Orang-utan density estimates from aerial surveys conducted at Deramakot Forest

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INTRODUCTION

The Sabah Forestry Department has been conducting regular orang-utan nest counts from a helicopter following the methodology described in the Wildlife Monitoring System designed for Deramakot Forest Reserve (see Lackman-Ancrenaz and Ancrenaz, 2002)

Recent work in Sabah has shown that aerial surveys of orang-utan nests were an efficient tool to monitor and to assess orang-utan population abundance and distribution in a given area. A statistical model was designed to extrapolate orang-utan densities from the results of aerial nest counts: see Ancrenaz et al. (2005) for the methodology.

Last aerial surveys over the forests of Dermakot and Tangkulap were undertaken on June 8th, 2005. Peter Lagan produced me the results of this survey in order to assist in statistical analysis of the results. This brief report shows how the results of the aerial nest counts can be transformed in orang-utan densities. We follow the methodology described in Ancrenaz et al., 2005.

1st STEP: Calculate the average aerial index of nest observed along the aerial transects.

The different transects and the number of nests that were detected are given in Table 1. Table 1: number of nests detected on both right and left sides of the helicopter and resulting aerial index (* indicate the number of nests; ** indicate the number of nest/km of flight or aerial index).

Transect	Length (km)	Right*	Left*	Total*	Aerial index (AI)**
1A-1B	20.3	105	105	210	5.17
2A-2B	24.2	117	74	191	3.95
3A-3B	23.1	50	113	163	3.53
TOTAL	67.6	272	292	564	4.17

2nd STEP: Derive a nest density from the average index.

The formula to be used is given as: $D_{nests} = \exp(4.7297 + 0.9796\log(AI))$

3rd STEP: Derive a Confidence Interval for the nest density estimates

A 95% confidence interval of the Nest density is then: $(D_{nest} / C\ ;\ D_{nest} \times C)$, with:

$$C = \exp(0.06067 \cdot \sqrt{1+v})$$
$$v = 0.1908 - 0.2628 \cdot \log(AI) + 0.1132 \cdot \log(AI)^2$$

A mathematical application is shown in Table 2.

Table 2: nest density for each aerial transect and the 95% Confident Limits

Transect	Aerial Index	Nest Density	Lower 95% CI	Upper 95% CI
1	5.17	556.5	297.5	1040.7
2	3.95	434.6	233.8	807.6
3	3.53	389.5	209.8	723.0
TOTAL	**4.17**	**458.9**	**246.7**	**853.6**

4th STEP: Deriving an orang-utan density from a nest density

The orang-utan density is obtained with the following formula (see Ancrenaz et al., 2004):

$$D_{orangutan} = D_{nests} / prt$$

With p, the proportion of nest builders in a population (p=0.9 in Sabah); r, the daily rate of nest production (r=1.084 in Sabah, CV=0.063) and t the nest decay rate (t=286.3 in Sabah, CV=0.373).

A 95% CI of the final orang-utan density is obtained with $(D_{ou} / K;\ D_{ou} \times K)$ and:

$$K = \exp\left[2.0796 \cdot (0.086(1+v) + 0.143)^{0.5}\right]$$

The final orang-utan density estimate becomes for Deramakot Forest Reserve:

Transect	Nest Density	Orang-utan Density	Lower 95% CI	Upper 95% CI
1	556.5	2.0	0.73	5.44
2	434.6	1.56	0.57	4.24
3	389.5	1.39	0.51	3.80
TOTAL	**458.9**	**1.64**	**0.60**	**4.48**

Discussion and Conclusion

At the time of the aerial surveys, orang-utans were more abundant along the first transect (although no significant difference is shown). The average orang-utan density of 1.64 individual/km^2 is similar to the results obtained during previous aerial surveys conducted by experienced staff from the Sabah Wildlife Department (July 2003, final orang-utan density estimate: 1.5 ind/km^2 ; SD: 0.8-2.8). These results indicate that the current orang-utan population living at Deramakot Forest Reserve seems stable. We can also conclude that the Model developed during the General Orang-utan Census throughout Sabah and explained in details in Ancrenaz et al. (2005) can be used by the staff of the Sabah Forestry Department during their regular aerial monitoring of orang-utans.

We however recommend that the same team of observers conducts the aerial surveys in order to decrease the observer bias.

Results for Tangkulap Forest Reserve

On June 08th, 2005, a new aerial transect was flown over the highly degraded forest of Tangkulap.

The length of the transect was 19.8 km. A total of 83 nests were observed from the helicopter (43 on the right side and 40 from the left), giving a general aerial index of 2.095 nests/km of line and a nest density of 233.8 nest/km^2 (95% CI: 125.3-436.5).

The final orang-utan density estimate for this forest reserve is 0.84 ind/km^2 (95%CI: 0.31-2.29).

Orang-utans are less abundant in Tangkulap than in Deramakot Forest Reserve. Similar findings were already reported during surveys that were conducted from the ground and from a helicopter during the general orang-utan census throughout Sabah. Tangkulap seems a less suitable habitat for orang-utan survival than Deramakot; the forests are more degraded in Tangkulap and they generally do occur at higher altitude than the forests of Deramakot. It will be interesting to document population trends through time (regular aerial surveys) in Tangkulap in order to assess the possible recolonization of these forests by orang-utans.