Darwin Project Information

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Project Title	Community-based sustainable management of forest resources in Amazonian extractive reserves
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UK Contract Holder Institution	University of East Anglia, UK
Host country Partner Institution(s)	(1) Secretaria Estadual do Meio Ambiente e Desenvolvimento Sustentável (SDS), Environmental Secretariat, State of Amazonas, Brazil; (2) Brazilian Institute of the Environment and Natural Renewable Resources (IBAMA), Brazil
Other Partner Institution(s)	n/a
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Project Leader Name	Carlos Peres
Project website	http://www.tropicalforestresearch.org/projects/jurua.aspx
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1. Project Background

This project seeks to understand a number of increasingly pressing issues related to natural resource management in a growing number (and aggregate area) of Amazonian extractive reserves or extractive reserve analogues. These semi-subsistence non-timber extractive resources are sourced from both primary forest environments (e.g. game vertebrates, medicinal oleo-resins, oil seeds, other therapeutic and cosmetic plant products) and freshwater bodies (e.g. fish and turtles from oxbow lakes, rivers and streams), and sustain the basic livelihoods of a growing population of nontribal rural Amazonians. The project is taking place at two contiguous sustainable development forest reserves, which were created by the Brazilian Government in the last decade and are located along the Rio Juruá of western Brazilian

Amazonia (Figure 1): the 632,949 hectare Uacari Sustainable Development Reserve (RDS), and the 253,227 hectare Médio Juruá Extractive Reserve (RESEx). According to our preliminary survey, these two reserves are legally occupied by approximately 3,080 people, who are willing participants in this research and management programme, and currently experience an annual population growth rate of ~2.6% yr^{-1} (or a doubling time of ~27 yrs). Virtually, all of these reserve occupants are second to fourth generation descendents of local indigenous groups and Brazilian rubber tappers (seringueiros) of northeastern Brazil (mainly the State of Ceará), who initially colonised this region of southwestern Amazonia in 1892 during the first rubber boom. However, the rural population of the Rio Juruá and other major white-water tributaries of the Amazon have experienced a period of pronounced economic transition marked by the collapse of the rubber boom and significant rural exodus to major urban centers (e.g. Carauari, Tefé, Manaus).

The Uacari and the Médio Juruá reserves are under the jurisdiction and are formally managed by two state-level and federal Brazilian government agencies (SDS and IBAMA, respectively), which comprise our formal execution partners in deploying and implementing this project, and disseminating the project results both within and outside these target reserves. Both of these agencies maintain some administrative presence at the local town of Carauari. However, the geographic extent of the burgeoning protected areas managed on paper by these agencies within Brazilian Amazonia is vast, and they are unable to allocate an implementation plan nor a sufficient number of qualified personnel to all of the reserves they oversee, including our target reserves. The project aims to develop an ambitious work program by identifying and examining a number of population ecology and population management issues that are relevant to real-world harvesting systems in spatially structured landscape mosaics that are often highly heterogeneous in resource productivity and yields. We aim to develop feasible yet effective management strategies at the landscape scale that can be field-tested and adopted by other Amazonian extractive and sustainable development reserves to help maximise the sustainable use of key resource populations and the long term persistence of full complements of forest biodiversity.

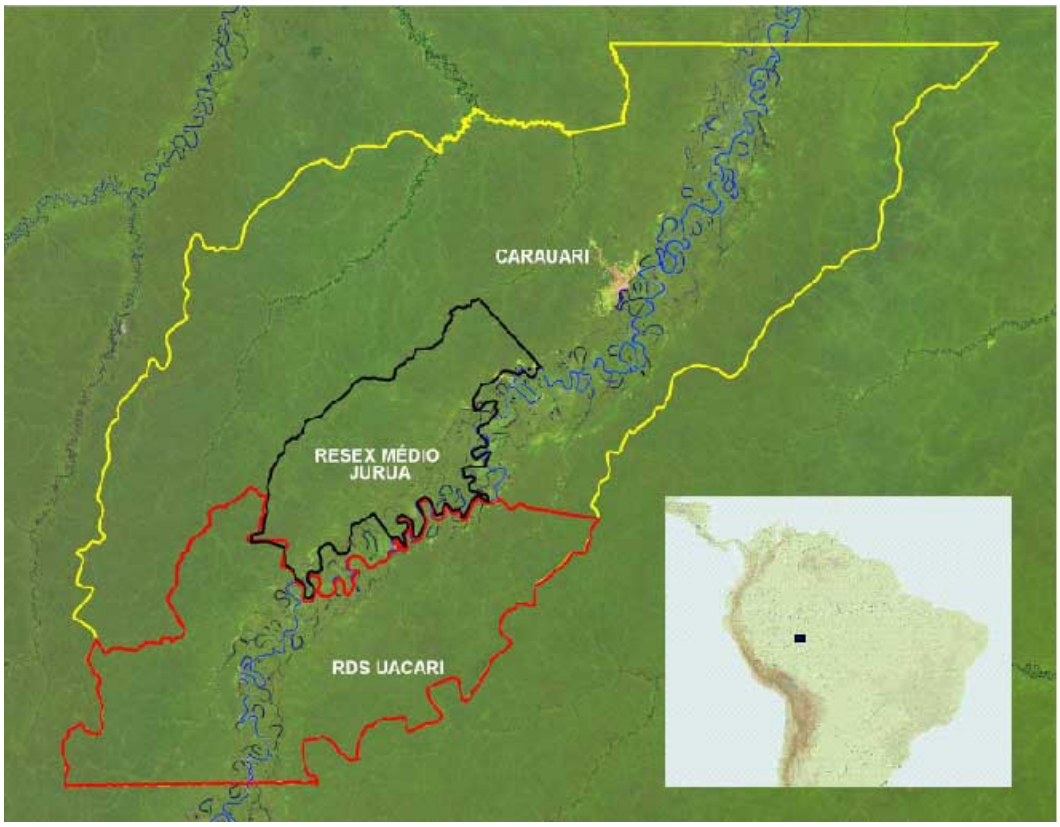


Figure 1. Map of the Médio Juruá Extractive Reserve (black polygon) and the Uacari Sustainable Development Reserve (red polygon) along the meandering Juruá River of western Brazilian Amazonia, showing the wider region of project influence (yellow boundaries) within the Municipal County of Carauari (deforested area in pink). Area of satellite image corresponds to the small rectangle in the inset map of South America.

2. Project Partnerships

Project partnerships:

The project is a formal partnership between the University of East Anglia (UK) and the Environmental Secretariat (Secretaria Estadual do Meio Ambiente e Desenvolvimento Sustentável; hereafter, SDS) of the largest Brazilian state (Amazonas); and the Brazilian Institute of the Environment and Natural Renewable Resources (IBAMA). Both of these administrative agencies have offices in Carauari, a town located 37 km from the nearest boundaries of the target reserves, and we have continued to maintain regular contact and consultation with these administrative offices between April 2008 and March 2009 by means of monthly visits to Carauari. In fact, our project now maintains an administrative office only three blocks away from the headquarters of the two reseves, and we are now able to establish regular radio (or satellite phone) contact from the Bauana Field Station at the RDS or the project research vessel, a mobile unit used to monitor project activities along a 400 km section of the Rio Juruá. Our relationship is best described as mutually collegiate and very cooperative in terms of how project activities interact with, or can be facilitated by these agencies. Given the

high prices (and often erratic supplies) of fuel in remote parts of Amazonia, government funding available for fluvial transport is in scarce supply, and this is one of the areas in which we have been able to cooperate with our local partners. There has also been increased cooperation on the joint-organisation of training workshops for monitors, which are usually centered at the Bauana Field Station where appropriate facilities have been developed.

Other Collaborations:

On a regional scale, the project collaborates with ProBUC (Programa de Monitoramento da Biodiversidade e do Uso de Recursos Naturais em Unidades de Conservação Estaduais do Amazonas), a biodiversity monitoring programme managed by SDS. Whilst similar in approach, our project activities and associated sampling protocols are more detailed, more extensive, cover a larger number of local communities and households, and the data acquisition and verification processes are more frequent. Our project is continuing to maintain a good partnership with ProBUC which will ensure a larger sampling effort, an economy of scale in deploying this sampling, good prospects for future data sharing and analysis, and an extension of long-term management objectives since ProBUC is expected to be funded for at least 10 more years.

External collaborations now include partnerships with the Federal University of Amazonas (UFAM) in Manaus: Dr. Lídia Medina Araujo and Dr. Valdir Veiga Junior will work with the project to catalogue fruits of woody plants (trees and lianas) occurring within the two reserves and conduct analyses of fruit nutrition and *Copaifera* oil properties, respectively. Botanical specimens will be collected by the project and deposited at the well established herbarium of the Instituto Nacional de Pesquisas da Amazônia (INPA), in Manaus for formal identification and reference. This is the largest herbarium of Amazonian plants, but the project will vastly increase their collection of plant vouchers from both terra firme (unflooded) and várzea (seasonally flooded) forests in the Rio Juruá basin. In addition, the project will collaborate with INPA to publish a comprehensive photographic catalogue of the fruits and seeds from the region. Mr. José Lima, a highly experienced technician from INPA will visit the site later this year to aid field identification and collecting techniques.

The project will also work closely with 1) Dr Flávia Costa, who will be conducting floristic inventories of herbaceous plants along our transects in the RDS and RESEX and soil sampling, which will provide useful data for several components of the project; 2) Cláudia Ohanna da Silva from the Instituto de Desenvolvimento Agropecuário e Florestal Sustentável do Estado do Amazonas (IDAM) to monitor the offtake of *Copaifera* oil by reserve residents recently trained and equipped by IDAM; and 3) Dr. Marcelo Derzi Vidal, a freshwater fisheries expert and the overall Coordinator of Aquatic Resource Management within the State of Amazonas as part of the AquaBio/MMA - ProVárzea/Ibama program. This collaboration has the principal objective of

integrating the fishery management part of the project with other efforts throughout the Brazilian Amazon. Other local partnerships, within the municipality of Carauari, include collaboration with the National Council of Rubber Tappers (CNS), the Association of Rural Producers in Carauari (ASPROC) and the Association of Extractivists of RDS Uacari (AMARU).The spatial modelling hunting sustainability component of this project in Year 3 expects to be able to collaborate with a project funded by the Leverhulme Trust (of which CAP is a PI) conducted with Matsigenka native communities of Manu National Park, Peru, which has attempted to model the spatial dynamics of game population depletion and renewal using source-sink dynamics. This will be of enormous assistance in the analytical approaches used to model game availability and harvest data – as well as establish parallels with other neotropical forest landscapes.

3. Project progress

3.1 Progress in carrying out project activities

Output 1. Assessment of forest resources extracted, and levels of offtake.

Activity 1.1. Household interviews

A total of 14 local monitors are now collecting data from weekly household level interviews in 13 local communities (10 households per community or all households in communities where the total number of households is ≤ 10, amounting to a total of 109 households). This total excludes other monitors associated with project but working for ProBUC (14 additional monitors in 14 additional communities). These interviews assess levels of extraction for timber, all non-timber forest products (NTFPs), game meat and fish, in addition to an assessment of yields from agricultural activities, all of which form the basis of the semi-subistence livelihoods typical of white-water tributaries of the Amazon like the Rio Juruá. Details are recorded for all activities of the proportions of products consumed locally or traded (bartered or sold), including information on income generation. The assessment of animal protein acquisition and game harvest also records the species, weight, sex, and reproductive condition of all animals and fish. By May 2009 a total of c. 2500 interviews have been achieved in these 13 communities.

Current household interviews will be complemented during the next project year, starting in May 2009, by the following additional interviews on three tiers, conducted by project members:

i) Household-level interviews, that will aim to secure detailed demographic and socio-economic profiles of each active household currently being interviewed on a weekly basis, providing important background variables against which to assess patterns and variation in agro-extractivist behaviour.

ii) Community-level interviews — to be conducted with community leaders or senior residents of each established settlement — will record data regarding demographic trends,

levels of access to public services (e.g. health, education, sanitation and energy) and to different forest types and markets.

iii) Focus-group interviews, that will probe more deeply into the motivational state of communities and residents for agro-extractivist behaviours, explaining variance in both quantitative and qualitative terms.

Means of Verification: Examples of completed data sheets (Figures 2-5). These data are being entered on project databases at the Carauari project office and we have therefore hired a full-time project assistant (Ms Lucineide Viana) to accelerate the rate at which these data can be processed.

Activity 1.2. GIS mapping of the reserves and habitat types

This activity has been successfully completed, with marked transects distributed evenly across both terra firme and várzea habitat types. Appropriate satellite images with topographical information have been acquired to assist mapping of habitat types, in combination with extensive ground-truthing of habitat types along transect.

Means of Verification: Maps of georeferenced transects (Figure 6) and topography across the reserves (Figure 7).

Activity 1.3. GIS analysis of game harvest areas

The extent, intensity and selectivity of hunting activities are being mapped by four different methods. Firstly, the hunting area for each community within the RDS was mapped by SDS, with the aid of several participants from each one of those communities, in November and December 2007. We then complemented this effort by allocating an equivalent effort throughout the local communities of the RESEX. Secondly, the weekly household interviews (see Activity 1.1) record specific locality names where hunts occurred. Thirdly, the location of each hunted animal weighed and measured by the project assistants distributed across all settlements (see Activity 1.4) is also recorded. These locations will soon be linked to more specific geographical references, using watershed (microbasin) divisions to be provided by SDS. Finally, the explicit mapping of individual hunting-trips (using WAAS-enabled GPS receivers that can capture GPS satellites through dense forest canopy) was incorporated into the project for the first time in August 2008. To date, ten of the most active hunters in the reserves have been identified, invited to work for the project and, trained to handle a GPS unit so that they can map the entire hunting catchment area of each of their communities. Over the course of the next year this approach will allow us to map well-defined hunting areas around all focal communities, over and above the ten communities at which this component has already been field-tested.

Means of Verification: Photograph of a trained hunting “monitor” operating a GPS unit (Figure 8).

Likewise, throughout the current project year the project expects to track the movements of commercial fishing boats from Carauari via satellite tagging devices. This initiative will be developed with full cooperation of the Carauari Fisheries Cooperative, following many months of discussion with key leaders in the Cooperative. This is an important component of the project because most of the animal protein captured along the Juruá (and the 83 oxbow lakes within the boundaries of our two target reserves) is sourced from aquatic habitats. This also represents the most thorny conflict between commercial interests from the fleet of fishing boats based in Carauari and other urban centers, which primarily use long gillnets, and the subsistence needs of small-scale local fishermen using artisanal fishing gear.

NEW ACTIVITY 1.4 Weighing and measuring hunted animals

Since March 2008, hunted animals brought to the communities are being monitored, including physically weighing and measuring all kills. This initiative of the project is independent of ProBUC but monitors conducting interviews for ProBUC have also been trained in this protocol to yield a total of 28 monitors distributed across 27 communities. All hunted animals arriving in the communities are identified to species, weighed, and measured (body length and tail length separately). Sex, age (adult, immature, juvenile), and reproductive status (with offspring, lactating, gravid (or replete oviducts in the case of gamebirds), not reproductive) are also recorded. In addition, the condition of the dressed/undressed carcass at the time it was processed is also recorded (i.e. whether weighing occurs following removal of skin, internal organs, or other body parts).

Means of Verification: Example of completed data sheet (Figure 9); Photograph of monitor weighing hunted animal (Figure 10).

Output 2. Quantitative assessment of the demographic sustainability of forest resource extraction.

Activity 2.1. Line-transect surveys of forest wildlife

Between May 2008 and April 2009 a further 36 transects (27 in várzea and 9 in terra firme forest) of 3-5 km have been cut and marked every 50m (with a HipChain©) to yield the current total of 88 transects (including 37 transects prepared in Year 1 (2 in várzea and 35 in terra firme) and the 15 previously existing ProBUC transects (6 in várzea and 9 in terra firme). This amounts to a total length of approximately 400 km of census transects, the largest effort of this kind that we know of ever deployed in a single tropical forest region worldwide. Sixty of these transects have been measured and marked (every 50m), and subsequently georeferenced.

Following a recent intensive effort to increase the total number of várzea transects, both várzea and terra firme forests across the two reserves are now extensively covered by the combined set of 34 transects located in várzea forests and 53 in terra firme forests.

With this accomplishment, the initial proposal to set up an ambitious target of 90-100 transects has already virtually been reached. However, the project is now planning to set up at least six additional transects at three distinct sites not previously considered to be part of the study area. These three sites, which will be the most inaccessible, will provide a better understanding of the influence of different environmental variables on both the plant and faunal communities and, at the same time, provide further information of areas with extremely low levels of hunting activities inside the two reserves. These new areas will be initially surveyed in May and June 2009.

Monthly data collection by previously trained transect monitors began in April 2008 and has continued to be conducted successfully in Year 2 of the project. Transect protocol comprises starting each transect at 06h30 and walking slowly (1.25 km per hour) and recording all target animals observed (visually or acoustically), the number, age and sex of individuals, the time of observation, distance along the transects (measured using flagging tape placed at 50m intervals), perpendicular distance from the transect, and the group size (of social species) and a measure of group spread.

Means of Verification: Map of survey transects set up for this project (Figure 6); Example of completed data sheet (Figures 11).

Activity 2.2. Map NTFP population density

No further work relating to the mapping of the spatial distribution of key nontimber tropical forest products (NTFP) populations has been conducted between May 2008 and May 2009, but all várzea transects are still due to be surveyed for the same key species using the same protocol in June and July 2009.

Means of verification: N/A

Activity 2.3. Assess impact of experimental harvest of *Copaifera*

From a therapeutic standpoint, *Copaifera* spp. (Leguminosae*:* Papilionoideae) trees across the lowland Amazon produce the most commercially valuable oleo-resins, which are extracted by millions of rural Amazonians for both sales and domestic use. This is a key component of the commercial extractive activities of inhabitants of both the RESEX and the RDS, and new purchase quotas this year have been set by a cosmetic/pharmaceutical company that trades with the local cooperative of extractivists. The project component which aimed to assess the impact of *Copaifera* oil harvesting on tree fecundity was dropped from activity schedule as a

consequence of two main factors. Firstly, the main seedfall period of *C. multijuga* occurred in the months when the principal investigator of this component was by necessity in the UK, and therefore unable to direct data-collection first hand. Trained field assistants attempted to collect the data under remote supervision but unfortunately were unable to adapt to the second factor, which was that the seedfall was more temporally dispersed than had been predicted. The overall result is that an insufficient number of seedfall periods will now occur within the project time-frame, and so reluctantly this component has been abandoned in favour of pursuing more productive, related activities, as described below.

We propose the changing of the title of Activity 2.3 to “Experimental harvest and monitoring of *Copaifera* oil”, in response to some potentially fruitful opportunities that have arisen within the last six months. The potential to extract *Copaifera* oil, a key NTFP that is currently under-exploited in these reserves, has begun to be assessed by means of an experimental harvest protocol. This is the first large-scale study of this type ever deployed anywhere in the Amazon. Seventy-seven trees of four *Copaifera* species were harvested for their oil in April 2009 (using a uniform, sustainable methodology approved by the reserve management plan) and the volume and weight of oil extracted from each tree recorded. Each harvested tree was measured, identified to species, and mapped in relation to all other *Copaifera* adults in the same 100-ha plot. This work represents the first spatially-explicit experimental harvest of identified *Copaifera* species, and we are now in a position to try to understand some of the factors that influence the large variability in oil yields observed both here and elsewhere in Amazonia.

Additionally, the project has, as of May 2009, implemented a program which will monitor *Copaifera* extraction across the two reserves. Reserve residents who extract *Copaifera* between May 2009 and April 2010 will tag each tree drilled and record the quantity of oil produced by each, together with basic sales data. Harvested trees will be revisited by members of the project team, to georeference each tree, measure its dbh and identify it to species. This monitoring will be conducted in collaboration with IDAM (see above), who within the last year have run a training course and provided equipment for reserve residents, to promote the sustainable exploitation of this resource. This monitoring will generate yield data on a wider spatial scale and in a greater variety of forest habitats than can be achieved by experimental harvesting alone. Together with the tree density data generated by the population surveys along a large number of transects, we expect to be in a position to estimate the total *Copaifera* oil sustainable harvest potential of the reserves in both demographic and economic terms.

Means of verification: Photograph of oil extraction process (Figure 12); Preliminary analysis of relationship between oil yield and DBH for the most productive species *C. multijuga* (Figure 13).

Activity 2.4. Develop population ecology model for *Copaifera*

A population ecology model will be developed for three *Copaifera* species. All adult *Copaifera* trees and saplings within three 9-ha plots have been mapped, marked and measured. Contained within these plots, twenty-seven 20m x 20m plots have been established to survey the fate of *Copaifera* seedlings and saplings. All seedlings and saplings were marked and measured in March 2008, and have been recensused in July & Nov 2008, and again in April 2009. One more recensus will be conducted in March 2010, providing growth and mortality data over 2 years.To assess whether findings within these plots are representative of the wider geographic area, these surveys have additionally been conducted along the 35 terra firme transects (five 10m x 10m plots per 5km transect) distributed throughout the two reserves. Flowering and fruiting phenology of these species will be monitored on the 1-km transects (see Activity 3.5).

Means of Verification: Photograph of tagged *Copaifera* seedling (Figure 14).

NEW ACTIVITY 2.5. Introduce reserve-wide harvest zoning agreements

Forest wildlife — Access to game vertebrates and other wildlife resources for central-place foragers throughout the humid tropics is primarily dictated by accessibility criteria dictated as a function of distance from settlements and households. However, during the course of 2008, SDS have been conducting the final analysis and approval for a game hunting zoning system within the RDS Uacari, based on information provided by local communities, biological surveys, various organizations and a wide array of researchers and experts. The latest version of the zoning system still requires approval (Figure 3), but the project has already been granted permission to census and conduct all studies within the total restriction zones (Figure 3 – green areas), where data will be collected to better understand source-sink dynamics of hunted vertebrate populations within the reserve. At least nine transects will fall inside those restriction zones. Of those, seven are already being surveyed monthly, with the oldest transects surveyed continually since April 2008.

Means of Verification: Map of provisional harvest zoning boundaries (Figure 15).

Aquatic resources — The same approach will also be extended to fish and other aquatic resources harvested from the main river channel and a large number of abutting oxbow lakes. Access to these lakes and fish resources therein had previously been negotiated between the local communities of the two reserves and commercial fishermen in Carauari. Currently, there are three classes of access to oxbow lakes negotiated under this agreement: (1) lakes permitting access to both local subsistence fishers and commercial fishing boats; (2) lakes permitting access to local subsistence fishers only; and (3) fully-restricted no-take lakes where access to aquatic resources is not permitted. The project still aims to take advantage of this

unique experiment to quantify the local benefits of oxbow lake protection (in terms of restricted access) to local communities; to quantify the level of real-world leakage in these formal agreements; and to examine how differential access restrictions to oxbow lakes along a 400 km section of the Rio Juruá impacts the transportation cost structure and fishing yields for the boat fleet stationed in Carauari.

Output 3. Local monitors, field technicians and students able to assess and monitor forest biodiversity using quantitative methods.

Activity 3.1. Conduct training workshop(s)

Following the success of the initial workshop in March 2008, a second training event was offered for all the local participating assistants, including new field monitors, as a means to reinforce and improve the effectiveness of their work. The four-day workshop at the Bauana field station (23-26th November 2008) was attended by 29 monitors and also had the presence of the project leader Carlos Peres (Figure 16). This year the event was much more of a field course, as described in the original proposal, with Carlos Peres taking monitors into the field on each day to walk transects and demonstrate field techniques first hand. Household interview monitors were given training at the field station by Whaldener Endo, which coincided with a detailed process of datasheet verification and data quality control. We take advantage of these workshops at the Bauana Field Station, which congregate most of the key community leaders and project field assistants who are otherwise widely dispersed across our vast study area, to give talks about natural resource management issues relevant to Amazonian forest dwellers and present preliminary data obtained during the course of this project. These annual workshops also represent a key opportunity for (1) welcome dialogue between community leaders of our two target reserves who otherwise rarely speak to one another; and (2) a social confraternization event among community leader who are able to share their experience in terms of the challenges and triumphs of earning a living while assisting the implementation of the project and the as of yet embryonic reserve management plans.

Activity 3.2. Maintenance of post-workshop training activities

To ensure the full training of each monitor working for the project, each of them is also assisted in their activities by means of bimonthly visits in situ (to their local communities and/or households) by project members. This is easier said than done, considering that it often takes 5 days by diesel-powered boat to travel the entire axis of the Juruá river within the boundaries of our target reserves. This is an important strategy that appears to be working well to ensure the continuity of a high-quality data verification process, minimize any possible errors in data collection, reinforce particular training points, and, finally, to encourage the continuation of data

collection through regular contact with project personnel located even in the most remote communities that we work with.

Activity 3.3. Conduct line transect surveys

Seventy-three line-transects have now been opened, with 29 transects located in várzea forest, and 44 transects in terra firme forest. Twenty-nine monitors are visiting those transects on a monthly basis to census forest wildlife populations; monitor residual fruit-fall along the transects; and record any feeding observations between frugivores and fruiting trees and woody lianas. An additional 15 transects are monitored in a similar fashion by ProBUC, and we have plans to eventually merge the two datasets to streamline the most robust possible approach to data analysis.

The faunal survey protocol is detailed under Activity 2.1. Following faunal surveys, monitors return along the same transect, recording information on fruiting plants, which forms one of the three complementary plant phenology sampling protocols undertaken by this project. All patches of fresh fallen fruit along the transects are recorded (initially using common names or morphospecies description, which will later be verified by herbarium identification using vouchers of dried and FAA-preserved fruit samples collected from each patch) together with the time and distance along transect. In addition, the fruiting tree or liana bearing fruit is measured in terms of DBH (trees) or crown spread (lianas), and the perpendicular distance to the transect is recorded. Any vertebrate species observed feeding on the fruit, on the ground or in the crown are also recorded.

Means of Verification: Example of completed data sheet (Figure 17); Photograph of transect monitor (Figure 18).

Activity 3.4. Conduct 100-ha plot surveys

Between May 2008 and May 2009 monthly surveys of the permanent plots for fauna and fruit fall continued successfully for the most part, although one terra firme plot was not surveyed between January and March 2009 (because of problems with water-level access) and the várzea plot was not surveyed in February 2009. Data are missing from these months due to difficulties found by monitors working under remote supervision by the principal investigator of this component, who was by necessity in the UK. Survey protocol in the 100-ha plots comprises four consecutive mornings walking the transect grid (3 km per morning starting at 06h30) in the same fashion as the 5 km transect surveys. Surveys for fruiting trees/lianas are conducted at the same time, again in the same fashion as the 5 km transect surveys. All feeding observations are recorded and more detailed information is recorded on fruit-frugivore interactions, including evidence of feeding at trees through marked fruit or tracks.

In addition, leaf-litter and fruits are collected from the traps on a biweekly basis, dried, divided into leaves, twigs, flowers and fruits and finally dry-weighed on an electronic balance. Data were collected from May 2008 until January 2009 when it became clear that the traps in the várzea plot were rotting. All traps have now been replaced with more durable PVC tubing traps and collections have recommenced in May 2009. This protocol is in line with the methodology used by all other fruit/seed-trapping studies in tropical forests. All fruit and seeds collected from the 100 ha plots, together with those from the 5 km transects, will contribute towards the photographic catalogue to be published in collaboration with INPA.

Means of Verification: Examples of completed data sheets (Figures 19 and 20); Photographs of fruit sampled and of fruit/leaf-litter traps (Figures 21 and 22).

Activity 3.5. Conduct plant phenology surveys

Two more transects were established in April 2009 to yield a current total of six 1 km transects (three terra firme; three várzea), with all trees with DBH ≥ 30 cm and lianas (DBH ≥ 10 cm) within 5 m of the transect marked with an uniquely numbered tree-tag (383 tagged trees or lianas in terra firme forest; 351 in várzea).The canopies of all these trees and lianas are observed once a month to record their phenophase (mature leaves, young leaves, flowers, immature fruits, mature fruits). Phenology data is again missing from February to March 2009 as a result of the difficulties in remote supervision when the principal investigator was necessarily absent. Retraining will be carried out during this year to strengthen the protocol and to prevent similar problems in the future.

Mean of Verification: Example of completed data sheet (Figure 23), Photograph of monitors trained to record phenology (Figure 24).

Activity 3.6. Conduct dung beetle surveys

No further dung-beetle surveys were conducted between May 2008 and May 2009 but extensive sampling of dung beetle populations throughout the two reserves is still due to commence in August 2009, using the system of transects and 100 ha plots already established. Findings will be related to results from faunal surveys and declines in large mammal populations (and dung resources) due to hunting pressure, to assess the dependence of dung beetle species on large mammals. Experiments will be conducted to determine the underlying relationship between dung beetle community structure and ecosystem functions such as dung removal and secondary seed dispersal.

NEW ACTIVITY 3.7. Conduct a large number of 0.1-ha tree plots

Between July 2008 and September 2008 vegetation survey were conducted along 20 forest transects (8 várzea, 12 terra firme). Three to four 10 x 100m plots (0.1 ha) were located along each transect, at least 800m apart, to yield a total of 59 plots (37 várzea, 22 terra firme). Within these plots all trees >10 cm DBH and all lianas >5 cm diameter were identified to common name and measured. In addition a 1m wide strip (1 x 100m) parallel to the transect was surveyed for saplings larger than 1m in height but smaller than 15mm in diameter (as measured with a calliper). These were counted and their diameter was measured using callipers. In total, we plan to sample 300 tree plots along both terra firme (150) and várzea (150) forest transects placed throughout the two target reserves. This will provide forest structure and forest composition data on ~20,000 trees from 30 ha of forest, which will aid a number of components of this project, including an assessment of aboveground biomass and carbon stocks retained by these two conservation areas.

Means of Verification: Abstract of resulting undergraduate thesis (In Annex 3).

Output 4. Local communities in RDS Uacari and RESEX Médio-Juruá, and other reserves are able to effectively apply large-scale management recommendations.

Activity 4.1. Analyse long-term data collected from all project components

One full year of data collection has already been completed by the monitors and project members. Data entry has been aided by the training of a local assistant from Carauari, who works five mornings a week to transcribe into Microsoft Excel the weekly household interviews (currently more than 2500 completed questionnaires for each product category—cultivated products, non-timber forest products, fishing and hunting—have been completed). Preliminary analysis has been conducted already on more than 1000 km of forest wildlife surveys, and on the approximately 700 game animals killed by subsistence hunters in all focal communities, which have been weighed and measured.

Means of Verification: Examples of completed datasheets (Figures 2-5).

Activity 4.2. Conduct meetings with all local stakeholders

The project was presented once again in Carauari, on the 9th October 2008, for the Local Management Council of the RDS Uacari Reserve. This council comprises some of the most important actors in the town and reserve (including representatives from CNS, ASPROC, Carauari Fisheries Association, Carauari Environmental Secretary, State University of Amazonas, SDS, and leaders from the main reserve communities). The meeting was useful in clarifying many aspects of the project for this diverse audience, and in strengthening project support by local organizations. In the same meeting, some of the project's most polemical

proposals (for example, access to, and establishment of transects within the no-take areas, and experimental extraction of *Copaifera* oil) were explained, debated and approved by the council.

Two more meetings with state partners, and in particular SDS staff in Manaus, have taken place (3rd July and 17th December 2008) to present recent results, to proceed in the formalization of all the bureaucratic demands and to reinforce the mutual colaborative relationship that is being built, specifically between our project and the ProBUC monitoring program at SDS. This relationship will also help ensure the best possivle application of project results.

From 23rd to 26th November 2008, we organized the second workshop for the project participants (monitors and collaborators) at the Bauana Field Station, with the presence of two-thirds of all the invited people. The three-day meeting was important in developing project activities, including: reinforcing and retraining the different data-collection tasks currently being undertaken by them, presenting preliminary results, receiving feedback from the monitors and promoting the concept of a team working together to reach common goals. Our project also participated in the 4th meeting of ProBUC at the Bauana field station (14-16th May 2009), strengthening our project links with SDS/ProBUC and presenting our project progress and preliminary results.

Means of Verification: Photograph of Bauana workshop (Figure 14).

Activity 4.3. Write publications and presentations

Publications and presentations will begin to emerge as individual components of the project reach completion. An initial plenary talk by Carlos Peres, based partly on preliminary project results was presented at the Latin American Wildlife Management Congress, in Rio Branco, Acre, Brazil (August 2008).

Activity 4.4. Interpret findings to develop recommendations

Interpretation of findings and subsequent recommendations will begin to emerge as individual components of the project reach completion.

Activity 4.5. Publish, print and distribute CBWM

An illustrated community-based wildlife management handbook (in Portuguese) has not yet been compiled. As originally anticipated, this will be developed following assessments of the various components of the project, and begin to be distributed by late 2010.

Activity 4.6. Organise workshop in Manaus to present findings and recommendations

A final technical workshop in collaboration with SDS in Manaus is expected to run in September 2010.

3.2 Progress towards Project Outputs

Output 1. Assessment of forest resources extracted, and levels of offtake.

Good progress has continued on all activities contributing towards Output 1. Weekly interviews recording the types and amounts of resources extracted, the frequency of extraction, and the relative contributions that these forest resources make to the income of households and communities have been conducted throughout the year in 13 communities (with an additional 14 communities monitored by our partners with ProBUC). These will be complemented during the next year by questionnaires investigating demographic and socio-economic profiles, access to services and markets, and motivations for particular agro-extractivist behaviours.

The species, identity, weight, sex and reproductive condition of all game animals consumed are being recorded at 27 communities by local field monitors trained by the project, independently of ProBUC. Spatially-explicit mapping of hunting forays, assisted with GPS receivers, has now started to complement the household interviews which also record locations of kills and hunting routes according to the cognitive map of the hunter and key landmarks across individual catchment areas. A similar initiative is due to be introduced during the next year for commercial fishing trips using fishing boats based in Carauari. Successful completion of the output is very likely but will only be achieved after further consolidation of these data sets.

Indicator 1a: Daily records of the identity, weight, sex and reproductive condition of animals consumed, including game vertebrates and fish.

Means of verification: Example of completed datasheet and photograph of monitor at work (Figure 8-9)

Indicator 1b: Spatially-explicit mapping of hunting trips and resources harvested.

Means of verification: Example of completed datasheet (Figure 4); Photograph of hunting monitor in action (Figure 8).

Output 2. Quantitative assessment of the demographic sustainability of forest resource extraction.

Good progress has continued on most activities contributing towards Output 2. In particular substantial work during the reporting year has successfully increased the number of várzea transects, which had been lagging behind terra firme transects because of access problems due to unseasonal water-level. There is now an even spread of 88 transects (including 15 monitored by ProBUC) on both banks of the Rio Juruá in both várzea and terra firme forest and, having reached the target number of transects, the project is now able to include some

extra transects in remote high terra firme areas within the reserves and some additional unprotected sites outside the reserves. Importantly, approval has already been given for transect census to continue in the no-take zones which are being developed with the endorsement of local communities.

No further activity has occurred regarding the spatial distribution of key NTFP populations during the reporting year but they will be mapped along várzea transects in July-August 2009. The study of the demographic impact of extraction of *Copaifera* oil has been adapted to become an experimental harvest. Both work in this new direction and the development of a population ecology model for *Copaifera* are progressing well.

Successful completion of the output is very likely but is dependent upon the completion of NTFP and hunting catchment area mapping and experimental oil extraction in the short term, and further long term accumulation of faunal censuses and household interviews. We also plan to generate a spatially-explicit sustainable harvest model for key game species in the reserves but this still requires the successful recruitment of a competent spatial modeller which will take place in early 2010 (but see correspondence of Jan – Feb 2009 with Darwin on the revised schedule for these project activities).

Indicator 2a: Seasonally repeated census data from at least 100 line-transects of 5 km in length in both hunted and non-hunted várzea, paleo-várzea, and terra firme forests, on both banks of the Rio Juruá.

Means of verification: Map of opened transects (Figure 6), Example of completed data sheet (Figure 11).

Indicator 2b: Mapping of the spatial distribution of key NTFP populations, including Copaifera and Carapa trees.

Means of verification: Photograph of principal investigator surveying terra firme transect with local monitor during Year 1 (Figure 25).

Indicator 2c: A study of the demographic impact of extractive practices on key NTFP resource populations.

Means of verification: Example of completed datasheets (Figure 3); Photograph of Copaifera extraction (Figure 11), Preliminary analysis of Copaifera yield (Figure 12).

Indicator 2d: Sustainable harvest models under different source-sink scenarios.

Means of verification: N/A to date.

Output 3. Local monitors, field technicians and students able to assess and monitor forest biodiversity using quantitative methods.

Good progress has been continued on most aspects contributing towards Output 3, particularly on the training of local monitors. At the present moment, most communities within the two study

reserves have, at least, one trained person monitoring, at least partially, the local forest biodiversity, using scientifically tested methods. For example, 29 monitors are now conducting monthly line transects for fauna and fleshy or sclerocarpic fruits. A further five monitors are trained to survey the three 100-ha plots (containing a 100 x 100m trail grid) for fauna and fruit, and to collect material from the 192 fruit/leaf-litter traps every two weeks, with an additional two monitors trained in the drying and weighing of this material. Reinforcement of training for phenology monitors is continuing, and dung beetle surveys, which will train further assistants, are planned to commence in August 2009. The majority of the trained monitors have already been assisted closely with their work by the project team for more than one year. To increase the effectiveness of their monitoring, each monitor has also had the chance to participate in two different training workshops promoted by the project. Amongst other skills, monitors have been trained or are being trained to: follow methodical proceedings, identify all target-species found in the area, quantify animal encounter rates (using analogic counters), weigh hunted animals (read spring scales), measure hunted animals (read rulers), map hunting areas (using GPS units), measure trees (using DBH measuring tapes), weigh dried fruits and leaves (using digital scales), record hunted animals (using digital cameras), and discriminate units for each product recorded in household interviews.

An extra component towards this output has been the introduction of 59 vegetation plots along existing transects to assess forest structure, and tree and sapling density. Together with all other transects and plots, these will be available for the expected Brazilian students, which are still to be recruited. In addition, the project offers some logistical support and access to data to Brazilian MSc students enrolled in the INPA Ecology & Conservation program, Manaus (Instituto Nacional de Pesquisas da Amazônia) who have conducted relevant studies in areas related to project goals. Examples of completed dissertation projects include a comparative study of camera trapping vs. line-transect censusing of large mammals and a study of the competitive interaction between fishermen and Giant River Otters (*Pteronura brasiliensis*) which are often perceived as a “problem animal” by river dwellers. Further work by Brazilian MSc students on three different areas of the project, which will be supported partly or entirely by the project logistics, is expected to take place in the 2009-10 reporting year. In summary the training of local monitors is progressing very well but successful achievement of the output will require additional recruitment of Brazilian students.

Indicator: Minimum of 49 local monitors and 10 Brazilian students trained in quantitative biodiversity surveys, and harvest assessments.

Means of verification: Photograph of training workshop (Figure 14), Examples of completed datasheets (Figures 15, 17, 18). Citations of INPA MSc dissertations:

(1) Munari, D.P. (2008) Técnicas de amostragem e a detecção de mamíferos terrestres na Floresta Amazônica. MSc disserartion, Instituto Nacional de Pesquisas da Amazônia (INPA) and Universidade Federal do Amazonas (UFAM), Manaus, March 2008; and

(2) Rosas-Ribeiro, P.F. (2009) Conflitos entre pescadores e ariranhas (Pteronura brasiliensis) na Reserva de Desenvolvimento Sustentável Uacari, rio Juruá, Amazonas. MSc disserartion, Instituto Nacional de Pesquisas da Amazônia (INPA) and Universidade Federal do Amazonas (UFAM), Manaus, March 2009.

Output 4. Local communities in RDS Uacari and RESEX Médio-Juruá, and other reserves are able to effectively apply large-scale management recommendations.

Progress will only commence following assessment of the various long-term project components, which are currently still at the data collection stage. Regular contact and good relationships are maintained with the local communities and the government agencies formally managing the reserves (SDS and IBAMA). The original assumptions hold true and the output is likely to be achieved by the project close.

Indicator 4a: A user-friendly, illustrated community-based wildlife management (CBWM) handbook that can be distributed to rural communities of lowland Amazonia.

Means of verification: N/A to date.

Indicatory 4b: Publications, presentations and SDS workshop, Manaus.

Means of verification: N/A

3.3 Standard Measures

Table 1 Project Standard Output Measures

Code No.	Description	Yr 1	Yr 2	Yr 3	Yr 4	Total to date	Number planned for this reporting period	Total planned from application
6A	Local community 'monitors' trained in resource monitoring field techniques	30	60			60	35	60
6B	Field-course delivered to local-community 'monitors'	1	1			2	1	3
4A	Brazilian undergraduate or graduate students trained in resource monitoring field techniques	0	3			3	3	12
6A	Full-time MSc-level project staff members, who will help to manage the project, receive the above training plus extensive training in project	0	1			1	1	2

Code No.	Description	Yr 1	Yr 2	Yr 3	Yr 4	Total to date	Number planned for this reporting period	Total planned from application
	management							
6A	Brazilian wildlife biologists trained in line-transect census and camera trapping techniques, and correspondent data analysis	0	2			2	1	4
6A	Reserve personnel in Carauarí trained in reserve spatial mapping, including the use of a GIS	1	1			2	1	2
8	A minimum of 32 weeks to be spent by UK project staff (C Peres and Spatial Modeller) at the two focal reserves. This excludes advisory, administrative and political meetings to be held in Manaus and Brasília.	4	4			8	4	32
12A	Datasets and dynamic databases to be established and shared with SDS and IBAMA.	2	2			2	0	15
20	Bauana Field Station at RDS Uacari refurbished and equipped (costing ~£3,000)	33%	33%			33%	0%	100%
20	One laptop and a desktop, equipped with the appropriate software, handed over to reserve office in Carauari.	1	1			2	0	2
20	Two 8-m aluminium boats powered by 30HP outboard engines to be handed over to reserve office in Carauari.	1	1			2	0	2
21	Bauana Field Station adequately developed and equipped to serve as a permanent research station and logistical base for future Amazonian forest ecology field courses	33%	33%			33%	0%	100%
22	Three hundred 0.1-hectare (30 ha) permanent tree plots (established according to RAINFOR guidelines) to be recensused over many years after the project is discontinued.	0	5.9ha			5.9ha	10ha	30 ha
22	Approximately 4,000 number-tagged trees included in phonological monitoring available for future studies	500	750			750	1000	4,000
22	'No-take areas' in sub-catchment basins >5,000 ha, established within 20 community territories, to be monitored post-project.	3	3			3	0	10

Code No.	Description	Yr 1	Yr 2	Yr 3	Yr 4	Total to date	Number planned for this reporting period	Total planned from application
23	A substantial support in kind in terms of fluvial transport coordination, office and laboratory facilities at SDS-Manaus, IBAMA-Manaus, INPA-Manaus, the SDS and IBAMA offices in Carauari, and the field station of Bauana (value cannot be estimated at present).	20%	20%			20%	0%	100%
New - Project specific measures	Preparation (cutting, measuring, marking, georeferencing, and mapping) of 60 forest transects of 4 to 5 km in length in várzea and terra firme forest	37	73			73	30	60
New - Project specific measures	Allocation of harvest categories to 30 oxbow lakes which will be monitored in terms of CPUE (catch per unit effort) of freshwater resources (mostly fish)	10	10			20	10	30

Table 2 Publications

Publications relating to current activities specifically deployed by this project are unavailable at this early stage but this table highlights a few of our recently published papers that are directly relevant to project objectives.

Type	Detail	Publishers	Available from	Cost £
Journal	Peres C.A. & E. Palacios (2007) Basin-Wide Effects of Game Harvest on Vertebrate Population Densities in Amazonian Forests: Implications for Animal-Mediated Seed Dispersal.	Biotropica 39: 304-315.	Blackwell	0
Journal	Stoner, K.E.; Vulinec, K.; Wright, S. Joseph; Peres, C.A. 2007. Hunting and Plant Community Dynamics in Tropical Forests: A Synthesis and Future Directions	Biotropica, 39: 385-392	Blackwell	0
Journal	Ohl, J., G.H. Shepard Jr., H. Kaplan, C.A. Peres, T. Levi & D.W. Yu. (2007) The sustainability of hunting by Matsigenka native communities in Manu National Park, Peru.	Conservation Biology 21:1174-1185	Blackwell	0
Journal	Wright, S.J.; Stoner, K.E.; Beckman, N.; Corlett, R.T.; Dirzo, R.; Muller-Landau, H.C.; Nuñez-Iturri, G.; C.A. Peres; Wang, B.C. 2007. The Plight of Large Animals in Tropical Forests and the Consequences for Plant Regeneration.	Biotropica 39: 289-291	Blackwell	0
Journal	Nichols, E., Gardner, T., Spector, S. and C.A. Peres. (2009) Declining large mammals and dung beetles: a case study of an impending ecological cascade.	Oikos, doi: 10.1111/j.1600-0706.2008.17268.x	Blackwell	0
Journal	Gardner, T.A., J. Barlow, R. Chazdon, R. Ewers, C.A. Harvey, C.A. Peres and N. Sodhi. 2009. Prospects for tropical forest biodiversity in a human-modified world.	Ecology Letters. doi: 10.1111/j.1461-0248.2009.01294.x	Wiley	0

Type	Detail	Publishers	Available from	Cost £
Book chapter	Overexploitation of biological resources. In: Conservation Biology for All (N. Sodhi and P. Erlich, eds)	Oxford University Press	Oxford University Press	0
Journal	Endo, W., C.A. Peres, E. Salas, S. Mori, G.H. Shepard, V. Pacheco, D.W. Yu. In press. Game vertebrate densities in hunted and nonhunted forest sites in Manu National Park, Peru.	Biotropica.	Blackwell	
Journal	Chazdon, R.L., C.A. Peres, D. Dent, D. Sheil, A.E. Lugo, D. Lamb, N.E. Stork and S. Miller. 2009. Where are the wild things? Assessing the potential for species conservation in tropical secondary forests.	Conservation Biology. In press	Blackwell	0
Journal	Parry, L., J. Barlow and C.A. Peres. 2009. Hunting for sustainability in tropical secondary forests.	Conservation Biology. DOI: 10.1111/j.1523-1739.2009.01224.x	Blackwell	0
Journal	Levi, L., G.H. Shepard, J. Ohl-Schacherer, C.A. Peres, D.W. Yu. In press. Mapping and managing the landscape sustainability of indigenous hunting in a tropical park.	Journal of Applied Ecology.	British Ecological Society	0
Journal	Parry, L., J. Barlow and C.A. Peres. 2009. Allocation of hunting effort by Amazonian smallholders: Implications for conserving wildlife in mixed-use landscapes	Biological Conservation. doi:10.1016/j.biocon.2009.03.018	Elsevier	0
Book chapter	Peres, C.A. 2008. Soil fertility and arboreal mammal biomass in tropical forests. Tropical Forest Community Ecology (S Schnitzer and W Carson, eds.).	Blackwell Scientific, Oxford.	Blackwell Scientific, Oxford.	0
Journal	Cunningham, A.A., E.L. Bennett, C.A. Peres and D.S. Wilkie. in press. The empty forest revisited.	Conservation Biology	Blackwell	0
Book chapter	de Thoisy, B. C. Richard-Hansen and C.A. Peres. 2008. Impacts of subsistence hunting on neotropical primates. In South American Primates: Testing new theories in the study of primate behavior, ecology, and conservation. (P. Garber, A. Estrada, J. Bicca-Marques, E. Heymann, K. Strier, eds)	Springer Press.	Springer Press.	0

3.4 Progress towards the project purpose and outcomes

At this early stage in this large-scale project, none of the project outcomes have yet been achieved, and therefore progress towards the defined project purpose is limited. The purpose level assumptions still hold true and the indicators still appear adequate for measuring outcomes at this stage. The active and willing participation of focal communities to date has been very encouraging and the project will continue to provide regular support and discussion to ensure this continued participation. No other two adjacent sustainable use reserve across the entire Brazilian Amazon (which contains over 550 protected areas) are moving towards an integrated natural resource management regime. It is our expectation that the lessons learned

in the Médio Juruá region will be applied to other reserves across Amazonas and other Brazilian states within the Amazon.

3.5 Progress towards impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

It is not possible at this early stage in the project to comment upon progress at the goal level, but we are pleased to report that we have been able to successfully conduct the various stages of local to regional scale project negotiation and to establish the field programme in practice. This has not been without its physical challenges; for example, we have cut, marked and measured more than 400 km of new forest transects plus three 100-ha plots with a 100x100m trail grid that will be used over the following years. In addition, all project participants are very confident that this project will be successful in achieving its most important targets, and there are a number of unanticipated positive spin-offs that are likely to result from this study and cooperation agreement. Most importantly, the local communities are still very pleased to be working with us, and we have a fantastic working understanding with the people in the villages and communities that we are working with.

4. Monitoring, evaluation and lessons

Project members with responsibilities for different project activities have been in constant discussion when in the field with each other to ensure optimal coordination and to monitor the combined progress of these complementary aspects of the project. When some members have been away from the field (i.e. in the UK or Manaus) contact has been maintained through email and telephone. Regular contact has also been maintained with the project leader in the field (Nov 2008) and by email and telephone, reporting on the progress of all project activities. This has worked well in general but communication is a problem, with inevitable periods where contact is not possible. This is particularly the case for project members trying to maintain contact with field assistants when away from field. There are some public telephones available in the reserves but they are not reliable. We have learnt over the course of the year that there is no replacement for physical visits to local monitors to ensure the best continuity of quality data collection. Recent improvements in communication, however, include a two-way radio available in the Bauana Field Station and frequent email connection from the village of Bauana next to the station.

Important indicators of achievements at this stage of the project include (1) the unreserved willingness of all local communities to participate in the project, and this includes a number of communities and isolated households that we are unable to work with due to financial and time limitations; (2) streamlining of our interaction and field coordination of efforts with partners at SDS and IBAMA; (3) accomplishment of perhaps 90% of the overall project targets at this

stage, and established of several proposed and new sampling protocols; and (4) establishment of new research and extension collaborations with partners at UFAM, INPA, SDS, Universidade Federal de Lavras (UFL)., and now the ProVárzea fishery management program of IBAMA.

5. Actions taken in response to previous reviews (if applicable)

Priorities highlighted in the Review of Annual Report 1 include the opening of the várzea transects and the establishment of 'no-take' areas. The project has acted decisively on both of these important components. A concerted effort has brought the total number of várzea transects up to a level sufficient to allow good comparison with terra firme transects. Work by the project's partner SDS will see the introduction of a zoning agreement within the RDS Uacari and survey work by the project has already been granted permission to continue within the restricted areas.

The review also emphasised the need to provide supplementary evidence of project achievements in future reports. As such we have attempted to include a variety of sources gathered over the past year to support our reported achievements so far, including maps of opened transects, photographs of meetings and locally trained assistants at work, details of survey protocols and examples of completed datasheets.

We were advised to discuss achievements clearly against all milestones, including those not achieved, and to try to separate outputs resulting from Darwin funding from parallel projects. As acknowledged, it is complicated to separate all outputs but every effort has been made to distinguish achievements of other projects, particularly those of ProBUC. However, project results will eventually be integrated with those of ProBUC, and this programme financed by the Government of Amazonas can be seen as a long-term extension of PMJ (the Darwin project) within both the Médio Juruá reserves and other sustainable-use reserves in the State of Amazonas.

Finally, it was noted in the review that while a project website had not been planned, this would be a very useful publicity tool. A preliminary web page for the project has now been established on the Tropical Forest Research website (http://www.tropicalforestresearch.org/projects/jurua.aspx), with further developments planned for the coming year.

6. Other comments on progress not covered elsewhere

The design of the project has not been significantly enhanced over the last year.

The project does not face any particular risk.

7. Sustainability

The profile of the project has increased within Brazil and internationally over the past reporting period. The project has been widely advertised by the project leader Carlos Peres, including talks at the international Tropical Biology and Conservation Congress in Suriname (July 2008), the Brazilian Congress of Mammalogy (August 2008), the Latin American Wildlife Ecology and Management Congress (Rio Branco, Acre, Brazil, September 2008), the Brazilian Congress of Ecology (June 2008), a meeting on the tropical biodiversity crisis held at the Smithsonian Research Institute in Panamá (November 2008), a policy/research meeting convening all Amazonian specialists (LBA Manaus, November 2008), and a meeting at Stanford University (California, USA) on the ecological consequences of tropical forest defaunation.

Through its wider recognition within Brazil, the project is now profiled on-line as one of the major biodiversity research and technical assistance programmes by PPBio, the National Research Program in Biodiversity coordinated by the Brazilian Ministry of Science and Technology, MCT (see http://ppbio.inpa.gov.br/Port/inventarios/mediojurua/), serving to further advertise the project as a potential field site for other research teams planning fieldwork in Amazônia. We plan to take advantage of this greater project profile to increase influx of Brazilian postgraduate students and researchers and make sure that all the effort placed in the Médio Juruá region will not be discontinued as of the end of the project period in 2010-11.

8. Dissemination

The project leader conducted dissemination work at various conferences attended during the past year, including the Brazilian Mammalogy Congress held in Caxambú, Brazil, and the Tropical Biology and Conservation Meetings held in Suriname. Seminars and discussion groups on project activities have also been presented to the Centre for Ecology, Evolution and Conservation (CEEC) at the University of East Anglia by project members.

Local dissemination has occurred at various smaller meetings, most recently at the ProBUC meeting at the Bauana Field Station (14-16th May 2009), where other participants included André Cunha (GFA Consulting Group Ltda.) and Camila Freitas (Instituto de Conservação e Desonvolvimento Sustentável do Amazonas: IDESAM).

Plans for the next reporting year include further dissemination of the project at various meetings, including the Tropical Biology and Conservation Meetings in Germany (July 2009), the Brazilian Zoology Congress in Belém, Brazil (February 2010), and the Cambridge Conservation Biology Student Conference, UK (March 2010). As a mark of the growing standing of this project internationally, we have been invited to contribute a paper to a special

edition of the journal *Environmental Conservation* on 'Community-based Natural Resource Management', which we are now working on.

9. Project Expenditure

Table 3 Project expenditure during the reporting period (Defra Financial Year 1 April 2008 to 31 March 2009)

Item	**Budget** (project application)	Expenditure	Variance
Rent, rates, heating, overheads etc			
Office costs (eg postage, telephone, stationery)			
Travel and subsistence			
Printing			
Conferences, seminars, etc			
Capital items/equipment (specify)			
Others (specify)			
Salaries Whaldener Endo Local monitors and local field assistants Spatial modeller			
TOTAL			

JUSTIFICATION ON DISCREPANCIES BETWEEN THE ORIGINAL BUDGET ALLOCATION AND EXPENDITURE IN THE REPORTING PERIOD: Several expenditure items, such as the purchase of laptops, aluminium boats, outboard motors, camera traps and other durable equipment have been severely delayed because of the late start of the project, so part of the Equipment budget category was carried over from Year 1 (2007/08) to Year 2 (2008/09), thereby making up for previously underspent funds (see Annual Report/Year 1). The project will not make use of a spatial modeller postdoc at UEA until its final year of the project, and these funds have been reallocated into Travel & Subsistence and Local wages for field assistants and field monitors (with the permission of Darwin; see email correspondence of January 2009). Almost all of the day-to-day running and operational costs of this project (e.g. food, fuel, boat repairs, local wages, airfares) have been allocated to Travel & Subsistence and Local wages, and we are currently running a deficit on these budget components of the project, which admittedly had been under-budgeted because we did not know the exactly costs of

deploying this ambitious field programme at the time the project was proposed and we have effectively lost >25% of our initial budget on the devaluation of the exchange rate of the GBP (£) against the Brazilian Real (R$). However, we have so far managed to compensate for this deficit by a surplus balance on other parts of the project, so that there are no net changes in overall funding allocation to the field budget of the project.

10. OPTIONAL: Outstanding achievements of your project during the reporting period (300-400 words maximum). This section may be used for publicity purposes

I agree for LTS and the Darwin Secretariat to publish the content of this section

Annex 1 Report of progress and achievements against Logical Framework for Financial Year: 2008/09

Project summary	Measurable Indicators	Progress and Achievements April 2008 - March 2009	Actions required/planned for next period
Goal: *To draw on expertise relevant to biodiversity from within the United Kingdom to work with local partners in countries rich in biodiversity but constrained in resources to achieve* *The conservation of biological diversity,* *The sustainable use of its components, and* *The fair and equitable sharing of the benefits arising out of the utilisation of genetic resources*		*(report on any contribution towards positive impact on biodiversity or positive changes in the conditions of human communities associated with biodiversity eg steps towards sustainable use or equitable sharing of costs or benefits)*	*(do not fill not applicable)*
Purpose To design appropriate guidelines to manage game vertebrates and other key NTFP resource populations in large multiple-use tropical forest reserve, helping the Brazilian federal and state governments in developing, stimulating and implementing effective community-based forest	*New and unique knowledge on the spatial structure of extractive activities in tropical forest reserves, and how these relate to natural mosaics of habitat productivity.* *Quantitative estimates of sustainable harvest quotas of target species, assuming both a closed and an open population scenario where depletion can be balanced by immigrants from source areas.*	Very good progress towards achieving the project purpose has been made on all outputs. Particular improvements have been made by the great increase in the number of monitored várzea trasects, and the approval already given to continue surveys within the soon to be introduced no-take zones. Important advances have been made by introducing spatially-explicit mapping of hunt locations and by the new developments in experimentally	Extra interviews for households and communities to provide background demographic and socio-economic information. Spatially-explicit mapping to be continued for hunting trips and commenced for commercial fishing trips. Opening and monitoring of additional transects both outside

Project summary	Measurable Indicators	Progress and Achievements April 2008 - March 2009	Actions required/planned for next period
resource management programmes that are grounded in the socioeconomic reality of Amazonian Sustainable Development and Extractive Reserves, and Indigenous Territories.	*An experimental study of the source-sink dynamics of game populations using multiple large no-take areas mapped with the assistance of and enforced with the help of local communities.* Results that provide the State of Amazonas and the Brazilian federal government with practical management information helping them fulfill commitments to the Convention on Biological Diversity.	harvesting *Copaifera*. In addition, the good start has been maintained in reinforcing the training of monitors and in monitoring households, transects, 100ha plots, and tagged phenology trees. Continued progress on all fronts remains reliant on the assumption of the continued high levels of active participation by focal communities.	the reserves and in remote areas within the reserves. Mapping of key NTFPs along várzea transects. Identification of tagged phenology trees. Continued monitoring of all households, transects and permanent plots. Continued regular support for all monitors to ensure the continuation of high quality data collection.
Output 1. Assessment of forest resources extracted, and levels of offtake.	*1a. Daily records of the identity, weight, sex and reproductive condition of animals consumed, including game vertebrates and fish.* *1b. Spatially-explicit mapping of hunting trips and resources harvested.*	Good progress has continued on assessing extraction of forest resources. Weekly interviews have been conducted throughout the year in 13 communities (with an additional 14 communities monitored by ProBUC). The identity, weight, sex and reproductive condition of game animals is being recorded in all 27 communities. Spatially-explicit mapping of hunting trips has now started and will be introduced for fishing trips. The output will only be achieved after further long term accumulation of these data. Indicators are appropriate.	

Project summary	Measurable Indicators	Progress and Achievements April 2008 - March 2009	Actions required/planned for next period
Activity 1.1 Household interviews		14 local inhabitants are now fully trained to conduct weekly household interviews in 13 local communities assessing terrestrial and aquatic resource extraction. This includes 6 monitors in 6 communities trained during this reporting period. All monitors will continue to receive regular support and further training where necessary during the next period. Existing interviews will be complemented during the next year by additional questionnaires on three tiers to provide demographic and socio-economic profiles, to record access to services and markets, and to investigate motivation for agro-extractivist behaviours.	
Activity 1.2 GIS mapping of the reserves and habitat types		This has been successfully completed and is available to be used by all other components of the project.	
Activity 1.3 GIS analysis of game harvest areas		Household interviews by 14 monitors in 13 communities are recording specific place names where the hunts occur. 10 active hunters have been trained to use a GPS to record each of their hunting trips. Hunt location will continue to be recorded during the next year, with regular support and further training for monitors where necessary.	
Activity 1.4. Weighing and measuring hunted animals		28 monitors in 27 communities are identifying, sexing, weighing and measuring hunting kills arriving in the communities. This activity will continue during the next year, with regular support and further training where necessary. This activity has also been extended to freshwater fish.	

Project summary	Measurable Indicators	Progress and Achievements April 2008 - March 2009	Actions required/planned for next period
Output 2. Quantitative assessment of the demographic sustainability of forest resource extraction.	*2a. Seasonally repeated census data from at least 100 line-transects of 5 km in length in both hunted and non-hunted várzea, paleo-várzea, and terra firme forests, on both banks of the Rio Juruá.* *2b. Mapping of the spatial distribution of key NTFP populations, including Copaifera and Carapa trees.* *2c. A study of the demographic impact of extractive practices on key NTFP resource populations.* *2d. Sustainable harvest models under different source-sink scenarios.*	Good progress has continued towards this output. Progress has been much improved on line-transect surveys, with particular attention paid to increasing the number of várzea transects. There is now an even spread of 88 (including 15 monitored by ProBUC) transects on both banks of the Rio Juruá in both várzea and terra firme, with extra transects planned for remote high terra firme areas. The spatial distribution of key NTFP populations will be mapped along várzea transects in July-August 2009. Indicator 2c is no longer appropriate as this aspect has changed from a study of the demographic impact of extraction to an experimental harvest of *Copaifera* oil. This and the development of a population ecology model for *Copaifera* are progressing well. Finally the approval has already been given for transect census to continue in the no-take zones which are being developed and will be introduced by SDS. The output will be achieved with the completion of NTFP mapping and extraction in the short term, and further long term accumulation of faunal censuses and household interviews. All indicators apart from 2c are appropriate.	
Activity 2.1. Census faunal transect		36 transects have been added this year with a concerted effort on várzea transects (27 várzea, 9 terra firme). 29 monitors have conducted >1000 km of census data from 73 transects. The grand total of transects is currently 88 (including 15 ProBUC transects) meaning the aim of 90-100 transects has almost been reached. Transect censuses will continue during the next year, with regular support and further training where	

Project summary	Measurable Indicators	Progress and Achievements April 2008 - March 2009	Actions required/planned for next period
		necessary.	
Activity 2.2. Map NTFP population density		No further mapping occurred in this reporting period following mapping of 35 terra firme transects in Year 1. Surveys for the same species will be conducted along várzea forest transects during June-July 2009.	
Activity 2.3. Experimental harvest of *Copaifera*		Assessing the impact of oil harvest on tree fecundity has been dropped from this activity. Instead, 77 adult *Copaifera* trees of four different species have been experimentally harvested, to analyse oil yield in relation to species, DBH and location, to help predict the potential for extraction on a reserve-wide scale. During the next year, this activity will monitor extraction of oil by reserve residents trained in extraction techniques.	
Activity 2.4. Develop population ecology model for *Copaifera*		Adult trees, saplings and seedlings from three *Copaifera* species have been recensused three times (July 2008, November 2008, and April 2009). One more recensus is planned in March 2010.	
Activity 2.5. Introduce reserve-wide harvest zoning agreements		SDS are completing the final zoning agreement for the RDS Uacari, and the project has already been granted permission to continue censuses in all areas, including total restriction zones, when the initiative is introduced.	
Output 3. Local monitors, field technicians and students able to assess and monitor forest biodiversity using quantitative	*3. Minimum of 49 local monitors and 10 Brazilian students trained in quantitative biodiversity surveys, and harvest assessments.*	Good progress has been maintained in the reinforcement of training for all local monitors. 29 monitors are now conducting monthly line transects for fauna and fruit. A further 5 monitors are trained to survey the three 100 ha plots for fauna and fruit, and to collect material from the 192 fruit/leaf-litter	

Project summary	Measurable Indicators	Progress and Achievements April 2008 - March 2009	Actions required/planned for next period
methods.		traps every 2 weeks, with an additional 2 monitors trained in the drying and weighing of this material. Reinforcement of phenology training is continuing, and dung beetle surveys are planned to commence in August 2009. An extra component towards this output is the introduction of 59 vegetation plots along existing transects to assess tree and sapling density. All these transects and plots will be available for the Brazilian students, which are still yet to be recruited. Training of local monitors is progressing very well but achievement of the output will require the recruitment of Brazilian students soon. The indicator is appropriate.	
Activity 3.1. Conduct training workshop(s)		A second training event (workshop/field course) was held at Bauana Field Station (23-26th November 2008) directed by the project leader Carlos Peres. A third event is planned for September 2009.	
Activity 3.2. Continue post-workshop training		Two additional/replacement transect monitors and five interviewers have been trained since the training workshop, and all monitors and interviewers have been revisited to check any problems, answer any questions or doubts, and to provide extra training if necessary. This regular support aims to assure the continued long-term collection of quality data.	
Activity 3.3 Conduct line transect surveys		73 line-transects have now been opened, with 29 transects located in várzea forest, and 44 transects in terra firme forest. 29 monitors are visiting those transects monthly to census wildlife populations and fruiting	

Project summary	Measurable Indicators	Progress and Achievements April 2008 - March 2009	Actions required/planned for next period
		trees.	
Activity 3.4 Conduct 100 ha plot surveys		Monthly censuses for fauna, residual fruit-fall, and fruit-feeding observations, have been conducted in the three 100 ha plots for most months between May 2008 and May 2009. In addition, from May 2008 to January 2009 material from 96 leaf-litter/fruit traps has been collected, dried, separated and weighed by trained assistants to assess primary productivity levels. Traps have now been replaced by 0.71m x 0.71m traps made from durable PVC tubing, and bi-weekly collections recommenced in May 2009.	
Activity 3.5. Conduct phenology surveys		Monthly surveys of four 1-km transects were carried out between May 2008 and January 2009. Surveys recommenced in April 2009 and two more transects have been added to yield a total of 734 tagged trees or lianas (351 in várzea, 383 in terra firme) observed monthly. Surveys will continue this year and closely attended training of assistants will be conducted to ensure quality of data collection over the next year.	
Activity 3.6. Conduct dung beetle surveys		No further dung-beetle surveys were conducted between May 2008 and May 2009. Extensive sampling of dung beetle populations throughout the two reserves is planned for August- September 2009.	
Activity 3.7. Conduct 0.1 ha tree plots		Vegetation surveys were conducted in 59 small plots (10m x 100m) along 20 transects. This work will assess the density of trees, lianas and saplings in várzea and terra firme habitats, as well as derive estimates of	

Project summary	Measurable Indicators	Progress and Achievements April 2008 - March 2009	Actions required/planned for next period
		aboveground biomass and carbon stocks across the reserves and will be continued during the next year. A total of 300 plots will be inventoried.	
Output 4. Local communities in RDS Uacari and RESEX Medio-Jurua, and other reserves are able to effectively apply large-scale management recommendations.	*4a. A user-friendly, illustrated community-based wildlife management (CBWM) handbook that can be distributed to rural communities of lowland Amazonia.* 4b. Publications, presentations and SDS workshop, Manaus.	Very good progress is being made on the collection of long- term data sets but analysis will still only be possible assuming the successful continuation of the survey methods established. Progress towards this output is therefore only just starting and will advance much further following assessment of various long-term components of the project. The indicators are still appropriate at this point.	
Activity 4.1. Analyse long-term data collected from all project components		One full year of data collection has been completed. Data entry is ongoing and preliminary analysis is starting. This year will see continued data entry and the first more in-depth analyses.	
Activity 4.2. Conduct meetings with all local stakeholders		Four significant meetings with local stakeholders have taken place during the past reporting year, including a meeting with the Management Council of the RDS Uacari in Carauari, two meetings with SDS/ProBUC staff in Manaus, and a four-day workshop/field course at the Bauana Field Station with local monitors. Further contact will be maintained and further strengthened during the next year.	
Activity 4.3. Write publications and presentations		Publications and presentations will begin to emerge as individual components of the project reach completion. The first of these are expected to emerge during the next year.	

Project summary	Measurable Indicators	Progress and Achievements April 2008 - March 2009	Actions required/planned for next period
Activity 4.4. Interpret findings to develop recommendations		Interpretation of findings and subsequent recommendations will begin to emerge as individual components of the project reach completion.	
Activity 4.5. Publish, print and distribute CBWM		The production of a community-based wildlife management handbook is not planned until September 2010.	
Activity 4.6. Organise workshop in Manaus to present findings and recommendations		The final technical workshop in collaboration with SDS in Manaus is not planned until September 2010.	

Annex 2 Project's full current logframe

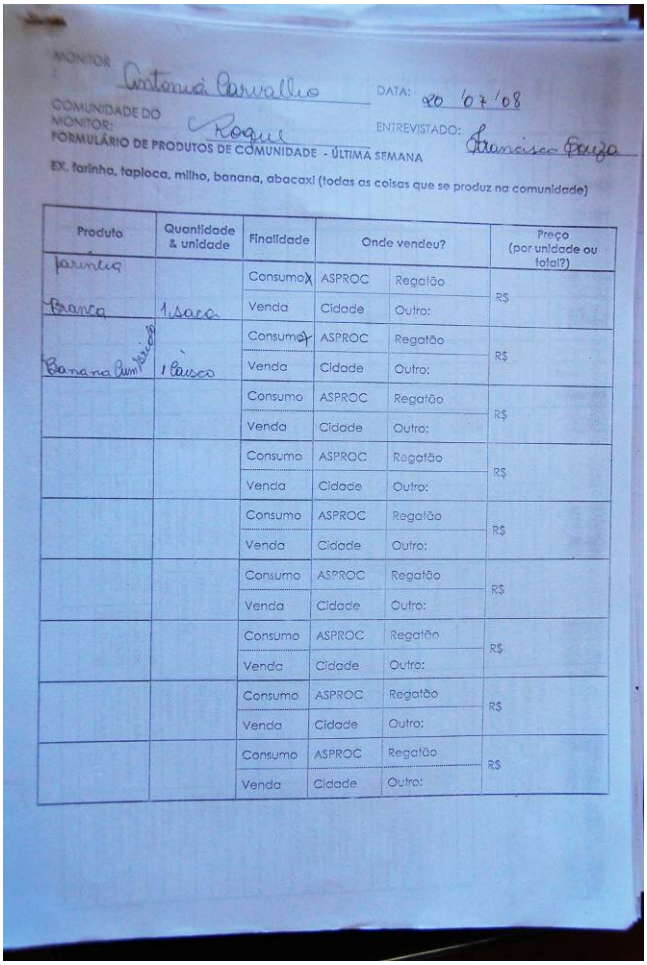
Project summary	Measurable Indicators	Means of verification	Important Assumptions
Goal: To work with local partners in countries rich in biodiversity but poor in resources to achieve the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.			
Purpose To design appropriate guidelines to manage game vertebrates and other key NTFP resource populations in large multiple-use tropical forest reserve, helping the Brazilian federal and state governments in developing, stimulating and implementing effective community-based forest resource management programmes that are grounded in the socioeconomic reality of Amazonian Sustainable Development and Extractive	*New and unique knowledge on the spatial structure of extractive activities in tropical forest reserves, and how these relate to natural mosaics of habitat productivity.* *Quantitative estimates of sustainable harvest quotas of target species, assuming both a closed and an open population scenario where depletion can be balanced by immigrants from source areas.* *An experimental study of the source-sink dynamics of game populations using multiple large no-take areas mapped with the assistance of and enforced with the help of local communities.* *Results that provide the State of*	*Field surveys and spatial modelling data.* *Successful implementation of a viable spatially-structured experimental harvest programme that can be co-managed by local communities.* *Publication and wide distribution of an illustrated user-friendly management handbook that can be understood by the semi-literate rural population of Amazonian extractive and sustainable development reserves.* *Publications in high-impact international scientific journals.* *Reports in Brazilian high-circulation*	*That focal communities will maintain their active participation in the project and uphold the experimental manipulation of hunting throughout the length of the project.* *That new knowledge will actually be used by state-level and federal government agencies to instigate, facilitate, design and implement community-based wildlife management (CBWM) programmes in a growing number of Amazonian multiple-use forest reserves.* *That any resulting policy changes will be implemented effectively via SDS-Amazonas, IPAAM, and IBAMA (state and federal branches).* *That IBAMA's National Centre of Sustainable Development of Traditional Populations (CNPT) can help promote participatory CBWM protocols in all Amazonian extractive reserves under its management jurisdiction.*

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Reserves, and Indigenous Territories.	*Amazonas and the Brazilian federal government with practical management information helping them fulfill commitments to the Convention on Biological Diversity.*	*popular science magazines (e.g. Ciência Hoje; Natureza & Sociedade).* *Reports to state-level and federal environmental agencies in Brazil including SDS-State of Amazonas, IBAMA, and Ministério do Meio Ambiente (MMA).*	*That several of the lessons and insights from this project will be generalised to other multiple-use Amazonian forest reserves, including Extractive Reserves, Sustainable Development Reserves, National Forests, and Indian Reserves.* *Project results can be fed through to the revision process of the now obsolete federal Faunal Protection legislation act of January 1967.*
Outputs *1. Assessment of forest resources extracted, and levels of offtake.* *2. Quantitative assessment of the demographic sustainability of forest resource extraction.* *3. Local monitors, field technicians and students able to assess and monitor forest biodiversity using quantitative methods.* *4. Local communities in RDS Uacari and RESEX Medio-Jurua, and other reserves are able to effectively apply large-scale management recommendations.*	*1a. Daily records of the identity, weight, sex and reproductive condition of animals consumed, including game vertebrates and fish.* *1b. Spatially-explicit mapping of hunting trips and resources harvested.* *2a. Seasonally repeated census data from at least 100 line-transects of 5 km in length in both hunted and nonhunted várzea, paleo-várzea, and terra firme forests, on both banks of the Rio Juruá.* *2b. Mapping of the spatial*	*1. Survey reports, biodiversity and resource databases and correspondent files from collaborators.* *2a. Survey reports, data and correspondent files from internal collaborators.* *2b. Survey reports, data and correspondent files from internal collaborators.* *2c. Survey reports, data and correspondent files from internal collaborators.* *2d. Development of spatially-explicit sustainable harvest models.*	*1. Proposed methods will allow standardised quantification of offtakes and resource densities.* *1&2. Level of acceptability of simplified protocols is sufficiently high, and data acquisition can be sustained.* *1&2. Harvest zoning agreements can be established and maintained.* *2. A competent spatial modeller can be recruited to apply empirical results to a series of harvest mosaic scenarios based on spatio-temporal simulations.* *2&3. Adequate students can be attracted from within partner institutions.* *3. Assimilation by local community 'monitors' and MSc students of field course information is satisfactory.*

Project summary	Measurable Indicators	Means of verification	Important Assumptions
	distribution of key NTFP populations, including Copaifera and Carapa trees. *2c. A study of the demographic impact of extractive practices on key NTFP resource populations.* *2d. Sustainable harvest models under different source-sink scenarios.* *3. Minimum of 49 local monitors and 10 Brazilian students trained in quantitative biodiversity surveys, and harvest assessments.* *4a. A user-friendly, illustrated community-based wildlife management (CBWM) handbook that can be distributed to rural communities of lowland Amazonia.* *4b. Publications, presentations and SDS workshop, Manaus.*	*3. Field survey reports, correspondent files from collaborators detailing student involvement and skills gained. Skills certification schemes for those involved.* *4a. Wildlife management handbook successfully developed and widely disseminated.* *4b. Twelve papers in peer-reviewed scientific journals, and high-circulation Brazilian science magazines.* *4a & 4b. Copies of all publications, conference abstracts and workshop proceedings sent to DEFRA (Darwin Initiative).*	*4. Impact of the SDS/INPA Technical Workshop and publications are sufficiently significant to influence wildlife management policy through IBAMA, IPAAM, and MMA (Ministry of Environment).* *4. Level of receptivity and uptake of resource management guidelines at RDS Uacari and RESEX Medio-Jurua are satisfactory.* *4. Results are adequate to provide novel publications with national and international impact.* *4. Level of receptivity and uptake of resource management guidelines are satisfactory in other State of Amazonas reserves where the project 'toolbox' approach is applied.*
Activities	Activity Milestones		Assumptions

Project summary	Measurable Indicators	Means of verification	Important Assumptions
GIS mapping of the reserves and forest types, establishment of harvest and population census protocols, experimental design and considerations of spatial scale; *Training of local community monitors, Brazilian MSc students and reserve staff;* *Field research programme involving the delimitation and implementation of experimental no-take areas following wide consultation with at least 20 of the 49 local communities.* *Data analysis and spatial modelling;* *Dissemination of results;* *SDS/INPA Workshop.*	*Yr1: Formal assessment of RDS Uacari and ResEx Médio Juruá, including spatial mapping of forest types, local communities, and stream subcatchment basins, and establishment of harvest protocols (4 months; Sept-Dec 2007).* *Yr1: Leaders of all 49 local communities attend the initial planning meetings and training sessions; Selection of Brazilian students from collaborating institutions; Initiation of short field courses and supervised training programme; Experimental no-take areas are delimited and begin operating (6 months; Sept – Feb 2007/08).* *Yr1 - Yr3: Sampling protocols agreed by July 2007. Household-level surveys targeting specific resource types and fieldwork begin, including 24 month quantification of seasonal changes and phenological patterns of resource populations and their food supply (Sept 2007 - Aug 2009).* *Yr 3: Ongoing analysis and spatial modelling conducted throughout the period of data collection will be enhanced and finalised within a 6 month period following termination of field data collection (Sept 2009 – Feb 2010).* *Yr 3 – Yr4: SDS/INPA Workshop; First high-impact publication and management handbook (March 2010) followed by others both in Portuguese and English. Information summarised and presented to the State of Amazonas and Brazilian Federal Government.*		GIS mapping can be completed both at UEA and SDS on the basis of high-resolution satellite images and initial field surveys. INPA and SDS contacts are in place; Fieldwork logistics can be implemented at Carauari, Amazonas; boats and other equipment are purchased and field station is refurbished. Local communities become willing collaborators, as indicated by partner institutions. Deployment of experimental no-take areas can be agreed upon following mapping of catchment areas, as indicated by collaborating institutions. Theoretical and applied results are written-up. Illustrator completes hand-drawings. Workshop is well attended by IPAAM, SDS, IBAMA and INPA staff.

Annex 3 Onwards – supplementary material (optional but encouraged as evidence of project achievement)



MONITOR: Antonia Carvalho DATA: 20/07/08

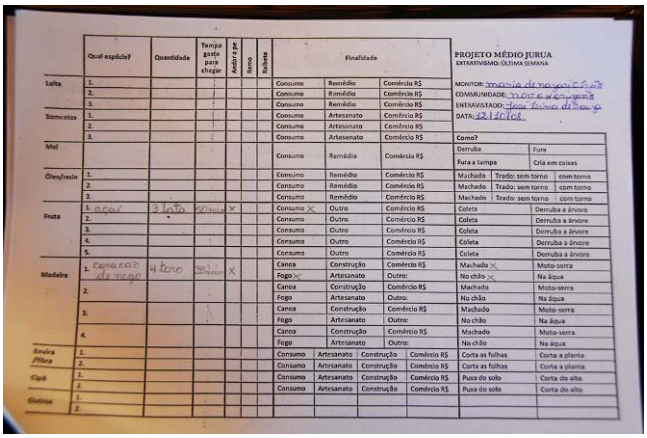
COMUNIDADE DO MONITOR: Roque ENTREVISTADO: Francisco Souza

FORMULÁRIO DE PRODUTOS DE COMUNIDADE - ÚLTIMA SEMANA

EX. farinha, tapioca, milho, banana, abacaxi (todas as coisas que se produz na comunidade)

Produto	Quantidade & unidade	Finalidade	Onde vendeu?		Preço (por unidade ou total?)
farinha		Consumo X	ASPROC	Regatão	R$
Branca	1 saco	Venda	Cidade	Outro:	
Banana Comprida	1 Cacho	Consumo X	ASPROC	Regatão	R$
		Venda	Cidade	Outro:	
		Consumo	ASPROC	Regatão	R$
		Venda	Cidade	Outro:	
		Consumo	ASPROC	Regatão	R$
		Venda	Cidade	Outro:	
		Consumo	ASPROC	Regatão	R$
		Venda	Cidade	Outro:	
		Consumo	ASPROC	Regatão	R$
		Venda	Cidade	Outro:	
		Consumo	ASPROC	Regatão	R$
		Venda	Cidade	Outro:	
		Consumo	ASPROC	Regatão	R$
		Venda	Cidade	Outro:	

Figure 2. Completed interview datasheet: community products



PROJETO MÉDIO JURUÁ

EXTRATIVISMO: ÚLTIMA SEMANA

	Qual espécie?	Quantidade	Tempo gasto para chegar	Andou pé	Remo	Voadeira	Finalidade			Como?	
Leite	1.						Consumo	Remédio	Comércio R$		
	2.						Consumo	Remédio	Comércio R$		
	3.						Consumo	Remédio	Comércio R$		
Sementes	1.						Consumo	Artesanato	Comércio R$		
	2.						Consumo	Artesanato	Comércio R$		
	3.						Consumo	Artesenato	Comércio R$		
Mel							Consumo	Remédio	Comércio R$	Derruba / Fura / Fura a tampa / Cria em caixas	
Óleo/resin	1.						Consumo	Remédio	Comércio R$	Machado	Trado: sem torno / com torno
	2.						Consumo	Remédio	Comércio R$	Machado	Trado: sem torno / com torno
	3.						Consumo	Remédio	Comércio R$	Machado	Trado: sem torno / com torno
Fruta	1. acai	3 lata		X			Consumo X	Outro	Comércio R$	Coleta	Derruba a árvore
	2.						Consumo	Outro	Comércio R$	Coleta	Derruba a árvore
	3.						Consumo	Outro	Comércio R$	Coleta	Derruba a árvore
	4.						Consumo	Outro	Comércio R$	Coleta	Derruba a árvore
	5.						Consumo	Outro	Comércio R$	Coleta	Derruba a árvore
Madeira	1. espaco de rezo	4 toro		X			Canoa	Construção	Comércio R$	Machado X	Moto-serra
							Fogo X	Artesanato	Outro:	No chão X	Na água
	2.						Canoa	Construção	Comércio R$	Machado	Moto-serra
							Fogo	Artesanato	Outro:	No chão	Na água
	3.						Canoa	Construção	Comércio R$	Machado	Moto-serra
							Fogo	Artesanato	Outro:	No chão	Na água
	4.						Canoa	Construção	Comércio R$	Machado	Moto-serra
							Fogo	Artesanato	Outro:	No chão	Na água
Envira Ffloca	1.						Consumo	Artesenato	Construção / Comércio R$	Corta as folhas	Corta a planta
	2.						Consumo	Artesanato	Construção / Comércio R$	Corta as folhas	Corta a planta
Cipó	1.						Consumo	Artesanato	Construção / Comércio R$	Pusa do solo	Corta do alto
	2.						Consumo	Artesanato	Construção / Comércio R$	Pusa do solo	Corta do alto
Outros	1.										
	2.										

Figure 3. Completed interview datasheet: NTFPs


Projeto Médio Juruá

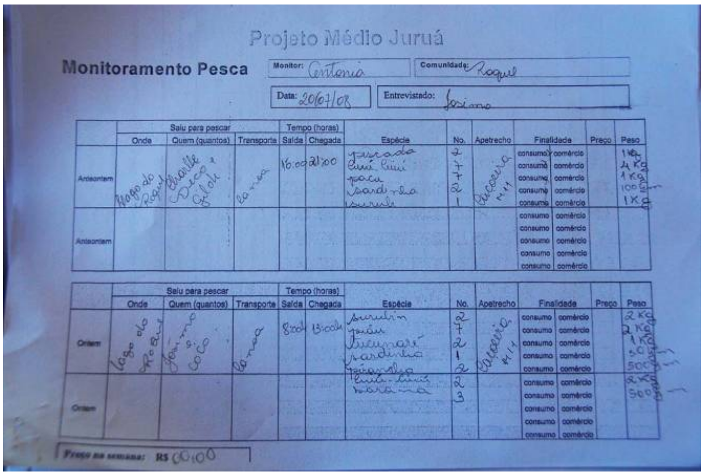
Atividade de Caça

(Ultima Semana)

Monitor: Antonia Comunidade: Roque

Data: 29/06/08 Entrevistado: Marconi ventura de Souza

Figure 4. Completed interview datasheet: hunting (including hunting locations)


Projeto Médio Juruá

Monitoramento Pesca

Monitor: Antonia Comunidade: Roque

Data: 20/07/08 Entrevistado:

Figure 5. Completed interview datasheet: fishing

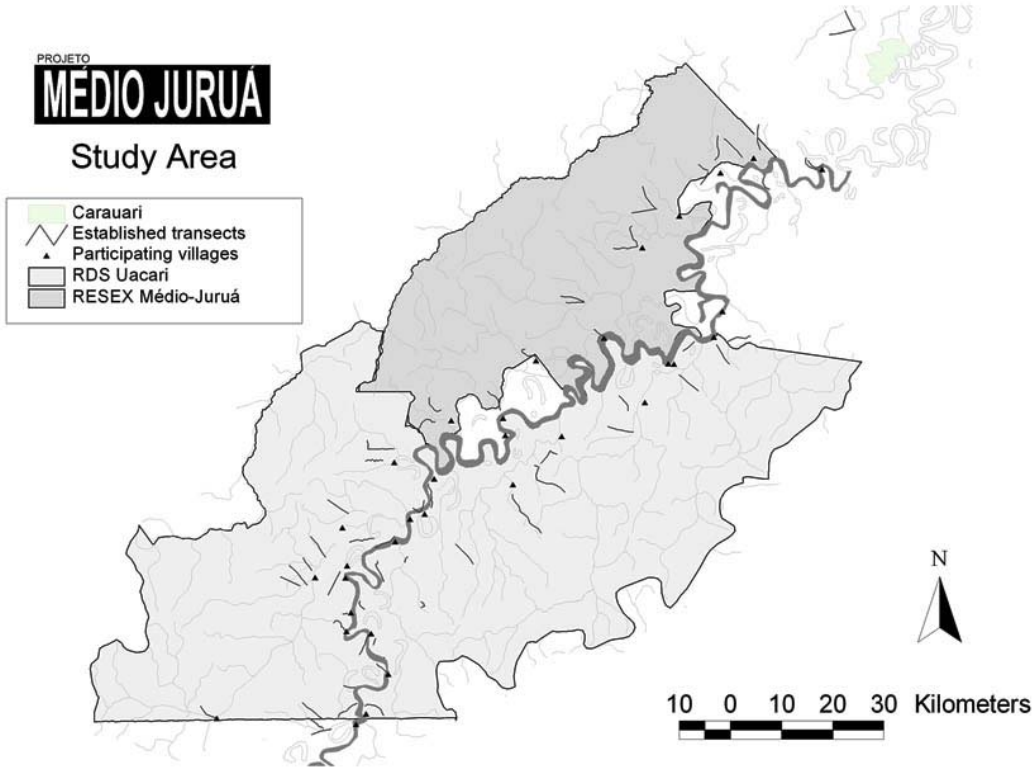


Figure 6. Map of the study area showing the two reserves and all participating communities and georeferenced transects.

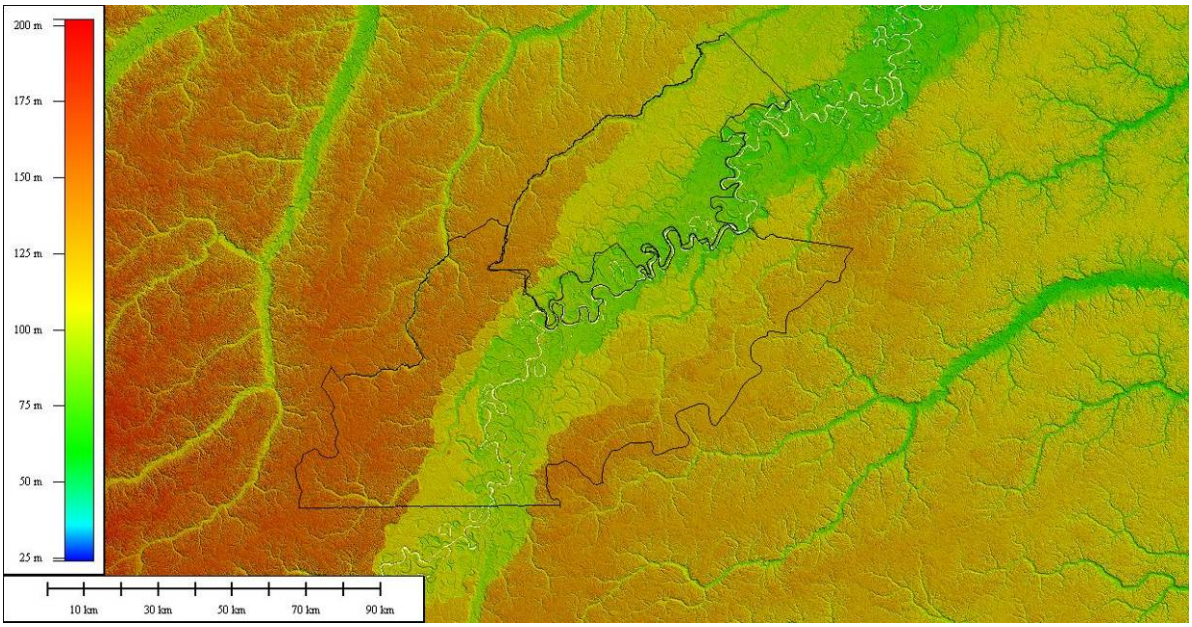


Figure 7. SRTM digital elevation image of the study area showing the two reserves and coarse-scale topography related to forest habitat type.

Figure 8. Project monitor using a GPS unit to mark the location of a hunting trip.

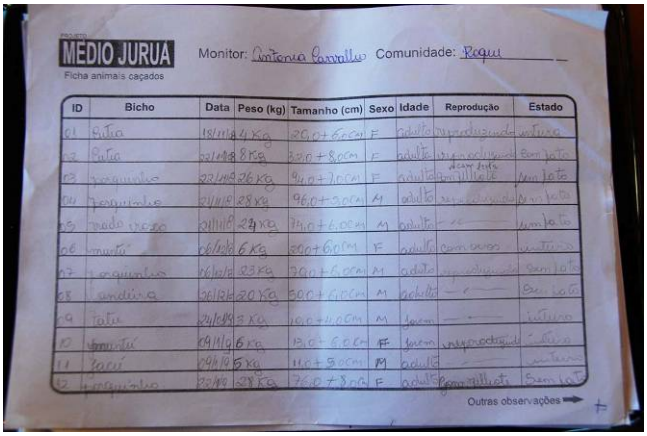


Figure 9. Completed datasheet: harvest profile of hunted forest vertebrates.

Figure 10. Project monitor weighing a *Geochelone* tortoise collected by a local hunter.

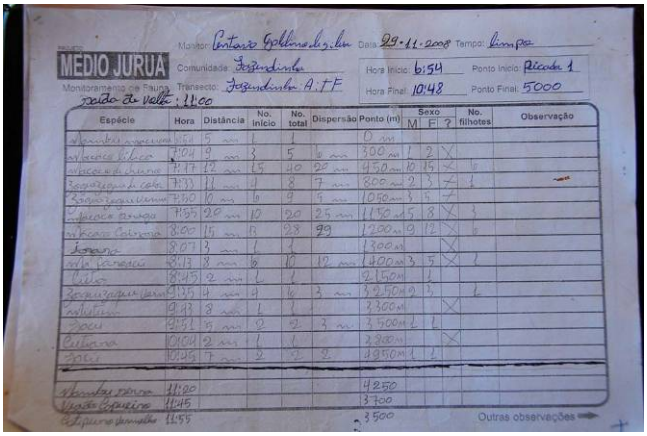


Figure 11. Completed transect data sheet: faunal survey

Figure 12. Extraction of *Copaifera* oil

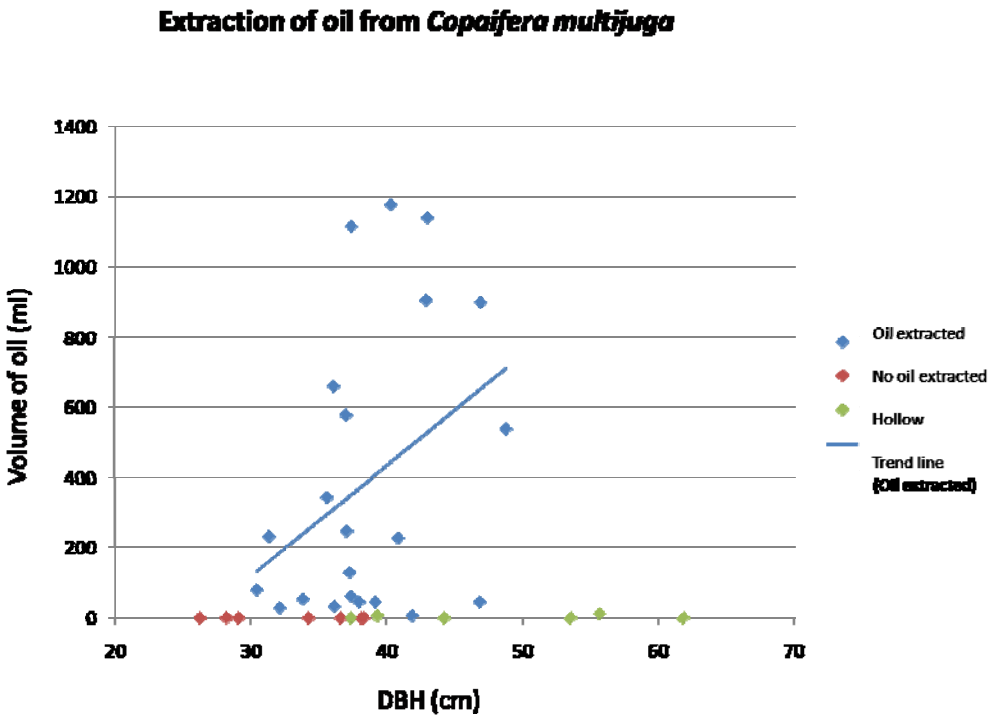


Figure 13. Preliminary analysis of relationship between oil yield and DBH for *C. multijuga*.

Figure 14. *Copaifera* seedling tagged for population ecology census.

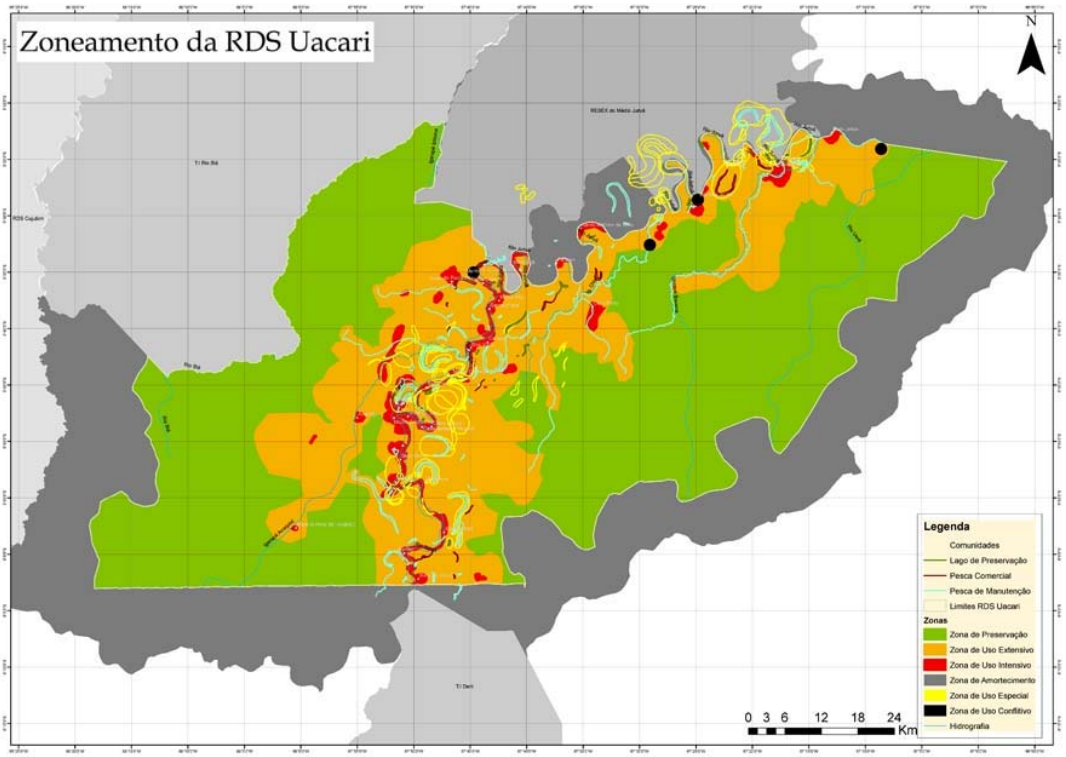
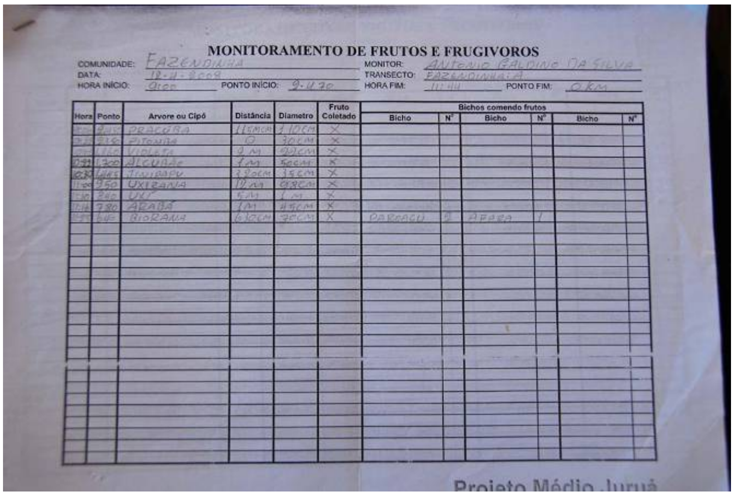


Figure 15. Map of the RDS Uacari reserve, showing different game harvest zones, divided into different restriction level categories.

Figure 16. Project leader, Prof. Carlos Peres with project monitors at the 2nd Workshop, Bauana Field Station, RDS Uacari (November 2008)



MONITORAMENTO DE FRUTOS E FRUGIVOROS

COMUNIDADE: FAZENDINHA MONITOR: ANTONIO GALDINO DA SILVA
DATA: 12-11-2008 TRANSECTO: FAZENDINHA A
HORA INÍCIO: 9:00 PONTO INÍCIO: 9.470 HORA FIM: 11:44 PONTO FIM: 0 KM

Hora	Ponto	Arvore ou Cipó	Distância	Diametro	Fruto Coletado	Bichos comendo frutos: Bicho	Nº	Bicho	Nº	Bicho	Nº
[illegible]	[illegible]	PRACURA	[illegible]	1.10CM	X						
[illegible]	[illegible]	PITOMBA	0	30CM	X						
[illegible]	[illegible]	VIOLETA	2 M	[illegible]	X						
[illegible]	1300	ALCUBÃO	1 M	50CM	X						
[illegible]	[illegible]	[illegible]	[illegible]	35CM	X						
11:00	950	UXIRANA	12 M	68CM	X						
[illegible]	280	UXI	5 M	1 M	X						
[illegible]	780	ARABÁ	7 M	45CM	X						
[illegible]	[illegible]	BIORANA	[illegible]	70CM	X	[illegible]	2	ARARA	1		

Projeto Médio Juruá

Figure 17. Completed transect data sheet: survey of residual fruit-fall.

Figure 18. Project monitor censusing wildlife along one of the seasonally flooded "várzea" forest transects.

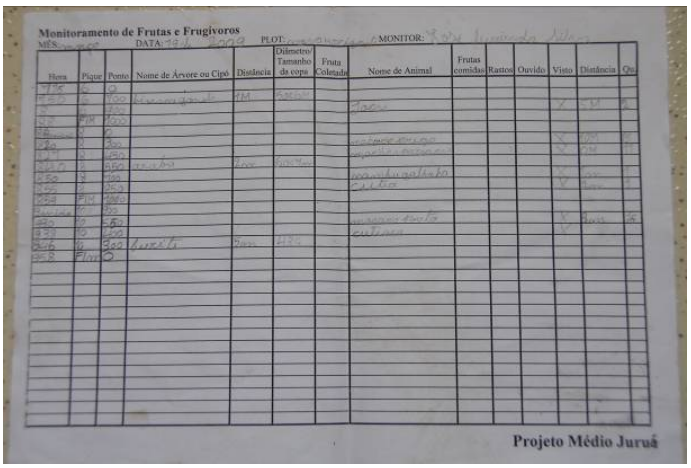


Figure 19: Completed 100-ha plot datasheet: survey of fruit-frugivore interactions.

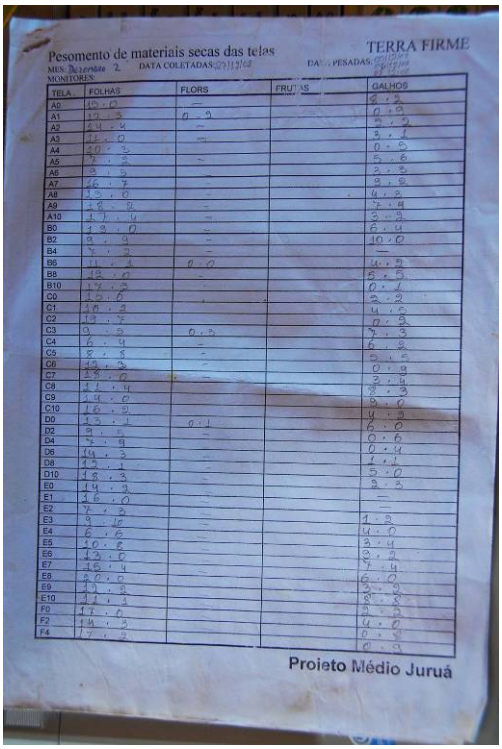


Figure 20: Completed 100-ha plot data sheet on leaf-litter/fruit trapping.

Figure 21: Selection of fruits sampled from 100ha plot surveys

Figure 22: Fruit/leaf-litter traps in terra firme and várzea forest

Figure 23: Completed plant phenology data sheet

Figure 24: Project monitors examining the crown of number-tagged trees along plant phenology transects

Figure 25: Mapping of key NTFPs along forest transects with a local monitor during Year 1.

NEW ACTIVITY 3.7: Forest inventories based on 0.1-ha tree plots: *The effect of seasonal inundation upon forest structure and composition on the forests of the Rio Juruá, Amazonas, Brazil* [An undergraduate dissertation (January 2009) at the University of East Anglia by Louise Riley]

Abstract — The effects that high amplitude seasonal flood pulses have upon forest structure and composition were investigated in the Uacari and Médio Juruá Extractive Reserves in the Rio Juruá region of Amazonas, Brazil. A total of 59 tree plots were sampled in total; 37 in the Terre firme and 22 in the Várzea forest. Within a tree plot, each tree with a diameter at breast height (DBH) greater than 10cm was measured, and identified by a local tree identifier. The diameters of any lianas greater than 5cm DBH within the tree plot were also recorded, as was the sapling density within each plot. Sapling density was found to be positively correlated with upland terra firme forests, where sapling densities were significantly higher. Lowland varzea forests were found to have a greater percentage of very large trees than the terra firme, indicating a higher level of productivity. The stepwise regression analysis also confirmed that the families Anonaceae, Burseaceae, L. Mimosoideae, Moraceae and Myristiaceae have a significant relationship with forest type. This can, in part, be attributed to the ability of certain families to develop physiological mechanisms in order to cope with long periods of inundation, meaning that only a small proportion of families are able to survive long periods of inundation. This could also help to explain the lower levels of species diversity that the várzea forests contain in comparison to terra firme forests. Other factors explaining differences in species composition and productivity between the two forest types include differences in soil nutrient status and that a higher percentage of fast growing pioneer species are reported to be found in várzea forests

Methodology — The fieldwork was carried out over a 10 week period during July, August and September 2008. During this period flood levels recede to their lowest annual levels, making data collection in the varzea more straight-forward as it can be navigated by foot rather than by canoe. Data was collected from a total of 59 0.1 hectare plots within the two reserves.

4.1 Plot selection. The 0.1 ha plots, (10m x 100m) were similar to Gentry plots (Gentry 1982) and were selected at random along pre-cut transects commonly around 3 km in length. Three to four plots were surveyed along each transect, with a distance of 400-1000m between any two plots.A hip chain was used to mark out the plot area. The plot was marked using plastic flagging tape every 25m, making relocation fairly simple. GPS points were taken at 0m and 100m of each plot, with at least 10m accuracy.

4.2 Tree sampling. Any tree greater than 10cm in diameter with the centre of its trunk inside the study area was included. For each tree, its diameter at breast height (dbh) was measured using a dbh tape. Normally, the measurement was taken at approximately 1.3m, except for those trees having tall buttresses or stilt roots, when the measurement was taken 50cm above the buttress or stilt root in accordance with Phillips and Baker (2002-6).

4.3 Tree identification. The local name of each tree was also recorded. A local expert on tree identification accompanied us on each day of fieldwork. Although not as precise as voucher collection, identification conducted in this way has its own merits, allowing a large area to be surveyed in a relatively

short time period (source needed). With a local name for each tree, it is possible to find out the genus for a large percentage of the trees. Although identification to the species level is preferable in many ways, much information can be gained from a genus level analysis (Butt et al 2008).

4.4 Liana sampling. Lianas with a DBH of greater than 5cm associated with a tree inside the plot were also included.

4.5 Sapling density. Sapling density was also counted for each plot. A 1 metre long pole was held at waist height whilst the counter walked the entire length of the plot, counting on a clicker counter any sapling less than 15mm dbh and greater than 1 metre tall which made contact with the stick.

4.6 Soil types. Soil type was ascertained for each plot by probing the soil and deciding on its predominant characteristics and classifying them as clay, sandy clay, clayey loam or sandy loam.

4.7 Canopy photographs. Canopy photographs were also taken using a Nikon hemispherical lens, capturing 180°. One photograph was taken at 0, 25,50,75 and 100m of each plot. Unfortunately, it has not been in the scope of this dissertation to analyse these photographs for canopy percentage cover. However, they will be used in future analysis as data from this project amasses.

4.8 Obtaining elevation data. Elevation data was extracted for each plot using its GPS points and the Global Mapper® program. For each plot the lowest elevation found in the plot was used to conduct the analysis.

4.9 Forest basal area. Basal area was calculated for each tree using the following calculation: $\pi \times (dbh/200)^2$.

Checklist for submission

	Check
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