

Darwin Initiative: Half Year Report

(due 31 October 2010)

Project Ref No	20-001
Project Title	Managing the landscape-scale sustainability of Amazonian freshwater fisheries
Country(ies)	Brazil
UK Organisation	University of East Anglia (UEA)
Collaborator(s)	SDS/CEUC, ICMBio, UFAM, INPA
Project Leader	Prof Carlos Peres (UEA)
Report date	31 October 2013 (submitted on 1 November 2013)
Report No. (HYR 1/2/3/4)	(1)
Project website	Not yet available

1. Outline progress over the last 6 months (April – September) against the agreed baseline timetable for the project (if your project has started less than 6 months ago, please report on the period since start up).

We have advanced the planning and execution of a number of core project activities. Although the official Start Date of this project was 1st July 2013, we were not able to effectively begin the project until 1 August 2013. During the month of July 2013 -- and for a few months leading up to this date since we received news of project approval -- we had been primarily making contacts with our partners in Brazil in preparation for fieldwork along the Juruá River, Amazonas, Brazil.

The following preliminary research and outreach activities, which were at least partly implemented, are worth mentioning at this stage:

1. Meetings in Manaus – It was important to meet face-to-face with a number of our partners in government, universities, and research institutes who will be serving a role in this project. Right at the outset, we met with representatives from the State Secretariat of the Environment, the State Protected Areas Management Agency, the State Agency of Fisheries Issues, the Brazilian Protected Areas Agency, University of Amazonas, and the National Institute of Amazonian Research, all of which based in Manaus. Results of these meetings were very good, although at times somewhat bureaucratic. These meetings will have to be repeatedly reinforced in the future.

2. Mapping key landscape features – For our large study landscape in the Central Juruá valley of Amazonas, we assembled a number of raster and vector shape files describing key features of the landscape, including elevation, the stream/river watershed, oxbow lakes, local communities, schools, churches, which are in the process of being integrated into a GIS. This forms the foundation for much of the spatial analyses to be conducted as part of this project. It is imperative that we can develop a high-resolution flood map for the floodplain forests, and we will be working with a collaborator at University of California at Santa Barbara (Dr Laura Hess) who is a world expert on radar imagery as applied to tropical wetland ecosystems.

3. Oxbow-lake productivity -- We sampled 55 oxbow lakes (size range = 3 – 250 ha) along a 450-km section of the Central Juruá River, and this was repeated both during the dry and wet seasons. This work is currently under way by Brazilian PhD student, João Vitor Silva (University of Rio Grande do Norte). Environmental (limnological) variables (covariates) that were measured included: water transparency; temperature; sediment load; conductivity; chlorophyll concentration; dissolved oxygen, nitrogen and phosphorus availability, and macrophyte (aquatic plant) cover. We hypothesize that these variables largely control the

baseline variation in fish productivity for the subsistence and commercial fisheries along the Rio Juruá as oxbow lakes represent critical feeding and spawning habitat for several commercially important fish species. These limnological variables may therefore interact with some of the lake set-aside management issues that form the core of the spatial zoning of harvesting areas that we are trying to understand.

4. Human-wildlife conflicts: ecology of 'problem-species' -- We sampled the abundance of a growing population of Black Caimans (*Melanosulchus niger*) at 30 sampling sites within a wide scatter of oxbow lakes as well as along the main Juruá River channel. Black caimans in this region of the Juruá represent a huge threat to local fishermen and river dwellers, with at least 12 reported attacks resulting in deaths and many more sublethal casualties recorded in the last 15 years. We will be assessing the effects of oxbow lake protection (within and outside the two protected areas), the effects of ongoing fishing agreements between different stakeholders, and the density of fishing effort (or fishermen activity) on several black caiman population parameters. We also began conducting local interviews with semi-subsistence and commercial fishermen in order to quantify the damage that black caimans have incurred to local fisheries via either damage to material property (gillnets) or accidents with fishermen (which can be lethal or sub-lethal). Future work in this area will include sampling caiman nests along oxbow lakes and a number of issues related to the economics of coexisting with a healthy population of apex predators in aquatic systems.

5. Fishing agreements and spatial zoning of fishing activity -- We conducted meetings with the municipal administration (Prefeitura Municipal) of Carauari, and several organizations holding offices in this market town (SDS/CEUC, ICMBio: Instituto Chico Mendes, ASPROC: Associação dos Produtores Rurais de Carauari, AMARU: Associação dos Moradores das Reservas; and the Municipal Fishing Cooperative: Colônia de Pescadores de Carauari) to evaluate the extent to which fishing access rights is a widely perceived conflict of interests, understand the general demand to enhance the spatial structure of fish exploitation along the Juruá River, and discuss a number of ideas of how this could be done. It was agreed that a more general fisheries management agreement between interested parties will be co-designed on the basis of information generated by our project. It was also agreed that this will be done in a more integrated manner between different sustainable use protected areas across the region. We are also pleased to report that we have obtained a strong commitment from the Prefeitura of Carauari to support previously neglected local communities outside the reserves, where fish stocks have long been chronically overexploited for many years. At this writing, these communities have already begun to protect of total of 6 additional lakes outside formal protected areas.

6. Aquatic bird surveys, including capacity building and participatory monitoring -- We sampled the local assemblages of some 30 species aquatic birds in both the dry season and the wet season in a total of 40 oxbow lakes. Most of this lacustrine avifauna are piscivores (fish consumers) and may serve as indicators of fish availability. To make these surveys possible, 10 local field assistants ("*monitores*") were repeatedly trained to execute this form of participatory monitoring of egrets, raptors, kingfishers, and other piscivores in a systematic fashion. On the basis of this pilot work, we then decided that only 31 oxbow lakes under different categories of protection could be repeatedly censused over a 12 month period, and this work has already started.

7. Surveys of commercial fish landings -- We have already started collecting data on commercial fishing activities, including the movement of the fleet of registered fishing boats based in Carauari and recording species-specific catches at a centralized marketplace. In order to make this rather delicate and intrusive activity possible, we had to strengthen our partnership with local fishermen by approaching the Fishermen Cooperative of Carauari, which required a lot of diplomacy. This organization is now assisting us in the data collection process, but this will be on ongoing dialogue that we will need to work on throughout the duration of this project.



8. Sampling of high-value fish abundance -- In consultation with experienced local

fishermen, we have designed a technique to sample the abundance (biomass density) of fish populations using simulated fishing bouts using cast-nets across a select group of 40 focal oxbow lakes. We have also used direct observations of surface water turbulence generated by large fish as an indicator of fish abundance, and this technique is being validated. These techniques essentially mimic some of the typical methods used by local semi-subsistence fishermen operating with artisanal fishing gear, which tends to be highly selective. Results from this part of the project are preliminary but promising. Later we will also begin to use a 'FishFinder' sonar device adapted to dugout canoes to provide an independent measurement of fish abundance and biomass density along census transects within oxbow lakes.



9. Arapaima surveys -- Pirarucu (*Arapaima gigas*) is the commercially most valuable fish species across lowland Amazonia. We have been working hard with experienced local fishermen to consolidate a protocol for sampling the abundance of these exceptionally large lungfish, via systematic observational censuses within previously specified sections of oxbow lakes, and this technique has been working very well. As of this writing, counts of Arapaima have been obtained at almost 80 nominally protected and unprotected lakes. Each lake was targeted by approximately 12 trained fishermen hired to do this work who have been able to reliably count both large juveniles and adults (but not smaller individuals). This method is critical because the quota management system authorized by IBAMA (the Natural Resources Agency) is defined on the basis of *arapaima* counts that are assumed to be accurate and reliable. We will be further fine-tuning and validating this methodology over the duration of the project.



10. Capacity building: Arapaima counts and experience sharing -- Our Darwin Project promoted an important meeting between fishermen that are either residents of formal protected areas and non-residents occupied entirely unprotected landscapes both upriver and downriver. This meeting was very important for the dissemination of *Arapaima* census techniques. In addition, residents of the reserves were able to exchange previous experiences on the socio-political organization that forms a base for lake protection and exclusion of commercial fishing boats. There is a great deal of local demand to roll out these activities well beyond the limits of our study area, and hitherto neglected communities that so far do not control access to protected lakes can begin to make the appropriate arrangements to kick-start this process of resource conservation and spatial management.



11. Seasonal movements of terrestrial vertebrates between floodplain (várzea) forest and upland (terra firme) forest --

We have begun conducting a major effort to camera-trap wildlife populations in both terra firme and várzea forests at different times of year, and this work will go on for two annual cycles. A MSc student from Universidade Federal do Pará (Hugo Costa) has been conducting this work. This project component is crucial to understand how terrestrial game species harvested by subsistence hunters interacts with the dry-phase and flood pulse of várzea forests when the floodwaters rise and recede on an seasonal basis. This work has been accompanied by a series of local interviews, and promises to uncover the poorly known lateral migrations between remote terra firme forests that are rarely hunted and potentially overhunted várzea forests in the vicinities of local communities. This information will hopefully also feed into a better understanding of the spatial requirements of terrestrial wildlife using varzea forests, and ultimately the Management Plans of the two reserves.

2. Give details of any notable problems or unexpected developments that the project has encountered over the last 6 months. Explain what impact these could have on the project and whether the changes will affect the budget and timetable of project activities.

We have no major issues or adversities to report so far, except that a number of project activities are yet to be initiated, including planned work on freshwater turtles, giant otters, floodplain (várzea) forest fruit production, várzea fruit-frugivore interactions,

Have any of these issues been discussed with LTS International and if so, have changes been made to the original agreement?

N/A

Discussed with LTS: no/yes, in..... (month/yr)

Formal change request submitted: no/yes, in.....(month/yr)

Received confirmation of change acceptance no/yes in.....(month/yr)

3. Do you expect to have any significant (eg more than £5,000) underspend in your budget for this year?

Yes No

If yes, and you wish to request a carryforward of funds, this should be done as soon as possible. It would help Defra manage Darwin funds more efficiently if you could give an indication of how much you expect this request might be for.

Estimated carryforward request: £

4. Are there any other issues you wish to raise relating to the project or to Darwin's management, monitoring, or financial procedures?

No

If you were asked to provide a response to this year's annual report review with your next half year report, please attach your response to this document.

Please note: Any planned modifications to your project schedule/workplan or budget should not be discussed in this report but raised with LTS International directly.

Please send your **completed form by email** to Eilidh Young at Darwin-Projects@ltsi.co.uk . The report should be between 1-2 pages maximum. **Please state your project reference number in the header of your email message eg Subject: 17-075 Darwin Half Year Report**