

Paraguay 2003 Interim Expedition Report

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Summary

In summer 2003 we were sitting down in the pub, grumbling about the London drizzle and wondering how we might spend the long break from uni when someone remembered a careers talk we'd had a few months previously that had mentioned student-led expeditions. South America seemed like an interesting place to go – but how to get there? And could we really raise the money? Just over a year later we were sat at the same tables, this time sharing a drink with friends in the warm June sunshine, saying goodbye to everyone before dashing to the airport to jet off to Sao Paulo in Brasil.

We were on our way to Paraguay, a small landlocked county in the centre of South America. Over the next six-and-a-half weeks we traipsed through over 750 miles of forests, fields, plantations and marshes, racking up over 350 hours of wildlife observations and surveys plus a lot of early mornings and barbeques.

In this interim report we describe our aims, travels and methodology as well as presenting our data and preliminary conclusions. We also give some of our cultural impressions of Paraguay, a country we found to be as fascinating and exciting as it was contradictory and (to our eyes) underdeveloped.

Acknowledgements

Without support from all the following people and organisations we'd never have reached the airport, let alone completed an expedition.

Firstly, we'd like to thank our sponsors, many of whom also had helpful advice and tips as well as funding what began as a crazy scheme but rapidly evolved into a going concern. Our chief financier and supporting institution was the Exploration Board of Imperial College London, who provided logistical support, advice and arranged our insurance as well as a substantial expedition grant. Generous personal contributions from a number of individuals constituted the bulk of the rest of our funding.

We are also indebted to: Rafael Carlstein and his company, Florido S.A. on whose Caaguazu estancia we carried out most of our work and who had much useful information; Guyra Paraguay and especially Dr. Rob Clay, their project director who provided us with maps, info and ideas we would never have had, as well as dispensing emergency advice down the phone whenever the real world collided with our plans; Señor Mario Hernandez, who allowed us to study his farmland, and the directors and staff of Golondrina, where we carried out the final part of our study.

Lastly thanks are due to the staff of Harrods, Knightsbridge and Snappy Snaps, South Kensington, who gave us friendly advice as well as competitive rates.

Introduction

The ecology of both atlantic forests and hardwood plantations have been studied before in some depth, although only a small proportion of work has been carried out in Paraguay. On the other hand, the relative differences in diversity between these two habitats have yet to be explored, as most studies have hitherto concentrated on one type of habitat alone.

We obtained estimates of the avian diversity of three differently managed habitats in the same area of eastern Paraguay: Primary Atlantic Forest, a medium-scale hardwood logging plantation and intensively farmed agricultural land. Our preliminary results indicate a higher diversity on the plantation than agricultural land, with the highest diversity found in the primary forest.

Obviously, these results represent a first analysis; more detail will be found in the 'Biodiversity and land management in eastern Paraguay' section below. This interim report (we hope to publish the full finished report in Spring 2004) also contains some of our cultural impressions of Paraguay and Latin America and a description of our activities. A selection of maps, photos and the full unedited expedition log are included as annexes for reference.

Biodiversity and land management in Eastern Paraguay

Our stated scientific aim was to assess the biodiversity in a sustainably managed hardwood plantation and compare it with untouched natural primary forest to establish to what extent this form of silviculture maintains diversity. We also studied diversity in intensively farmed agricultural land for further comparison. We used avifauna diversity as a measure of total diversity, a commonly used technique that is acknowledged as suitable for performing rapid biodiversity assays of the kind we wanted to do (Bibby *et al.*, 1993). This technique relies on the assumption that the number of different bird species present in an ecosystem reflects the number of available niches; and that since vacant niches are usually filled, this represents an estimate of the invertebrate, plant and overall diversity.

Our method of sampling bird diversity was to utilise a non-stratified point count system of surveying, with all observations made by an observer in the field logged by unique cumulative absolute time, as well as the actual time. This allowed us to pool all our results together in layered non-adjusted cumulative encountered curves, which enables us to quickly produce rough first estimates of avian diversity in the given ecosystem studied. Because our data was recorded and preserved in separate 'observer layers', however, we have the ability to retrospectively perform more subtle statistical transformations on the data, such as McKinnon (species) list analysis and timed list analysis. To date these have not been performed but we intend to do so for our final scientific report.

We also began recording rudimentary behavioural data from the middle of our second field week. Using a five-category code system we recorded the behaviour of our subjects as we encountered them. It is hoped that we can use this data to further explore the differences between the three areas studied. For example, if many records show territorial or nesting behaviour for a particular species then it may well be that it is heavily dependent upon the area in question; altering the ecology of that area would be likely to have an adverse effect on that population. Conversely, species usually only sighted overflying an area are less likely to be dependent on that area or affected by changes to it. This analysis is not currently complete.

Our studies typically consisted of three to four hours of birding per day per person, usually spent wandering more-or-less randomly within an area. However, we recorded which sub-areas we surveyed in and at what time of day as we went along to keep track of bias and tried, as far as possible, to uniformly cover all areas and times of day. A full breakdown of this information will be included in the final report.

Florida: Managed forestry.

Our first and principal area of study was the Florida S.A. plantation (owned by Rafael Carlstein) around 60km north of Ruta VII in the Caaguazu province of eastern Paraguay. The plantation area itself was reasonably large (approx 12km wide by 7km deep at maximum dimensions, or around 600ha total) and we expected that a large proportion of this would be large, actively managed, single- or mixed-variety tree stands following a classic 'plantation' model.

However when we arrived we quickly realised that this was not the case. Interviews with the plantation personnel, GIS data supplied by Guyra Paraguay and preliminary vegetation surveys made in the first week (and expanded upon in the final

week) revealed a very different picture. We have not yet produced a full fair-copy map or plan presenting all the vegetation information we collected, but it can essentially be described thus: Firstly the number and extent of monoculture or mixed (two-variety) stands represented only a very small area of the plantation, maybe as little as 1% of the total area and certainly not more than 30ha. Secondly, these areas were highly fragmented and often laid out in linear strips of no more than a couple of hundred metres' width. As a result we would have had great trouble eliminating bias due to edge effects from our data. Lastly, the remaining area of the plantation (mainly secondary Atlantic forest, with some primary forest to the NW) was under a variety of management schemes, including total clearance for agriculture as well as selective logging and enrichment. Furthermore, the degree of human activity varied continuously throughout the plantation, with high-intensity areas (such as tree nurseries, fruit orchards and a sawmill) being located close to the main road. This graded into medium-impact activities (roads, maize fields) then areas at the furthest extent of the plantation with little or no human activity - here logging might occur only occasionally, hunting trips by Indians the only other activity.

This heterogeneity of habitats and diversity of land uses presented us with a dilemma; now that the original scenario we had envisaged had changed, how would we pursue our study? One important factor was time. We had timetabled 5 days for mapping, preliminary surveys and species acquaintance. Unfortunately we didn't realise until the start of the second week in the field the extent of the problem. Additionally, we had been so preoccupied with mapping and vegetation surveys that we'd managed fewer than 5 field-hours species acquaintance each. Given that a maximum of four weeks remained, we had to decide if it would be worth spending some of this precious time looking for a larger plantation of standard composition, securing permission to work there and re-surveying this new area. We came to a group consensus that this could take unacceptably long (we also planned to spend a week in the two other areas to provide comparative data and leave at least a few days in Asuncion before our departure.)

Our approach was to revise our definition of 'plantation'. We concluded that for our purposes we could take plantation to mean 'all areas with significant human silviculture-related activities.' Thus roads, orchards, tree nurseries, logger's gardens and the sawmill – all part of the infrastructure associated with logging and timber extraction – could all be included. Within this definition, some argument remained as to which areas of the estancia should be included or discounted as a) setting a threshold activity level for inclusion would have remained a highly arbitrary and contentious process, while b) establishing the exact extent of human impact in any given area with precision was difficult given our inexperience with the local flora and poor Spanish. However after discussion we decided on a number of areas where there was clearly an impact on the wildlife due to human activities. We spent three days at the end of our stay recording the vegetation in the areas surveyed in more detail by sample collection and systematic photography as well as taking notes and interviewing plantation personnel in greater depth.

Continuous walking and point counts over two weeks recorded 178 species at the most recent analysis (Sept. 20th) with some data still to be analysed. The majority of these identifications were by sight, due to our lack of familiarity with calls (though the situation improved towards the end of the period, bird call tapes would have been useful.)

Santa Rita: Intensive agriculture.

A farming community was centred around the small village of Santa Rita, located a few km to the south of the Florido plantation. Many of the farmers in what was a comparatively well-off community were aware of modern western intensive agriculture techniques. Many practised such techniques with large open fields, crop rotation and widespread mechanisation by new machines. Some of the farms had been present for as long as 20 years, but most in the area had been cultivated for 10 years or fewer, with some as new as a couple of seasons (we actually witnessed three separate areas of land being cleared by burning during our stay.) The main crops under cultivation were maize, wheat and soya with substantial areas too of beef pasture.

We got to know some of the farmers of Santa Rita (through football games and fiestas!) and several of these warm and generous people were interested in our project and origins. We were granted permission to work by one Mario Hernandez, and it was his farmland that formed our agricultural study.

The farmland comprised maize and soya crops over a 9 km² area, with a small area of wheat. Two main roads ran through the area, which was situated on a plateau at the top of a small rise overlooking one arm of the Laguna Acaray. There were two small watering-holes and few tall trees. The land had been under cultivation for 7 years.

Due to the good visibility afforded by the low crops and topography of the area, we mostly surveyed by point counts. Over two days of continuous dawn-till-dusk surveying by rotating teams we recorded 21 species of birds. We consider that this list is virtually complete. Identifications were made on this site by both visual and call matching.

Golondrina: Untouched (primary) Atlantic sub-tropical forest.

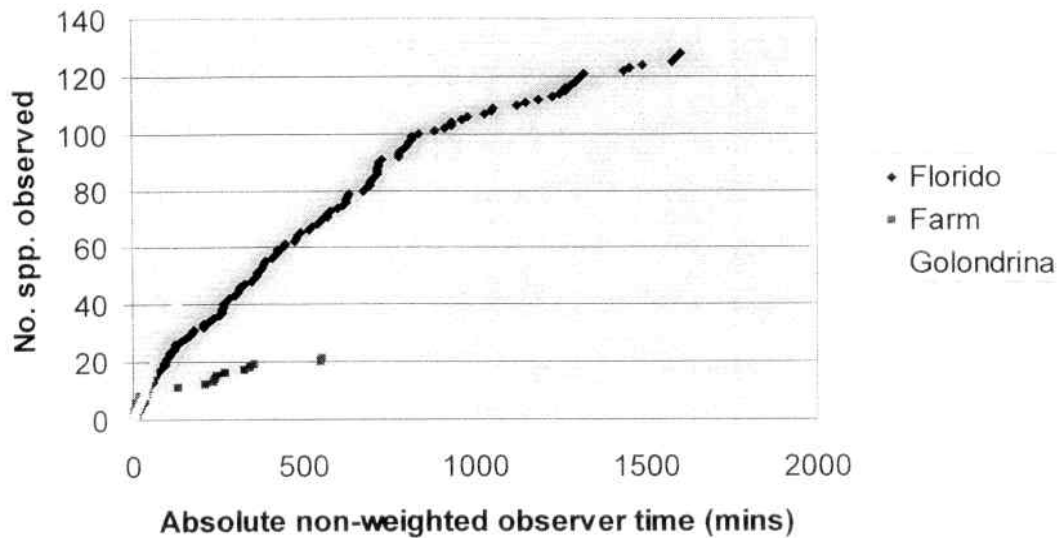
Golondrina is a commercial estancia run by a Portuguese concern (Sociedad Agricola Golondrina) with international investment. In total the company has significant properties across Paraguay and Brasil, running into hundreds of thousands of hectares. The Estancia Golondrina, located on the Rio Ypeti at the SE corner of the Caaguazu province, comprises over 24,000ha and is their flagship project in Paraguay. The main focus of the centre's activities is agricultural – over half the area of the reserve is given over to pasture or maize and soya cultivation – and testing of new crop varieties is a significant part of their work. The remainder of the land is used in a variety of ways; as well as workshops, silos, nurseries and barns there are housing and community amenities (church, school, medical centre and shops) for the 140 workers and their families; there is also an office complex (where the Paraguay HQ is located); finally the remainder of the land is covered in forest.

This is a mixture of logged forest, formerly logged forest, reforested areas and plantations as well as about 8,000ha of primary Atlantic forest (though some is altered primary). The primary forest area (divided into two blocks) was designated a natural reserve in 1995 and the owners are in the process of converting it into a national reserve (they already have a small ecotourism business centred around the reserve.) It is intended that this area be maintained for a minimum of 25 years.

We spent three nights at Golondrina in the excellent hospitality of the company, including a very informative presentation by the director (and use of his horses!) We were assigned a professional ranger and fed very well – the running hot and cold water felt luxurious after 4 weeks in Florido! Two student staff from Guyra Paraguay also joined us at this point, and their expertise was greatly appreciated. We

conducted around 50 person-hours of surveys evenly split between the two sites (one of which bordered onto the Rio Ypeti, while the other was surrounded by beef pasture) and with roughly even time-of-day coverage. Out of around 28 hours of data so far analysed, we found new 42 species – clearly a substantially greater number than the farmland. Cumulative encounter analysis (see below) also predicts more species in Golondrina than at Caaguazu, possibly by a factor of two or three.

Comparative encounter rates



Comparative cumulative encounter curves.

We have analysed our initial data by pooling all absolute observer times¹ for each site along a common time axis. We then extracted first species encounters for the whole group from all lists to build a species list for the whole group with time sighted. This list uses observer (absolute) time as a measure of effort – although the initial graphs we have produced need to be interpreted with care since they are not weighted to reflect the fact that, for example, not every observer completed 500, 1000 or 2000 minutes of observations – so that the *actual* effort represented by a sighting at 2014 minutes (where perhaps three observers reached 2014 minutes of cumulative time) is less than the effort represented by a sighting at 538 minutes (eight observers might have reached this time.) We are currently working on ways to represent this fact.

Once a unique encounter list for each site had been compiled, we were able to plot encounter curves for each site. This treatment followed the standard method outlined by Bibby *et al* (1993.) All three sites show similar initial rates, followed by a divergence in the main encounter phase. The agricultural land shows a decline to approach zero (plateau), while new encounters continue to appear in the forest and plantation. The initial rate was maintained in the forest study, while the plantation encounter rate shows a gradual decline before appearing to enter the plateau stage. By eye, the data points for all studies show little scatter, especially in the initial and encounter phases, although we have not yet applied a model to fit this data so cannot numerically determine variance.

Interpretations.

The plateau clearly observed in the farmland study cumulative encounter curve suggests that we have managed to detect nearly all bird species present in this area within the limits of our methods. Although the same cannot be said definitively for the other two areas (as they show no clear transition to the plateau stage) it seems probable that we may have approached this point in the plantation study, which seems to begin to level off after around 1000 minutes. While we are confident that at least 2/3 of present bird species have been detected in this instance it is likely that some groups, possibly involving significant numbers of species, have been missed by our methods. These include many understorey species (the 'small brown birds' so often recorded in our notes but positively identified in perhaps fewer than 5% of encounters) and nocturnal species (less than two hours of survey time were logged for *the whole team* between midnight and 0530.)

However, it is clear that the number of species supported by the plantation system was many times greater than that supported by the farmland. We can say the same for the forest; at 135 minutes, where data for the forest ends with the 42nd unique sighting, more species had been recorded here than in either of the other areas. We would also suggest, though, that had the forest survey run for a similar length of time as the plantation or even farmland study this lead in species encounters might still be maintained. We believe this because of the high rate in the encounter stage as well as because of the literature evidence suggesting that avian diversity at these latitudes is greatest in primary forests, plus the observation that we were frequently overwhelmed in the forest with too many birds present at any one time to identify each one – there was certainly no shortage of birds!

The general picture that emerges, then, is of very low diversity on farmland², with greater avian diversity in plantations and very probably more diversity in unaltered primary forest. This is not surprising and conforms to the expectations we had while planning. What is interesting is the reasonably high diversity found in the plantation. Even on the (conservative) assumption that the list we made was 90% complete, the eventual total species list here would exceed 200 species. This is very respectable and indicates good ecosystem health; to put this in perspective, Clay *et al* compiled a 'nearly complete' list numbering 228 species on their 2-week survey of Golondrina in 1995; Guyra Paraguay suppose that Golondrina may support 260 species in total (Mercolli et al.1995b.) This may well be due to the heterogeneity of habitats present in the plantation, which include marsh, orchards and some grassland as well as the normal forest habitats. It would therefore seem that in its current configuration timber production activities in Florido are having a minor impact on avian diversity (and hence probably a minor impact too on diversity and ecosystem health as a whole.) This could of course change were large-scale clearing or extensification of agriculture to be introduced; and in many ways the land-use at Florido represented a 'special case', as outlined above.

¹Unique species encounters, i.e. when a given observer encountered a species for the first time. These were made on-site by filtering everyone's raw encounter sheets to remove subsequent sightings of the same species, building a 'unique encounter sheet'.

²Even were we to assume that only 50% of species had been detected (unlikely since the graph shows a clear plateau), a projected total of 42 species would still fall short of the plantation and forest projections (196 and 50 total species at 90% and 80% estimated survey completion respectively – bear in mind also that 80% completion is a very pessimistic estimate and 30% is more probable, if a species count in Golondrina of 240 is assumed.)

Cultural impressions

For most of us, South America was an experience without precedent. From the moment we stepped off the plane in Sao Paulo until we returned to the same airport nearly seven weeks later, hairy and unwashed, our senses and prejudices were bombarded by an army of unfamiliar sensations and ideas. At every turn, it seemed, our embryonic understanding and synthesis of Latin America would be confounded and overthrown. There were new elements and ideas, as well as familiar ones in different contexts – and the repercussions of our experience are still remoulding our worldview, over a month after our return. We cannot claim to be experts on the culture and customs of this startlingly diverse region, of Paraguay, or even on Santa Rita, the little farming village that was our base and home for four weeks; to become expert would take a lifetime or more. Neither can we accurately relate our own – lack of skill and memory will not allow it – instead, this section of the report is simply an attempt to convey our general impressions of Paraguay, as engendered by our experiences and escapades there. For a sketch of our life and routine in Paraguay, the complete expedition log can be read in the annex to this report.

Food, weather and sex – the universal currency for the linguistically challenged – cropped up frequently in our (half-) conversations with our hosts and the dozens of Paraguayans who fell within range. John was an avid linguist from day one (not surprising given that spend nearly a whole day in (Portuguese-speaking) Brasil with only a Spanish phrasebook and some questionable sideburns to keep him company. Everyone else soon caught up more or less, particularly when we tried to hit the bars – talking to pretty girls with only *my name is...* and *How's it going?* proving a bit limiting.

Adrian had tried to warn us about the food and reception that would greet us in Paraguay, but we scoffed at the notion that mere food might put us down. He was right – while Paraguayans might not be renowned for the intricacy of their cooking, they are rightly famed throughout the continent as hosts *par excellence*. We never managed to finish all the food on offer at any given social

To cook beef for *asado*:

- 1) Make a huge log fire
- 2) Cut up an entire cow (maybe 4-5 bits) and salt
- 3) Put on fire.
Simple!

Mandioc (*n*): A fibrous root vegetable of high starch, but no taste, content. Eaten religiously at practically every meal in Paraguay, boiled fried or thrown at cheeky biodiversity surveyors from N. Ireland.

occasion (and no-one ever seemed to really need an excuse to make *fiesta*.) A favourite meal was *asado*, a barbeque invariably featuring beef, beer and mandioc. A whole cow might be eaten at one sitting, with pig's brains, fresh cornbread and chicken hearts thrown in for good measure. Other common dishes around camp included various bean and rice dishes. Two foodstuffs that seemed to be largely absent were fish and pastries – we ate fish only a handful of times (though they were freshly-caught and delicious), and the variety of breads and pastry dishes common in Britain was not seen (perhaps due to the lesser importance of wheat crops there?) There were however a bewildering variety of snacks both sweet and savoury with *empanadas* (a sort of pasty in a tortilla) and *chipas* (a cornbread stuffed with meat) both favourites.

Other surprises included the driving (exhilarating and terrifying); the music (rubbish) and the bars (great); people's patriotism (passionate but not really arrogant); the markets, which bustled and heaved, spilling out everywhere; the cheap electrical

goods for sale in Ciudad del Este (a centre for electronics contraband, we learned); the corruption, which was widespread touched our group on more than one occasion; being constantly mistaken for north Americans, Swiss or Germans; Pub Britannica; legions of private security guards with meaty weapons at every bank, cambio, supermarket and liquor store; and quite how *western* some things (such as malls, supermarkets etc in the richer areas of town) could feel. A constant was the politeness and warmth of generally everyone we met – total strangers often going to extraordinary lengths to help us.

Perhaps the most charming and pleasant, yet irritating and disabling factor we encountered was '*mañana*'. This was the Paraguayan (and in fact Latin American) habit of putting things off till later to enjoy time now, making time for new events as they arose and generally living life at a much slower pace. Arriving straight from a hectic term of exams and last-minute planning, we were often infuriated by late or missed appointments, broken engagements or simple tasks that might be done in an hour at home seeming to drag on for days. At the same time, there could be no denying the benefits to us; more time in bed, more time to party, cruising around to arrive everywhere utterly relaxed. '*Mañana*' presented us with a real dilemma in this respect as often rushing around as we were used to hugely irritated our guides, who seemed almost offended by the idea of punctuality. Eventually we learned how to work in the new system, leaving plenty of time to complete the most important tasks and leaving less urgent items for a more opportune moment.

One factor that we had tried to anticipate, but were sadly unprepared for in scale, was the poverty of many of the people. This first started to sink in on the long, hot bus ride from Iguazu airport to Asuncion. Up until this point we'd moved from slick airport terminal to terminal, with a brief stay in a hotel in Iguazu; our contact with Brasil had been mostly through panes of glass at 20,000 feet. Now we passed through village after village, each one dusty and dilapidated-looking. At every bus stop (and there were many) a mass of people would press against the bus, with every possible type of article and seller all clamouring for our money (ironically we had no Guaranies then.) From tiny girl to toothless old man, the poverty of these people and their desperation to sell to us was surprising, shocking and almost revolting; we hadn't really seen this before at all and wondered if we'd feel as uncomfortable for the next six weeks as we did now.

We generally responded in two ways. Firstly, we could simply ignore the silent women by the roadside, their children thronging around our shiny pickup excitedly or the men who called out to us on the street ("New watch! Hey! Only five dollars!"), and mostly we did, to begin with. After all, our Spanish wasn't up to much anyway, we might say to ourselves and, of course if we stopped for one of them wouldn't they all overwhelm us? While this often felt awkward it did solve the dilemma in a moment – keep talking loudly to each other and stride on. The kids would trail off sooner or later, leaving only a nagging sense of unfairness at our backs.

Then again, we could – and did – open ourselves up to these people (with whom we shared the planet), and were almost always surprised at what we learnt. There was the Brazillian immigrant farmer who shared his battered radio with us as he listened to the World Service (we never quite got reception for more than a few minutes, but we did buy a pig from him...) Also Oskar, the cheerful logger who cooked lots of our meals and generally looked after us, as well as beating us at football, pool, learning each other's language and virtually everything. He wanted to

travel somewhere, anywhere that wasn't Paraguay (of which he was nonetheless very proud) – of course, he lamented, it would take him a long time to save up enough money to travel, and by then he'd probably have a family... Or Freddy, the ex-chemical engineer who had fled the country during the Stroessner dictatorship then returned to teach. Disgusted with an education system which, he said, still discouraged the free thinking he had exiled himself to seek, he had given up teaching and now travelled the country as a migrant agricultural worker with his wife, a trained theatre nurse who now practised in local healthcare centres. He planned to write a book about the new Paraguay he had returned to, but had no publisher or computer or typewriter and looked exhausted after his day's work. Often, the common Western pick-me-up of 'go for it, you can do it!' or 'look at what you've got' just rang hollow, and we left these people to the rest of their lives with mixed feelings as we jetted off to bustling London, to e-mail and council tax, to Starbucks and dishwashers.

Conclusions

Our stay in Paraguay was not trouble free. As well as minor problems that occurred from day-to-day, such as logistics, cultural relations, one instance of petty theft and one instance of what threatened to become a major illness (but did not), circumstances presented us with difficult situations on a number of occasions. Once we arrived in Caaguazu and it became apparent that our initial study conditions would not be met we were left with the option to adapt our study or move to a new location. Partly due to time constraints we chose the former; but better reconnaissance and communications might have highlighted this earlier. At the same time, a longer period in the field would have afforded us the flexibility to choose the second option. The time constraint imposed by our six weeks' stay (really only just over four weeks' field time) precipitated difficult decisions towards the end of the study, too – we were forced to choose between intensifying the vegetation survey at the expense of gathering comparative data (the visit to Golondrina, which proved very valuable – although we regard our vegetation data as barely adequate.) Six weeks was essentially the minimum possible duration for an expedition of this sort, and in many ways if our results and conclusions are useful to anyone it is largely due to the efforts and assistance of our guides, companions and support team (as well as the *long* hours put in on-site.)

Two further constraints on our activities in the field were our poor knowledge of bird calls (we quickly became adept at visual identification) and lack of linguistic ability. We managed to muddle along (special thanks to Adrian and our guides, who were all required constantly for translation in the first fortnight, and frequently thereafter) but we regard bird call tapes or the presence of at least two experts in this area as essential for studies of this type. On a similar note, the ability to use mist netting would have greatly improved our identification of cryptic species. While there was not time to train in their use or money to acquire them, doing so would have greatly benefited our data (although integration with our existing methodology would have required significant thought.)

Did we succeed? It might be easier to give an answer had our goal been a concrete one, such as navigating the Rio Parana, or eating 25 cows during the course of our stay (which, incidentally, we might have actually done.) Our aims were to learn more about Paraguay and investigate the ecology of sustainable plantations compared to natural forests; the second essentially being an attempt to answer the question 'is buying timber labelled 'sustainable' really of any help to the environment. For the first part, it would hard not to have learnt at least something of the country and peoples we were immersed in for over six weeks. As to the second, our achievements can be viewed in a mixed light; we produced a lot of data, but collected over a limited period; our initial study parameters could not be met, but we hope that we adapted in the best way we could have; our conclusions (which are not yet complete) are hardly surprising, but then a similar study has yet to be carried out in Paraguay (as far as we know), so the whole thing was worthwhile on this level at least.

Perhaps it is simplest and most fitting to say that we did not fail, despite all the opportunities we had of doing so along the way from that pub in summer '02 up to today. Above all, we have all learned a fantastic amount on that journey which, we now realise, will only really start when we hand over the final reports of this expedition in the New Year. As well as schools and colleges to visit and others with

whom we need to share our experiences and our Paraguayan friends, there are already tentative plans for expeditions or work in a similar vein. Six weeks' expedition is rapidly evolving into a lifetime's adventure.

Annexes

(Log, itinerary and species lists for Florido, Santa Rita and Golondrina to follow by e-mail.)

Maps are currently being revised but will not be ready for a month at least, and will be included in the final report.

Illustrations

To follow by e-mail in a separate file.