

## Forest Structure Surveys

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### ***Summary***

This large scale and potentially long term study of all trees over 100 circumference at breast height (cbh), has already shown a noticeable correlation between the frequency of low level selective felling of primary timber species and decreasing accessibility to the area in which the cut stumps of those species are found. Furthermore, such a large data set is likely to be beneficial to scientists of various taxa in future years of study.

### ***Introduction***

The 2007 research season has been the first to welcome sixth form students from schools in England into its science programme, both as assistants to several of the scientific teams but more importantly as a team of surveyors in their own right. Over the course of the summer the students have been carrying out forest structure surveys on 1 hectare plots with the aim of identifying the important timber trees and fruiting species. This is with the ultimate aim of generating a map so that any gradient(s) in selective logging along a transect that runs perpendicular to a major road can be both seen and evaluated, and so that the important fruiting species' locations can be related to various mammal, bird, herpetofauna and botanical surveys carried out in the same area.

### ***Method***

#### Finding and Marking Plot

Using a random number generator on a scientific calculator, an integer between 1 and 40 was selected; these corresponded to a map of the area (Figure 1) on which a 100m<sup>2</sup> UTM grid had been overlaid. The coordinates for the centre of the chosen hectare plot were then entered into a GPS and navigated to. Once at the centre, a pole was placed and two 100m long surveying tapes were used to mark out two 100m bisecting lines from that point, along both North to South and East to West orientations. This formed four quadrants which were then numbered 1-4, always with the

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same geographic orientation. i.e.: Quadrant 1 always had a NE orientation, quadrant 2 SE, quadrant 3 SW and quadrant 4 NW.

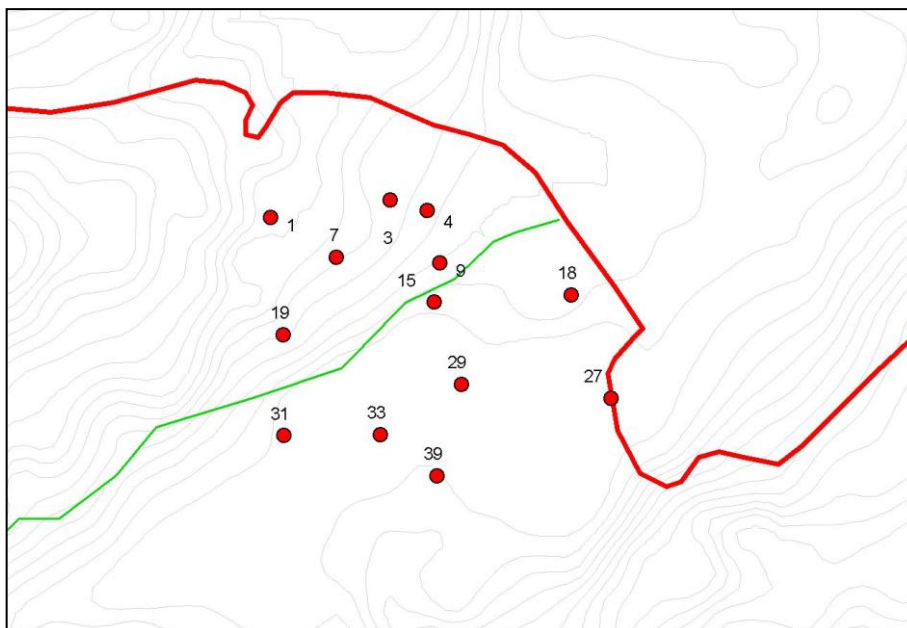
### Tree Surveys

Led by a trained habitat surveyor and in four separate groups the students surveyed all trees over 100cm cbh and also any cut stumps. The cbh, local name, both the bearing towards the tree and the distance to the tree from the centre of the hectare, and the presence or absence of lianas, ferns and strangling fig infestations were all recorded. In addition a plastic tag with a unique identification number was nailed to each tree and cut stump that was surveyed. A GPS unit with an averaging feature was also used to secure a very precise set of coordinates for the centre of the plot, enabling accuracy recorded to +/- 2m.

### Results

Over the course of the survey period, a total of over one thousand trees were measured, spread throughout thirteen separate hectare plots. This survey included over seventy different species in the survey area alone and this diversity is expected to significantly increase in subsequent years. The table below shows all of the species found and their distribution within the areas studied, which is the first step to the production of the afore mentioned map.

**Figure 1** – Map of the study area. Red dots represent the centre of 1 ha study squares. Labels show square number.



Quadrat Number	1	3	4	7	9	15	18	19	27	29	31	33	39
<b>Species Name</b>													
Aniaga	0	1	0	0	0	0	0	0	0	0	0	0	0
Bau	1	1	1	1	1	1	1	0	1	1	1	1	1
Bayam	0	0	1	0	0	1	0	0	0	0	0	0	0
Behi	0	1	0	1	0	0	0	0	0	0	0	0	0
Behi Merah	0	0	0	1	0	0	0	0	0	0	0	0	0
Beleko	0	1	1	1	0	0	0	0	0	0	1	0	1
Beringin	0	0	1	1	0	0	1	1	0	0	1	0	0
Bataui	0	0	0	1	0	0	1	0	0	0	0	0	0
Bigi	1	0	0	0	0	0	0	0	0	0	1	0	0
Bolongita	0	1	0	1	1	1	0	1	0	0	0	1	0
Bubno Hutan	0	0	0	1	0	0	0	0	0	0	0	0	0
Cepulu	0	0	0	1	0	0	0	0	0	0	0	0	0
Damar	0	1	1	1	1	0	1	0	0	1	1	1	1
Ete	1	1	1	1	1	1	1	1	1	1	1	1	0
Euris	0	0	0	0	0	0	1	0	0	0	0	0	0
Ewu Ewu	0	0	0	1	0	1	1	1	0	0	1	0	0
Eya	0	0	0	1	1	1	0	0	0	0	1	1	0
Gihonda	0	0	0	1	1	1	0	0	0	0	1	1	1
Guara	0	0	0	1	0	0	1	0	0	0	0	1	0
Ia Sora	0	0	0	1	0	1	0	0	0	0	0	0	0
Jambu Jambu	0	0	0	1	0	0	0	0	0	0	0	0	0
Ka Apu Apu	0	0	1	1	1	0	0	0	0	0	0	0	1
Kafofo	0	0	0	1	1	1	1	1	0	1	1	1	0
Kafofo Merah	0	1	1	1	1	0	1	0	0	0	0	0	0
Kafofo Putih	0	0	0	0	0	0	1	0	0	0	0	0	0
Kalimete	0	1	1	1	0	0	0	1	0	0	0	0	0
Kaloba	1	0	0	1	0	0	0	0	0	0	0	0	0
Kalokaloka	0	0	0	0	0	0	0	0	0	0	1	0	3   0
Kambo Bangsa	0	0	1	0	0	0	0	1	0	0	0	1	0
Kanamu namu	0	0	0	1	0	0	0	0	0	0	0	0	0
Kanguha	0	0	1	1	1	1	1	1	0	0	1	1	1

Quadrat Number	1	3	4	7	9	15	18	19	27	29	31	33	39
Species Name													
Kapok Hutan	0	0	0	0	1	0	0	0	0	0	0	0	0
Kapoluli	0	0	0	1	0	0	0	0	0	0	0	0	1
Kapu Puluka	0	0	0	0	0	0	0	0	0	0	0	1	0
Kase	0	1	1	1	0	0	1	1	1	1	1	1	1
Kawu Kawu	0	0	0	0	0	0	0	1	0	0	1	1	0
Kenta Kenta	0	0	1	0	0	0	0	1	0	0	0	0	0
Kia	0	0	1	1	0	0	1	0	1	1	1	1	1
Kia Merah	0	0	0	1	0	0	0	0	0	0	1	1	0
Kimbou	0	0	0	0	0	0	0	0	0	0	0	1	1
Koba Hitam	0	0	0	0	1	1	0	0	0	0	1	0	1
Koro Koronjo	0	0	0	0	0	0	0	0	0	0	0	1	1
Kui	0	0	0	1	0	0	0	0	0	0	0	0	0
Loga	0	0	1	1	1	0	1	1	1	1	1	1	1
Mandi Mandea	0	0	0	1	1	0	1	0	0	0	0	1	0
Mongimongeva	0	0	0	1	0	0	0	1	0	0	0	0	0
Nuhu	0	0	0	0	1	0	0	0	0	0	1	1	0
Olo	0	0	0	1	1	1	1	1	0	1	1	1	1
Pada Mata	0	0	0	1	0	1	0	0	0	0	0	0	0
Paha Cumbu	0	0	0	0	0	0	1	0	0	0	0	0	0
Palu Hutan	0	0	0	0	0	0	0	1	0	0	0	1	0
Parigi-rigi	0	0	0	1	0	0	1	1	0	0	0	0	0
Pepu	0	0	0	1	0	1	0	1	0	0	0	0	0
Rau	0	0	0	0	0	0	0	1	0	0	0	0	0
Roda	0	0	0	0	1	1	0	0	0	0	0	0	1
Rufi Hitam	0	0	0	0	0	1	0	0	0	0	0	0	1
Sahempa	0	0	0	1	1	1	1	1	0	0	1	1	1
Saru Bongko	0	0	0	1	0	1	0	0	0	0	0	1	0
Sau Korea	0	0	0	1	0	0	0	0	0	0	0	1	4
Sau Moni	0	0	0	1	0	0	0	0	0	0	0	1	0
Sau Ngkofulu	0	0	0	1	0	0	0	0	1	0	0	1	0
Sela Sela	0	0	0	1	0	0	0	0	0	0	0	0	1

Quadrat Number	1	3	4	7	9	15	18	19	27	29	31	33	39
<b>Species Name</b>													
Silato	0	0	0	1	0	0	0	0	0	0	0	0	0
Taihimanu	0	0	0	1	0	0	1	0	1	0	1	1	0
Ti Pulu	0	0	0	1	0	0	0	0	0	0	0	0	0
Tokulo	0	0	0	1	1	1	0	1	0	1	0	0	0
Tompira	0	0	1	1	0	0	0	0	0	0	1	1	0
Tovo Tovo	0	0	0	1	0	0	0	0	0	0	0	0	1
Uneye	0	0	0	0	0	0	0	0	0	0	1	0	0
Urufi Hitam	0	0	0	1	0	0	0	0	0	0	0	1	0
Urufi Merah	0	0	0	0	0	0	0	0	0	0	0	1	0
Urufi Putih	0	0	0	1	0	0	0	0	0	0	0	1	0
Wasa	0	0	0	0	0	0	0	0	0	0	0	0	1
Wintona	0	0	0	0	0	0	0	0	0	0	0	1	0
Wola	1	1	1	1	1	1	1	1	0	1	1	1	1

## ***Discussion***

Considering that 2007 has been the first season of schools in Indonesia and more importantly the first that these forest structure surveys have been carried out, the data is extremely promising and looks set to be both expanded upon, and used by the other scientific teams in the years to come. On initial analysis, the data set appears to indicate that there is a decrease in the frequency of cut stumps correlating with increasing distance from the major road, and also from the more widely used paths within the study area. From this year's experience, we are planning to adjust the method of marking out the hectare plots so that 4 smaller (25m x 25m) quadrants will be defined within each 50m x 50m quadrant, so as to ensure a higher level of accuracy when determining positions for each surveyed tree and cut stump. The study area is also set to expand into areas further along the transect, which is expected to further support our preliminary indications.

## ***Conclusions and implications for conservation***

In terms of potential implications this data set may have for other biota in the region, we can make the tentative suggestion that a map of important tree species in the area (such as the various species of strangling figs) will facilitate scientists working with other species, e.g. the Buton Macaque, that may use those trees as either a food source or as a sleep site, to be able to locate their study animal faster and to more accurately determine its locomotion patterns. Furthermore, such a map may provide botanists working in the area with the ability to quickly locate a large number of trees of a particular species, and thus assist them in carrying out long term studies of both growth rates and population dynamics.