period of over 9½ hours, lasting from 06:59 to 16:48 on 7th August 2005. The observed behaviour was place into simple categories, and the proportion of time spent on each activity was:

Resting/Perched Alert:	83.30%
Preening:	4.17%
Walking/Other:	12.53%

These are, to our knowledge, the first records of the Pawi's time budget during the middle of the day. The figures are similar to those cited by Floyd Hayes (Hayes, 2002) for behaviour during the early morning.

In tandem with call counts we feel that this technique has potential for further use. Over a longer period of observation one could expect to have many more opportunities to observe individual behaviour and it should be possible to determine whether behaviour shows seasonal patterns.

Radio telemetry

It had initially been our intention to trial the use of radio telemetry on the Pawi to facilitate fine-scale habitat studies and behavioural observations. A grant for the purchase of radio telemetry equipment was awarded to the Pawi Group prior to the commencement of Project Pawi but the group did not feel that the safety of individuals could be guaranteed if attempts were made to capture them in order to fit radio-collars. Plans for radio telemetry were therefore placed on hold until the safety concerns could be adequately addressed.

Chapter 5: Interviews

Introduction

Human activity is thought to be at the root of the Pawi's current problems, with habitat destruction and illegal hunting cited as the two main threats to its survival (BirdLife International, 2004). The extent to which these activities are ongoing is unclear however, and the factors which motivate them remain relatively unexplored. In 1997 a large-scale education campaign was initiated (Butler, 1998) in an attempt to raise highlight the threats faced by the species. This was apparently successful in heightening awareness of the Pawi (Butler, 1998) although it has been suggested that it may have come as "too little, too late" (Temple, 1998). It is therefore important to try to understand how the species is perceived by local stakeholders, and how this influences their interactions with it.

Although the role played by hunters in the Pawi's decline has been highlighted repeatedly, we should not overlook the potentially positive contributions that they can make to the future conservation of the species. Trinidad & Tobago is fairly urbanised, with 76% of its total population residing in urban areas (UNICEF, 2006), comparable to France or Spain. Relatively few Trinidadians venture into the uninhabited parts of the Northern Range and the majority of those that do are hunters, rangers or guides. These are therefore the people most likely to encounter the Pawi and may represent important but undervalued stores of knowledge concerning its ecology, behaviour and status.

Methods

We used a form of semi-structured interview – a social research technique whereby interviews are conducted using open ended, interactive questions to encourage a conversational style (Kapila & Lyon, 1994) – to collect data on local Trinidadian's encounters with the Pawi. Each interview was conducted by two team members, one of whom lead the interview and asked the majority of the questions while the other was primarily responsible for the recording of responses. This was facilitated by the use of a standardised data sheet (see Appendix B) which helped to ensure that comparable data

was recorded in each case, although the order and nature of questions was kept deliberately flexible to make the interviews seem as natural as possible. Whenever a response was ambiguous, or we felt that more detail would be useful, one of the interviewers would ask follow up questions to elicit further information.

Semi-structured interviews have several advantages over traditional questionnaire surveys, primarily arising from their flexibility and the rapport that can be established between interviewer and interviewee. In particular, the approach helps to put respondents at ease and allows them to report information in their own way.

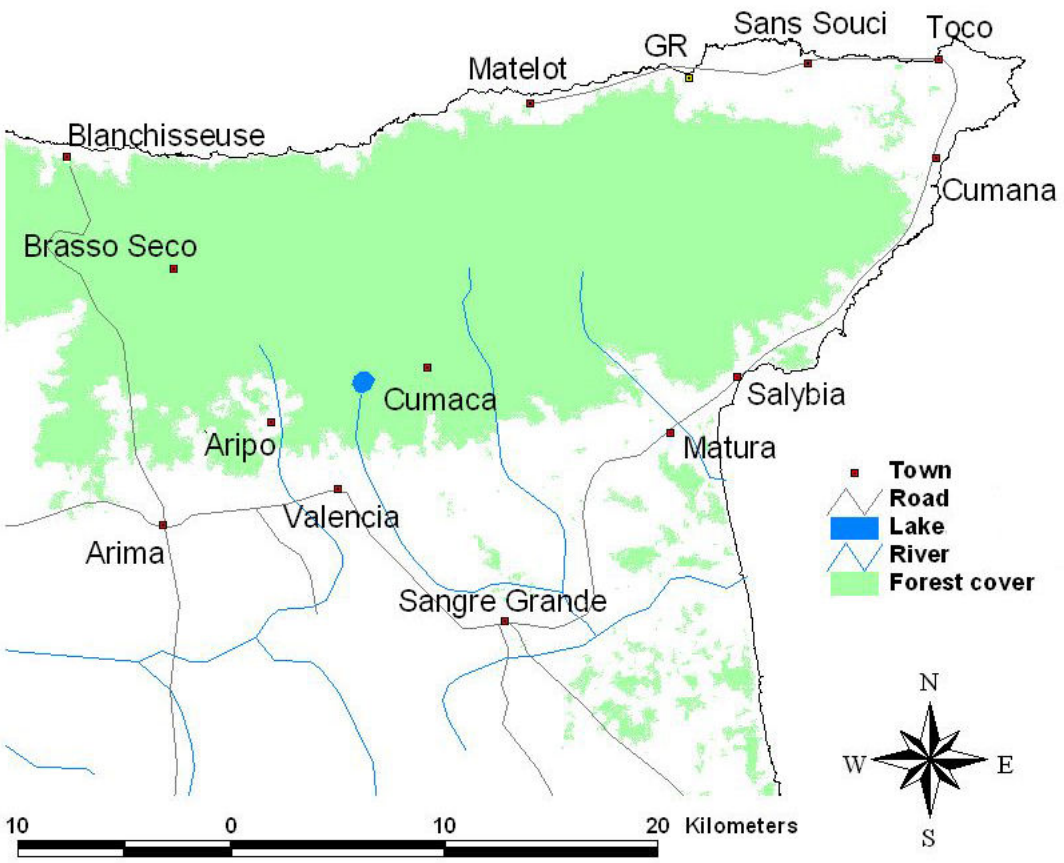

Figure 5.1: Map of north eastern Trinidad showing interview locations. Interviews were carried out in each of the towns marked except for Arima, Valencia and Sangre Grande, and along the Madamas Road (not marked), which runs east of Brasso Seco before turning North to meet the coast two thirds of the way from Blanchisseuse to Matelot, and the Anglais Road (not marked), which runs from Cumana to Sans Souci.

Interviews were carried out at villages and other settlements around the perimeter of the Pawi's suspected range (see Figure 5.1). In choosing respondents we specifically targeted people who spent a large amount of time in the forest, including hunters, government rangers, tour guides and naturalists. At the end of each interview respondents were asked whether they could suggest other candidates for interview. Using this 'daisychaining' method we were efficiently able to identify the majority of suitable respondents in a short space of time.

Results

In total 141 interviews were conducted between 30th June and 17th September, 2005. The majority (67.6%) of respondents said that they had encountered Pawi in the last 12 months (Table 5.1). In the following analyses only data on the last reported sighting is used in order to maximise the accuracy of recall.

Time since last sighting	**n**
0-1 months	39
1-3 months	17
3-6 months	18
6 months-1 year	22
1-5 years	28
5-10 years	2
10-20 years	10
Can't remember	6

Table 5.1: Time since last Pawi sighting reported by interviewees.

These sightings came from many different areas across the eastern half of the Northern Range (Figure 5.2). The number of Pawi encountered in a group appears to have decreased over time. Average reported group sizes for three time periods are shown in Table 5.2.

	n	**mean**	**median**	**mode**	**st dev**
0-1 years	94	3.1	2	2	2.2
1-5 years	27	4.2	3	2	3.7
10+ years	10	6.1	2.5	2	4.5

Table 5.2: Various measures of central tendency in the group sizes reported by interviewees.

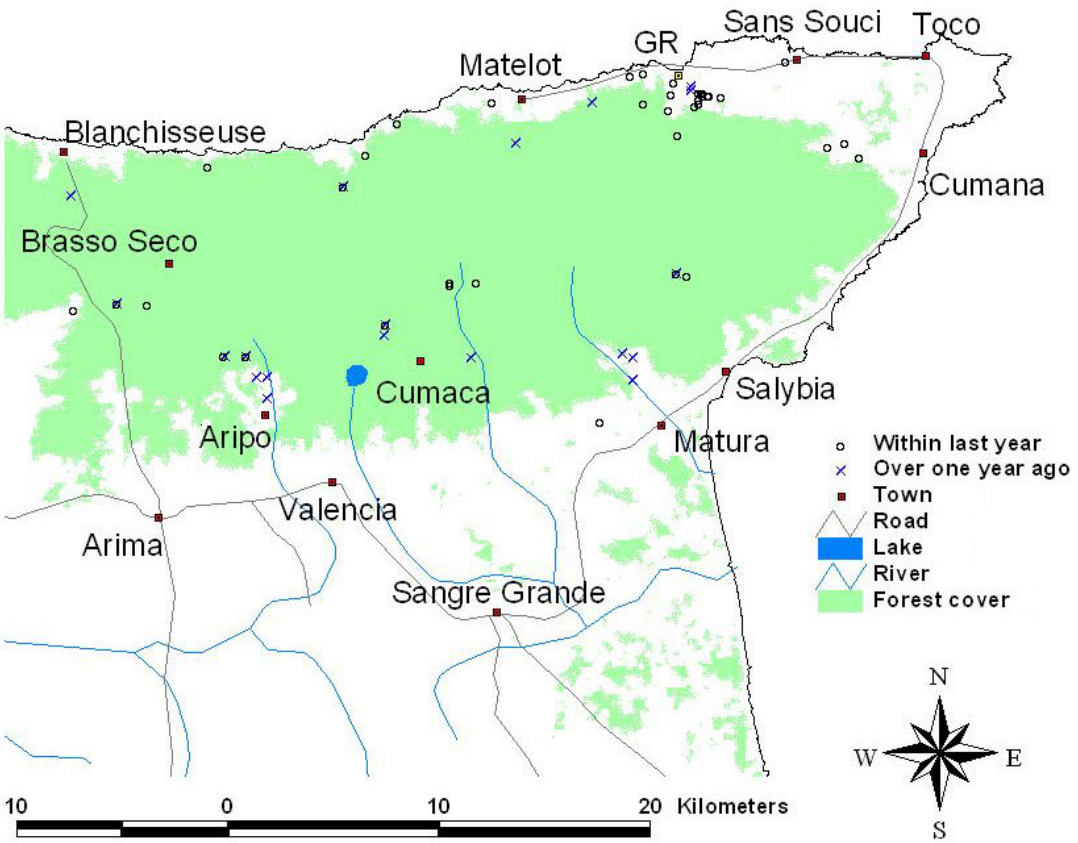

Figure 5.2: Map of north eastern Trinidad showing the location of the most recent Pawi sightings reported by interviewees. Circles indicate sightings that occurred within the last year (at the point of interview). Reported sightings that occurred over one year ago are marked by a cross.

	n	mean	median	mode	st dev
JAN	4	5.9	2.5	1	7.9
FEB	11	4.2	4	2	2.7
MAR	9	3.6	2	1	5.3
APR	3	2.3	2	2	0.6
MAY	6	2.6	2	2	1.8
JUN	4	1.9	2	2	0.3
JUL	11	3.2	2	2	1.6
AUG	34	3.0	2	2	1.7
SEP	8	2.5	2	2	1.3
OCT	2	7.5	7.5	---	3.5
NOV	6	4.4	4.8	6	1.6
DEC	5	5.6	6.5	---	2.8

Table 5.3: Measures of central tendency in the group sizes reported, grouped according to month of encounter (n = number of reports).

The average reported group size also varies over the year, with the smallest group sizes reported between March and September (Table 5.3).

There was no significant difference between the number of sightings reported from mature forest and those from plantation land (Chi-squared, df = 1, ns; Table 5.4). Over time the proportion of sightings reported from mature forest has declined.

	All		**Last year**		**1-5 years**		**5+ years**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Forest	55	50.9	36	45.6	12	60.0	7	100.0
Plantation	53	49.1	43	54.4	8	40.0	0	0

Table 5.4: Number of sightings reported from forest areas and plantations.

The size of groups encountered in mature forest was greater than those encountered in plantation land (t-test, df = 103, $p < 0.05$; Table 5.5).

	n	**mean**	**median**	**mode**	**St dev**
Forest	53	4.0	3	2	3.3
Plantation	52	2.8	2	2	1.4

Table 5.5: Measures of central tendency in the group sizes encountered in forest areas and plantations (n = number of reports).

The majority (94.2%) of respondents reported that Pawi were sighted in trees rather than on the ground. This split remains when the data are grouped according to the period that has elapsed since the sighting (Table 5.6).

	Overall		**Last year**		**1-5 years**		**5+ years**	
	n	**%**	**n**	**%**	**n**	**%**	**N**	**%**
Trees	104	94.2	81	95.3	24	96.0	9	81.8
Ground	7	5.8	4	4.7	1	4.0	2	8.2

Table 5.6: Number of encounters of Pawi in trees and on the ground.

Many interviewees reported having observed the Pawi feeding, identifying a total of 29 food plants, several of which have apparently not been reported in the literature previously (Table 5.7).

Common name	Scientific name	n
Nutmeg	*Myristica fragrans*	14
Serette	*Byrsonima coriacea*	12
Cajuca/Wild nutmeg	*Virola surinamensis*	7
Pomerac	*Eugenia malaccensis*	3
Bois canot	*Cecropia peltata*	2
Fiddlewood	*Vitex compressa*	2
Wild caimite	*Chrysophyllum sp.*	2
Balata	*Manilkara budentata*	1
Clove seed	*Syzygium aromaticum*	1
Cocorite	*Attalea regia*	1
Coffee seeds	*Coffea sp.*	1
Hog plum	*Spondias mombin*	1
Immortelle	*Erythrina poeppigiana*	1
Kiskidee	*Vismia cayennensis*	1
Lange gaco	*Lansium domesticum*	1
Matak	*Asclepias curassavica*	1
Peewah	*Bactris gasipaes*	1
Plum	*Spondias mombin purpurea var. lutea*	1
Wild cherrie	*Flacourtia indica*	1
Wild fat pork	*Chrysobalanus icaco*	1
Wild grigri	*Bactris cuesa/savannanum*	1
Wild tobacco	*Dunalia arborescens*	1
Bois lay-lay	*Cordia spp.*	1
Jereton	*Didymopanax morototoni*	1
Lacre tree	*Vismia spp.*	1
Manjack	*Corida collococca*	1
Matapal	*Clusia rosea*	1
Matchwood	*Didymopanax morototoni*	1
Sardine	*Laetia procera*	1

Table 5.7: Pawi feed plants reported by interviewees (n = number of reports).

The most commonly reported were Nutmeg (*Myristica fragrans*), Serette (*Byrsonima coriacea*) and Cajuca, or Wild Nutmeg, (*Viriola surinamensis*). It is not clear whether Nutmeg and Cajuca were properly distinguished by interviewees, but together they are by far the most reported food item for the Pawi making up 21 reports out of 64 (32.8%). A further 15 interviewees reported a food item but were not able to give sufficient information for us to identify the species with confidence.

Respondents were also asked whether they had encountered juvenile Pawi, or their eggs or nests. In total 33 interviewees reported young Pawi while 15 said that they had found nests and 10 reported seeing eggs. The months in which these sightings occurred are given in Table 5.8.

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Juvenile	?	?	?	X	X	?		X		X	X	?
Egg				X	X		X	X				
Nest	?	?	?	X	X		X	X				?

Table 5.8: Calendar of reported signs of Pawi breeding activity. X = report specifies month; ? = report mentions possible range of dates for sighting (e.g. "dry season", or "January to March time")

Opinions were divided on the question of whether the population of the Pawi was increasing, decreasing or staying constant, 38.4% believing that the population was increasing in size while 30.4% thought that is was decreasing (Table 5.9).

	All		**Hunters only**		**Non-hunters only**		**Opinions based on personal observation**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
No, decreased	34	30.4	25	27.5	9	42.9	8	32.0
No, increased	43	38.4	37	40.7	6	28.6	8	32.0
Yes, stayed the same	17	15.18	14	15.4	3	14.3	9	36.0
No opinion	18	16.07	15	16.5	3	14.3	---	---

Table 5.9: Interviewees' opinions on trends in population of the Pawi.

A wide variety of justifications were given for these opinions. Of the 76 respondents who were able to give an opinion only 25 (32.9%) referred to their own encounter rate with the species rather than relying on inference (i.e. "I see the Pawi more often than I used to" as opposed to "I think that they are more numerous because people do not hunt them here" or the like). Within this group the numbers of respondents thought that the Pawi population was increasing, decreasing or staying the same were about equal (32.0%, 32.0% and 36.0% respectively).

Discussion

Data quality

Although local knowledge is potentially a very valuable resource for conservation, there are significant limitations to its use which should be acknowledged. One fundamental problem in trying to assess population trends or ecological traits through the use of interview data is that any patterns detected could result from the behaviour of the interviewees rather than the process we are truly interested in. Any attempt to interpret trends and patterns should therefore bear in mind the possibility of an anthropogenic explanation.

Further difficulties arise from the limitations of human recall. The accuracy of recall diminishes with increasing time after the event and a person's ability to remember details may be affected by the significance that they held for them. Several of our interviewees, for example, commented that recalling aspects of a specific encounter was difficult because they were not really interested in the species so paid it little attention.

The Pawi is a protected species in Trinidad and its status as such is widely recognised. Any hunting of the species is therefore illegal, creating an incentive for hunters to refuse to answer questions or lie if they feel that it could result in punishment. Conversely, hunters might also wish to boast about their prowess in capturing a rare species. We tried to minimise these effects by not asking questions about illegal activity, but it is not possible to tell whether this potentially biasing was avoided entirely.

In the following discussion we have tried to be mindful of the limitations outlined above but we cannot be sure that their effects have been avoided. We therefore envisage the primary role of these results being to stimulate and direct further enquiry.

Population status and range

Several of our results offer encouragement about the conservation status of the Pawi. The position of sightings reported to us (Figure 5.2) should reflect both the distribution of the

species itself and the areas most often visited by people. We would therefore expect that the distribution of sightings would broadly delineate the margins of the Pawi's range. Establishing an accurate location for sightings from interview data is difficult, and the precision varies from one report to the next, but (1) a comparison of our results with a previous estimate of the species' extent of occurrence (BirdLife International, 2004), and (2) a comparison of reported sightings from the last year with reports from earlier years, both suggest that the species range has most likely not suffered a major contraction in the past 5-10 years. A second positive finding is that approximately two thirds (67.6%) of the most recent sightings reported occurred during the twelve months preceding Project Pawi. Thus it appears that the species is still encountered quite regularly where interviews were conducted.

When interviewees were asked directly whether the Pawi population had increased, decreased or stayed constant, opinions were very evenly divided. This statistic masks some differences however. A greater proportion of hunters, for example, thought that the species was increasing (40.7%) in numbers than thought it was decreasing (27.5%). There were also differences in the strength of argument supporting these opinions, ranging from direct observation of encounter rates to inference based on unsubstantiated assumptions. When we limited the analysis to those people who had based their opinion on the frequency of their own encounters with the species virtually the same proportion though that the population was increasing, decreasing and staying the same (32.0%, 32.0% and 36.0% respectively).

If one accepts the hypothesis that a real decrease in overall population size would be reflected in smaller group sizes then our data might provide support for a continuing population decline. Mean reported group size is lower in sightings that occurred between one and five years ago (6.1 individuals per group) than in those from more than five years ago (4.2 individuals per group), and lower still in sightings from the last year (3.1 individuals per group). Other explanations are, however, equally plausible. Average group size might have declined for another reason, independently of overall population size. Alternatively, changing patterns of human behaviour might account for the apparent

trend. Table 5.5 shows that the mean group size reported from plantations is significantly smaller than the mean group size reported from mature forest (2.8 and 4.0 individuals per group respectively). If people are venturing shorter distances into the forest, preferring instead to stay in and around their plantations, this could also have contributed to the observed change.

Breeding biology

Table 5.3 shows a variation in the size of group encountered over a year with smaller groups on average reported between March to September, an particularly from April to June. Interestingly, all reported signs of breeding that could be placed in a particular month (rather than a vaguer indication such as 'in the dry season', for example) occurred between April and August (Table 5.8). One interpretation of this could be that the Pawi breed in these months, and that the smaller group sizes reported between March and September result from a greater number of encounters with single males or breeding pairs. Although it remains speculative, this interpretation also makes biological sense since the Trinidad's wet season begins around the start of June, and one might expect breeding to coincide with the increased availability of food that this brings. Despite this, alternative explanations cannot be ruled out. The hunting of non-protected species is allowed on Trinidad & Tobago outside of a closed hunting season which runs from the beginning of March to the end of September. This also coincides with the period of lowest average reported group size (although there is apparently no relationship with the absolute numbers of encounters), potentially causing unknown confounding effects in either the species' ecology or human behaviour and reporting patterns.

Other observations

An important advantage of semi-structured interviews is that they area easily able to accommodate the collection of useful, but unanticipated information. We were therefore able to gather observations on topics which were not directly addressed our interviews.

Although non of our interviewees was asked whether they hunted Pawi, several either admitted to having done so or told us of others who had. In light of this it seems likely

that hunting persists and continues to be a threat, although its extent cannot be judged from the data available. The problems of hunting may be exacerbated by misconceptions that we heard repeated on several occasions. For example, a commonly expressed view was that the species would move to another area when subjected to hunting and that this – rather than an overall decline in numbers – explained any apparent scarcity. We also observed that although the majority of interviewees recognised that the Pawi was protected, very few understood why it is special or knew that it was rare or endemic to Trinidad. A more positive finding was that fewer young people are taking up hunting, and it might therefore be expected that pressure from hunters will gradually decrease over time. Conversely, however, general environmental awareness might also decline and cause diminished concern for the conservation of the Pawi and its habitat in the Northern Range.

Chapter 6: Outputs

In addition to the data collection outlined in the previous chapters, Project Pawi produced several other significant outputs.

Literature archives

Much of the work done on the Pawi has remained in the grey literature. In trying to establish what had been achieved at the start of Project Pawi we referred to a number of student projects, unpublished reports and other material which was difficult and time consuming to obtain. We therefore produced a small collection containing all the references we were able to find, leaving copies with the Pawi Study Group, UWI and the Grand Riviere Nature Tour Guide Association (GRNTGAss) to provide a reference for future researchers and help ensure that the knowledge is not lost.

Awareness

Our work brought us into contact with a large number of hunters throughout the Pawi's range in north-eastern Trinidad. Although the project did not include a formal education component we took care to explain why the Pawi is such an important species for Trinidad and a conservation priority. As discussed in Chapter 5, many hunters do not realise why the Pawi has been granted protection. Raising awareness therefore continues to be vital since even low levels of poaching can pose a serious threat to small populations.

Formal talks & presentations

Since the start of Project Pawi two formal presentations have been given on our work. The first was given to the Trinidad & Tobago Field Naturalist's Club, an active society with approximately 250 members, on 11th August, 2005. The second was at the World Pheasant Association convention on 14th October, 2006.

In addition to these presentations, we maintained contact with the Pawi Study Group, regularly speaking at their monthly meetings, and met with representatives of the

Forestry Division and Wildlife Section and with the Presidents of the GRNTGAss and the Pawi Group at Matelot, to explain the purpose of our project and its findings up to that point.

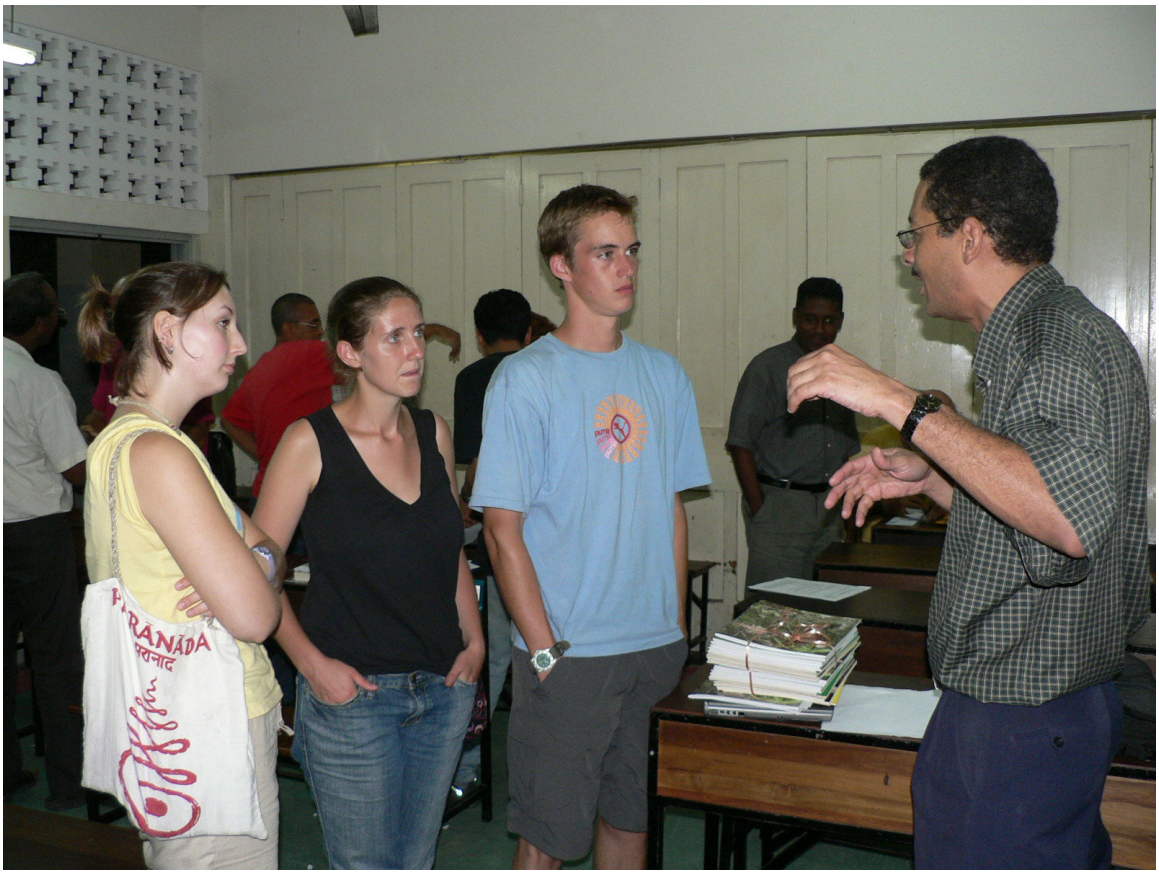

Figure 6.1: Some of the Project Pawi team in discussion after attending a TTFNC meeting. Photographer: Margaret Cooper.

Trialling of research techniques

Although the timescale of our study restricted the amount of information that could be collected, we were able to trial several techniques such as call counts which might be of use to future researchers (see Chapters 3 & 4). Furthermore, by working closely with local students and Trinidadians we were able to pass on skills required for their implementation.

Capacity building

The Project Pawi team included several Trinidadian students who were involved in the planning and implementation of all aspects of our fieldwork. This was vital to the success of the project and played an important role in building capacity for the future of conservation within Trinidad, both in terms of sharing of knowledge and encouraging an independent and proactive approach to fieldwork.

Figure 6.2: Members of the Project Pawi team and the Pawi Group at a Pawi Group meeting. Photograph courtesy of Margaret Cooper.

Chapter 7: Discussion & Recommendations

Our principal aim for this project was to collect data to allow the preparation of a recovery plan for the Pawi. The extent to which we were able to address this problem was limited, however, by the failure of distance sampling as a tool for assessing the species' population. In light of this, two of our seven initial objectives could not be tackled directly: we were unable to produce a revised estimate for the Pawi's population (Objective 1) or assess the effects of habitat type and human disturbance on population density (Objective 3) and the preparation of a full recovery plan (Objective 5) would therefore be premature.

Some progress has been made towards establishing monitoring protocols (Objective 2), although this requires further work. Documenting the unsuitability of distance sampling for surveying the Pawi is an important step, and allows us to shift attention to other alternatives. Two possibilities which are further discussed below are to establish a system of participatory monitoring based on the reporting of encounters by local forest users, or to initiate long term call count studies (for a discussion of the method see Chapter 4) to track changes in group size at important sites. Our findings concerning the Pawi's current range (see Chapter 5, and particularly Figure 5.2) can help to inform the choice of these sites (contributing to Objective 5).

Our results have contributed to our understanding of the Pawi's reproductive ecology (Objective 6) and we hope that this will stimulate further enquiry into the topic. In addition they demonstrate the continued importance of hunting as a threat (Objective 4) and have highlighted several factors which might contribute to the problem (see Chapter 5).

We have made a good start in publicising our findings (Objective 7), presenting results to relevant government departments, prominent NGOs and individuals in both Trinidad and the United Kingdom (see Chapter 6). These efforts will of course be continued whenever suitable opportunities present themselves.

Recommendations

Based upon our experience we would like to propose the following recommendations. These are by no means the only actions that could be taken to improve the Pawi's prospects, but we believe they are achievable and worthwhile aims.

Talking with hunters from villages throughout the eastern Northern Range revealed many interesting things but the clearest message, in our opinion, was that there is still a need to reduce the threat of hunting to the Pawi and address some of the misconceptions revealed in our interviews. Achieving this will require a well thought-out education programme to promote conservation awareness. Targets for a long term, coordinated programme of education might include both the hunters who currently threaten the species and schoolchildren who will be the next generation's decision-makers. Other avenues for promoting the conservation of the Pawi, such as the annual Tourism Fair, could have a very positive impact on the perceptions of the wider public and should be pursued whenever possible.

A rational approach to the Pawi's conservation requires information on the species' home range, habitat specificity and movement patterns amongst other things. Such data would also help to facilitate the preparation of updated population estimates. Many fundamental aspects of the species, however, are unlikely to be understood without a well supported radio-tracking study. If the resources for such a study are not immediately available, steps could still be taken towards facilitating radio-tracking in the future through a series of small scale pilot studies into capture and tagging, for example.

Although we cannot currently be sure how the behaviour of the Pawi at Grande Riviere has been affected by their proximity to humans and frequent disturbance, this should not diminish the importance of continuing to study this population. It seems inevitable that human-modified landscapes will play a role in the future of the species and understanding its ecology in anthropogenic ecosystems may prove to be just as important to conservation efforts as its ecology in (shrinking) mature forests. Specifically, regular call counts at Grande Riviere would build on the data collected in Project Pawi and help to

determine whether the species' behaviour follows seasonal patterns and whether it is affected by the weather, number of individuals present or other factors. A long term series of observations here might also provide a simple barometer of the fortunes of the species in this area, and provide opportunities to make further behavioural observations such as whether the same individuals are being observed time and time again or whether the population is more dynamic.

Our final recommendation would be to increase efforts to involve local people, perhaps hunters, in conservation initiatives. These people spend large amounts of time in the Pawi's habitat and therefore represent the best source of information available to conservationists. It might therefore be possible to design a monitoring system for the species based upon reporting of encounters by forest-goers. If such a scheme were to be successful, however, it would require incentives to ensure that respondents reported sightings accurately. One option would be to incorporate monitoring as a requirement for hunting licenses, while another might involve small payments for voluntarily reporting encounters.

References

Alexander, G.D., 2002. Observations of the endangered Trinidad Piping-Guan (*Pipile pipile*), or Pawi, in Northern Trinidad. Pp. 119-130 in Hayes, F.E. and Temple, S.A., eds. (2002) 'Studies in Trinidad and Tobago Ornithology Honouring Richard ffrench', Occ. Pap. 11. Dept. Life Sci., Univ. West Indies, St Augustine.

Alliance for Zero Extinction, 2003. Website <www.zeroextinction.org/>, accessed 11th February, 2005

Bibby, C., Jones, M. and Marsden, S., 1998. Bird Surveys. Expedition Advisory Centre, Royal Geographical Society. London.

BirdLife International, 2004. Threatened Birds of the World 2004. CD ROM. Cambridge, UK: BirdLife International.

BirdLife International, 2006. Species factsheet: *Pipile pipile*. Website <http://www.birdlife.org>, accessed 26th March, 2006

Brooks, D.M., Olmos, F. & Begazo, A.J. (eds), 1998. Biology and Conservation of the Piping Guans (*Aves: Cracidae*). Special Publication 1. Cracid Specialist Group, Houston, Texas.

Brooks, D.M. and Strahl, S.D. (compilers), 2000. Curassows, Guans and Chachalacas. Status Survey and Conservation Action Plan for Cracids 2000-2004. IUCN/SSC Cracid Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK. viii + 182 pp.

Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L. and Thomas, L., 2001. Introduction to Distance Sampling. Estimating abundance of biological populations. Oxford University Press.

Butler, P., 1998. Promoting Pride in the Pawi. A Conservation Education Campaign for North Eastern Trinidad. RARE Centre for Tropical Conservation. Philadelphia.

CITES, 2005. Convention on the International Trade in Endangered Species, website <http://www.cites.org/>, accessed 11th February, 2005

Delacour, J. and Amadon, D., 1973. Curassows and Related Birds. 1st edition. The American Museum of Natural History of New York.

del Hoyo, J., 1994. Family Cracidae (chachalacas, guans and curassows). Pp. 310-363 in 'Handbook of the Birds of the World, Vol. 2. New World vultures to guineafowl.' (J. del Hoyo et al., eds.). Lynx Edicions, Barcelona.

del Hoyo, J. and Motis, A., 2004. Trinidad Piping Guan. Update Chapter. Pp342-476 in Delacour, J. & Amadon, D., 'Curassows and related birds.' 2nd edition. Lynx Edicions & the National Museum of Natural History, Barcelona & New York.

Grau, E.T., Pereira, S.L., Silveira, L.F., Höfling, E. and Wajntal, A., 2005. Molecular phylogenetics and biogeography of Neotropical piping guans (Aves: Galliformes): *Pipile* Bonaparte, 1856 is synonym of *Aburria* Reichenbach, 1853. Molecular Phylogenetics and Evolution 35: 637-645

Green, R.H. and Young, R.C., 1993. Sampling to detect rare species. Ecological Applications 3(2): 351-356

Gregory, R.D., Gibbons, D.W. and Donald, P.F., 2004. Bird census and survey techniques. pp. 17–55 in Sutherland, W.J. Newton, I. & Green, R.E. (eds), 'Bird ecology and conservation: a handbook of techniques'. Cambridge University Press.

Haverschmidt, F., and Mees, G.F., 1994. Birds of Suriname. Vaco, Paramaribo.

Hayes, F.E., 2002. Current Research Projects. Status ecology and behaviour of the endangered Trinidad Piping-Guan (*Pipile pipile*). Website <www.geocities.com/floyd_hayes/research_piping-guan>, accessed 11th February, 2005

Hilty, S. L., 2003. Birds of Venezuela. Princeton University Press, Princeton, New Jersey.

Hilty, S. L., and Brown, W.L., 1986. A guide to the birds of Colombia. Princeton University Press, Princeton, New Jersey.

IUCN, 2004. 2004 IUCN Red List of Threatened Species. Website <www.redlist.org>, accessed 11th February 2005

James, C. & Hislop, G., 1988. Status and conservation of two cracid species, the Pawi or Trinidad Piping Guan (*Pipile pipile*) and the Cocrico (*Ortalis ruficada*) in Trinidad and Tobago. Report presented at the II International Cracid Symposium, Feb/Mar 1988, Caracas.

James, C. and Hislop, G., 1997. Status and Conservation of the Trinidad Piping Guan or Pawi (Pipile pipile). Pp. 242-247 in Strahl, S.D., Ellis, S., Brooks, D.M., Begazo, A.J., Sedaghatkish, G. & Olmos, F. (eds), 'The Cracidae. Their Biology and Conservation'. Hancock House, USA & Canada.

Kapila, S. and Lyon, F., 1994. People Oriented Research. Expedition Advisory Centre, Royal Geographical Society. London.

Marsden, S.J., 1999. Estimation of parrot and hornbill densities using a point count distance sampling method. Ibis 141(3): 377-390

Nelson, H.P., 2004. Tropical forest ecosystems of Trinidad: Ecological patterns and public perceptions. Ph.D. Dissertation, University of Wisconsin, Madison

Pereira, S.L., Baker, A.J. and Wajntal, A., 2002. Combined Nuclear and Mitochondrial DNA Sequences Resolve Generic Relationships within the Cracidae (Galliformes, Aves). Systematic Biology 51(6):946

Remsen, J.V., Cadena, C.D., Jaramillo, A., Nores, M., Pacheco, J.F. , Robbins, M.B., Schulenberg, T.S., Stiles, F.G., Stotz, D.F. and Zimmer, K.J., 2006. A classification of the bird species of South America. American Ornithologists' Union. Website <http://www.museum.lsu.edu/~Remsen/SACCBaseline.html>, accessed 10/12/06.

Ridgely, R.S., and Greenfield, P.J., 2001. The birds of Ecuador. Vol. I. Status, distribution, and taxonomy. Cornell University Press, Ithaca, New York.

Sibley, C.G. and Monroe, B.L., 1990. Distribution and taxonomy of birds of the World. Yale University Press, New Haven, Connecticut.

Temple, S.A. (1998). The status of *Pipile pipile* in Trinidad. P. 13 in Brooks, D.M., Olmos, F. & Begazo, A.J. (eds). 'Biology and Conservation of the Piping Guans (*Aves: Cracidae*)'. Special Publication 1. Cracid Specialist Group, Houston, Texas.

Thomas, L., Laake, J.L., Strindberg, S., Marques, F.F.C., Buckland, S.T., Borchers, D.L., Anderson, D.R., Burnham, K.P., Hedley, S.L., Pollard, J.H. and Bishop, J.R.B., 2004. Distance 4.1. Release "2". Research Unit for Wildlife Population Assessment, University of St. Andrews, UK. Website <http://www.ruwpa.st-and.ac.uk/distance/>, accessed 11th February, 2005

UNICEF, 2006. Country Information – Trinidad. Website <http://www.unicef.org/infobycountry/trinidad_tobago_statistics.html>, accessed 10th December, 2006.

Appendix A – Distance Sampling Sheet

Date:	**Grid square:**
AM/PM:	**Area:**
Observer:	**Others present:**

Point ID	Co-ordinates						Time		Interruptions			Weather			Habitat			No. Pawi	Diagram done?	Notes (e.g. evidence of hunting? type of roads?)
	GPS/Map	N	W	Acc.	4+	Elev.	Start	End	Start	End	Reason	Cloud	Wind	Rain	Canopy	1y/2y	Type			

Appendix B – Interview Data Sheet

Data sheet

Introduce selves, ask whether they are busy and, if not, whether they can spare time to answer a few questions. Explain study and purpose of questions before starting.

Name:	
Age:	
Occupation:	
Place of residence:	

Q1. Have you ever see the Pawi in the wild? YES NO

If YES, go to next question.
If NO go to Q13.

Q2. When did you last see the Pawi?

0 – 1 month	☐	5 – 10 years	☐
1 – 3 months	☐	10 – 20 years	☐
3 – 6 months	☐	Over 20 years	☐
6 months – 1 year	☐	Can't remember	☐
1 – 5 years	☐		

Q3. Can you remember what time of year it was? *(Mark on most accurate scale possible)*

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Rainy season/ Dry season

Open hunting season/ Closed hunting season

BirdLife INTERNATIONAL

WILDLIFE CONSERVATION SOCIETY

bp

CONSERVATION INTERNATIONAL

FAUNA & FLORA International

Data sheet

Q4. Can you remember what time of day it was? *(Mark on most accurate scale possible)*

Morning/ Daytime/ Evening/ Night time

Dark/ Light

Q5. Where in Trinidad did you see the birds?

(Be as specific as possible: walking time from nearest village, landmarks – hills, rivers; nearest trace or road)

Q6. Is the area in: deep forest estate/plantation land

Q7. How many birds did you see together?

Q8. Were they: in the trees on the ground both

Q9a. Have you seen Pawi on other occasions? YES NO

Q9b. If YES, where?

Q9c. If in different area from above, then when?

Q9d. If in same area as above, then how frequently?

Data sheet

			Year	Time of year
Q10a. Largest group size observed				
Q10b. Smallest group size observed				
Q10c. Different sizes of birds?	YES	NO		
Q10d. Nest seen?	YES	NO		
Q10e. Eggs seen?	YES	NO		

Q11a. How often are you in the forest? AND Q11b. When were you last in the forest?

(Please note if there is a difference between open and closed hunting seasons)

Q12a. Do you think that the number of Pawi in the forests you visit has stayed the same over the past 20 years?

No, increased ☐ No, decreased ☐ Yes, stayed the same ☐

Q12b. Why?

Q13. Can you think of anyone else who has seen them OR reports of promising sites?
(Use blank sheet for additional detail if necessary)

Remember thanks and goodbyes and explain when and where copies of results will be available if there is interest. Ask if they'd like an info sheet on the project.

DATE CONDUCTED: *INTERVIEWERS PRESENT:*

PLACE:

BirdLife INTERNATIONAL

WILDLIFE CONSERVATION SOCIETY

bp

CONSERVATION INTERNATIONAL

FAUNA & FLORA International