Rapid Assessment Of Orang-Utan Distribution And Density In Segaliud Lokan Forest Reserve, Deramakot Forest Reserve And Tangkulap Forest Reserve.

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**Background – Important Orang-utan Habitat in Borneo**

Orang-utan (*P. p. pygmaeus*) is classified as ‘totally protected’ under Part 1 of Schedule 1, Section 25 (1) of Sabah’s *Wildlife Conservation Enactment 1997*, and is listed as ‘endangered’ in the *IUCN Red List of Threatened Species*. The subspecies and any products derived from it are prohibited from international trade under CITES where it appears under Appendix 1 of the agreement.

Following global consultation among orang-utan specialists, the WWF network and other major conservation agencies, WWF in 2005 produced “WWF’s Species Action Plan for the Conservation of Orang-utans (*Pongo abeli* and *Pongo pygmaeus*) in the wild”. This plan requires that WWF should concentrate attention on four “priority orang-utan landscapes”, with three in Kalimantan (Indonesian Borneo) and one in Malaysian Borneo (the State of Sabah - refer to Map 1).

Map 1: Predicted Distribution Pattern of Orang-utan in Sabah (J. Payne, 1987)

Segama-Kinabatangan (named after the two rivers) is the only Malaysian “priority orang-utan landscape”; the Ulu Segama and Malua (USM) forest reserves located in the Segama-Kinabatangan landscape represent a core area for Sabah’s orang-utan population. This area also lies within the Heart of Borneo (HoB), a tri-national conservation initiative, also a WWF Network Initiative (NI) to support the three
countries’ conservation vision.

It is estimated by WWF and by another NGO, HUTAN, in year 2003 that the orang-utan population in Sabah is approximately 11,000 individuals. There are now five main areas of special importance to orang-utans in the State of Sabah. They are listed below in decreasing order of importance:

1. **Ulu Segama Malua area plus adjacent forests of Danum Valley Conservation Area and the Malubuk River valley** (about 3,000 sq. km.) – this area represents the “Kinabatangan and Segama river catchments” landscape mentioned in the “WWF’s Species Action Plan for the Conservation of Orang-utans (Pongo abeli and Pongo pygmaeus) in the wild”; it supports an estimated 5,000 orang-utans. It is of vital importance that this entire area be retained under natural forest management in order to secure the long-term survival of the orang-utan in Malaysia.

2. **Kinabatangan North** (about 1,400 sq. km) – this area includes Deramakot Forest Reserve (still the only natural forest in Malaysia granted international recognition under Forest Stewardship Council principles and criteria for production of timber under “sustainable management”) plus the adjacent Segaliud-Lokan and Tangkulap Forest Reserves, both also timber production forests under sustainable forest management plans. It supports about 1,700 orang-utans.

3. **Tabin Wildlife Reserve** (1,200 sq. km.) – with an estimated 1,400 orang-utans.

4. **Lower Kinabatangan (Kinabatangan Corridor of Life)** (about 400 sq. km.) – 15 blocks of forest in and adjacent to the Kinabatangan floodplain, with about 1,100 orang-utans scattered around Kinabatangan Wildlife Sanctuary and several small Forest Reserves, including Supu and Gomantong.

5. **Kulamba Wildlife Reserve** (210 sq. km.) – with about 500 orang-utans.

WWF’s vision is to maintain the (above) five main remaining wild orang-utan populations, currently totalling around 9,700 individuals in 6,210 sq. km. All five populations are potentially viable as long as the five habitats can be maintained and restored where they are currently degraded. If the currently damaged forest habitat in the lowland parts of these five areas can be restored, it is anticipated that a population of 10,000 wild orang-utans can be sustained long-term in Sabah.
Study Areas and Objective

The survey covers the three forest reserves located at the northern part of Kinabatangan River, namely (i) Segaliud Lokan Forest Reserve, (ii) Deramakot Forest Reserve and (iii) Tangkulap Forest Reserve.

Segaliud Lokan Forest Reserve is currently managed by KTS Plantation which is a member of the KTS Holdings Sdn. Bhd. It has entered into an agreement with the Sabah Government to manage a forest concession at Segaliud Lokan Forest Reserve in the Sandakan area. A major part of the area is being rehabilitated with dipterocarps, rubber (*Hevea brasiliensis*), and some other indigenous species. KTS Plantation is in the process of getting its Natural Forest Management (NFM) operations in Sabah, in FMU 19b (Segaliud-Lokan FR) which occupies an area of around 57,240 ha* to be certified under the Malaysian Timber Certification Scheme (MTCS). The Malaysian Timber Certification Council (MTCC) is an independent organisation established to develop and operate a voluntary national timber certification scheme in Malaysia (MTCS), in order to provide independent assessments of forest management practices as well as to meet the demand for certified timber products. Timber certification is a market-linked tool to promote and encourage sustainable forest management as well as to provide an assurance to buyers that the timber products they buy come from sustainably managed forests.

Deramakot Forest Reserve is 55,083 hectares of Mixed Dipterocarp Forest. The forest had been logged at least once with subsequent silvicultural treatment (i.e. poison girdling) before the commencement of sustainable forest management (SFM). Past forest management practices have resulted in a very heterogeneous stand types and a patchwork of different stocking conditions. Only 20% of the area is considered well-stocked and more than 30% is covered by very poor forest with virtually no mature growing stock left. Apart from some small human settlements that are located at the fringes of the Reserve, the entire forest area is uninhabited. These characteristics have made Deramakot an ideal site as an SFM model. As dictated by a Comprehensive Forest Management Plan, about 51,000 ha of the area is set aside for log production and the remaining 4,000 ha for conservation.

Tangkulap Forest Reserve (FMU 17A) is located at the western part of Deramakot Forest Reserve. A large portion of FMU 17A is heavily degraded due to excessive logging over the past 15 years. Based on the Tangkulap FR’s Forest Management Plan, intensive restoration in many compartments will be needed to enhance the productivity of the area. A new approach to restoration based on a mosaic design where small patches (below 30 ha) of severely degraded areas (less than 50 potential crop trees/ha [PCT]) can be cleared and planted with fast growing native species as part of the restoration process. The mosaic design also includes the requirement that at least 20% of the outer area of each patch should be planted with high value
commercial Dipterocarps and habitat trees to support the restoration process. The objective of the mosaic design for forest restoration is to provide short economic returns from fast growing native trees for the degraded commercial class II forests as an integral part of the restoration process for timber stand improvement.

Goals and Objectives

The main goal of this project is to do a rapid assessment on the orang-utan distribution and density pattern in the Segaliud Lokan Forest Reserve (SLFR), Deramakot Forest Reserve (DFR) and Tangkulap Forest Reserve (TFR) using an aerial survey technique developed and established by WWF-Malaysia’s orang-utan research team, and to highlight the management measures to manage the identified key habitats.

The main objective of this survey is to identify key habitat for the orang-utan in the three FMUs, as a baseline data on orang-utan spatial distribution and density pattern in the mentioned FMUs.

Methodology

Due to the limitation of fund, the rapid assessment of orang-utan in Segaliud Lokan Forest Reserve is being funded by WWF-US (USD5,000), while the rapid assessment of the orang-utan in Deramakot Forest Reserve is by WWF-Germany (EUR3,000).

An aerial survey was carried out in order to gather a rapid assessment of the nest density pattern in Kinabatangan North (Segaliud Lokan Forest Reserve and Deramakot Forest Reserve) between 16 February 2009 to 19 May 2009.

The aerial survey was carried out using a helicopter (Bell 206 Jet Ranger). We followed a systematic stratified sampling pattern using parallel line-transects, at 3 kilometres interval spacing. The direction of the aerial route is in the north-south transect direction (refer to Map 2). Helicopter speed was maintained in between the range of 70-90 km/hour depending on the condition of the terrain elevation. Flying elevation varied from 70-80 metres (depending on the terrain elevation) above the forest canopy. Sighting of orang-utan nests was recorded using Garmin GPSmap 76CSx, by two people sitting on the left and right back seat of the helicopter, while another person (co-pilot) sat next to the pilot assisting the navigation part and taking photo on the forest condition.

After the aerial survey, the locations of the nests from the GPS handheld were downloaded directly using the Map Garmin software. The orang-utan nest data is
analysed using GIS in order to develop the value of each grid. The value of the grid is actually generated based on aerial orang-utan nest density index (orang-utan per km, \( n^a/km \), where \( n^a \) = number of orang-utan’s nest sighted). Then, by using the value of each grid in the GIS system, surface interpolation method is used to model the nest density pattern in the study area. The distribution of the orang-utan nest density pattern derived from the aerial survey is then categorized equally into three zones, namely (i) Zone 1 (40 nest/km and above), (ii) Zone 2 (20-40 nest/km), and Zone 3 (0-20 nest/km).

**Map 2: Direction of the Aerial Survey Route**

In this rapid assessment, the density of the orang-utan is generated based on the data of orang-utan density in each zone, derived from complete long-term monitoring of nest decay rates and a number of 33 ground survey transects in North Ulu Segama (NUS) (refer to table 1).
Table 1: Estimation of orang-utan density in NUS for each Sampling Zone (R. Alfred et al, 2009 unpublished report)

<table>
<thead>
<tr>
<th>Sampling Zone</th>
<th>Aerial Index (nest/km)</th>
<th>Estimated Density (Orang-utan/km²)</th>
<th>Standard Error</th>
<th>Coef. of variation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 1</td>
<td>40 and Above</td>
<td>3.9</td>
<td>0.72216E-02</td>
<td>18.58</td>
</tr>
<tr>
<td>Zone 2</td>
<td>20 – 40</td>
<td>2.5</td>
<td>0.68828E-02</td>
<td>27.04</td>
</tr>
<tr>
<td>Zone 3</td>
<td>0 - 40</td>
<td>1.1</td>
<td>0.42707E-02</td>
<td>35.88</td>
</tr>
</tbody>
</table>

**Results**

Map 3 shows the relative orang-utan density based on nest count from the aerial survey, carried out in Segaliud Lokan Forest Reserve and Deramakot Forest Reserve. Table 2 shows the size of the area for each zone (Zone 1, Zone 2 and Zone 3) in Segaliud Lokan, Deramakot and Tangkulap Forest Reserves.

Table 2

<table>
<thead>
<tr>
<th>Segaliud Lokan Forest Reserve</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sampling Zone based on aerial index</strong></td>
</tr>
<tr>
<td>Zone 1 (40 and above)</td>
</tr>
<tr>
<td>Zone 2 (20 – 40)</td>
</tr>
<tr>
<td>Zone 3 (0 – 20)</td>
</tr>
</tbody>
</table>

Estimated population size of orang-utan in Segaliud Lokan FR 1,426

<table>
<thead>
<tr>
<th>Deramakot Forest Reserve</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sampling Zone based on aerial index</strong></td>
</tr>
<tr>
<td>Zone 1 (40 and above)</td>
</tr>
<tr>
<td>Zone 2 (20 – 40)</td>
</tr>
</tbody>
</table>
### Sampling Zone based on aerial index

<table>
<thead>
<tr>
<th>Zone</th>
<th>Size (km²)</th>
<th>Estimated Density (Orang-utan/km²) based on NUS’s Model</th>
<th>Estimated Number of Orang-utan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zone 1 (40 and above)</td>
<td>38.86</td>
<td>3.9</td>
<td>152</td>
</tr>
<tr>
<td>Zone 2 (20 – 40)</td>
<td>203.21</td>
<td>2.5</td>
<td>508</td>
</tr>
<tr>
<td>Zone 3 (0 – 20)</td>
<td>33.48</td>
<td>1.1</td>
<td>37</td>
</tr>
</tbody>
</table>

Estimated population size of orang-utan in Deramakot FR 1,414

Estimated population size of orang-utan Tangkulap FR 697

The overall aerial index for SLFR, DFR and TFR is 34.78 nest/km, 30.12 nest/km and 33.33 nest/km respectively.

Map 3: Relative Orang-utan Density Pattern, based on Nest Count from Aerial Survey (February-May 2009).
Discussion

As shown in Map 3, the southern part of both the forest reserves consist of relatively high density of orang-utans. Most of the orang-utans in Segaliud Lokan FR and Deramakot FR are concentrated nearby or along the Kinabatangan River, and also at the northern part of Tangkulap, and western part of Segaliud Lokan Forest Reserve. This may be due to the effect of most of the lowland dipterocarp forests of eastern Sabah which were the prime natural orang-utan habitat in the state being heavily exploited and converted to large scale plantation. Since orang-utans cannot survive in extensive large scale mono plantation (tree or oil palm), habitat loss resulting from this process forced the orang-utans to concentrate in the southern part of both forest reserves.

The size of the orang-utan population in three areas, based on rapid assessment using aerial survey is about 3,537 orang-utans. (SLFR=1,426, DFR=1,414, TFR=697).

Based on orang-utan population survey done earlier in Segaliud Lokan, Deramakot and Tangkulap Forest Reserve in year 2004, the estimated population size of the orang-utan is about 861 (458-1,618) orang-utans, 1,091 (582-2,050) orang-utans and 308 (161-589) orang-utans respectively (M. Ancrenaz et. al, 2004)

The above results (2004) were derived based on (i) 5 ground line transect surveys (7.78 km) in Segaliud Lokan, (ii) 7 ground line transect surveys (12 km) in Deramakot Forest Reserve and (iii) 11.1 km distance of ground line transect survey, with 1 aerial transect in Tangkulap Forest Reserve.

Due to the size of the study area, a high number of ground line transect survey is required, and all line transects should be able to represent all types of habitat, which is based on forest type and tree species (A. Johnson, 2004). Our early aerial survey in North Ulu Segama shows that the distribution of orang-utan density is not consistent and their distribution is merely depending on the fruiting and flowering season of the tree species.

The estimated population derived from this survey was based on the model density derived from our orang-utan study in North Ulu Segama, where the nest decay rate is about 157.93 days (n:168, SD:86.12, SE:0.51). Due to the different condition of forest and geographic location, it is very important to derive the nest decay rate for the orang-utan’s nest in Segaliud Lokan, Deramakot, as well as in Tangkulap FR.

Therefore, in order to further improve the accuracy of the orang-utan population estimation in Segaliud Lokan FR, Deramakot FR and Tangkulap FR, further systematic ground line transect surveys need to be carried out, and the rate of the nest decay rate in this study area need to be established.
**Conclusion and further recommendations**

Tentatively, pending further ground survey and nest decay rate observation activities in Segaliud Lokan FR, Deramakot FR and Tangkulap FR, this rapid assessment using aerial survey indicates that the density of orang-utan in Segaliud Lokan FR is higher than in Deramakot Forest Reserve and Tangkulap Forest Reserve.

The overall aerial index for SLFR, DFR and TFR is 34.78 nest/km, 30.12 nest/km and 33.33 nest/km respectively. The aerial survey carried out in Oct 2008 in North Ulu Segama (R.Alfred et. al. 2008 unpublished report) shows that the aerial index is 34.58 nest/km.

The Kinabatangan North area (consisting of Segaliud Lokan FR, Deramakot FR and Tangkulap FR) represent the second largest population of orang-utan (~3,500) in Sabah after Ulu Segama Malua Forest Reserve (~5,500).

Therefore, there is a need to provide supports to these three FMUs in order to address the management measures to conserve the orang-utan population in this area. Supports may include funding and technical advice to support their habitat or forest restoration for orang-utan programme.

**Acknowledgement**

We would like to thank WWF-US (Adam Tomasek) and WWF-Germany (Stefan Zigler) for their donations to cover the cost for the rapid assessment on the orang-utan status in Segaliud Lokan and Deramakot Forest Reserves. We would also like to extend our thanks to the Director of Sabah Forestry Department (Datuk Sam Mannan) for granting us the permission to do the aerial survey in these two FMUs, and to all the Borneo Species Programme’s staff (Lee Shan Khee, Edwin Matulin, Middle Seen Kapis and David James) and HoB (M’sia) staff (Ms Fadzilawati Zahrah Hamdan) for their support in implementing the survey.
References

