Darwin Initiative – Final Report

(To be completed with reference to the Reporting Guidance Notes for Project Leaders (http://darwin.defra.gov.uk/resources/reporting/) -

Darwin project information

Project Reference	R15176 (UEA); Darwin Ref. 16-001
Project Title	Community-based sustainable management of forest resources in Amazonian extractive reserves
Host country(ies)	UK, Brazil
UK Contract Holder Institution	University of East Anglia, UK
UK Partner Institution(s)	n/a
Host Country Partner Institution(s)	(1) Secretaria do Estado do Meio Ambiente e Desenvolvimento Sustentável (SDS), State of Amazonas, Brazil; (2) Brazilian Institute of the Environment and Natural Renewable Resources (IBAMA), Brazil
Darwin Grant Value	£245,864
Start/End dates of Project	1 Sept 2007 – 30 April 2011
Project Leader Name	Prof Carlos Peres
Project Website	http://www.tropicalforestresearch.org/projects/mediojurua.aspx
Report Author(s) and date	Carlos Peres, Whaldener Endo, Joseph Hawes, Peter Newton & Elizabeth Nichols 31.10.2011

1 Project Background

This project sought to understand a number of increasingly pressing issues related to natural resource management in a growing number (and aggregate area) of Amazonian sustainable use forest reserves (i.e. extractive reserves and sustainable development reserves) that are legally inhabited by hundreds of thousands of both tribal and non-tribal native Amazonians. In general, these reserves have been affected by very low deforestation rates but many natural resources extracted by often rapidly-growing human populations for subsistence or sale are likely to become overexploited in the future. The semi-subsistence non-timber resources harvested in these reserves are sourced from both forest environments (e.g. game vertebrates, fibres, medicinal oleoresins, 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 both reserve occupants and the surrounding populations.

This project took place at two contiguous sustainable development forest reserves, which were created by the Brazilian Government in the last fifteen years and are located within the State of Amazonas 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). These two reserves are legally occupied by approximately 3,080 ± 50 people, who are willing participants in this research and management programme, and who currently experience a human population growth rate of ~2.6% per year. All of these reserve occupants are second to fourth generation descendants of increasingly hybridized local indigenous groups and Brazilian rubber tappers (*seringueiros*) of northeastern Brazilian origin, who initially colonised this region of Amazonia from around 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 industry and significant rural exodus to major urban centres (e.g. Carauarí, Tefé, Manaus). Economic development has largely now been driven by oil and gas exploration led by

Brazilian petrochemical companies. These reserves are managed by two different government agencies, which in itself presents a major challenge in terms of communication and integration of management objectives. The Uacari Sustainable Development Reserve is under the jurisdiction and formal management of the state-level Environmental Agency of Amazonas (SDS), whereas the Médio Juruá Extractive Reserve is managed by the federal Protected Areas Agency of Brazil (IBAMA/ICMBio). These two government agencies comprised our formal execution partners in deploying and implementing all stages of this project, and in disseminating the project results both within and outside these target reserves. However, the geographic extent of the areas managed on paper by these (severely underfunded and understaffed) agencies within Brazilian Amazonia is truly vast, and they are unable to allocate a sufficient number of qualified and well equipped personnel to all of the reserves they oversee, including our target reserves. This project was thus granted a positive reception and a good working relationship followed. The project aimed to develop an ambitious work programme by identifying and examining a number of population ecology and population management issues that are relevant to real-world harvesting systems in spatially structured animal and plant populations occupying tropical forest landscape mosaics that are often highly heterogeneous in resource productivity and yields. We aimed to develop feasible yet effective management strategies at the landscape scale that could be adopted by other (often large) Amazonian extractive and sustainable development reserves to help maximise the sustainable use of key resource populations and the long term persistence of forest biodiversity.

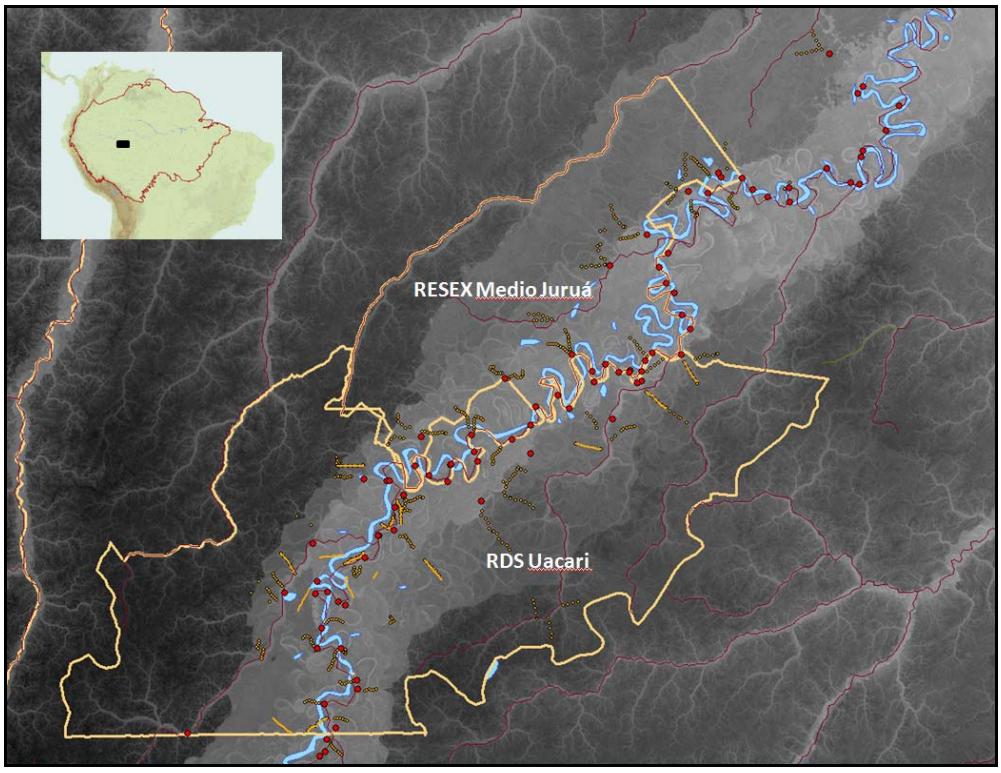

Figure 1. Map of the 253,227-ha Médio Juruá Extractive Reserve and the 632,949-ha Uacari Sustainable Development Reserve (yellow polygons) along the highly meandering Juruá River of western Brazilian Amazonia (see inset map of South America), showing the wider region of project influence. Red circles and orange dotted lines indicate the spatial distribution of local communities and sampling transects within and outside these two reserves. Background satellite image shows a digital elevation model of the entire region: darker areas are upland *terra firme* forest, whilst lighter areas are low-lying floodplain areas of *várzea* or paleo- *várzea* forests closer to the Juruá River.

2 Project support to the Convention on Biological Diversity (CBD)

The project supported three main articles of the CBD (see Annex 3):

i. By implementing a biodiversity monitoring and natural resource co-management programme, the project quantified the distribution, density, and offtake of key tropical forest resources. Without these baseline data, it would be impossible to identify processes and activities that adversely impact biodiversity, or to demonstrate to government agencies the key threats to, and opportunities for, sustainable-use reserves in vast tropical forest regions, such as Amazonia.

ii. The project helped ensure the compatibility of resource use and conservation. By building a comprehensive understanding of forest use by traditional forest dwelling Amazonians, and informing resource managers who wish to guide the behaviour of these communities.

iii. In working closely with reserve communities at every stage (planning, data-collection, implementation), the project directly supported the process of community empowerment and support.

3 Project Partnerships

The project has been a formal partnership between the University of East Anglia and (1) the Environmental Secretariat (*Secretaria do Estado do Meio Ambiente e Desenvolvimento Sustentável*; hereafter, SDS) of the largest and most forested Brazilian state (Amazonas); and (2) the Brazilian Institute of the Environment and Natural Renewable Resources (IBAMA). Both of these administrative agencies maintain permanent offices in Carauari, a town located over 800 km from the administrative capital of Amazonas (Manaus) and 37 km from the nearest boundary of the two target reserves. We managed to maintain regular contact and consultation with these administrative offices and their envoys between May 2008 and April 2011 by means of monthly visits to Carauari; radio contact from the reserves; and monthly/bimonthly visits from SDS/IBAMA officers to project localities. Because of our permanent contact with both local residents and local institutions, the project also acted as an interface between those actors, facilitating and strengthening the relationship between them. Our relationship was always very cooperative in terms of how project activities interacted with, or could be facilitated by these agencies. Given the exorbitantly high fuel prices 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 were able to cooperate with our local partners. There was also a great deal of cooperation on the joint-organisation of workshops for project 'monitors', here defined as personnel hired from any of a number of local communities, whom we trained to execute specific project activities. The project also helped to develop technical capacity within the local communities of the two reserves and these reserve agencies. In particular, we contributed substantially to refining and implementing the official management plans of the two reserves under the auspices of the local representatives of these agencies and the local management councils of these two reserves. Finally, the continuous physical presence of project members in both reserves, combined with our high spatial mobility throughout this vast area allowed the project to provide several formal and informal briefings on the current conservation status of those reserves to both management agencies, including the environmental diagnosis and the incidence of illegal activities in some of the most remote reserve areas that had never been visited by governmental staff.

Other collaborators

On a subregional scale, the project still maintains a strict collaborative agreement with ProBUC (*Programa de Monitoramento da Biodiversidade e do Uso de Recursos Naturais em Unidades de Conservação Estaduais do Amazonas*), a resource use and biodiversity monitoring programme managed by SDS. Whilst similar in approach, our project activities and associated sampling protocols are more detailed, more extensive (including, for example, 15 communities not had not been enrolled by the ProBUC program), and the data acquisition and data-quality verification processes were more frequent. Our project maintained an excellent partnership with ProBUC which ensured a larger sampling effort, an economy of scale in deploying this

sampling over a diffuse set of study sites, and good prospects for future data sharing, data processing, and data presentation. This partnership is in the interest of enhancing natural resource management practices in human-occupied protected areas throughout the State of Amazonas initially, and subsequently across Brazilian Amazonia. But most importantly, ProBUC represents the best available exit-strategy, in maintaining the execution and analyses of a range of data sampling protocols instigated or consolidated by our project.

The many study areas and local contacts developed by this project were formally incorporated into the wider, government-supported Brazilian Programme of Biodiversity Research (PPBio – see http://ppbio.inpa.gov.br/Port/inventarios/mediojurua/), with ongoing and future science collaborations expected to come from this national research consortium. Project sites will be advertised on an annual basis to postgraduate programmes in Ecology and Conservation in Amazonian universities and research institutes, and we predict a 'snowballing' effect from merging with PPBio.

External collaborations included two partnerships with the Federal University of Amazonas (UFAM) in Manaus. Fruit pulp specimens have been deposited with Dr. Lídia Medina Araújo, who is conducting analyses of fruit nutrition for both human and non-human consumption. Forest environments in the Brazilian Amazon support the highest diversity of tree and liana species bearing fleshy fruits, yet the nutritional value of fruit pulp and seeds for either wildlife or humans remains poorly understood, and this is one area of the project that has been developed in the last 24 months. Secondly, Dr. Valdir Veiga Junior is analysing the physical and chemical properties of samples of *Copaifera* oleoresins. Oleoresins from two of the species collected have never previously been analysed, so this collaboration represents an exciting opportunity to expand our knowledge of this important medicinal resource.

Botanical specimens, including dried fruit, were deposited at the Instituto Nacional de Pesquisas da Amazônia (INPA), in Manaus for formal identification and reference. Mr Agenor Bentes Azevedo, an experienced herbarium technician from the Dept of Botany, INPA visited our study sites at the two reserves for three weeks in February 2010 to aid tree identification. The complete fruit and seed collection has now been transferred to the accredited herbarium of the Instituto Federal do Amazonas (IFAM) in Manaus in collaboration with Prof Valdely Ferreira Kinupp.

The project has also worked closely with Cláudia Ohanna Araújo da Silva from the Instituto de Desenvolvimento Agropecuário e Florestal Sustentável do Estado do Amazonas (IDAM) both to monitor the offtake of *Copaifera* oleoresin by reserve residents recently trained and equipped by IDAM, and in the publication of a *Copaifera* species identification guide for reserve residents.

The dung beetle community ecology sub-project principally collaborates with the Federal University of Lavras (UFLA), in the state of Minas Gerais, with Dr. Júlio Louzada who is a co-PI with C.A. Peres and E. Nichols on the Brazilian Science Council (CNPq) grant which funded the dung beetle work. UFLA operates the entomology laboratory where the specimens are currently being sorted, counted and identified. Also at UFLA is Rodrigo Braga (PhD student) and Gustavo Schiffler (post-doctoral fellow) who participated in intensive field collections in the Médio Juruá between August and October 2009.

Dr Flávia Costa (INPA, Manaus), Dr Hanna Tuomisto (Turku University, Finland) and their joint Brazilian PhD student Gabriela Zuquim (INPA) are set to sample the herbaceous flora across a large number of terra firme and várzea forest transects established by this project within the two focal reserves. This work had been planned to take place during the dry season (Aug – Oct) of 2011, but had to be postponed because G. Zuquim was unable to commence this work before the várzea sampling sites became inaccessible due to the last inundation period. This study will, however, take place in March – July 2012, thereby substantially boosting the plant community data available from this poorly known part of the Amazon. In addition, this collaborative study will conduct extensive chemical and texture analysis of the soil types occurring at the two focal reserves, providing an economy of scale and additional explanatory variables for the spatial variation in vertebrate, invertebrate and plant community structure sampled by the project. Soil analysis was never budgeted in our Darwin Initiative grant, so we see this as one way forward in plugging this data gap.

Dr Laura Hess (Univ. of California at Santa Barbara) is collaborating with project researchers in developing seasonal flood-pulse and habitat availability models for the floodplain (várzea) forests contained by the two focal reserves. This modelling approach relies on state-of-the-art double-bounce radar technology, resulting in a resolution 90 times greater than currently available SRTM (Shuttle Radar Topography Mission) digital elevation model data. These data will be subsequently used in several outputs resulting from this project.

The project's substantial ornithological work in the Medio Juruá region benefited from initial sampling by Andrew Whittaker and Dr Alexander Lees – at the invitation of the Project Leader – and this work was subsequently consolidated by Carlos Peres, Whaldener Endo and Regina Yabe, as part of a standardized avifaunal mistnetting program in both terra firme and várzea forests.

Other local partnerships, within the municipality of Carauarí, include collaboration with the National Council of Rubber Tappers (CNS), the Association of Rural Producers of Carauari (ASPROC), and the Association of RDS Uacari Inhabitants (AMARU).

Despite lack of funding (due to DEFRA-approved changes in the project budget; see previous paper trail of email communication with **LTS International**, c/o Eilidh Young), spatial modelling of the hunting sustainability component of the project is still expected to go ahead in collaboration with Taal Levi of University of California at Santa Cruz (see Levi et al. 2009, 2010). This collaboration builds on results from a previous project funded by the Leverhulme Trust (of which CAP was a PI) conducted with Matsigenka native communities of Manu National Park, Peru, which successfully modelled the spatial dynamics of game population depletion and renewal using source-sink dynamics (Levi et al. 2010 Ecological Applications, Levi et al. 2011 J Applied Ecology). The project will therefore take advantage of a previously tested and verified spatial modelling approach at no extra cost, to provide a landscape-scale understanding of the degree to which populations of the most vulnerable vertebrate game species in these two extractive reserves and neighbouring areas can co-exist with typical levels of subsistence hunting offtakes under different scenarios of human population growth and settlement diffusion. This will be of enormous assistance in the analytical approach used to model game availability and harvest data – as well as establish parallels with other exploited landscapes in neotropical forests.

Finally, several project components will collaborate with the sustainable resource use doctoral work (2010 – 12) of Whaldener Endo (the former project field manager and now a PhD student at the Norwegian University of Life Sciences, Ås, Norway) with seven native communities of Deni and Kanamari Indians located along the lower Xeruã River, a tributary of the Juruá River. Many of the sampling protocols deployed by our project were used in this study, thereby maximising the comparability of results. These analyses will examine differences in resource use between former rubber tappers and native Amazonians subsisting in a similar biophysical setting. Moreover, the Deni and Kanamari control an indigenous territory larger than 2.1 million hectares, which is contiguous with our focal reserves. This will reinforce basin-wide cohesion in any resource management guidelines proposed and applied to this network of protected areas.

4 Project Achievements

4.1 Impact: achievement of positive impact on biodiversity, sustainable use or equitable sharing of biodiversity benefits

The project had considerable, but principally indirect, impacts on biodiversity conservation at different spatial scales. The project aimed to understand the density and spatial distribution of key forest resources, most of which occurring at a pan-Amazonian scale, and to record current offtake of these resources, and thus to model the likely impacts on biodiversity of different management scenarios. The main direct impacts of the project will thus be felt when the results and management implications of the various project components are translated into policy by the state- and federal-level management agencies involved.

The social impact of the project on local communities was generally extremely positive. The project was well-received by the majority of communities both within and outside the focal reserves, who welcomed the opportunity to engage with research and conservation. By training local monitors to facilitate the data-collection process, a greater understanding and appreciation for the scientific method was instilled in local people. A strong conservation ethic was nurtured by the project, building on previous outreach and education work conducted by our collaborating institutions. This was further reinforced by the training workshops deployed by the project during each of the three consecutive years, which targeted both local project personnel (our *Monitores*) and village leaders across the two reserves.

4.2 Outcomes: achievement of the project purpose and outcomes

The project succeeded in generating new and unique knowledge on the spatial structure of extractive activities in tropical forest reserves. Our data-set of household and community resource use has already been used to demonstrate a clear link between physical geography and rural Amazonians' livelihood strategies (see Newton et al. in press, Annex 5). Many more analyses will stem from this unique data-set, and these extractive activities will be related to the vast data-set of forest structure and resource distribution, also generated by the project.

The results based on an unprecedented sampling effort that included 30 months of continuous/weekly household monitoring at more than 25 local communities of all key plant and animal species exploited, and the monthly wildlife census work carried out along more than 350 km of newly established forest transects. These data are now being used to generate high-quality estimates of sustainable harvest quotas for most, if not all, target species. The data collected in different source and sink areas of both reserves will, together with other data sets, are now being analysed to generate a better understanding of the source-sink dynamics of game populations consumed by local forest dwellers.

Finally, the project succeeded in generating results that provide both the state government of Amazonas and the federal government of Brazil with practical management information, which will help them to shape the management strategies implemented in these sustainable development reserves, and to fulfil their commitments to the Convention on Biological Diversity.

4.3 Outputs (and activities)

The project has already produced a number of publications which will have a tangible impact within their fields of enquiry. However, several project investigators have not yet begun publishing the vast amounts of project results and most of the project outputs are yet to be completed. With all major fieldwork components now completed we are working hard to make this happen. Within the next year, two more PhD theses (J. Hawes and L. Nichols) and their associated papers will be submitted, and we anticipate the majority of data-analysis and synthesis to be completed by the end of 2012. In conjunction with SDS-Amazonas, project members will organize a final technical workshop to be hosted by one of the main counterpart institutions (CEUC-SDS) which will take place in late 2012[1]. This will be an opportunity to both showcase the wide spectrum of project results and translate them into management initiatives that can be rolled-out to a number of sustainable-use forest reserves in the State of Amazonas, and beyond.

4.4 Project standard measures and publications

A number of early publications are complete, including a *Field Handbook for Line Transect Censusing of Forest Wildlife in Tropical Forests* (Peres & Cunha 2011) – made available for downloads in both English and Portuguese. The 12 output publications available so far are only the beginning of this project's formal productivity (see Annex 5 for a full list of papers, theses and field guides so far).

[1] Funding for this technical outreach workshop, to be co-organized with SDS, has not yet been secured, but this event will likely be heavily subsidized by governmental sources in Amazonas.

4.5 Technical and Scientific achievements and co-operation

This project collected biological and socioeconomic data-sets that are unique both in their spatial scale and sample size. Our network of 90 5-km transects throughout terra firme and várzea forest offered an opportunity to collect data on resource abundance and variation on a scale rarely achieved. These transects were used for surveys of vertebrate, plant, and insect diversity. Similarly, our weekly household surveys achieved a regularity of data-collection unmatched by any previous study of rural household resource consumption. The careful spatial referencing of all project components means that great potential exists for cross-taxa comparability – for example, by relating resource abundance to forest structure, and tri-trophic interactions in the spatiotemporal mosaics of fruit production, large mammal biomass and dung-beetle community structure.

The project staff working in the field included the Project Leader (Prof Carlos Peres) together with the Field Manager (Whaldener Endo), several key researchers (Joseph Hawes, Peter Newton, Elizabeth Nichols), and a multitude of additional research staff – both Brazilian and non-Brazilian.

Please refer to Annex 5 for details of formal project outputs (most of which have, or will be, peer-reviewed).

4.6 Capacity building

A unique strength of this project was the large number of local people trained and employed by the project as forest and household monitors. Two large data-sets were collected entirely by these monitors. The intense fieldwork, large-scale data-collection, and reliance on local knowledge provided the opportunity to build capacity in various other ways, including:

1. Data on weekly household resource use were collected by 14 reserve residents who were trained by the project in social survey methods. These monitors also weighed and recorded hunted game.
2. These data were digitised by an undergraduate at the *Universidade do Estado do Amazonas* (UEA), Carauari, who was trained by the project in data-entry and the use of Microsoft Office software.
3. An additional 11 reserve residents were trained to weigh and record all game hunted by the community.
4. A total of 35 reserve residents were trained in the methodology for conducting line-transect surveys for large vertebrates.
5. Six reserve residents were trained to use a GPS, to record positional data and the spatial extent of their hunting activity.
6. Three reserve residents were trained to conduct similar line-transect surveys in the three 100 ha floristic plots, with the methodology including additional surveys for fallen fruit patches.
7. Four assistants were trained to collect material from the leaf-litter traps traps in two of the 100 ha plots, with two more trained to dry, sort and weigh the collected material and to label and store the resultant fruit collections.
8. Three assistants were successfully trained to conduct monthly tree phenology surveys and three assistants were trained to conduct the inventories of the 0.1 ha tree plots.
9. The *Copaifera* and non-timber resource component of the project trained two reserve residents in the methodology of conducting line-transect surveys for key tree species. These assistants were also trained in the use of a handheld GPS to record transect locations.
10. One assistant was additionally trained to monitor the harvest of *Copaifera* oleoresin by other extractors working with the project.
11. Three assistants were trained to conduct mist-netting surveys during the avifaunal component of the project.

4.7 Sustainability and Legacy

Excellent relationships persist with several collaborators, including – critically – key figures at ProBUC and SDS in Manaus, Amazonas. The multitude of possibilities for data-merging, guiding management guidelines, and publishing research in peer-reviewed journals mean that these relationships will remain active for some time ahead. The PL is committed to serve a central advisory role with Phase II of ProBUC, and, for example, is currently helping SDS staff to analyse data and prepare material to be presented in the next Latin American Wildlife Management Congress to be held in Salta, Argentina (May 2012).

The research skills gained by many of the monitors and field assistants will benefit them as they seek future employment and experience with other research teams, local NGOs, private enterprises, and government agencies. The project issued many of these assistants with references and/or certificates of attainment, formally acknowledging their assistance, qualification, and expertise. Several assistants are already successfully engaged with complementary research programmes in neighbouring protected areas, and within the environmental sector of oil and gas exploration concession areas in the Purús-Juruá interfluves charged with generating mitigation measures from hydrocarbon developments.

Local to regional fisheries: One crucial area of the project, however, that remains poorly developed relates to the science and policy underpinnings of the sustainability of the freshwater fisheries along the Rio Juruá. Commercially valuable fish stocks are by far the single most important natural resource harvested in this part of Amazonia, and severe conflicts, often resulting in deaths, are fought out every year in the Juruá between local subsistence and commercial fishermen. At the outset of this project we failed to realize just how important this area of the local extractive economy is, and the limited funds we had available did not permit further stretching an already oversubscribed project budget. It is hoped that our continued interaction with ProBUC will serve to assist this area of natural resource management in the central-western Amazon, although additional funds would be welcome to implement the fisheries component of project continuity.

5 Lessons learned, dissemination and communication

This was a ground-breaking study of a natural resource co-management system, which fortunately uncovered a number of win-win lessons for similar sustainable use protected areas in the lowland tropics. Most of the outputs targeting different audiences are yet to be realized, yet we can anticipate that many of these will be significantly meaningful. The study has already attracted the attention of the German Service for International Development (GIZ), which aims to fund similar studies elsewhere in Amazonia via the Brazilian Ministry of Environment (MMA). For example, the research contained within the thesis of P. Newton (see section 4.4) produced various results of interest to the governmental agencies responsible for managing these and other extractive reserves, and to NGOs involved in developing extractive activities and PES programmes in Amazonia. The principal findings of this thesis have been summarised in the form of a six-page brief in both English and Portuguese, which has been disseminated to our partner collaborators SDS and IBAMA. Similar management and conservation implications will be disseminated to these and other agencies, as other components of the project draw to completion. The project was instrumental in consolidating the methodology of a standardized line-transect census program, which has now been summarized in a handbook (co-authored by the Project Leader) that can be downloaded by hundreds of students and wildlife professionals throughout Latin America. It is hoped that this will now help maximize the comparability of line-transect censuses targeting tropical forest wildlife in neotropical forests and beyond.

5.1 Darwin identity

The Darwin logo has been included in all relevant presentations, seminars, and workshops run by project members. Darwin funding has been acknowledged by all published papers directly resulting from the project.

6 Monitoring and evaluation

6.1 Actions taken in response to annual report reviews

All issues raised by annual report reviews have been addressed appropriately, and the reviewer(s) of our last annual report was/were suitably impressed (see review 16-001 AR3R of 23 Sept 2010). We have a clear legacy in place, primarily through the continued efforts of ProBUC, which we see as the project's natural successor. The PL is committed to maintain regular contact and offer guidance to ProBUC for several years to come, as we move into joint integration activities suich as our technical workshop in Manaus in 2012 and further spin-off applied research ventures in the Médio Juruá region. However, one area of concern firmly expressed in our last two annual reports concerns the slow materialization of the many project outputs as the project moves into its final phase of data analysis, data integration, writing-up of production of scientific papers and management guidelines. We acknowledge that many of these outputs are well behind schedule, but this is expected of a data-hungry research program that consumed more than 36 months of primary data collection. This is our top priority now, but we expect that results from this project will continue to occupy much of our time for at least the next 3-5 years, with many of the formal and informal products coming to maturity in the next 2 years.

7 Finance and administration

7.1 Project expenditure

In broad terms, the main areas of project expenditure and budget items are detailed below. There were a number of severe financial stressors — including the awkward manner in which GBP funds were transferred to field personnel (in R$), erratic fuel supply and exorbitant fuel prices in this part of western Amazonia, the wrecking of the project diesel-powered boat, and spiralling costs of airfares — that often made the day-to-day continuity of the project challenging to say the least. Significant approved changes to our original budget were introduced in early 2009 (see Feb-March 2009 paper trail of email communication between the PL and Eilidh Young/Helen Beech), as noted below. At the end of the project financial period, we were able to clear all of our in-country debts with project field assistants and local suppliers, although given the then depleted status of the project account at University of East Anglia, it was not possible to be reimbursed for all of those expenses, resulting in a significant shortfall in project expenditure which was absorbed by the PL.

7.2 Additional funds or in-kind contributions secured

The project was carried out with the almost exclusive financial support provided by the Darwin Initiative. A marginal part of the field activities was, somehow, contemplated by financial aid from other sources, which included:

a) Two out of the three monitor workshops had a small part of their costs shared with SDS (boat rental, food, fuel and kitchen assistants).
b) A small part of a Brazilian Science Council (CNPq) and an American Museum of Natural History (AMNH) grants to E. Nichols were used to pay a small part of the costs of field activities in 2009.
c) The project´s final year of field data acquisition (2010) also received a small financial support from the Norwegian Research Council, allocated to the PhD field work of W. Endo.
d) All costs incurred exclusively by the ProBUC program were covered by SDS Amazonas, thanks to funds from the State Government of Amazonas and federal support from the Brazilian Ministry of the Environment. This is relevant because ultimately all data acquisition carried under the jurisdiction of ProBUC will also become part of our project outputs. Conversely, our project will share a number of data sets or data summaries with staff at ProBUC and/or associated researchers.
e) A modest amount of "matching funds" (US$25,000) from Conservation International – US, which were primarily used to cover international and domestic airfares, and local fuel costs, both of which were in huge excess in relation to the original project proposal to DI.

f) Four doctoral studentships including two PhD studentships from NERC-UK, which covered the monthly stipend of J. Hawes and P. Newton; one PhD studentship from the Norwegian Research Council (W. Endo); and one PhD studentship at Columbia University (E. Nichols).

7.3 Value of DI funding

Establishing a large-scale government-endorsed monitoring program in a remote subregion of the western Brazilian Amazon, which included the continuous training and temporary hire of over 70 local people from 26 different communities over a 3-yr period to collect fundamental data on key natural resources would not have been a realistic proposition without the critical funding support from the DI. We are firmly confident that the way these funds were applied will continue to accrue concrete benefits to the viability of many plant and animal populations in the Amazon and the promotion of better-quality, more sustainable livelihoods amongst the rural populations of the Rio Juruá and beyond, who depend almost exclusively on forest and aquatic resources. The results obtained in this project will bring to light an understanding of the ecological processes that promote common-sense conservation strategies at a local level and, potentially, at many other Amazonian forest reserves sharing similar ecological features. Our continued endeavours, formal and informal dissemination of project results, and interaction with SDS and IBAMA will ensure that the project objectives are maximized in the interest of realistic management goals within Amazonian sustainable use reserves.

1. Report of progress and achievements against final project logframe for the life of the project

Project summary	Measurable Indicators	Progress and Achievements Sept 2007 - April 2011	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 reserves, 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 Reserves, and Indigenous Territories	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 Amazonas and the Brazilian federal government with practical management information helping them fulfil commitments to the Convention on Biological Diversity.	Large, spatially-explicit dataset of forest plots extending over both varzea and terra firme. Data collection using different methods (e.g. faunal censuses and continuous household monitoring) was completed on 30 September 2010 and are now being analysed to provide reliable sustainable harvest indices for the local populations in the study region. Comparisons between data collected in source and sink areas will enable the construction of a sustainable harvest model that will include estimates of recruitment rates in sink areas based on migration of individuals from source areas. A comprehensive handbook targeting hunters living in rural areas of the Amazon, and containing key guidelines on how to sustainably exploit game populations is expected to be completed by late 2012. See also output 4(4a.) A comprehensive list of key results and management implications from the PhD thesis and publications of P. Newton have been disseminated to our government agency collaborators. Similar contributions will follow from other project components.	*(Highlight key actions planned for next period)*

Project summary	Measurable Indicators	Progress and Achievements Sept 2007 - April 2011	Actions required/planned for next period
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	*Key results*: The degree of reliance on either agriculture or extractivism amongst reserve residents was largely influenced by local geography – specifically, by the proportion of unflooded forest in the neighbourhood of communities. Those with a greater access to terra firme forest were more engaged with agriculture. Information on c. 2500 animals harvested by 25 different communities were obtained from March 2008 to September 2010. Results are now being analysed. Data collection was completed in September 2010, including data from weekly household interviews and georeferenced hunting trips. Analyses are being conducted and expected to be finished on the 2nd semester of 2012.	
Activity 1.1 Household interviews		Data collection was completed in Sept 2010, and the household monitors individually thanked for their assistance. Many of these data have now been processed, analysed and published (see Activity 4.1).	
Activity 1.2 GIS mapping of the reserves and habitat types		Spatially explicit data collected by both the project and SDS-Amazonas has been integrated into a GIS, and this activity will continue to be developed and incorporated into project outputs. This has been boosted by the recent return of Romulo Batista to a collaborative role in relation to a number of mapping outputs, following his 12-month absence from SDS.	
Activity 1.3 GIS analysis of game harvest areas		See 1 (1b.)	
Activity 1.4. Weighing and measuring hunted animal		See output 1 (1a.)	
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 nonhunted 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.	Data collection was completed in September 2010, with a total sampling effort of ca. 6,000 km of census walks. Analyses are in their preliminary stages and additional supporting data derived from ca. 10,000 km of faunal census conducted at RDS Uacari are to be provided by SDS-ProBUC within the next few weeks. *Key results*: *Copaifera* density, spatial distribution and adult size structure was found to vary between species and between forest types. Current management restrictions permit exploitation of only a very small proportion of the resource. *Key results*: *Copaifera* oleoresin yields varied between species and forest types. Three of five species produced commercially-viable volumes. Reharvested trees produced an average 43% of the original volume.	

Project summary	Measurable Indicators	Progress and Achievements Sept 2007 - April 2011	Actions required/planned for next period
Activity 2.1. Census faunal transects		See activity 2 (2a.)	
Activity 2.2. Map NTFP population density		Data collection was completed in 2009. Data for *Copaifera* species have already been analysed (see Activity 2.4). Analyses for other key NTFP resources have yet to be conducted.	
Activity 2.3. Experimental harvest of *Copaifera*		The initial harvest was conducted in April 2009. In April 2010, 41 trees that had been previously harvested were reharvested to assess the rate of renewal of this resource. The results of this work have now been published (Newton et al. 2011 – see Annex 5).	
Activity 2.4. Develop population ecology model for *Copaifera*		An analysis of the spatial distribution, density and adult size structure of *Copaifera* trees across the study site has been conducted and incorporated in the PhD thesis of P. Newton (see Annex 5). This will be submitted as a paper before Dec 2011.	
Activity 2.5. Introduce reserve-wide harvest zoning agreements		This initiative was finally introduced in 2008-09, with the establishment of six no-take areas, but this is a long-term proposition well beyond the time frame of this project.	
Activity 2.6. Quantitative ethnobotany of terra firme and várzea forests		Data collection was completed in 2010 and analysed as part of an MSc thesis. The results of this work are currently being prepared for publication by Débora Peterson, a Brazilian MSc student, who is now doing her PhD at University of Alberta, Canada.	
Output 3. Local monitors, field technicians and students able to assess and monitor forest biodiversity using quantitative methods.	3. Minimum of 49 local monitors and 10 Brazilian students trained in quantitative biodiversity surveys and harvest assessments.	A total of 65 local monitors and 4 Brazilian students were trained in quantitative biodiversity surveys and harvest assessments.	
Activity 3.1. Conduct training workshop(s)		Three training workshops were successfully conducted throughout the project.	
Activity 3.2. Continue post-workshop training		Post-workshop training was continued successfully throughout the project, with a near-constant presence of the research team in the reserves.	

Project summary	Measurable Indicators	Progress and Achievements Sept 2007 - April 2011	Actions required/planned for next period
Activity 3.3 Conduct line transect surveys		See activity 2 (2a.)	
Activity 3.4 Conduct 100 ha plot surveys		Data collection was completed in April 2011, giving a total effort of approximately 36 months for residual patch surveys (including at least 12 continuous months of high quality surveys conducted by the PI for this project component) and 34 months for the fruit traps (including 24 continuous months with the new design traps). Analyses have yet to be conducted.	
Activity 3.5. Conduct plant phenology surveys		Data collection was completed in October 2010, giving a total effort of approximately 24 months (including 12 continuous months of high quality surveys conducted by the PI for this project component). Analyses have yet to be conducted.	
Activity 3.6. Conduct dung beetle surveys		Data collection was completed in February 2010, giving a total effort of approximately 8 months for transect and plot based dung beetle surveys. Analyses are currently ongoing, and the first publication from this work is expected to be ready for submission by January 2012.	
Activity 3.7. Conduct 0.1 ha tree plots		The initial round of data collection was completed in September 2008. These data were analysed as part of an undergraduate student dissertation (L. Riley). This work was subsequently continued and the final plots were completed in July-August 2011, giving a total effort of 200 plots (100 in terra firme, 100 in varzea). Final analyses are currently being conducted and the first publication from this work is expected to be ready for submission by January 2012.	
Activity 3.8. Conduct bone and leaf decomposition experiments		Initial data collection on bone decomposition was completed in September 2009 and were analysed as part of an undergraduate student dissertation. Monthly monitoring of bones and leaf decomposition continued January 2010 and September 2010 respectively. These results will supplement the initial analyses and are currently being prepared for publication.	
Activity 3.9. Conduct surveys for scavenger fauna		Data collection was completed in September 2009 and were analysed as part of an undergraduate student dissertation.	

Project summary	Measurable Indicators	Progress and Achievements Sept 2007 - April 2011	Actions required/planned for next period
Activity 3.10. Conduct avifauna surveys		An intensive programme of understorey bird sampling was carried out in both terra firme and várzea forests on both banks of the Juruá River, to understand the effects of both river barriers and forest types on the structure of avifaunal assemblages. Net-lines, of 20 nets of 12m each, were deployed at sites on both reserves by C.A. Peres and W. Endo, with further work at different sites farther upriver expected to take place in the dry season of 2012. In total, a total of 30 net-lines were sampled, which amounts to the most comprehensive study of understorey bird communities in seasonally flooded and unflooded Amazonian forests conducted to date.	
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	The first of two stages in materializing this potentially popular practical handbook on forest wildlife surveys is now finally available, and will be hosted by the Wildlife Conservation Society-Brasil web site for free downloads (Peres & Cunha 2011). The second stage will include user-friendly lessons on CBWM that will be summarized in a Part-2 handbook for which we anticipate a different audience in both government and non-government agencies. The project has a number of papers either published, in press, in the peer-review process, or in preparation (see Annex 5). A conservative checklist generated by project PIs suggest that at least 55 papers will be eventually published as a direct result of this project. In the meantime, project members have presented results at various workshops, seminars, and conferences (see Annex 5).	
Activity 4.1. Analyse long-term data collected from all project components		Many of the data from the weekly household surveys and one-off interviews have been analysed, and some of the results published (see Annex 5). Both of the principal papers from the dung beetle transect and plot research are in advanced stages of analysis, with publication expected in early 2012 (authored by L. Nichols, co-authored with C. Peres, J. Hawes and W. Endo).	
Activity 4.2. Conduct meetings with all local stakeholders		Three workshops were held at Bauana Ecological Field Station during the course of the project, at which representatives of all local stakeholders (reserve inhabitants, residents' associations, NGOs, government agencies) were present.	
Activity 4.3. Write publications and presentations		Three research papers (one published, two in press) have been authored by P. Newton (with C. Peres, L. Nichols and W. Endo as co-authors; see Annex 5).	

Project summary	Measurable Indicators	Progress and Achievements Sept 2007 - April 2011	Actions required/planned for next period
Activity 4.4. Interpret findings to develop recommendations		A six-page brief of the principal management recommendations contained within the PhD thesis of P. Newton has been written in Portuguese and disseminated to our partner institutions (SDS and IBAMA) (see Annex5).	
Activity 4.5. Publish, print and distribute CBWM		This activity has not yet been achieved because it depends on a full set of data analyses that are yet to be completed. We intend to find funds to publish the Community-Based Wildlife Management Handbook from another source, possibly SDS-Amazonas, but this is still very much a future output to be realised by the project.	
Activity 4.6. Organise workshop in Manaus to present findings and recommendations		A workshop will be held in Manaus to present and discuss the final key findings of the project with our principal collaborators in 2012 or 2013.	

Annex 2 Project contribution to Articles under the CBD

Project Contribution to Articles under the Convention on Biological Diversity

Article No./Title	Project %	Article Description
6. General Measures for Conservation & Sustainable Use		Develop national strategies that integrate conservation and sustainable use.
7. Identification and Monitoring	**30**	Identify and monitor components of biological diversity, particularly those requiring urgent conservation; identify processes and activities that have adverse effects; maintain and organise relevant data.
8. In-situ Conservation	**30**	Establish systems of protected areas with guidelines for selection and management; regulate biological resources, promote protection of habitats; manage areas adjacent to protected areas; restore degraded ecosystems and recovery of threatened species; control risks associated with organisms modified by biotechnology; control spread of alien species; ensure compatibility between sustainable use of resources and their conservation; protect traditional lifestyles and knowledge on biological resources.
9. Ex-situ Conservation		Adopt ex-situ measures to conserve and research components of biological diversity, preferably in country of origin; facilitate recovery of threatened species; regulate and manage collection of biological resources.
10. Sustainable Use of Components of Biological Diversity	**40**	Integrate conservation and sustainable use in national decisions; protect sustainable customary uses; support local populations to implement remedial actions; encourage co-operation between governments and the private sector.
11. Incentive Measures		Establish economically and socially sound incentives to conserve and promote sustainable use of biological diversity.
12. Research and Training		Establish programmes for scientific and technical education in identification, conservation and sustainable use of biodiversity components; promote research contributing to the conservation and sustainable use of biological diversity, particularly in developing countries (in accordance with SBSTTA recommendations).
13. Public Education and Awareness		Promote understanding of the importance of measures to conserve biological diversity and propagate these measures through the media; cooperate with other states and organisations in developing awareness programmes.
14. Impact Assessment and Minimizing Adverse Impacts		Introduce EIAs of appropriate projects and allow public participation; take into account environmental consequences of policies; exchange information on impacts beyond State boundaries and work to reduce hazards; promote emergency responses to hazards; examine mechanisms for re-dress of international damage.
15. Access to Genetic Resources		Whilst governments control access to their genetic resources they should also facilitate access of environmentally sound uses on mutually agreed terms; scientific research based on a country's genetic resources should ensure sharing in a fair and equitable way of results and benefits.

Article No./Title	Project %	Article Description
16. Access to and Transfer of Technology		Countries shall ensure access to technologies relevant to conservation and sustainable use of biodiversity under fair and most favourable terms to the source countries (subject to patents and intellectual property rights) and ensure the private sector facilitates such assess and joint development of technologies.
17. Exchange of Information		Countries shall facilitate information exchange and repatriation including technical scientific and socio-economic research, information on training and surveying programmes and local knowledge
19. Bio-safety Protocol		Countries shall take legislative, administrative or policy measures to provide for the effective participation in biotechnological research activities and to ensure all practicable measures to promote and advance priority access on a fair and equitable basis, especially where they provide the genetic resources for such research.
Other Contribution		Smaller contributions (eg of 5%) or less should be summed and included here.
Total %	**100%**	Check % = total 100

Annex 3 Standard Measures

Code	Description	Totals (plus additional detail as required)
Training Measures		
1a	Number of people to submit PhD thesis	3 (JH & LN to submit within 12 months; WE to submit within 24 months)
1b	Number of PhD qualifications obtained	1 (PN)
2	Number of Masters qualifications obtained	1 (DP)
3	Number of other qualifications obtained	2 (LD, LR)
4a	Number of undergraduate students receiving training	3 (LD, LR, LV)
4b	Number of training weeks provided to undergraduate students	30
4c	Number of postgraduate students receiving training (not 1-3 above)	2 (RB, TT)
4d	Number of training weeks for postgraduate students	22
5	Number of people receiving other forms of long-term (>1yr) training not leading to formal qualification(ie not categories 1-4 above)	0
6a	Number of people receiving other forms of short-term education/training (ie not categories 1-5 above)	69 (65 household monitors, forest monitors, hunting GPS monitors, game monitors; 4 Brazilian undergraduates assisting LN with dung beetle identification)
6b	Number of training weeks not leading to formal qualification	85
7	Number of types of training materials produced for use by host country(s)	0
Research Measures		
8	Number of weeks spent by UK project staff on project work in host country(s)	WE: 102 JH: 82 PN: 61 LN: 20 CP: 15
9	Number of species/habitat management plans (or action plans) produced for Governments, public authorities or other implementing agencies in the host country (s)	Contributions made to 2 management plans (RDS Uacari and ResEX Médio Juruá)
10	Number of formal documents produced to assist work related to species identification,	Total 5

Code	Description	Totals (plus additional detail as required)
	classification and recording.	PN: 1 (*Copaifera* guide) JH: 1 (fruit guide) WE: 3 (wildlife posters)
11a	Number of papers published or accepted for publication in peer reviewed journals	4 (plus ~20 in preparation)
11b	Number of papers published or accepted for publication elsewhere	12
11c	Number of academic theses and dissertations	4
12a	Number of computer-based databases established (containing species/generic information) and handed over to host country	0
12b	Number of computer-based databases enhanced (containing species/genetic information) and handed over to host country	0
13a	Number of species reference collections established and handed over to host country(s)	0
13b	Number of species reference collections enhanced and handed over to host country(s)	Total: 7 LN: 2 (dung beetle reference collections distributed in two national collections) PN: 2 (*Copaifera* leaves at INPA; *Copaifera* oleoresin at UFAM) JH: 3 (Herbarium specimens (plant vouchers of the Flora of the Juruá) at INPA; Fruit pulp nutrition specimens at UFAM; Seed/fruit specimens at IFAM).
Dissemination Measures		
14a	Number of conferences/seminars/workshops organised to present/disseminate findings from Darwin project work	3
14b	Number of conferences/seminars/ workshops attended at which findings from Darwin project work will be presented/ disseminated.	Total: 18 PN: 6 CP: 4 JH: 3 LN: 3 WE: 2
15a	Number of national press releases or publicity articles in host country(s)	0
15b	Number of local press releases or publicity articles in host country(s)	0
15c	Number of national press releases or publicity articles in UK	0

Code	Description	Totals (plus additional detail as required)
15d	Number of local press releases or publicity articles in UK	0
16a	Number of issues of newsletters produced in the host country(s)	0
16b	Estimated circulation of each newsletter in the host country(s)	0
16c	Estimated circulation of each newsletter in the UK	0
17a	Number of dissemination networks established	0
17b	Number of dissemination networks enhanced or extended	2 (SDS & IBAMA)
18a	Number of national TV programmes/features in host country(s)	0
18b	Number of national TV programme/features in the UK	0
18c	Number of local TV programme/features in host country	0
18d	Number of local TV programme features in the UK	0
19a	Number of national radio interviews/features in host country(s)	0
19b	Number of national radio interviews/features in the UK	0
19c	Number of local radio interviews/features in host country (s)	0
19d	Number of local radio interviews/features in the UK	0
Physical Measures		
20	Estimated value (£s) of physical assets handed over to host country(s)	R$57,000
21	Number of permanent educational/training/research facilities or organisation established	0
22	Number of permanent field plots established	0
23	Value of additional resources raised for project	0
Other Measures used by the project and not currently including in DI standard measures		

Annex 4 Publications

Type *	Detail	Publishers	Available from	Cost £
Direct outputs from the Darwin project				
Journal	Newton, P., Watkinson, A.R., Peres, C.A., 2011. Determinants of yield in a non-timber forest product: *Copaifera* oleoresin in Amazonian extractive reserves	Forest Ecology and Management, 261: 255-264		0
Journal	Newton, P. Endo, W., Peres, C.A. 2011. *In press*. Determinants of livelihood strategy variation in two extractive reserves in Amazonian flooded and unflooded forest	Environmental Conservation, in press		0
Journal	Newton, P., Nichols, E., Endo, W., Peres, C.A. *In press.* Consequences of actor level livelihood heterogeneity for additionality in an undifferentiated payment-based payments for environmental services programme in a tropical forest region	Global Environmental Change, in press		0
Journal	Peres, C.A. 2011. Conservation in Sustainable Use Tropical Forest Reserves.	Conservation Biology, in press		0
Management Handbook	Peres, C.A. and A. Cunha. 2011. Line-Transect Censuses of Large-Bodied Tropical Forest Vertebrates: A Handbook. Wildlife Conservation Society, Brasília, Brazil [in English].	Wildlife Conservation Society of Brazil		0
Management Handbook	Peres, C.A. and A. Cunha. 2011. Line-Transect Censuses of Large-Bodied Tropical Forest Vertebrates: A Handbook. Wildlife Conservation Society, Brasília, Brazil [Translated to Portuguese].	Wildlife Conservation Society of Brazil		0
Book Chapter	Peres, C.A. 2011. Wildlife Conservation Performance of Sustainable Use Tropical Forest Reserves. In: "Conservation Biology: Lessons from the Tropics." (P. Haven, P., N. Sodhi and L. Gibson, eds.),	Blackwell-Wiley, Oxford, in press		0
Thesis	Newton, P. PhD thesis. 2011. Opportunities for conservation and livelihoods in Amazonian extractive reserves.	University of East Anglia, UK. Submitted Sept 2011		0
Thesis	Peterson, D. MSc thesis. 2010. Quantitative ethnobotany of Amazonian forest dwellers: drivers of congruence in local names	University of East Anglia, UK. Submitted Aug 2010		0
Dissertation	Riley, L. BSc thesis 2009. Forest structure and floristic composition of Amazonian flooded and unflooded	University of East Anglia, UK. Submitted Jan		0

Type *	Detail	Publishers	Available from	Cost £
	forests	2009		
Dissertation	Dorward, L. BSc thesis. 2010. Soil fertility effects on nutrient decay in Amazonian flooded and unflooded forests: a bone decalcification experiment.	University of East Anglia, UK. Submitted Jan 2010		0
Field guide	Newton, P. 2009. As espécies da *Copaifera* (copaíba) na ResEx Médio Juruá e RDS Uacari	IDAM		0
Field guide	Hawes, J. 2011 Fruits of the Médio Juruá			0
Posters	Endo, W. 2009. Birds, reptiles, and fish of the Médio Juruá			0
Related outputs by project members				
Journal	Peres, C.A., Gardner, T.A., Barlow, J., Zuanon, J., Michalski, F., Lees, A.C., Vieira, I.C.G., Moreira, F.M.D., Feeley, K., 2010. Biodiversity conservation in human-modified Amazonian forest landscapes.	Biological Conservation, 143: 2314-28		0
Journal	Palminteri, S. GV.N. Powell, G.P. Asner, C.A. Peres. 2011. Forest structure determines three-dimensional habitat use by a canopy specialist of south-western Amazonia.	Ecology, in press		0
Journal	Gibson, L. T.M. Lee, L.P. Koh, B.W. Brook, T.A. Gardner, J. Barlow, C.A. Peres, C.J.A. Bradshaw, W.F. Laurance, T.E. Lovejoy, N.S. Sodhi. 2011. Biodiversity value of degraded tropical forests: there is no substitute for primary forests	Nature, published online 20 Sept 2011		0
Journal	Peres, C.A. and M. Schneider. 2011. Subsidized agricultural resettlements as drivers of tropical deforestation.	Biological Conservation, in press.		0
Journal	Levi T, GH Shepard Jr, J Ohl-Schacherer, CC Wilmers, C.A. Peres, DW Yu. 2011. Spatial tools for modelling the sustainability of subsistence hunting in tropical forests.	Ecological Applications, 21: 1802–1818		0
Journal	D.S. Wilkie, E.L. Bennett, C.A. Peres, Cunningham, A.A. 2011. The empty forest revisited.	Annual Reviews of the New York Academy of Sciences, 1223: 120–128		0
Journal	de las Heras; I. Lake; A. Lovett; C.A. Peres. 2011. Future deforestation	Journal of Land Use Science, in		0

Type *	Detail	Publishers	Available from	Cost £
	drivers in an Amazonian ranching frontier.	press		
Journal	Michalski, F. Norris, D., C.A. Peres. 2010. No Return from Biodiversity Loss	Science, 329: 1282-83		0
Journal	Parry, L., Day, B., Amaral, S., Peres, C.A., 2010. Drivers of rural exodus from Amazonian headwaters.	Population and Environment, 32: 137-176		0
Journal	Tabarelli, M., Lopes, A.V., L.C. Girão, B.A. Santos and C.A. Peres. 2010. Pervasive pioneer hyper-abundance drives floristic shifts in long-term Atlantic Forest isolates.	Conservation Biology, 24: 1654–1663		0
Journal	Galetti, M., 4 authors + C.A. Peres. 2010. Mudanças no Código Florestal e seu impacto na ecologia e diversidade dos mamíferos no Brasil.	Biota Neotropica, 10: 000-000		0
Journal	Bicknell, J. and C.A. Peres. 2010. Vertebrate population responses to reduced-impact logging in a neotropical forest.	Forest Ecology and Management, 259: 2267–2275		0
Journal	Barlow J, J Louzada, L Parry, MIM Hernández, J Hawes, C.A. Peres, FZ Vaz-de-Mello, TA Gardner. 2010. Improving the design and management of forest strips in human-dominated tropical landscapes: A field test on dung beetles in the Brazilian Amazon.	J Applied Ecology, 47: 779–788		0
Journal	Endo, W., C.A. Peres, E. Salas, S. Mori, G.H. Shepard, V. Pacheco, D.W. Yu. 2010. Game vertebrate densities in hunted and nonhunted forest sites in Manu National Park, Peru.	Biotropica, 42: 251–261.		0
Journal	Lees, A.C. and C.A. Peres. 2010. Habitat and life history determinants of antbird local extinction in variable-sized Amazonian forest fragments.	Biotropica 42:614–621.		0
Journal	Parry, L., C.A. Peres, B. Day and S. Amaral. 2010. Rural-urban migration brings conservation threats and opportunities to Amazonian watersheds.	Conservation Letters, 3: 251–259.		0
Journal	Urquiza-Haas, P. Dolman and C.A. CA Peres. 2010. Large vertebrate responses to forest cover and hunting pressure in communal landholdings and protected areas of the Yucatan Peninsula, Mexico.	Animal Conservation, 23: 1–12		0
Journal	Norris, D., F. Michalski and C.A. Peres. 2010. Habitat patch size modulates terrestrial mammal activity patterns in	Journal of Mammalogy, 91: 551–560,		0

Type *	Detail	Publishers	Available from	Cost £
	Amazonian forest fragments.			
Journal	Gardner TA, J Barlow, N. Sodhi and C.A. Peres. 2010. Biodiversity conservation in human-dominated tropical forests.	Biological Conservation, doi:10.1016/j.biocon.2010.05.017		0
Journal	Barlow J, TA Gardner, J Louzada, C.A. Peres. 2010. Measuring the Conservation Value of Tropical Primary Forests: The Effect of Occasional Species on Estimates of Biodiversity Uniqueness.	PLoS ONE, 5: 1-8.		0
Journal	Sampaio R, AP Lima, WE Magnusson and C.A. Peres. 2010. Long-term persistence of midsized to large-bodied mammals in Amazonian forest fragments.	Biodiversity and Conservation, DOI 10.1007/s10531-010-9848-3		0
Journal	Michalski F, JP Metzger and C.A. Peres. 2010. Rural property size drives patterns of upland and riparian forest retention in a tropical deforestation frontier.	Global Environmental Change, 20: 705–712		0
Journal	Tabarelli T, AV Aguiar, MC Ribeiro, JP Metzger, C.A. Peres. 2010. Prospects for biodiversity conservation in the Atlantic Forest: Lessons from aging human-modified landscapes.	Biological Conservation, 143: 2328-41.		0
Journal	Tuck, J.M., T. Haugaasen, C.A. Peres, R. Gribel and P. Wegge. 2010. Brazil nut seed dispersal by scatter-hoarding rodents in a central Amazonian forest.	Journal of Tropical Ecology, 26: 251–262.		0
Journal	Louzada J, TA Gardner, C.A. Peres, J Barlow. 2010. A multi-taxa assessment of nestedness patterns across a multiple-use Amazonian forest landscape.	Biological Conservation, 143: 1102–1109		0
Book Chapter	Peres, C.A. 2010. Overexploitation. In *Conservation Biology for All* (eds. N. S. Sodhi & P. R. Ehrlich), pages 107-130.	Oxford University Press, Oxford.		0

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