

2009 Forest Research Objectives and Staffing

1. Introduction

The 2009 – 2011 Lambusango forest research programme is led by Dr Phil Wheeler (Hull University) and has 4 main research themes (Animal Community Dynamics, Animal Species Dynamics, Forest Dynamics Research and Human Wildlife Conflict) comprising 25 projects. These themes and projects though feed into two main outputs; Ecosystem Management data needed to monitor how the forest changes post the World Bank/GEF project and Fundamental Ecology data designed to improve our understanding of the fundamentals of the ecology of forest ecosystems, including the impact of disturbance and climate change on the dynamics of species and communities. Not all the projects from the overall programme run each year of the research programme and this report is designed to identify the projects that will comprise the 2009 programme. The teams are divided into those working in the node camps (Biodiversity Monitoring) and those working in the stretch of forest that lies between the Labundo and Lapago Camp (Ecosystem Processes).

2. Node Camp Teams (IN101)

Six camps are being used in the Lambusango Forests and each have 4 X 3km long transects already marked. Each of these camps (except Lapago which is open throughout the season) will be open for 1 week for the surveys to be completed. The following projects will be completed by the Node Camp Teams:

Animal Community Dynamics Research Theme

Project 1.1 Birds

The node camp sample sites surveyed in the previous years will be re-surveyed in the 2009 surveys. The senior ornithologist is Tom Martin (Lancaster University) with help from Dani Heyadi (Lawane Ecotone). Bird species will be surveyed using the Variable Circular Plot methods (point counts with distance estimates to each contact) following Bibby et al. (2000) at 150m intervals along each of 4 transects at each node camp. Surveys will be carried out between 0600 and 0800 hours. All birds heard and seen will be recorded and an estimate of distance was made to each contact. Population sizes will be estimated using DISTANCE sampling. Habitat surveys will also be carried out to determine how bird communities are related to habitat. Vegetation structure and other variables will be surveyed within a 20-m radius circular area around the bird count points. Density of understorey and canopy openness will be estimated using 1.5 m stick with fifty black bands, counting the number of black bands seen from a distance of 10 metres and by using a sighting tube. Slope, aspect, topography, number of fallen trees, trees with DBH > 50 cm and indicators of disturbances, such as presence of rattan, palms (Palmae), lianas, and Pandanus will also be recorded.

Project 1.4 Habitat Preferences of Stream-Dwelling Amphibians

Stream dwelling amphibians may be indicators of water quality. Identifying the habitat features that are important in governing their distribution is a key step in understanding how they relate to forest and stream quality. This team will be led by Adininggar (IPB) with advice by Michael Shelton (Zoos Victoria). Frogs will be observed on streams near node camps, with standard sampling techniques such as visual encounter surveys with headlamps, and dip-net sampling for larvae. 100m long transects will be established along the streams and marked with coloured flagging tape at intervals of 5m. Visual censuses will be conducted between 19.00 and 23.00. Meteorological conditions will be recorded. Individuals will be identified to species and position, perch type, activity and distance along the transect will be recorded. Distances from the exact position at which the individual is found to various nearby habitat features will be measured. Sex, reproductive condition and body mass will be assessed where possible. An equivalent number of randomly located points will be surveyed for habitat variables as a control against which to assess the importance of various habitat variables to different species.

Animal Species Dynamics Research Theme

Project 2.1 Monitoring Anoa and Wild Pig Populations

Anoa and pig populations will be monitored by track counts along 3km survey lines in each of 6 node camps within the LFMA. Numbers of individual track lines will be counted on each survey line and their location to the nearest 50m recorded. Occupancy will be estimated using

program PRESENCE. Damian Smith (Operation Wallacea) will be leading this project under the supervision of Dr Phil Wheeler.

Project 2.2 Monitoring Buton Macaque Populations

Macaques will be surveyed by Distance sampling along 3km transects at node camps. Surveys will be conducted in the mornings beginning at 6.30 am. Transects will be walked at a speed of 800m per hour and distances to sighted groups of macaques estimated. In addition mean group size will be estimated by following four groups of macaques at each location. The group size and distance sampling data will be combined to estimate population size using programme DISTANCE. Damian Smith (Operation Wallacea) will be leading this project under the supervision of Dr Phil Wheeler.

Project 2.5 Demography of stream-breeding frogs

Southeast Sulawesi is home to one of the world's largest frogs, *Limnonectes grunniens*. Like most large frog species in developing, heavily populated, regions of the world, it is hunted for human consumption. The conservation implications of this are unknown, however, anecdotal observations suggest that this species persists in a wide range of habitats including areas subject to strong hunting pressure. Apart from direct effects upon population density, hunting may have a number of indirect effects on species, through directional selection on behaviour and life-history. For instance, selective hunting for larger frogs may result in life history shifts to smaller size at sexual maturity, faster growth-rates to sexual maturity and/or activity patterns and microhabitat use. This team will be led by Adininggar (IPB) with advice by Michael Shelton (Zoos Victoria) and will involve monitoring transects along streams supporting populations of *Limnonectes grunniens* on each of the Lambusango node camps. This includes a range of sites with varying habitat conditions and access to people; a surrogate for hunting pressure. Populations will be censused at each site, using mark-recapture techniques. Life history, behaviour and microhabitat associations will also be measured. Spatial and temporal variation in population density, key life history traits and behaviour will be compared between sites and across years.

Forest Dynamics Research Theme

Project 3.1 Monitoring Forest Structure and Diversity

Dr Bruce Carlisle (Northumbria University) and Adjat (Bogor Herbarium) will be measuring forest vegetation at sampling plots along the node-camp transects. At each plot a number of measurements will be taken including slope, aspect GPS position, the identity, circumference and height of all trees > 15 cm circumference at breast height, ground cover and canopy openness. Surveys will measure all trees but with a particular focus on rattans, figs and timber trees. Samples of leaves and/or fruits need to be taken for those species that cannot be identified, and duplicate samples will be obtained for the herbarium at Bogor.

Project 3.2 Ecology of Epiphytes

Adjat (Bogor Herbarium) with dissertation students will complete this project. Epiphytes will be surveyed at points along transects at node camps. The average number of epiphytes and diversity of epiphytes on trees will be measured. Epiphytes will be identified to species level where possible. Where necessary samples of leaves and/or fruits will be taken and duplicate samples will be obtained for the herbarium.

Project 3.4 Monitoring Rattans

Rattans are the most important non-timber forest product in the LFMA. Their harvesting may be sustainable under certain circumstances. Understanding rates of growth of different species in different conditions is important in developing a sustainable harvesting strategy. This project is led by Dr Bruce Carlisle (Northumbria University) and Dr Andrew Powling (Portsmouth University). A number of rattan plants of different species have been marked in the forest in previous years. These will be relocated. The stem heights of these will be measured using a tape measure. Light conditions will be estimated using a light meter, and soil conditions examined using a portable pH meter. Samples of leaves and/or fruits need to be taken for those rattans that cannot be identified, and deposited at UNHAS and in the herbarium at Bogor.

3. Ecosystem Processes Teams (IL102)

The stretch of forest that lies between the Labundo and the Lapago study grids is approximately 5 km in length and 3km wide bounded on one side by steep cliffs and on the other by a deep valley. It is this stretch of forest that has been the location of many of the more detailed studies of particular taxa. If detailed information could be obtained about the how this stretch of forest changes spatially and temporally these data would be of great benefit in interpreting the ecological information of the studied faunal groups. Within this overall programme there are a series of related projects: forest structure, herpetofauna, small mammals, civets and bats.

Animal Community Dynamics Research Theme

Project 1.3 Monitoring Herpetofauna Communities

Herpetofauna have been surveyed at sites in the LFMA for nine years. These data are providing a picture of the dynamics of communities in tropical forests and their relationship with forest change and disturbance. Dr Graeme Gillespie (Zoos Victoria) is advising on this project which will be led by Dwi Susanto (IPB) and Sean Doody (Zoos Victoria). A number of sites will be surveyed for herpetofauna using pit-lines (each consisting of four pit-buckets connected by a drift fence). Opportunistic nocturnal surveys will also be carried out. Trapping sites will be arranged at fixed points along a transect running into the forest from a small local road. Habitat surveys will be carried out to assess differences in forest structure along each pit-line. 5mx5m quadrats will be placed at both ends of each pit-line and the following variables recorded: leaf litter depth, vine count and circumferences, log count, tree count, aspect and gradient. The number of large trees, mean number of buttresses and a log count will also be recorded for an area 20m in radius surrounding the pit site. Canopy photographs will be taken to assess canopy.

Project 1.6 Monitoring Bat Communities

Bats are important components of biodiversity as seed dispersers and pollinators. Their diversity may also give an indication of diversity of more difficult to study and less well known groups that make up their prey such as insects. Trapping at fixed points in the Kakenauwe reserve has been carried out for several years and now forms a substantial data set that is valuable in monitoring temporal change in this forest. This team will be led by Samsudin (Lawana Ecotone) and Felicia Lasmana (IPB). Bats will be captured in harp-traps at fixed points in the LFMA. Traps will be checked twice nightly and moved every morning in order to cover as much area as possible. Bats will be identified to species level, sexed, aged, and measured (forearm length and body mass). Females will be checked for reproductive condition. Individuals will be released as close as possible to their site of capture. Where further taxonomic assessment is needed, specimens and wing membrane samples (with a request for duplicates to be borrowed) will be taken and lodged with the Zoological Museum at Bogor.

Project 1.9 Fig Wasp Community Ecology

Figs are an important group in tropical forest systems, providing a vital source of food for a range of species. Fig wasps are an integral component of this system, being necessary for pollination of all figs. The communities of these wasps exist for a large part of their life-cycles encased in the syconia themselves. Studying these species gives an insight into the fundamentals of competitive processes in ecological systems that may be relevant beyond the fig wasps themselves. This project will be led by Simon Segar (Reading University). Figs will be collected from a range of species either from ground level or using roped access where appropriate. They will be dissected and wasps found inside will be removed, preserved in ethanol and identified to functional group under the microscope. Wasps will be sorted to morpho-species, and specimens will be lodged at Bogor and the Eijkmann institute for later reference. Where appropriate duplicate specimens will be exported for species identification.

Animal Species Dynamics Research

Project 2.3 Behaviour of Buton macaques

Three groups of macaques have been habituated to the presence of human observers, one in the forest bordering the village of Kaweli, one at the Kakenauwe study site, and one at the La

Pago study site. Behavioural data will be collected from all three study groups. The macaques at Kaweli crop raid and their behaviour will be recorded both in the forest and when crop raiding. The macaques will be located daily and then followed opportunistically for as long as possible throughout the day. General behaviours will be recorded using instantaneous scan sampling every 10 minutes, and specific behaviours recorded using both *ad libitum* recording and continuous focal sampling. In some cases specific behaviours will be videoed for later analysis. The following age-sex categories will be used: alpha adult male, adult male, adult female, sub-adult, juvenile, infant. The following behaviours have been recorded in previous years and will be used to assess behaviour again: Foraging, Carrying food, Feeding, Locomotion, Climbing, Resting, Self grooming, Social grooming, Vigilant, Playing, Fighting. This will provide data on the amount of observation time that the macaques spend engaged in the various non-social and social behaviours. These will be compared between groups, and between the various age-sex categories.

Project 2.4 Population dynamics and spatial ecology of Malay civets

Malay civets *Viverra zibellina* are the main mammalian predator in the forests of Buton; they are also an introduced species. Understanding their population dynamics and use of landscape and habitats is important for understanding their potential impact on native forest species and on broader scale forest dynamics. Malay civet populations have been surveyed through trapping for the past 5 years in Buton. This dataset is becoming one of the longest-running sets of detailed population data on a rainforest carnivore anywhere in the world. This project is led by Dr Phil Wheeler with help from Dr Ruth Cox (Liverpool John Moores University). Around 25 cage traps (140 x 40 x 40cm) will be set in 26 locations. Traps will be baited with salt fish and checked daily in the mornings. Civets will be immobilised by intramuscular injection of a mixture of Ketaset (Ketamine HCl, Parke, Davis & Co., Detroit, Mich.) and Rompum (Xylazine HCl, Bayer) In order to reduce trauma during immobilisation a “squeeze panel” will be used to restrict the civet’s movements inside the cage. While under anaesthetic civets will be weighed, measured, and sexed and aged based on body size and condition of the teeth. Reproductive status will also be determined. Animals will be marked using coloured plastic tags clipped into both ears. Immobilised animals will be allowed to fully recover for 2-3 hours before being released.

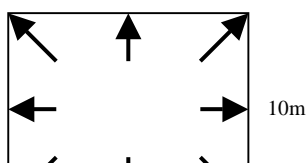
Forest Dynamics Research Theme

Project 3.1 Monitoring Forest Structure and Diversity

This team led by Hannah Thomas (Operation Wallacea) and a series of assistants works with teams of General Surveyors to obtain these data. Sample size needs to be of sufficient size to ensure main forest characteristics such as basal area can be assessed within each sample. Data from forest surveys on different sample sizes in Lambusango has indicated that 50m X 50 m squares is the minimum size for accurately basal area. However, the samples need to be small enough to be able to accurately map the positions of trees so spatial patterns can be determined. 50m X 50m is too large for this objective and it is therefore proposed to subdivide the 50m X 50m squares in 25 X 10m X 10m squares. The objective is to complete 30 – 40 samples during the 2009 survey season which will provide detailed measurements on approximately 1% of the total study area. In order to get as wide a geographical spread throughout the study area as possible it is proposed to complete 3 samples within each 1km square. Within each of these squares one sample will be taken from a ridge top, a slope and a flat or valley bottom area. In order to obtain data on the precision and accuracy of the results being collected after training each survey team will be tested on a standardised square.

Each survey team will be divided into 4 teams plus the leader. The first group will use two 100m surveying tapes and compasses to mark out the perimeter of the 50m x 50m plot and will then divide the 50m x 50m plot into twenty-five 10m x 10m plots. This group also takes the GPS coordinates of the four corners ('A', 'B', 'C' and 'D') of the 50m x 50m plot will taken using the averaging feature on the GPS unit, and measures the angle from the highest point to the lowest point in the 50m x 50m plot using a clinometer.

The second group is obtaining data on the vegetation structure of the plots. A 3m vegetation touch-test pole is used to quantify the density of the understorey at 8 points around each 10m



X 10m square. A canopy scope reading is also taken from the centre of each 10m x 10m plot. The third group is the tree tagging group. For each tree over 30cm in circumference at chest height, the local guide will identify the species and the team will measure the circumference, and fix a unique numbered tag.

The fourth group is looking at disturbance and regeneration patterns. Within each 10m X 10m plot the number of saplings in a 2m x 2m quadrat will be counted. A sapling is defined >1.5m and <15cm circumference. Within this quadrat a 1m x 1m quadrat will be positioned and the number of tree seedlings within it will be counted. A seedling is defined as <1.5m with woody stems. For each 10m x 10m plot the numbers of any dead trees that are wholly or partially within that block will be counted along with the numbers of cut stumps.

Project 3.3 Ecology of Figs

Figs are a vital part of the forest ecosystem as they provide an important food source for a range of species. In the Lambusango area they also produce some of the largest trees in the forest and are thus a key component of the ecosystem architecture. Understanding the factors that affect their diversity and distribution is crucial to a full understanding of the dynamics of the forest ecosystem in Lambusango. This project is led by Dr Andrew Powling (Portsmouth University) and figs will be surveyed based on a combination of opportunistic encounters and systematic searches on transects. Syconia and leaves will be used to give identifications in the field where possible. Where not possible samples will be brought temporarily to the field laboratory and returned after identification. Where identification is not been possible or is uncertain samples will be collected in line with best practice for this species and taken to the herbarium in Bogor for definitive identification.