Forest Structure Surveys

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Summary

The first year of this long-term survey examining a selection of variables which can be used to study how the stretch of forest that reaches between the road and the Lapago node camp changes both temporally and spatially, has had a secondary purpose in that the accuracy of the Sixth-form school students who assist in the collection of this data has been examined, and has been shown to be of good quality.

Introduction

The 2008 research season has seen low numbers of school students in Indonesia and as such has provided the perfect opportunity to pilot a new vegetation survey methodology in which a selection of 50m x 50m plots have been surveyed from ridge top sites, sloping sites and valley bottom locations. These plots were selected based upon knowledge provided by those experienced in surveying in the 2km wide by 3km long strip of forest, in which a series of long-term studies on the ecology of some of the key faunal groups, namely herpetofauna, small mammals, civets, bats and macaques, have been carried out over several research seasons. These vegetation survey plots will provide data that will be most useful in interpreting the information of the other studied faunal groups in the area. Additionally, the low numbers of school students has allowed time to conduct repeat surveys, using only leaders and local experts, on each of the 13 plots surveyed by the school groups, thus allowing the questions of: “What can one use untrained surveyors to survey in a tropical forest” and “is there greater variability within the school students’ data than within the experts’ data” to be asked.

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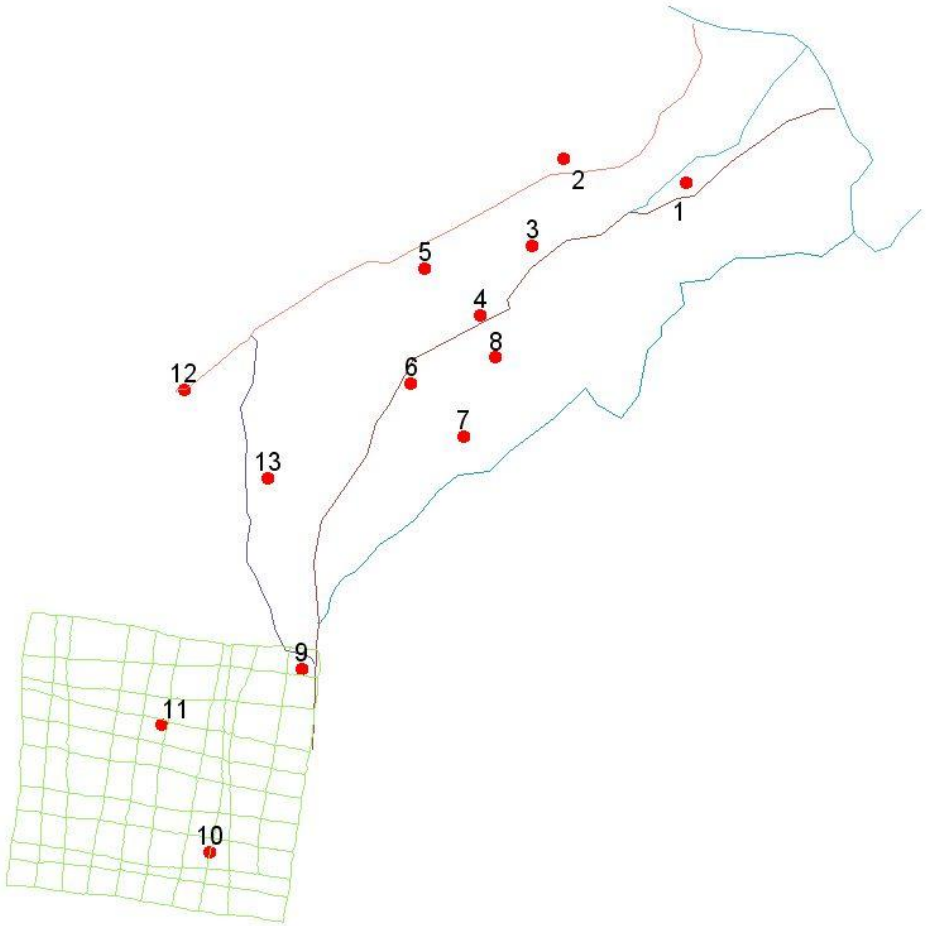
Figure 1 **–** Map of study area showing transect lines between the road (top right) and the Lapago grid (bottom left). Red dots represent the NW corner of each of the thirteen 50m x 50m plots surveyed; the labels show the number of each plot. NB: Plot 1 was used as a training plot.



Method

Each survey team will be divided into 4 teams plus the leader and the following tasks completed by each team:

Group One (2 students)

a) From the flagged start point of the plot the students will use two 100m surveying tapes and compasses to mark out the perimeter of the 50m x 50m plot.

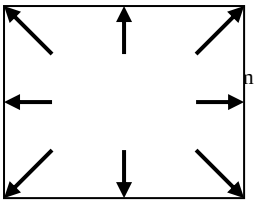
b) Using eight 54m lengths of rope and compasses the same students will then divide the 50m x 50m plot into twenty-five 10m x 10m plots.

c) The GPS coordinates of the four corners ('A', 'B', 'C' and 'D') of the 50m x 50m plot will be taken using the averaging feature on the GPS unit, thus allowing each of the twenty-five 10m x 10m plots to be labelled with a plot ID (1-25).

d) The angle from the highest point to the lowest point in the 50m x 50m plot will be measured using a clinometer.

Group Two (2 students)

a) For each 10m x 10m plot the students will use a 3m vegetation touch-test pole to quantify the density of the understory. 8 measurements will be taken per plot as illustrated below



b) A canopy scope reading will be taken from the centre each 10m x 10m plot.

Group Three (1 guide and 1 student)

a) For each tree over 30cm in circumference at chest height, the following variables will be recorded:

i. ID number of 10m x 10m plot
ii. Circumference of tree at breast height (CBH)
iii. Local name of tree
iv. Number of Latchsbacher tree tag nailed to tree

Group Four (2 students + 1 guide)

a) In the corner of each 10m x 10m plot that is closest to the GPS coordinate 'A':

i. A 2m x 2m quadrat will be roped off and the number of saplings within it will be counted. (A sapling is defined >1.5m (taller than the student) and <15cm circumference (small enough for them to fit their hands around the trunk).
ii. Within the 2m X 2m quadrat a 1m x 1m quadrat will be roped off and the number of seedlings within it will be counted. A seedling is defined as <1.5m (shorter than the student and small enough for them to get their hands around the stem.)

b) For each 10m x 10m plot the numbers of any dead tree that had roots within that 10m x 10m plot will be recorded.

c) For each 10m x 10m plot the numbers of any dead tree that had roots outside that 10m x 10m plot will be recorded.

d) For each 10m x 10m plot the numbers of cut stumps will be recorded.

Leader

a) For each 10m x 10m plot the leader will estimate the height of the tallest tree.

b) For each 10m x 10m plot the leader will use the Braun-Blanquet cover-abundance scale to estimate the total vegetation by volume in an imaginary 10m x 10m cuboid in the following height classifications:

i. 0-1m
ii. 1-5m
iii. 5-20m
iv. 20+m

The volume of vegetation in each height classification will be defined as follows:

0: < 1% cover
1: 1 to 5%
2: 6 to 25%
3: 26 to 50%
4: 51 to 75%
5: > 75%

Results

As data was collected on a wide range of vegetation structure variables, there are several sets of results that can be compared between the leaders' and school students' surveys in order to examine the level of accuracy within the students' data. Two of these that are of particular note are a) the counts of numbers of saplings in a 2m x 2m quadrat in the NW corner of each 10m x 10m quadrat within the 50 x 50's, and b) the measure of all the CBH's recorded within each of the 50 x 50's.

Table 1 below shows the results of a paired samples t-test performed on the counts of numbers of saplings per survey plot, table 2 shows the results of a paired samples t-test performed on all the CBH's per survey plot

Table 1

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	NoSaplingsLeaders2 - NoSaplingsSchools2	3.04000	1.59374	.31875	2.38214	3.69786	9.537	24	.000
Pair 2	NoSaplingsLeaders3 - NoSaplingsSchools3	.56000	2.20000	.44000	-.34812	1.46812	1.273	24	.215
Pair 3	NoSaplingsLeaders4 - NoSaplingsSchools4	5.72000	3.93192	.78638	4.09698	7.34302	7.274	24	.000
Pair 4	NoSaplingsLeaders5 - NoSaplingsSchools5	.56000	2.10317	.42063	-.30815	1.42815	1.331	24	.196
Pair 5	NoSaplingsLeaders6 - NoSaplingsSchools6	.12000	1.90000	.38000	-.66428	.90428	.316	24	.755
Pair 6	NoSaplingsLeaders7 - NoSaplingsSchools7	1.00000	2.36291	.47258	.02464	1.97536	2.116	24	.045
Pair 7	NoSaplingsLeaders8 - NoSaplingsSchools8	2.56000	2.08327	.41665	1.70007	3.41993	6.144	24	.000
Pair 8	NoSaplingsLeaders9 - NoSaplingsSchools9	.24000	2.75802	.55160	-.89845	1.37845	.435	24	.667
Pair 9	NoSaplingsLeaders10 - NoSaplingsSchools10	-.40000	2.27303	.45461	-1.33826	.53826	-.880	24	.388
Pair 10	NoSaplingsLeaders11 - NoSaplingsSchools11	3.80000	2.62996	.52599	2.71441	4.88559	7.224	24	.000
Pair 11	NoSaplingsLeaders12 - NoSaplingsSchools12	-.16000	2.15407	.43081	-1.04915	.72915	-.371	24	.714
Pair 12	NoSaplingsLeaders13 - NoSaplingsSchools13	-.12000	.60000	.12000	-.36767	.12767	-1.000	24	.327

Table 2

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	CBH Leaders Plot 2 - CBH School Plot 2	1.22430	46.42529	4.48810	-7.67380	10.12240	.273	106	.786
Pair 2	CBH Leaders Plot 3 - CBH School Plot 3	-7.85714	70.62338	6.89214	-21.52451	5.81022	-1.140	104	.257
Pair 3	CBH Leaders Plot 4 - CBH School Plot 4	-2.09155	52.06269	4.36900	-10.72877	6.54567	-.479	141	.633
Pair 4	CBH Leaders Plot 5 - CBH School Plot 5	4.57325	52.87360	4.21977	-3.76202	12.90851	1.084	156	.280
Pair 5	CBH Leaders Plot 6 - CBH School Plot 6	.48921	48.17907	4.08650	-7.59103	8.56945	.120	138	.905
Pair 6	CBH Leaders Plot 7 - CBH School Plot 7	-6.70408	79.57843	8.03864	-22.65855	9.25038	-.834	97	.406
Pair 7	CBH Leaders Plot 8 - CBH School Plot 8	-5.29921	59.63464	5.29172	-15.77137	5.17294	-1.001	126	.319
Pair 8	CBH Leaders Plot 9 - CBH School Plot 9	5.19718	35.94067	4.26537	-3.30984	13.70420	1.218	70	.227
Pair 9	CBH Leaders Plot 10 - CBH School Plot 10	1.59783	83.06889	8.66053	-15.60525	18.80091	.184	91	.854
Pair 10	CBH Leaders Plot 11 - CBH School Plot 11	-1.73288	68.26756	5.64986	-12.89960	9.43385	-.307	145	.760
Pair 11	CBH Leaders Plot 12 - CBH School Plot 12	9.10112	67.32790	7.13674	-5.08165	23.28390	1.275	88	.206
Pair 12	CBH Leaders Plot 13 - CBH School Plot 13	-3.56250	72.62849	6.86275	-17.16149	10.03649	-.519	111	.605

Discussion

Since the significance value for counts of numbers of saplings for 5 out of the 12 survey plots measured is lower than 0.05 it can be concluded that the difference between almost half of the counts taken by the leaders alone, and then the school students with leaders, is significant and that the repeatability of this measurement is very poor. This is very likely to be due to the fact that after each survey, the perimeter tapes and the ropes that divide the plot into 25 10m x 10m quadrats were wound up and used to set up one or more plots before returning to the original for the re-survey, thus probably leading to the ropes being in a slightly different position during each survey and so less / more saplings being included in each 10m x 10m quadrat. In future years, this can be tested through leaving the ropes set up on plots between two surveys. However, the significance values for the CBH's of all the trees measured during each survey show that there is no significant difference between the sets of CBH's measured by the leaders alone, and the sets of CBH's measured by the school students with the leaders. A similar result is displayed when testing the counts of numbers of trees measured per survey plot and these two latter tests together are very positive as they suggest that the school students can be relied upon to accurately record the positions and CBH's of trees throughout these, and in future years more, vegetation structure survey plots. It is planned that these analyses along with others will be published in the very near future.

Conclusions and implications for conservation

If school students can be relied upon to collect accurate data, this data set, once augmented by further surveys in future years, will provide a very powerful background to the surveys of the other scientists outlined above. Once sufficient plots have been completed, it will also be possible to compile an X and a Y GPS coordinate (accurate to within 10m) for each tree surveyed based upon extrapolation from the GPS positions taken for the four corners of each 50m x 50m plot; the resulting map produced will show the distribution of tree species throughout the area of forest that stretches between the road and Lapago and thus possible tree zonation and species distribution patterns can be sought and examined. Such a map will also show the abundance and diversity of the three primary timber species within this area of forest, which is regularly accessed by the local communities, and thus could provide a valuable contribution to the annual State of The Lambusango report, which will be presented to the World Bank and the Lambusango Forum.