



FIELD REPORT Climate Change and Landscape in Borneo's Rainforests

Project scientists

Dr Glen Reynolds

Country

Malaysia

Research site / region

South-Central and Eastern Sabah, Malaysian Borneo

Protected area status

Danum Valley, Maliau Basin and Imbak Canyon are Class I Protected Forest Reserves. The Ulu Segama and Malua Forest Reserves are Class II (commercial) forest reserves but are under management for conservation.

Date field report completed

20th March 2011

Period covered: from

January 2010 to December 2010

Report completed by

Glen Reynolds - assisted by Vani Annammala, Dzaeman Dzulkifli & Benny Yeong

Dear Earthwatch Volunteer,

2010 proved to be an exciting and productive year for the project - the first year of data collection - and one in which the contribution you made was vital. As you will have learned while you were with us, most of the research on the project is being done by three young Malaysian students - Vani Annammala, Dzaeman Dzulkifli and Benny Yeong.

Vani and Dzaeman were most actively involved with the teams and their work, (on forest/plantation hydrology/soil erosion and forest restoration respectively) progressed well, very much according to plan and assisted greatly by the support the volunteer teams provided during the year. Vani's work in particular, which involves establishing numerous (several hundred in total) erosion bridge sites is especially labour-intensive and would simply not have been possible without your support. Dzaeman, who is registered for a PhD at the University of Zurich, spent much of the year in Switzerland to complete his literature review and plan his project in detail - but he also, again with your help, established several plots and planted many seedlings that will be monitored through the course of the project.

Benny, who some of you may have met, and whose work is based largely in forest fragments within oil palm plantations, has done incredibly well this year. He and his Research Assistants have planted several thousand seedlings in the primary forest at Danum, at Malua (some of the later teams in the year helped with this) and in several small patches of forest within oil palm plantations. Over the next two years he will monitor these seedlings for survival, growth and insect herbivory with the aim of assessing the 'resilience' and likely restoration requirements of small areas of forest embedded within oil palm plantations.

Both Vani and Dzaeman have spent periods in the UK and Switzerland respectively - and as I write this letter (in March 2011) Vani is currently in Swansea to learn and also carry out some of the highly complex laboratory analysis on some of the soil samples you helped to collect, and Dzaeman is in Zurich undertaking, in part, training in statistical analysis. Benny will be travelling to the University of York later this year to learn the laboratory methods he will need to use and conduct some initial analyses. The training of these students in advanced laboratory and statistical techniques is one of the most important aspects of the programme Earthwatch is supporting.

As you will appreciate, during these early stages of the project much of the focus is on training the students, establishing experiments and field sites and collecting baseline data - so, during this first full year of the project, we don't yet have results to report. But collectively and when completed, Vani, Dzaeman and Benny's work will be some of the most comprehensive and detailed research done in SE Asia on the impacts of forest disturbance and conversion to plantation - and will provide important information about the conservation and sustainable management of both forests and plantations, particularly within the context of a changing climate.

Your contribution to this critical work has been important and greatly appreciated by all concerned with this project. Vani, Dzaeman and Benny - as well as Philip, Ahmad, Udin and our team of dedicated Research Assistants at Malua - join with me in thanking you for your time, efforts and support.

Kindest regards,
Dr Glen Reynolds

Director - Royal Society SEARRP and Earthwatch Lead Scientist



Photo 1. Bridge crossing (Credit: Vani Annammala)

SECTION ONE – REPORT SUMMARY

Top highlight from the past field season

No defining results or significant findings this year since data collection is at a very early stage. Results from Vani's analyses of soil cores will be available during the next reporting period.

Non-technical overview of results

Research on the project remains at a very early stage - particularly the work being done by Dzaeman (addressing Objectives 2 and 3) and Benny (Objectives 1, 2 and 3) who are still very much in the establishment phase of their research.

Vani's research - which addresses Objective 4 of the project - is at a more advanced stage and although much of the reporting period was taken up by establishing field sites (particularly the 252 erosion bridges that she will repeat-measure during the project) she has completed some early analysis of sediment cores taken from the lower catchment of the Segama River. These analyses appear to indicate that changes in nutrient balance and chemical composition at the topmost part of the core are due to the conversion of forest to plantation and the intensive use of chemical fertilisers.



Photo 2. Seedlings before being planted (Credit: Vani Annammala)

SECTION TWO – TECHNICAL SUMMARY

REPORTING AGAINST RESEARCH OBJECTIVES

Objectives

1. *To establish the regeneration status and restoration requirements of degraded and fragmented forest and how restoration can best be achieved.*

Research towards this objective is being led by Benny (supervised by Dr John Tay and Professor Jane Hill). During the reporting period Benny and his assistants planted a total of 3,840 dipterocarp seedlings at a total of 12 sites ranging from the pristine forests of Danum Valley, through the degraded forest of Malua and at a total of 8 patches of forest (with size of patch ranging from three hectares to 3,700 hectares). These will be monitored through the project for mortality, growth and insect herbivory (Photo 2).

Although the collection of data on mortality of the planted seedlings only began in December 2010, early indications suggest higher mortality in smaller forest fragments.

During the reporting period Benny has also developed protocols for the leaf litter decomposition component of his study and started to collect detailed habitat data (structural assessment of the forest) at all his field sites.

2. *To assess biodiversity and vegetation structure in pristine and degraded rainforest, forest under active restoration and in rainforest fragments.*

Research towards this objective, which is being led by Dzaeman under the supervision of Professor Andy Hector, is at a very early stage as for much of the reporting period Dzaeman has been in Zurich conducting his literature review and refining the detailed objectives, design and methods of this component of the project. However, Dzaeman has now completed the planting of his main plots at Malua and conducted an initial census of seedling mortality. He has also established climber cutting plots and completed the first census (using fogging techniques) of the arthropod population of the plots. The climber cutting treatments will be imposed during the coming field season in 2011.

3. *To assess the ability of degraded and fragmented forest to maintain ecosystem functioning*

This objective will be addressed by Dzaeman and Benny - and is integral with Objectives 1 and 2, see above.



Photo 3. Taking measurements in the forest (Credit: Vani Annammala)

4. *To establish the susceptibility to erosion and soil moisture status of forest fragments and degraded/restored rainforest*

Research towards this objective is being led by Vani under the supervision of Dr Kawi Biddin and Professor Rory Walsh. The soil erosion component of Vani's research has involved establishing 252 erosion bridge sites in the primary forest of the Danum Valley Conservation Area, the Malua Forest Reserve and at the Sabahmas oil palm plantation near to Lahad Datu. These have all now been successfully established and the first measurements at each site taken. The first round of repeat measurements will be taken during 2011. The sediment fingerprinting/core analyses component of the project has involved taking 12 core samples from the lower Segama flood plain and associated tributaries during the reporting period - and a 1.6 metre sampling pit, also in the lower Segama - for radionuclide and geochemical analyses respectively and will be compared with samples taken from upstream sources. Field based (geochemical) measurements have been taken using a portable Niton XFR elemental analyser - and lab analysis is currently underway (at Swansea and Plymouth Universities) to assess radionuclide composition of the samples/cores using a low background EG&G Ortec Planar HPGe Gamma Spectrometry system.

Early results indicate that enrichment of downstream sediment cores by calcium and potassium at the top end of the core may be linked to the recent conversion of parts of the flood plain from forest to oil palm plantation.

REPORTING AGAINST MEASURES OF SUCCESS (MoS)

Partnerships

Our ongoing partnerships with Yayasan Sabah and the Danum Valley Management Committee (SEARRP's main partners in Malaysia) are key to the success of the project - not least as the main sites are in forests managed by these organisations.

- Research from this project will feed directly into the Malua BioBank forest restoration project (www.maluabank.com).

Universiti Malaysia Sabah (UMS) is closely linked with this project - with Benny Yong and Vani Annammala both co-supervised by senior academics from UMS (Dr John Tay and Dr Kawi Bidin respectively).

We have also established links with the Round Table on Sustainable Oil Palm (RSPO) - an industry (upstream and downstream)/NGO collective which aims to improve sustainability within the oil palm industry. We expect to sign an understanding with the RSPO in 2011 that will facilitate the exchange of information on this and other related projects as part of SEARRP. SEARRP has also been invited to report directly to the RSPO sub-committee on biodiversity.



Photo 4. Measuring soil parameters (Credit: Vani Annammala)



Photo 5. Taking quadrat measurements in the forest (Credit: Vani Annammala)

DISSEMINATION

Visual

This project has contributed to existing displays at Danum Valley and Universiti Malaysia Sabah,

Meetings and conferences

A public lecture was given by Dr Glen Reynolds in London, UK at an Earthwatch/Royal Geographic Society event in May 2010.

Developing Environmental Leaders

Significant training has been provided to Vani, Dzaeman and Benny who we hope and believe will take on a leading role in environmental conservation/research on completion of their studies.



Photo 6. River crossing during fieldwork (Credit: Vani Annammala)

LONG TERM IMPACT OF PROJECT

Taxa of conservation significance enhanced, restored or maintained

This research does not directly contribute to the conservation of high conservation value taxa - but rather to the restoration and sustainable management of a key habitat (lowland tropical rainforest) which many important and threatened species occupy.

Habitats enhanced, restored or maintained

This project is at an early stage, though we anticipate that it will provide important new information on the 1) restoration of degraded lowland tropical rainforests by enrichment planting and climber cutting (both continuous and fragmented forest), 2) the importance of retaining forests, and the role forests play, within agricultural landscapes, and 3) understanding and addressing soil erosion from degraded forest, forest fragments and agricultural plantations.

Ecosystem services enhanced, restored or maintained

This project is at an early stage (first full year of data collection) but we expect it to make a significant contribution in a number of key areas, in particular:

- 1) Provisioning: Sustainable supply of timber (from natural forests), sustainable agricultural production (from oil palm plantations).
- 2) Regulating: Carbon sequestration (through the restoration of tropical rainforests by enrichment planting and climber cutting), water quality (through understanding sources of soil erosion and how erosion might be reduced), pest regulation/pollination (understanding how natural forests embedded within plantations are functioning and the contribution they might make to sustainable plantation management).
- 3) Cultural: Not specifically addressed by this project.
- 4) Supporting: Primary production (through studies of plant growth in pristine, degraded and fragmented forest) and nutrient cycling (through studies of decomposition in these habitat types) will be addressed by this project.



Photo 7. Elephants on the road (Credit: Vani Annammala)