

Securing orang-utan survival in a mosaic landscape: Kinabatangan

YEARLY ACTIVITY REPORT – 2015

BY

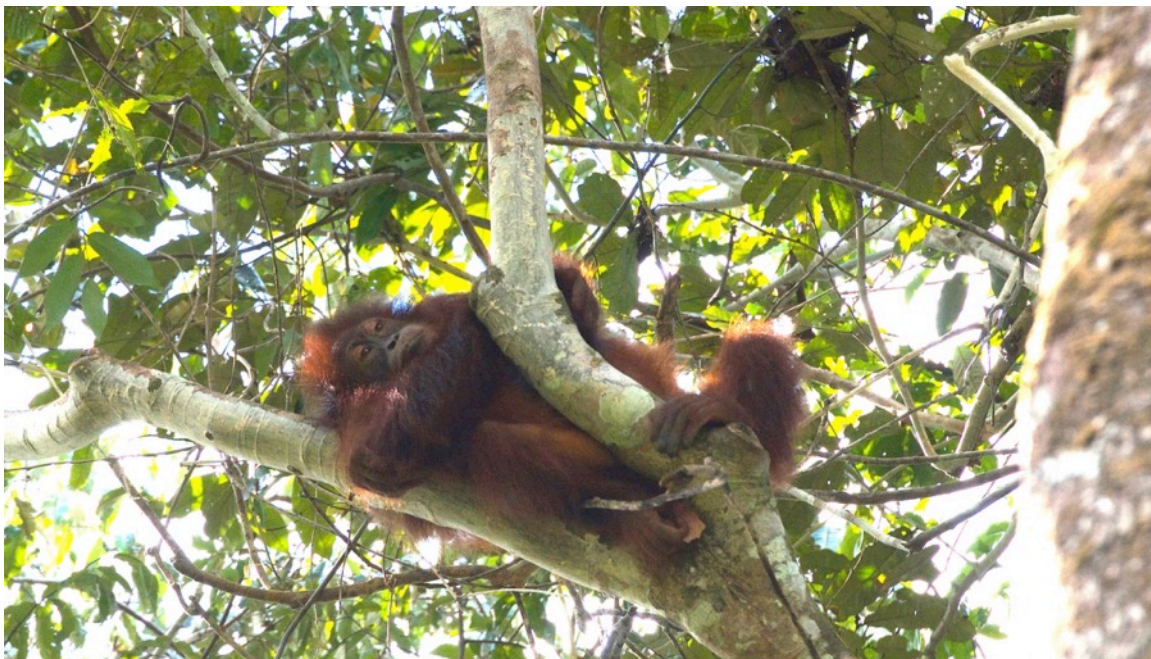


Maria, wild habituated female followed by KOCPP and her newborn baby Wawa

The conservation targets and goals identified by HUTAN-KOCP regarding orang-utan conservation in Sabah include:

- Enhanced scientific knowledge of the ecology of orang-utans and other species in Kinabatangan and in disturbed forests of Sabah;
- Reduced level of conflicts between human activities, orang-utans and other wildlife in the Kinabatangan and other areas in the State;
- Improved policy framework for orang-utan population management within and outside of protected areas throughout Sabah;
- Enhanced community engagement in the conservation of orang-utan and their habitat;
- Enhanced human resource capacity and commitment to manage and conserve orang-utan populations in Sabah.

This report presents some of the activities and results that were secured in 2015 by the KOCP teams. The scope of this report is mostly orang-utan, and therefore only orang-utan conservation-related activities are presented in this Report. A more comprehensive report summarizing the different research and conservation components of KOCP will be available in the next few weeks.



Felicity, resting on a branch....

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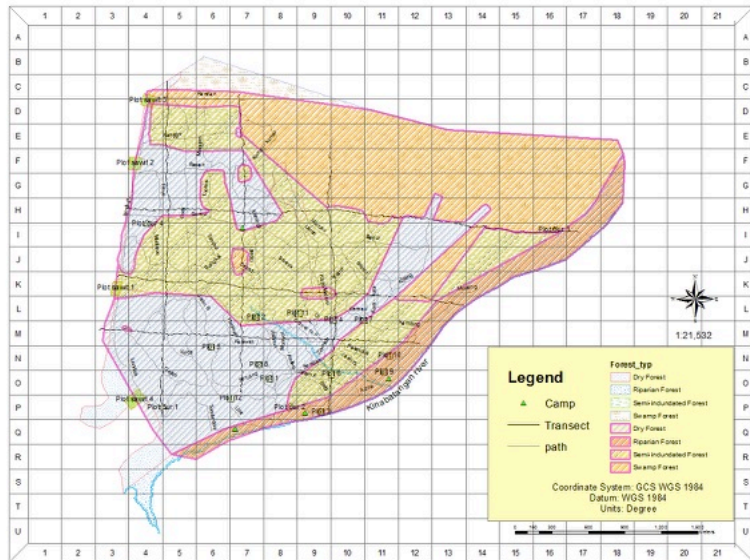
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Goal 1. Enhanced scientific knowledge of orang-utan ecology and conservation status.

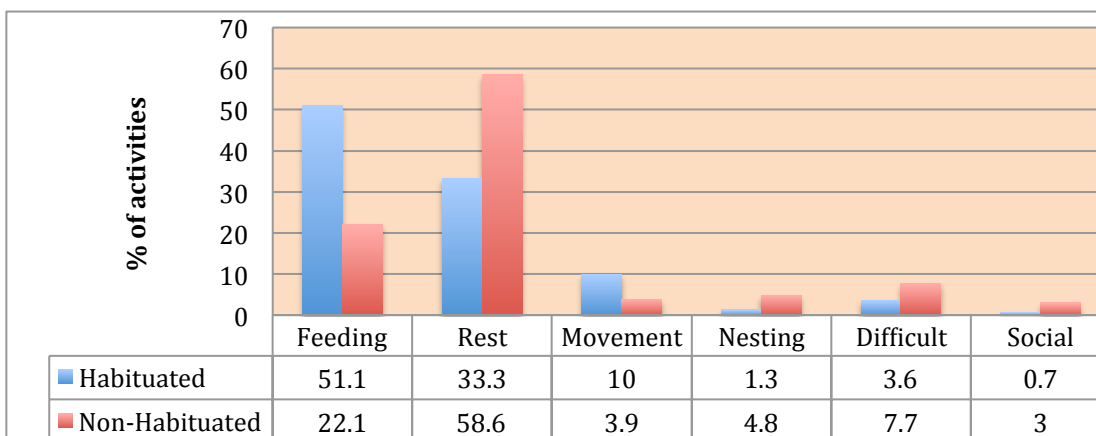
Objective 1. Document eco-ethology of wild orang-utans in highly disturbed forests

KOCP started its research activities in Lot 2 of the Lower Kinabatangan Wildlife Sanctuary in 1998. Every day, teams of field research assistants enter the site and search for wild orang-utans to document their behavior and ecology. In 2015, the team established new transects using old logging roads to minimize damages to the forest. Hence we increased the size of our study area; it is currently reaching 8.7 km²: see map. This site contains a mosaic of different habitat types (dry; semi-inundated; swamp and riparian forests) that are all highly degraded and regenerating from past logging activities. Last logging at our site took place in 1997.



During the year 2015, the KOCP Orang-utan team followed 16 different wild individuals, and secured 168 full days of direct follows (or 2054 hours of direct observation).

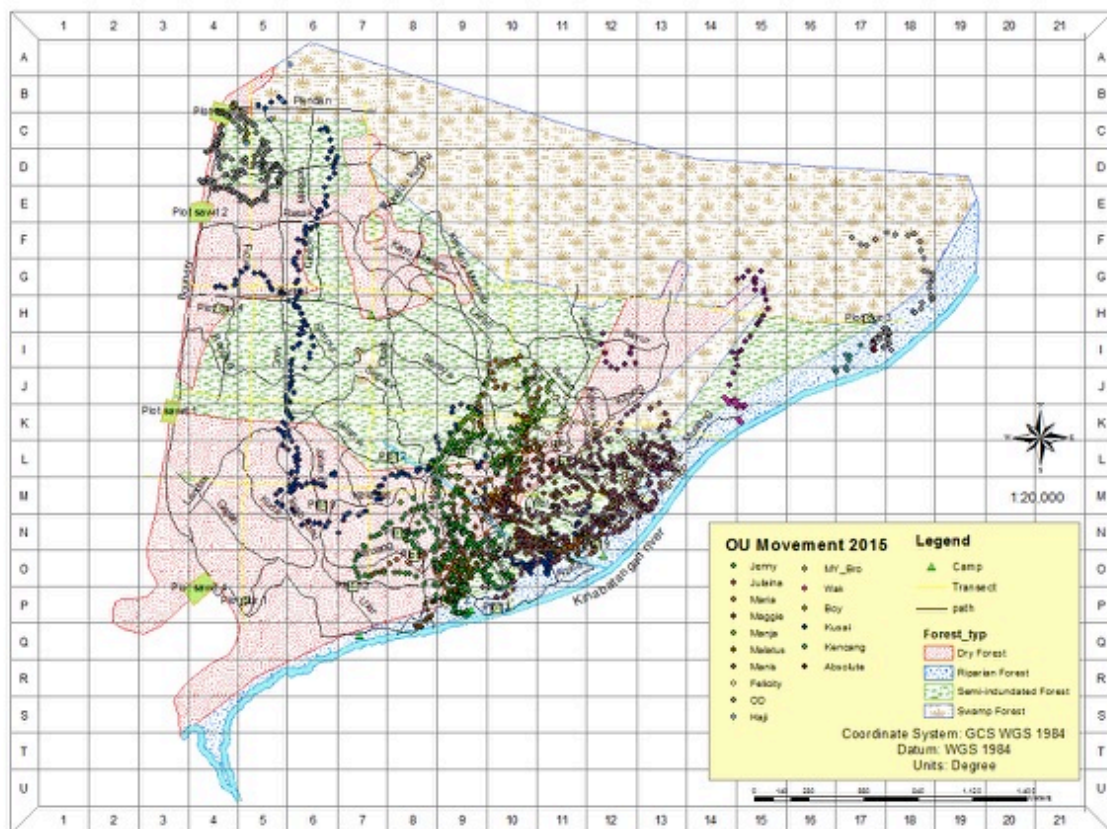
The time budget of non-disturbed individuals that are used to human presence is dominated by feeding activities (51.1%) and resting activities (33.3%). Other activities include movements (10.0%), nest construction (1.3%), social interaction (0.7%) or unknown (3.6%). However, disturbed individuals (ie, those animals that are not habituated to the continuous presence of human observers yet) show an increased proportion of resting time (58.7%) and a decrease of feeding activities (22.1% in average): see Graph 1.



Graph 1: bars comparing the different activities included in the time budget of habituated vs non-habituated (and disturbed) individuals followed in 2015.

In 2015, we secured a total of 18,020 scans about feeding activities., and we identified a total of 105 plant species belonging to 46 families (66 species of trees; 30 climbers; 6 epiphytes and 3 unknown) as part of the diet of the focal orang-utans. Fruits of *Dracontomelon dao* (Anacardiaceae) represented 17.8% of the time spent eating by focal individuals; followed by fruits and leaves of *Ficus sp.* (11.1%); fruits and leaves of *Eugenia sp.* (9.2%); pods and leaves of *Bridelia sp.* (6.3%); fruits of *Gnetum sp.* (5.8%) and leaves of *Spatholobus sp.* (5.5%). The orang-utan diet is directly influenced by the seasonality in forest productivity but also by individual preferences for certain food items.

In the forest, we carefully record the location of each trees used by orang-utan during their movements. Then we map these movements in order to better understand the social dynamic between different individuals. Our results show that the home range of resident females at our site is averaging about 1 km². We also found that these home ranges show a strong overlap: for example Maria's home range is overlapping 80% of Jenny's home range and 75% of Julaina's; Jenny's and Julaina's overlap for 65%. It is more difficult to determine precisely the home range used by adult males since they are roaming over larger areas than females: they tend to leave our site for relatively long periods of time before returning occasionally, in period of food abundance or when females are sexually responsive (see below).



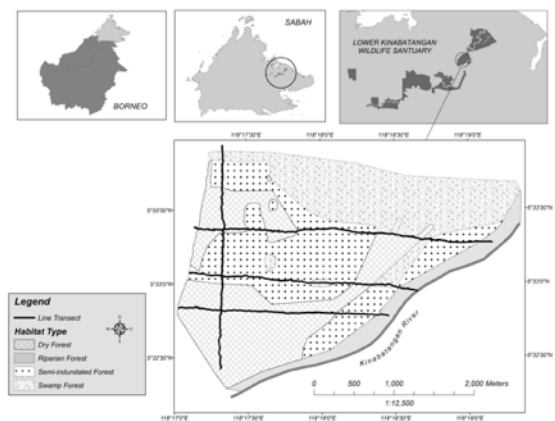
Map of the KOCF study site showing the movements of several orang-utans followed in 2015.

Objective 2. The Kinabatangan orang-utan population distribution, densities and conservation status is known and monitored.

Documenting the trend of the orang-utan population living in Kinabatangan is key for a better management of the LKWS. However, orang-utan surveys are long and difficult to carry out. In addition, orang-utans are very slow breeders and it takes a long time to detect any significant population trend (unless it is a massive and fast crash due to poaching, fires or major similar event).

KOCP is using a combination of techniques to assess orang-utan population trends in Kinabatangan:

- *Repeated nest counts along permanent transects (marked nest recapture):* every six weeks (which is about the lower limit for nest decay rate), the team surveys four permanent transects in search of the new nests that have been built between two successive surveys. These transects are all located in our intensive study site. They are used to investigate seasonal fluctuations of orang-utan abundance at our site (see Map);

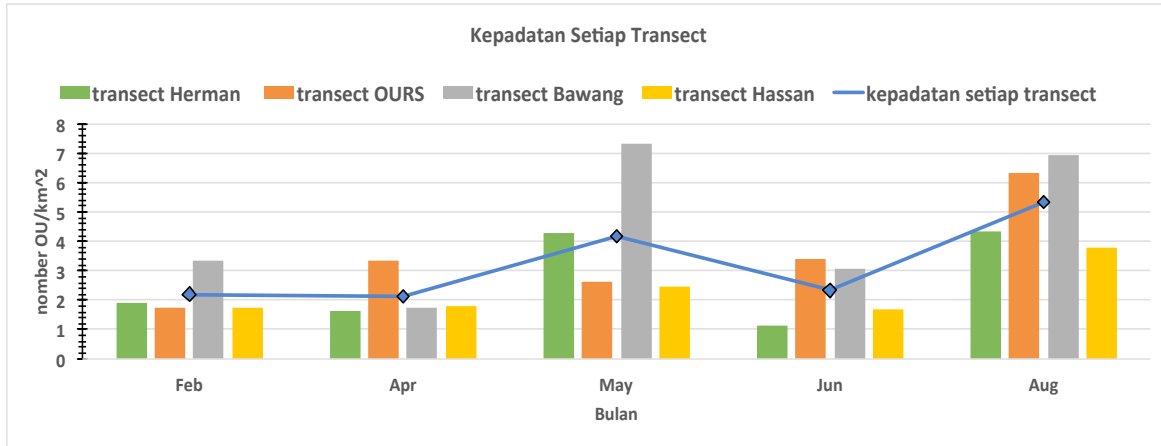


- *Standing-crop surveys (or one-off line transects) located in various Lots of the LKWS:* these surveys are conducted once every few years to assess populations trends in Lots that are outside of our study area. The results are also used to calibrate the data collected during aerial surveys;
- *Aerial nest surveys using helicopter:* every few years, KOCP is undertaking helicopter surveys so we can cover the entire LKWS, following the methodology established by KOCP in early 2000. These surveys allow us to estimate the overall population size of orang-utans throughout the entire forests of lower Kinabatangan and to assess the extent of habitat loss and degradation.



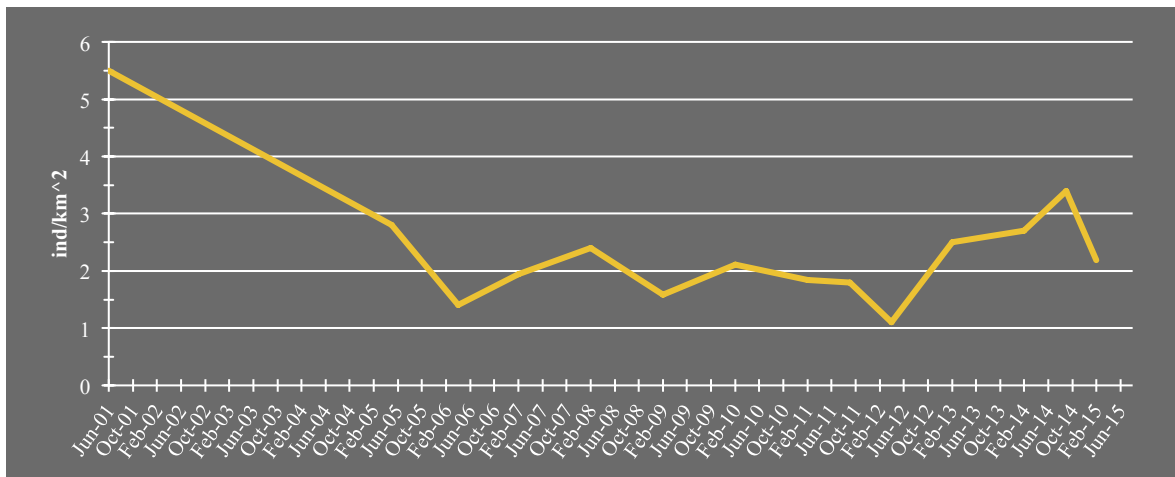
Results of the regular ground surveys at our study site:

The results for 2015 show that orang-utan densities at our site has fluctuated between 2.1 ind./km² and 5.3 ind./km², with a yearly average of 3.2 ind./km² (95% CI: 2.8-3.4 ind./km²).



Densities recorded at our study area in 2015 (period February-August).

We established the line transects at our site in 1999. In 2004, we started to conduct yearly standing crop surveys once a year after the monsoon season. The results show a significant decline between 2001 and 2005 from about 5 ind./km² to between 2 and 3 ind./km²: yellow line in the Graph below. We started the repeated counts (or marked nest count surveys) every six weeks in 2005. Results of these surveys show intense seasonal fluctuations between 0.5 and 5.5 ind./km² that are mostly explained by food availability and presence of sexually active females.



Graph showing fluctuations of overall orang-utan abundance at the KOCP Study Site (Lot 2 of the LKWS) between 2001 and 2015

Over the course of 15 years of intensive research in the forests of Kinabatangan, we have never witnessed any dye-off event that could explain such a sudden decline. At our research site, we found dead orang-utans only three times: an unflanged male that had been stroke by lightning; a carcass of an unknown individual dead for unknown reasons; and Jenny's 3 days old baby that appeared to have a cleft palate at birth. Our results also show that the resident females living at our site breed regularly (with an average inter-birth interval of about 6 to 7 years), and seem to be healthy.



Picture showing the female Maggie with her seven years old son Elie and younger baby born in August 2015.

However, when we started our observations in the early 2000's we were surprised by the high ratio male/female encountered in the forests of Kinabatangan (60% males vs 40% females). We explained this abundance of males by the recent influx of individuals who had left places that were being converted to oil palm plantations and took refuge in the forests that were left standing (compaction and emigration effects). Genetic analysis showed that most of these individuals were males (especially unflanged males). Over the years though, we also realized that the ratio male/female (estimated from direct encounters with orang-utans at our site) seemed to decrease regularly. One of the reasons for this decline could be explained by a reverse emigration process due to male dispersal: males who cannot established a territory in patches of forest where they have emigrated to previously, leave these patches and venture into oil palm plantations (see below).

Since 2005, densities have stabilized and are increasing slightly (although not significantly), showing a satisfactory breeding and health status of the population that is studied by KOCP. However it is still far too early to ascertain the viability of this population. Indeed, only long-term studies will show if the forests of Kinabatangan can sustain or not a viable population in the long-term.

Monitoring of the Kinabatangan orang-utan population:

We conducted general surveys over the range of the orang-utan population living in lower Kinabatangan in 2001, 2007 and 2015. For each of these surveys, we are following a similar methodology: aerial nest counts from a helicopter associated with ground surveys for calibration. During our latest survey (July 2015), we experimentally used drones to investigate whether this new technology could be useful to assess orang-utan densities and abundance. Indeed, if drones were possible tools to conduct nest surveys, surveying remote areas that are of difficult access would become easier (this project is a collaboration between HUTAN; Drones for Conservation and Danau Girang Field Center). Drones were flown over transects that were also surveyed from the ground and from the helicopter in order to assess any correlation between the three techniques. Data collected by the drones are not fully analyzed yet.

Table showing date and sampling efforts of the three comprehensive orang-utan surveys undertaken in Kinabatangan during the period 2001-2015.

YEAR	Ground Survey	Aerial Survey	LKWS	Other forests than LKWS
2001	89.7 km	136.8 km	Totality	Yes
2006/2007	172.9 km	182.5 km	Totality	No
2015	55 km	233.8 km	Totality	Yes



Pictures showing the aerial surveys (helicopter and drone) and the aerial route followed by the helicopter.

A genetic analysis done by HUTAN and Danau Girang Field Center showed that in the early 1900's, estimated that the total population of orang-utans in the Lower Kinabatangan was in the order of the 20,000's individuals. In the early 1960s', Yoshida estimated this population to be down to about 4,000 individuals.

Our first surveys in 2001 established the baseline data for the orang-utan population currently remaining in Lower Kinabatangan. Aerial observations showed that not all the parts of the survey area were suitable to sustain viable orang-utan populations. Some parts of the LKWS were completely devoid of trees and couldn't sustain any orang-utan: oxbow lakes; areas burnt by fires where natural forest recovery cannot take place; areas overdegraded by past logging operations with extreme soil disruption and compaction, etc. Overall, our data showed, only 36,430 ha (364.3 km²) of forest were suitable for orang-utans (out of the total area of 51,710 ha): Table below.

In 2001, we estimated that 1,125 (691 – 1,807) individuals were found in the 36,430 ha of habitat occupied by orang-utans in Kinabatangan. This population was distributed as:

- ✓ 670 individuals in the proposed LKWS (27,400 ha);
- ✓ 228 individuals in Protected Forests under the SFD;
- ✓ 227 individuals in non-protected forests belonging to the state or to private individuals (12,300 ha).

For most areas, mean orang-utan densities estimated during these surveys fluctuated between 0.5 and 3.5 individuals/km². These values were comprised within the range reported previously for the region. Overall, our results showed that heavy habitat disturbance had a negative impact on orang-utan densities. But these results also highlighted a compaction effect due to recent land-use transformations.

In 2007, the final orang-utan population size estimated for lower Kinabatangan was about 812 individuals (95% Confidence Interval: 425-1,418 animals). This result showed an overall decline of 28% compared to the previous estimates from 2001. Orang-utan densities showed the strongest decline in Lots 1, 2, 5 and 9, areas that used to be the major orang-utan strongholds in 2001.

This decline was explained by a combination of two major mechanisms:

- *rebound effect following compaction*: on-going research by KOCP at the interface oil palm-plantations–natural forest (see below) shows that excess males that have taken refuge in forest patches following forest conversion will disperse into nearby agricultural landscapes after a few years in search of new territories where they can settle down. Over the years, some of the animals that accounted for the artificially inflated densities recorded in 2001 left the forest and dispersed into plantations. This applies especially to Lots 1 and 2;
- *further destruction of the forest*: resulting in the loss of orang-utan habitat and the decrease of population size: Lot 9.

Our most recent surveys conducted in July 2015 yielded a total population size of 785 individuals for Kinabatangan (95% CI=414-1,467). Although the number of orang-utans in Lower Kinabatangan is still declining, the population appears to show some signs of stabilization.

Most of this decline is explained by the continuous and drastic loss of habitat that started in the late 1960s with commercial timber exploitation, followed by the boom of oil palm development in the late 1980's and early 1990's.



Overall trend of the Kinabatangan orang-utan population over the past century.

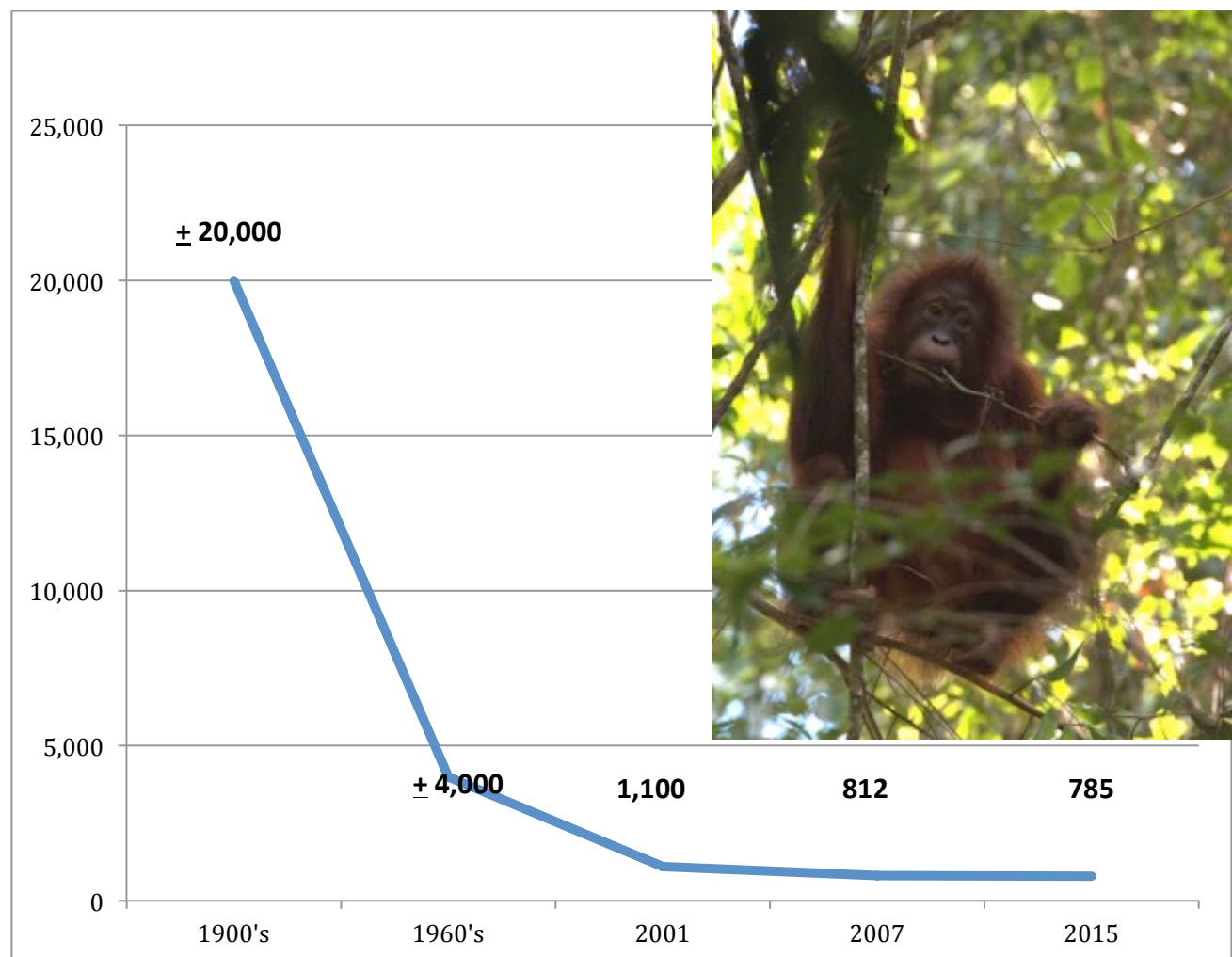


Table showing orang-utan abundance in the different lots of forests identified as part of the orang-utan range in the lower Kinabatangan floodplain (results with * are an average taken from literature for forests that were never surveyed).

Sampling Unit	Forest area	Available habitat (km ²)	Suitable habitat (km ²)	OU density 2001 (Aerial)	OU density 2007/2008 Aerial/Ground	OU density 2015 Aerial
1	Lot 1	33.4	21.3	6.00 (3.9-9.2)	1.35 (0.72-2.50) ^a	1.65 (0.89-3.07)
	Other	40.0	25	3.40 (2.20-5.30)	1.57 (1.20-2.04) ^g	1.00 (0.54-1.85)
2	Lot 2	37.6	33.5	5.00 (2.80-8.90)	3.14 (1.64-6.01) ^a	1.75 (0.94-3.27)
	Other	10.0	7.0		1.58 (0.86-2.89) ^g	
	Kerouak	2.0	2.0	2*	2*	2*
3	Lot 3	22.2	21.8	1.90 (1.00-3.6)	2.15 (1.14-4.02) ^a	2.37 (1.26-4.46)
	Other	7.0	3.0		1.74 (1.22-2.49) ^g	2.90 (1.52-5.52)
	Pangui	4.4	4.0	2.60 (1.80-3.70)	2*	1.51 (0.82-2.81)
4	Lot 4	18.8	13.2	3.10 (2.20-4.50)	3.08 (1.61-5.87) ^a	2.38 (1.26-4.49)
	Other	5.0	3.0		1.62 (1.21-2.16) ^g	0.55 (0.29-1.04)
	Bod Tai	2.5	2.0	2*	3.93 (2.03-7.64) ^a	0.37 (0.19-0.72)
5	Lot 5	74.2	70.1	2.10 (1.10-3.50)	1.11 (0.60-2.06) ^a	2.16 (1.15-4.05)
	Gomantong	45.4	38.0	3.80 (2.80-5.40)	0.97 (0.71-1.33) ^g	1.90 (1.01-3.54)
6	Lot 6	26.7	25.8	2.10 (1.30-3.60)	2.34 (1.24-4.40) ^a	3.24 (1.69-6.21)
					1.93 (1.60-2.33) ^g	
7	Lot 7	10.3	8.5	1.30 (0.80-2.20)	1.14 (0.61-2.11) ^a	1.65 (0.89-3.08)
	Pin Supu FR	27.0	13		0.56 (0.04-7.4) ^g	
					3.30 (1.72-6.33) ^a	
8	Lot 8	12.0	12.0	0.70 (0.30-1.60)	1.60 (0.86-2.98) ^a	1.62 (0.87-3.00)
	Other	24.0	17.6		1.54 (1.06-2.26) ^g	
9	Lot 9	11.2	7.5	1.60 (1.00-2.60)	0.71 (0.38-1.34) ^a	1.73 (0.93-3.23)
	Safoda	40.0	7		3.34 (1.74-6.42) ^a	2.87 (1.51-5.45)
10	Lot 10 a	8.7	6.9	1.80 (1.10-3.10)	2.72 (1.44-5.16) ^a	0.88 (0.47-1.64)
	Other	8.0	6.0		0.77 (0.57-1.03) ^g	
11	Lot 10 bc	19.4	16.7	2.40 (1.20-4.80)	3.07 (1.61-5.85) ^a	2.52 (1.33-4.77)
	Other	9.0	5			3.46 (1.80-6.67)
	Segaliud FR	18.5	16		4.34 (2.22-8.50) ^a	3.46 (1.80-6.67)
TOTAL		517.3	364.3			

Table showing orang-utan numbers in the different lots of forests identified as part of the orang-utan range in the lower Kinabatangan floodplain

Sampling Unit	Forest area	OU Suitable Habitat (km ²)	Population size 2002	Population size 2008	Population size 2015
1	Lot 1	21.3	128 (87-189)	29 (15-53)	35 (19-65)
	Other	25.0	102 (68-153)	34 (18-62)	30 (16-55)
2	Lot 2	33.5	160 (102-291)	105 (55-201)	54 (34-118)
	Other	7.0	35 (20-62)	22 (11-42)	12 (6-21)
	Kerouak	2.0	4*	4*	4*
3	Lot 3	21.8	42 (22-79)	47 (25-88)	52 (28-97)
	Other	3.0	10 (5-18)	6 (3-12)	14 (8-28)
	Pangui	4.0	11 (8-16)	8	7 (4-12)
4	Lot 4	13.2	41 (30-57)	41 (21-77)	32 (17-59)
	Other	3.0	15 (11-21)	9 (5-18)	3 (1-5)
	Bod Tai	2.0	5	8 (4-15)	1 (0-2)
5	Lot 5	70.1	146 (77-266)	78 (42-144)	152 (81-284)
	Gomantong	38.0	147 (107-199)	111 (58-96)	72 (39-135)
6	Lot 6	25.8	55 (33-90)	60 (32-114)	84 (44-160)
7	Lot 7	8.5	11 (7-18)	10 (5-180)	14 (8-26)
	Pin Supu FR	13.0	23 (12-44)	43 (22-82)	40 (21-61)
8	Lot 8	12.0	8 (4-19)	19 (10-36)	19 (10-36)
	Other	2.0	3 (1-6)	3 (2-6)	6 (3-12)
9	Lot 9	7.5	17 (10-26)	5 (3-10)	18 (10-34)
	Safoda	7.0	32 (20-50)	23 (12-45)	5 (3-10)
10	Lot 10 a	6.9	12 (8-21)	19 (10-36)	6 (3-11)
11	Lot 10 bc	16.7	40 (20-80)	51 (27-98)	42 (22-80)
	Other	5.0	19 (9-37)	15 (8-29)	21 (11-40)
	Segaliud FR	16.0	38 (19-77)	69 (36-136)	55 (26-106)
TOTAL		364.3	1,125 (691-1807)	812 (425-1,418)	785 (414-1,467)

Objective 3. Better understanding of orang-utan ecology at the interface between natural forests and oil palm plantations.

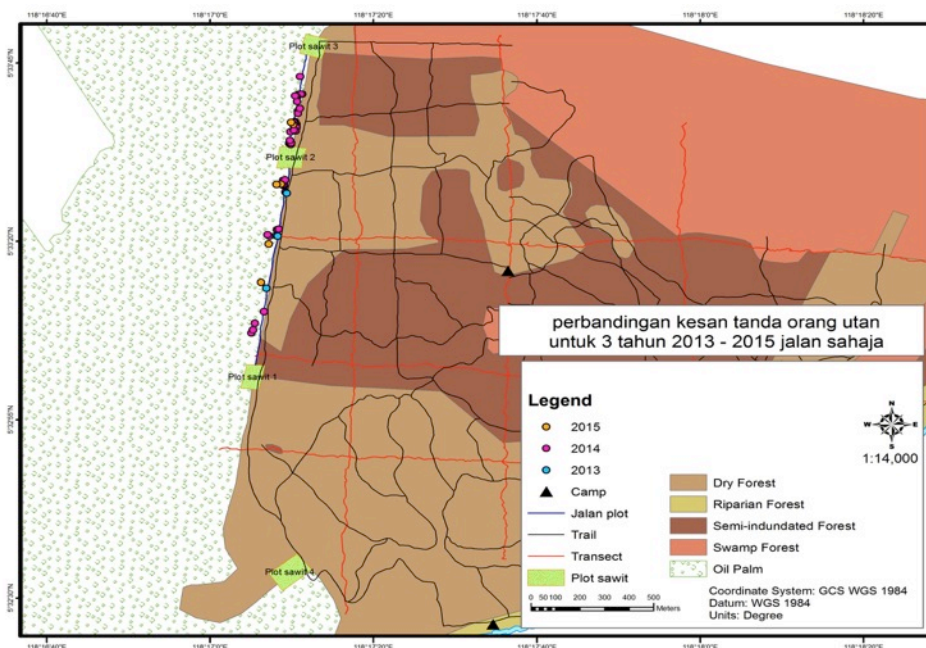
Under current standard practices, industrial large-scale agriculture has limited compatibility with conservation of tropical wildlife. Although some protected species have been recorded in oil palm landscapes, such as tigers *Panthera tigris* in Sumatra and elephants *Elephas maximus* in Borneo and Sumatra, it is unlikely that these animals could survive in a pure oil palm landscape in the long term.

Recent studies in Borneo and in Sumatra report orang-utan presence in a mosaic of mixed agriculture and forests, in mature agro-industrial plantations of oil palm, or in acacia plantations.

Information currently available is suggesting that agro-industrial plantations cannot sustain viable orang-utan populations in the long-term. However these landscapes could at least provide essential connectivity between areas of natural forest that still retain apes. Better management practices by the oil palm industry could minimize the strong negative impacts of agro-industrial development on overall orang-utan population viability. This must be recognized and acknowledged by government planners and policymakers, the scientific community, the private sector and all land-users.

However further research is needed to establish how conservation of this nationally and internationally protected species can be assured within a mixed-use landscape.

Our studies conducted at the interface between forest edges and oil palm plantations show that orang-utans can indeed penetrate and use mature oil palms to a certain extent. The results of these studies are described in a scientific article that was published in the journal *Oryx* in 2015 (see full list of scientific articles published in 2015 in the Annex).



Map showing the interface of a part of the KOCP study site with oil palm plantations: signs of presence and penetration within the plantations were identified all along the edge between forest and plantation.



Picture showing pith of palm leaves being chewed and spat by an orang-utan.

Picture showing ripe fruits of palm after consumption by orang-utans.



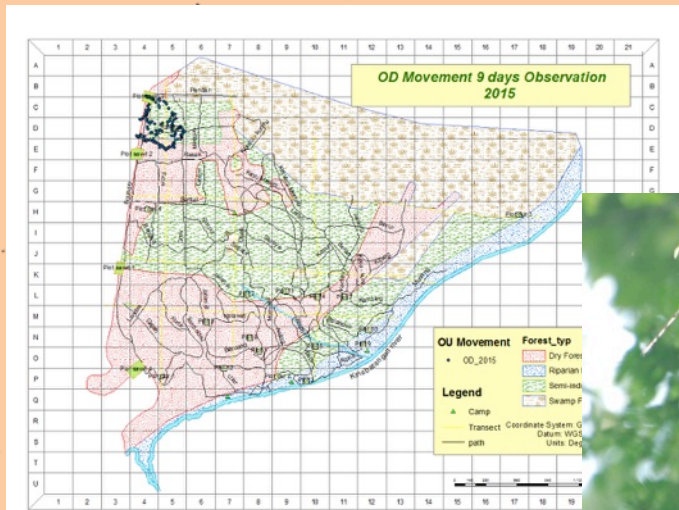
Young leaves of a mature oil palm plant after an orang-utan feeds on its stem.

Direct sightings and use of camera traps at our site showed that all orang-utan sex and age classes are venturing into the oil palm estates. Most of the signs left by the animals are within 50 m of the boundary with the forest, showing that mostly the animals don't penetrate far inside this landscape. However, males can sometimes walk several km inside plantations (see below). Animal raiders often enter the plantations at the end of the afternoon, after the workers have left the area. Our camera traps show that some individuals are active late evening and early at night when the sky is bright enough.

Six days with OD

Following wild orang-utans in oil palm plantations is a real challenge, even with individuals who are fully habituated and well known from the KOCF teams. The KOCF field research assistants spend a lot of time patrolling the edge between the forest and the plantations in search of animals that we could follow in order to better understand the reasons and modalities of the use of oil palm plantations by the orang-utans.

OD is a young adult female that we first met in the northern east side of our study area in October 2013. Although very elusive, she is not too wary and afraid by human presence.



On April 8th the team spotted OD in the North-Eastern side of the study site, close to nearby oil palm plantation. The full-day follow was initiated the following day after she left her nest at 6 am. The team followed OD for six consecutive days. Every other day during this follow, OD would leave the forest and enter the oil palm estate in late afternoon: 17:00-18:54 on the 10th; 15:57-17:15 on the 12th, and 17:57-20:30 on the 14th. Note that at our site, it is dark at around 18:30 all year long. Each time, OD would select a palm tree and start feeding on ripe fruits for a few minutes to half an hour. Then she would move to another palm and do the same again. Twice, she consumed the pith of young leaves. OD will then come back to the forest and build her nest close to the edge with the plantation. At this period, a lot of food was also available in the forest and over a six day period, OD was able to consume fruits, flowers, young leaves and bark 23 different plant species in the forest. Over the six-day observation period, OD spent 49.9% of her active time budget in feeding activities, showing that food was not scarce in the forest. OD would always wait for the workers to leave the area before she enters the plantation. Then she would be extremely silent when moving from palm to palm.

We use the results of our research to issue practical recommendations that need to be disseminated and shared with a wider audience: policy makers, industry players and partners interested to design more functional landscapes that could accommodate some of the basic needs for orang-utan survival in human-modified habitats. Thus, HUTAN is involved in several initiatives that aim at improving the practices of the oil palm industry: RSPO; PONGO (Palm Oil NGOs); etc. We also publish our findings in various ways: scientific articles; reports and books, such as the State of the Ape Report published by the ARCUS Foundation, or the UNDP-GRASP Report on “Oil Palm and Great Ape in Asia and Africa” to be published in 2016, press articles, etc.

Major recommendations originating from our findings include (this list is not exhaustive):

- **Land use planning must avoid orang-utan habitats.** Avoiding forest areas and peat lands that contain orang-utans is the best way to avoid impacting the species negatively. More broadly, both governments and the industry must avoid oil-palm developments in sites where the social and environmental costs outweigh the economic, environmental and societal benefits.
- **Need to maintain patches of natural forest within the landscape.** From the data collected in Sabah, it is clear that the conservation paradigm for orang-utan within agro-industrial landscape must include the preservation and/or restoration of small patches of forest. Used as corridors or stepping stones, these forest patches (even if degraded) play an important role in sustaining orang-utan populations by providing opportunities for dispersal or food resources. All remaining forests and forest patches located within an industrial landscape should be identified as “High Conservation Value Forests” and should be maintained as forests:
 - Before oil-palm development, HCV and HCS forests must be identified, marked and set aside with a view to maintaining ecosystem functionality and meta-populations of wildlife. These patches should not be converted but marked in the field and incorporated in land-use plans as ecological set-asides, and appropriately managed to prevent illegal logging and fire.
 - When the landscape has already been converted in an oil-palm matrix, reestablishing greenways or corridors of natural forest is a necessary step to recreate continuity between isolated orang-utan sub-populations. These greenways, either in the physical form of contiguous forest corridors or stepping stone fragments will eventually be embedded in the landscape matrix and function to link larger blocks of forest. These forests have to be of sufficient ecological quality to allow the animals to stay and to survive in terms of food resources, nesting sites, and tree cover, and they also have to allow for animal movements.
- **Favorize habitat heterogeneity.**
 - Planting non-palm trees throughout an agro-industrial oil palm landscape will increase food opportunities for wildlife and create possible nesting sites for orang-utans.
 - Habitat heterogeneity through the plantation lifecycle should also be integrated into planning more biodiversity-friendly oil-palm landscapes. Creating “blocks”

for rotation at different periods is a widespread approach that benefits biodiversity in the timber industry, and oil-palm growers could adopt a similar approach. Planting schedules could also increase permeability and connectivity between remaining forests by using progressive strips to maintain some continuous crop corridors.

- **Find ways to cohabitate in a peaceful manner.**
 - Orang-utan survival in highly modified landscapes is dependent on human tolerance towards them, and hunting will threaten the survival of these populations. A zero-tolerance policy on the killing of orang-utans and other harmful acts needs to be strictly enforced at all management levels.
 - Trenches and strips of bare land seem to deter orang-utans from entering oil palm plantations and could physically separate plantations from forests inhabited by orang-utans to mitigate conflicts when plantations are newly established. When palms become more mature these trenches could be bridged to allow orang-utans to move across the mature oil palm landscape.
 - Finally, thorough and regular monitoring of orang-utan presence and of the condition of forest patches needs to be implemented in all oil palm estates within the orang-utan range. All sightings of orang-utans and other protected wildlife should be reported by oil palm workers to their team leaders and a proper flow of information needs to be established between field operation management and wildlife authorities.
- **Ecological expertise is required to manage orangutan populations in oil-palm areas.** Where orang-utans and oil palm overlap, companies can minimize negative outcomes for orang-utan conservation through careful management of remaining orang-utan habitats. Experience shows that this can only be effective if the companies take on qualified environmental staff that can influence decision-making at plantation level regarding land clearance, spatial planning, and management practices.

Additional methodologies need to be also promoted: raising yield efficiency through better technology, increasing production and transportation efficiency, diversifying the primary production of the landscape, favorizing certified products and transitioning to diets that are less protein rich in order to reduce individual consumption rates

Many relevant recommendations have already been included in broader guidelines for several certification schemes such as sustainable oil palm (the Round Table for Sustainable Palm Oil – RSPO), sustainable timber extraction (Forest Stewardship Council - FSC), and others. However, it is currently not clear whether certification schemes will really mitigate environmental and biodiversity impacts of agro-businesses as they are supposed to, for several reasons: difficulty to make principle and criteria operational, reluctance by the industry to compromise on yield and profit, difficulty in documenting the actual biodiversity and ecological processes we want to maintain, and reluctance of consumers to pay for a premium which certification might entail. We have to accept that certification is not the only solution. It is part of an arsenal of tactics that must be developed to fulfill the global needs and desires of humankind while safeguarding the environment as much as possible.



Flanged male caught on camera trap walking on the ground. This type of male can penetrate several km inside oil palm plantations from the nearest forests.

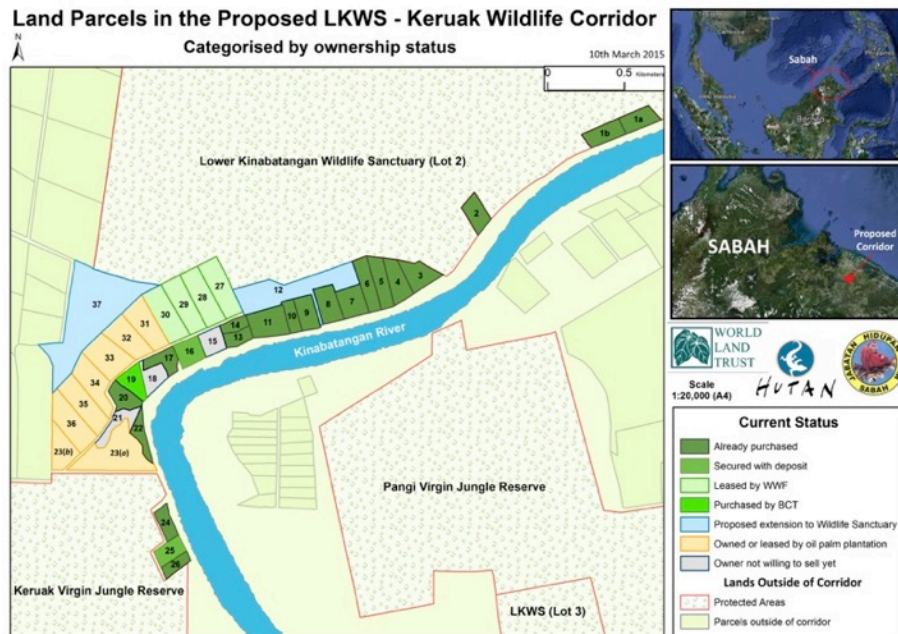
Goal 2. Policies based on scientific knowledge are formulated and agreed on by stakeholders for long-term orang-utan conservation in Sabah.

<i>Objective 1. The Orangutan State Action Plan is implemented.</i>

HUTAN's activities are aligned with the recommendations developed by the Sabah Wildlife Department and its partners and described in the Orangutan State Action Plan 2012-2016. The orangutan population living in Kinabatangan is recognized as one of the High Priority Populations for Sabah, and is particularly threatened by habitat fragmentation. One of the primary objectives of the SAP is "to create forest corridors to link the different populations together".

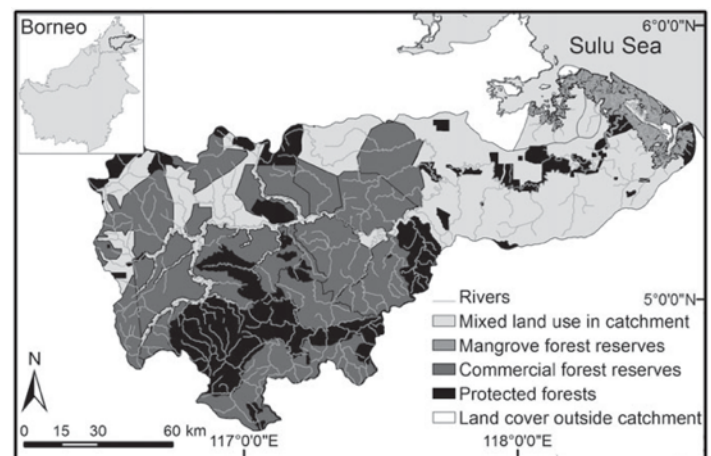
A few years ago, HUTAN embarked in a land acquisition scheme in order to recreate contiguous forest corridors that will support orang-utan movements in the Kinabatangan floodplain.

Our first project, called the “Kerouak Forest Corridor” aims at linking Lot 2 of the LKWS with the Kerouak Virgin Jungle Forest Reserve (see map below). This corridor is currently nearly completed; the land that has been secured over the past three years will be soon officially added to the protected areas of the LKWS.



The team of KOCP wardens members patrol regularly the parcels of land that have been acquired in order to make sure that no encroachment takes place in this corridor of forest.

In its current form, the LKWS by itself cannot fulfill its role of wildlife corridor: several orangutan sub-populations are completely isolated from one another. Overall, the population that survive in the lower parts of Kinabatangan are not connected with the population living in the upper parts of Kinabatangan (which is the major stronghold for the species in the State: about 4,500 individuals). A PHVA modeling the future orang-utans in Kinabatangan showed that in its current design, this landscape won't sustain a viable meta-population in the long-term: indeed, we predicted that the smallest sub-populations would become extinct within the next few decades, unless the overall meta-population is reconnected. Results from our on-going nest survey monitoring seem to confirm the results of this modeling exercise. It is therefore urgent to identify ways to reconnect all these isolated sub-populations together if we want to maintain a viable meta-population of orang-utans in Kinabatangan.



But at the same time, it is also crucial to prevent the creation of any new additional bottleneck that would fragment further the habitat available to the orangutans and to other species

A new project by the government is the construction of a new bridge and a highway in Sukau. If done without proper mitigation measures, this project will exacerbate the fragmentation of the landscape and will result in increased conflicts and illegal human activities (such as poaching) in the region.

Dr Isabelle Lackman highlighted the conflicting views that often oppose biodiversity conservation and economic development during the last “Heart of Borneo” Conference organized in Kota Kinabalu. She was then interviewed about the possible construction of this bridge. Over the past few months, HUTAN has engaged with state agencies and other partners to minimize the potential negative impacts of such development scheme. During its last Cabinet Meeting, the government decided to postpone the start of this project and asked to identify possible alternative measures to this bridge.

The Borneo Post
12 Nov 2015
Page 3

Sukau highway, bridge will further isolate wildlife

By Jesse Lajon

KOTA KINABALU: Wildlife conservationists already struggling with the negative impacts of forests being fragmented in Sabah's east coast will be facing a new predicament that will further isolate the already alienated wildlife population and pose another challenge to wildlife conservation efforts in Kinabatangan – the construction of the Sukau highway and bridge.

Of course roads are necessary as it will link the communities,” said Hutu-KOCP founder and primatologist, Dr Isabelle Lackman at the International Conference on the Heart of Borneo “Bridging HoB Landscapes and Beyond through Healthy Watershed Corridors” held at the Magellan Sutra Harbour here yesterday.

However, she felt strongly that the construction of the Sukau highway and bridge, scheduled to start sometime next year, will jeopardise all the efforts that have been taken to connect fragmented forests and link wildlife habitats in Kinabatangan.

Dr Isabelle said this when presenting her paper, entitled “Orangutans on the edge: Fragmented Sanctuary and Wildlife Corridors in the Lower Kinabatangan”.

She pointed out that the new development would be conflict with wildlife conservation efforts that had been taking place in the area,



Isabelle

and expressed her worries that the new highway would further escalate the problems associated with the fragmented situations of forests in the Kinabatangan area, which includes wildlife isolation from their larger population.

Presently, the Kinabatangan is home to a variety of animal species, the most renowned being the orangutans, the Borneo pygmy elephants and the proboscis monkeys. Hutu-KOCP has carried out 18 years of wildlife research and conservation in the area, in particular on the orangutan population.

Dr Isabelle said the orangutan population in Kinabatangan had been declining from 20,000 in the 1960s to 4,000 in 1980s. By 2001, there were only 1,100 orangutans left, and by 2008, the number further dwindled to 800.

She blamed logging activities for the dwindling population in the 1960s right up to 2001, but said after that, the further decrease in the orangutan population was largely due to habitat fragmentation.

Among the alleged main culprits behind forest fragmentation are the oil palm industry (plantations), as well as villages, roads, electric fences, trenches and drains.

“Orangutans cannot swim, so the existence of drains isolates them from other populations,” she said.

Dr Isabelle also mentioned that aerial surveys conducted at the Lower Kinabatangan in 2008 and in 2012 found that orangutans were present in isolated forest patches throughout the entire oil palm matrix and that a survey carried out involving 500 oil palm plantation workers had indicated that 90.2 per cent of the respondents had seen orangutans within their plantation.

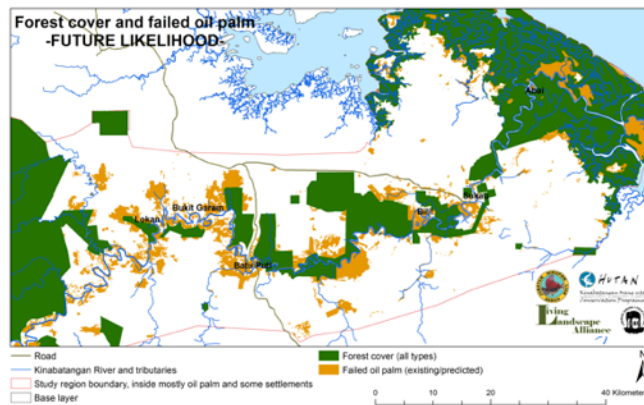
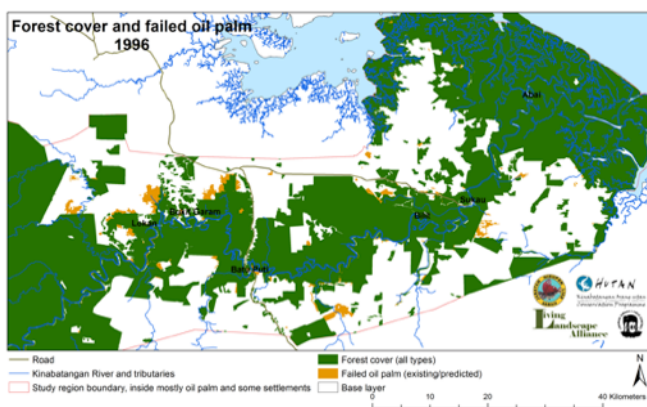
She cited that the reasons the orangutans had ventured into the plantations were to get to another forested area; to eat fruits picked from bunches; and to eat shoots of young palms.

She added that orangutans seldom built their nests and spent the night at plantations.

Dr Isabelle mentioned that efforts were made to restore riparian reserves and connect the fragmented forests.

However, she warned that the endeavour was not only expensive but also required several years before restoration could take place.

Objective 2: Data on orangutan habitat needs are incorporated in new policies and management plans.



Recent spatial and remote sensing analysis of the lower Kinabatangan floodplain conducted by HUTAN and Living Landscape Alliance showed that in 1996, the corridor of forest along the Kinabatangan River was still continuous (see maps above). Over the years, more forests were converted to oil palm, and today the remaining forests are highly fragmented. This situation is jeopardizing the long-term viability of the meta-population remaining in the floodplain.

In addition, our analysis showed also two new factors:

- A total of about 25,000 ha of forest in lower Kinabatangan was still unprotected at the end of 2014 (most of these patches are connected with the current network of protected forests, either the LKWS or the Virgin Jungle Forest reserves found in the floodplain). This land belonged to private people (mostly villagers) for 2/3 and to the State (1/3). If these non-protected forests were to be developed and converted to oil palm agriculture, this would worsen the fragmentation of the population.
- About half of this non-protected forested land is not suitable for oil palm development. Converting this forest to oil palm production would be a net loss and would result in the destruction of 12,000 ha of land without any benefit for people or for biodiversity.

These findings were published in Plos One, and were also disseminated via presentations delivered at various international platforms (HoB Conference; RSPO Conference; etc.). We also organized a series of discussions with key government partners: Datuk Masidi Manjun, Minister of Environment, Culture and Tourism; William Baya, Head of the Sabah Wildlife Dpt; Sam Mannan, Head of the Sabah Forestry Dpt; Natural Resources Office (under the Chief Minister Dpt); etc. The Sabah Wildlife Dpt has been tasked by Datuk Masidi to prepare a cabinet paper about these findings in order to identify possible mechanisms that will allow for securing the future of these non-protected and not productive lands.

HUTAN and other partners are currently urging the creation of the “Kinabatangan Management Committee” that was proposed when the Sanctuary was created (2005). Such a Committee is necessary to manage the Kinabatangan floodplain in a holistic way.

Becoming an active voice in formal technical groups allows conservationists to be part of the discussion that seeks to influence land use decisions and policies taken by the State government and the industry. Consequently, HUTAN members are part of various Technical Working Groups, such as:

- *Technical Working Group for the “UNDP-GEF-SFD Multiple-Use Forest Landscape Project in Sabah”* (Marc Ancrenaz: MA); these forests are home to a few hundreds orang-utans and are part of one of the five Major Elephant ranges recognized for Sabah. In this area, fifteen elephants were poisoned in early 2013 (although no one has been prosecuted yet). The presence and intensity of conflicts in this range illustrates the perverse impacts of improperly planned and delivered land-use changes. This Group was formed to advise the Project Board on issues related to biodiversity, with specific reference to proposed changes to the Project’s land use scenario, possible impacts of these changes and how these might be mitigated. Our input resulted in a significant modification of the land-use plan. The new plan is now incorporating significant protection areas and forest corridors for elephant migration;
- *Sabah Wildlife Advisory Panel (MA)*; this Panel is advising the Department in terms of research and conservation priorities;

- *Malua Scientific Committee (MA)*; the Committee supervises research and conservation activities that are being undertaken in the first Bio Bank created in South East Asia. Malua is also home to a significant orang-utan population (part of the upper Kinabatangan population);
- *Deramakot and Kuamut Working Groups (MA)*; for the development of their respective Forest Management Plans (both forests are home to significant orang-utan numbers part of the upper Kinabatangan population);
- *Working Group for the IDEEAL initiative (MA)* under Eco Health Alliance (Infectious Disease Emergence and Economics of Altered Landscapes);
- *Kinabatangan Land Acquisition Task Force* (Isabelle Lackman: IL); see above;
- *RSPO Compensation working group* (Harjinder Kler: HK); this working group has been instrumental to develop the compensation mechanism that is going to become the yardstick for RSPO in the next few years;
- *Palm Oil NGO (PONGO) Scientific Commission (MA-HK)*; PONGO was officially created in June 2015 in Singapore under the leadership of Orangutan Land Trust, Borneo Futures and Wilmar. This group intends to serve as a collaborative platform that supports managing orang-utans within plantations;
- *Orangutan land Trust Advisory board (MA)*;
- *GRASP Scientific Commission (MA)*;
- *IUCN SSC Section of Great Apes scientific Commission (MA)*;
- Several other national and international groups.

Of course, attending and preparing for these meetings and discussions represents a significant effort and takes a lot of our time. But we see this as a significant element for our strategy to achieve conservation goals at a larger geographic scale.



Absolute, flanged male living at the KOCP study site.

Goal 3. Reduced level of conflicts between human activities and orangutans

Objective 1. Levels of degradation and fragmentation of orang-utan habitat are reduced through forest restoration (work undertaken by the KOCP Reforestation Unit).

Since 2008, HUTAN has embarked in forest restoration exercises. Although reforestation is extremely consuming in terms of time and financial resources, it appears to be a crucial endeavor to restore key habitats, such as riparian areas, that have been encroached by oil palm plantations and by other stakeholders. Riparian forests are an essential habitat for many species, including orang-utans. However intense soil compaction and destruction of the seed bank prevent natural restoration in many key riparian areas.

The HUTAN Reforestation Unit is currently taking care of more than 30,000 seedlings. The Reforestation team started to plant young seedlings at Malbumi area in 2010. This estate had in the past encroached and destroyed the riparian forest, which jeopardized movements for species like elephants, orang-utans and many other animals. This illegally planted riparian area was returned by the plantation to the Sabah Wildlife Dpt but was never rehabilitated. The results of our reforestation efforts are very encouraging. Today the area is already covered with small trees and it is just a matter of time before orang-utans start to use this site for movements or for food: see pictures below.



Aerial view of Malbumi planting site (2010) and picture of the same area taken in 2015.

Objective 2. Illegal logging, poaching and other illicit activities are controlled in Kinabatangan (KOCPP Honorary Wildlife Wardens).

Twelve KOCPP field research assistants are certified as Honorary Wildlife Wardens under the Sabah Wildlife Enactment, 1997. HUTAN is supporting a specific team of five HWW who are engaged in wardening activities on a full time basis. This team is on duty 24 hours a day. They conduct regular patrols to detect any sign of illegal activities. In 2015, the team carried out 125 ground patrols (during the day and at night) and 118 river patrols. The team was also involved in several road-blocks organized jointly by the SWD, the police and wardens from HUTAN and from other groups.

In 2015, enforcement activities led to a few cases:

- Arrest of people selling turtle eggs;
- A case of illegal logging in Lot 5 of the LKWS;
- Two cases of poaching (people were arrested by the HWWs and entrusted to the SWD staff for legal action).

Early 2015, we started to collect evidences of poachers entering Lot 2 of the LKWS. The team set up camera traps, and collected direct and strong evidences of these illegal activities. A report was then compiled and shared with the SWD and with neighboring oil palm estate managers. This approach proved to be successful to halt poaching activities in this Lot. However, one of the camera traps used to capture evidences of poachers was stolen during the deployment time.

Objective 3. Establish a better communication channel with oil palm plantations established in the Lower parts of Kinabatangan for a better orang-utan management.

In 2015, the team of wardens and Isabelle welcomed the Environmental team from IOI, one of the largest oil palm plantations in Kinabatangan. The discussion was an opportunity to exchange with IOI about the environmental issues that prevail in Kinabatangan. Elephant and orang-utan management was high in the agenda and we are hopeful that a better communication with large companies such as IOI will prove beneficial for wildlife conservation in Kinabatangan.



Dr Isabelle Lackman giving a presentation to IOI about environmental issues and needs to mitigate peacefully elephant conflicts in Kinabatangan.

In December 2015, a nearby oil palm estate captured an adult orang-utan flanged male five kilometers away from the nearest forest (Lot 2 of the LKWS, our study area). This animal was transported to Sepilok Rehabilitation Center before the KOCP team of orang-utan researchers was contacted. We immediately went to Sepilok to check out this individual: it turned out that this orang-utan was one of the males followed by the KOCP teams at our study site! His name is Wak. Wak has been followed by the KOCP teams since 2010. After a few days spent in Sepilok where he recovered from the stress of the capture, Wak was returned to our site and released in the forest. The team followed Wak for a few days, but we had to stop our observations when a herd of 65 elephants invaded our study area! We haven't see him since...



A picture of Wak after his release in Lot 2 of the LKWS

Objective 4: Illegal wildlife trade is reduced.

Wildlife Trade is becoming a major issue in Sabah. Local and national trade mostly targets bushmeat (wild boars, deers, turtle eggs, etc.), but this trade is increasing despite the fact that all species are protected under Sabah's laws. Several sting operations carried out by SWD and the Honorary Wildlife Wardens have been highlighted in newspaper articles in order to raise awareness about unsustainable meat trade and consumption in the state.



The international trade is targeting mostly protected species that are used for their alleged traditional medical value or for high-end meat consumption (pangolins, geckos, sun bears, sea turtles, etc.). In 2015 two elephants were killed for their tusks. We are seriously concerned that the ivory trade is going to hit the populations of Bornean elephants in Sabah.



In a recent incident (early 2016), tourists spotted in Sukau spotted a sun bear carcass floating in Kinabatangan. The poachers had cut off the paws and the gall bladder of the animal.

The extent of wildlife trade is worrying and we need a concerted effort to fight this threat efficiently. In March 2015, the ASEAN Regional Security Forum Workshop was organized in Kota Kinabalu with the theme "Combatting Wildlife Trafficking". Under the umbrella of the American Embassy and its partners, many organizations and government agencies pledged to mobilize their resources to combat this threat. Better collaboration between countries in the region is urgently needed to tackle wildlife trade. Azri (head of the WWCMU) attended this two days discussion.



Following this Forum, the Sabah and Sarawak judiciary systems acknowledged that judges and prosecution officers usually took wildlife and environmental crimes too lightly. Often, culprits would walk away from the court unsentenced or with a very light penalty. Under the leadership of Tan Sri Melanjum (the High Judge in charge of the judiciary for Sabah and Sarawak), the court has called for a collaboration with environmental NGOs and government agencies in order to (1) reinforce prosecution capabilities of enforcement officers and wardens; (2) raise awareness about environmental crimes and laws within the judiciary; (3) amend the laws that need to be strengthened.

In 2015, three different workshops were organized by the judiciary system: one at University Malaysia Sabah and two at the Kota Kinabalu High Court. Each time, these 2-days workshops gathered about 100 people, lawyers and members of the judiciary system, government servants, NGOs, and members from local communities. KOCP Wardens, IL, HK and MA attended all these discussions. HUTAN is currently part of the NGO panel that is in charge of proposing what law amendments are necessary to better tackle wildlife trade.



Goal 4. Enhanced human resource capacity and commitment to manage and conserve orang-utan populations in Sabah

Objective 1. Local capabilities enhanced among Malaysian conservation professionals: trainings are organized to increase local knowledge about orang-utans.

Building local capacities is one of HUTAN's priorities. This is done through the organization of training courses for selected audiences or by attending specific sessions organized by other groups and organizations.

In 2015, members of the KOCP Orang-utan team and of the Warden Unit attended the following training courses:

- *Borneo Eco Film Festival*: three trainings of 5-days were organized by BEFF and SUARA Community film-making during the year. A variety of skills were learnt during these courses: video editing; video programming; video recording; story telling; etc. The team produced a total of seven short documentaries: two of them were presented during the Eco Film festival organized in Kota Kinabalu last September. The Minister of Tourism in Sabah requested the satellite TV company ASTRO to broadcast one of these films that is about the trade of small-hanging parrots;
- *Professional photography*: A full week session organized by professional photographers in Sandakan and followed by three team members;
- *Tree climbing techniques*: Ken Krank, an American professional tree climber is assisting our teams when there is a need to get access to tree canopy. Ken has been instrumental to assist the teams when they need to reach tree tops without jeopardizing personal safety! In this picture, Eddie is checking one of the KOCP Orang-utan bridges set up above the Menningul River;
- *Acoustic gibbon survey*: A Phd student registered in Davis University (Dina Dari) spent five days with the WWCMU team to investigate whether acoustic surveys could be used to estimate gibbon densities in lower Kinabatangan. Results of this innovative study are not available yet;



- *Workshop about emerging diseases and health risks associated with land-use changes:* this two-day workshop was delivered by our friend Dr Steve Unwin (Chester Zoo – PASA) during his visit to Kinabatangan in July 2015;
- *Droning activities:* light unmanned drones are a possible way to monitor wildlife, habitat and human activities in remote places or in places that are of difficult access. We assisted a team from Sandakan during a droning exercise over the forests of Lot 2 of the LKWS. However, the drone crashed during operations and the team had to retrieve it a few days later (see picture of the broken drone...);
- *Hornbill data collection:* Ravinder Kaur visited our site twice and spent time with the WWCMU team members to train them in data collection and bird monitoring. Ravinder is going to be working in close collaboration with the team of KOCP field research assistants for the next four years, time for her to complete her PhD research.



Various training courses were also organized by the KOCP field teams last year:

- January: two days of exchange organized in Sukau with wildlife officers from Perhilitan in Peninsular Malaysia (equivalent agency to Fish and Wildlife): the topic was mostly about elephant conflict mitigation and exchange of experiences;
- Two groups from the Dragon Fly programme (USA) who were exposed to orang-utan research methodology;
- Four Malaysian students from UPM followed the team activities for several weeks. This internship program is a way for HUTAN to expose young Malaysian students to the reality of wildlife conservation in the field;

Objective 2. Environmental awareness campaigns that target orang-utan conservation are implemented.

In 2015, the “Hutan Environmental Awareness Program” (HEAP) organized education programmes in 24 different schools, reaching out more than 4,000 students and 300 teachers. Rajak Saharon and other members of the Orang-utan team are involved in these education events to raise awareness about the needs to conserve orang-utans in Sabah.

Other major education events organized by HEAP and attended by representatives of the Orang-utan team in 2015 included:

- An education campaign led by the Sabah Forestry department in the Kinabatangan-Segama Wetlands. During a week, the team visited all the villages located within this Ramsar site;
- The “ROR” (Rhythm of Rimba) Festival organized in Sandakan; two days of fun, music and education activities to raise awareness about wildlife conservation;



- Seminar about Environmental Education Race: organized by the Sabah Forestry department and targeting teachers;
- PAWSE (Protective Action for Wildlife in Sabah through Education) workshop;
- Asean People Forum Conference.

Objective 3: Disseminate information collected in the field via scientific articles published in peer-reviewed journals and oral presentations.

The following scientific articles were produced and published during the year 2015. They are all available upon request.

- Ancrenaz, M., F. Oram, L. Ambu, I. Lackman, E. Ahmad, H. Elahan, and E. Meijaard. 2015. Of pongo, palms, and perceptions – A multidisciplinary assessment of orangutans in an oil palm context. *Oryx*. 49 (3), 465-472. <http://dx.doi.org/10.1017/S0030605313001270>.
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- Ancrenaz, M. and E. Meijaard. 2015. Encroaching on ape habitat: deforestation and industrial agriculture in Cameroon, Liberia and Borneo – The island of Borneo. In *State of the Apes: Industrial Agriculture and Ape Conservation*. A. Lanjouw, H. Rainer & A. White eds, ARCUS Foundation, USA. Pp. 61-69.
- Abram, N.K., E. Meijaard, J.A. Wells, M. Ancrenaz, A.S. Pellier, R.K. Runting, D.L.A. Gaveau, S. Wich, Nardiyono, A. Tiju, A. Nurcahyo and K. Mengersen. 2015. Mapping perception of species' threats and population trends to inform conservation efforts: the Bornean orangutan case study. *Diversity and Distribution*, 1-13. DOI: 10.1111/ddi.12286.
- English, M., G. Gillespie, B. Goossens, S. Ismail, M. Ancrenaz and W. Linklater. 2015. Recursion to food plants by free-ranging Bornean elephants. *Peer Journal Review*, 3:e1030, <https://dx.doi.org/10.7717/peerj.1030>.
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- Struebig, M.J., A. Wilting, D.L.A. Gaveau, E. Meijaard, R.J. Smith, The Borneo Mammal Distribution Consortium, M. Fisher, K. Metcalf and S. Kramer-Schadt. 2015. Targeted Conservation to Safeguard a Biodiversity Hotspot from Climate and Land-Cover Change. 2015. *Current Biology*, <http://dx.doi.org/10.1016/j.cub.2014.11.067>.

In addition to these publications, HUTAN staff has delivered several oral presentations during international events: the Heart of Borneo Conference (Kota Kinabalu); the ZACC Conference (Denver, USA); the Luísa Pinho Sartori Foundation Conference (Rio, Brazil); the PONGO Workshop (Singapore); the ARCUS Forum “Farming for the Future” (Washington DC); several zoos in the UK, France, Japan and the USA – and during several national workshops and meetings.

HUTAN (MA) was one of the scientific advisors for the development of the Great Ape Exhibit that was officially launched at the French Museum of Natural History in February 2015 (Paris). This event was the opportunity for MA to give several radio and TV interviews about the status of orang-utan conservation in Borneo.

On May 8th, HUTAN was honored to receive the Commitment to Conservation Award delivered by Columbus Zoo. This was the second Award to ever be given by Columbus Zoo, and our entire team feels extremely proud of this achievement!





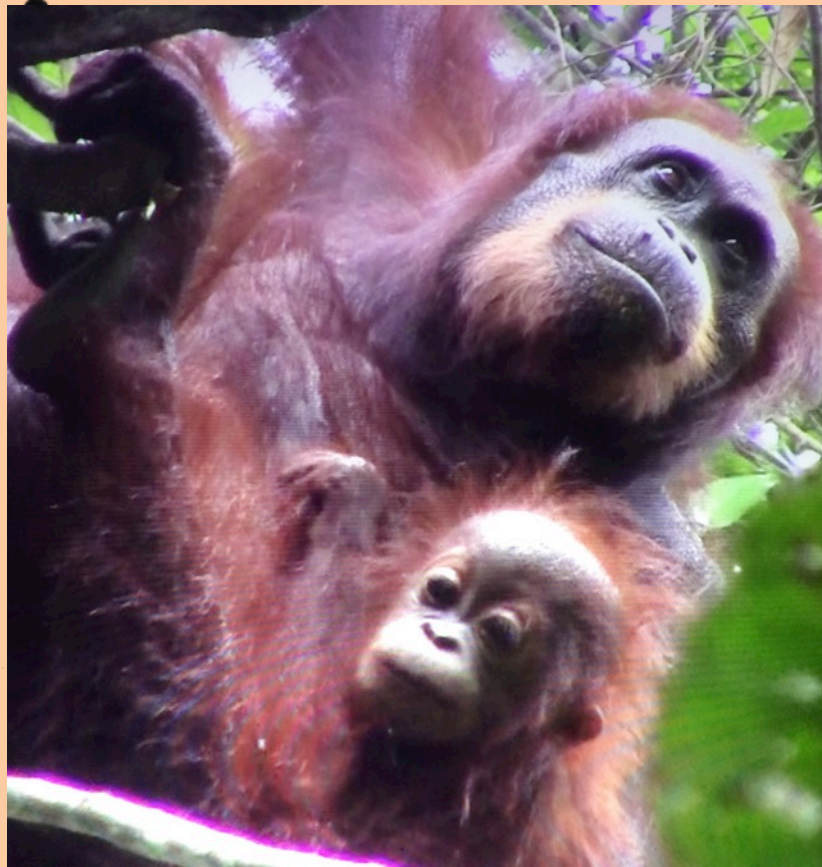
Kusai

WHO is JENNY?

Jenny was the name given to the first orang-utan that we identified and started to follow at our study site in 1998. Our teams since have intensively studied Jenny. She is a well-known character for many KOCP friends who have visited Kinabatangan since she is the most popular and visited orang-utan at our study site. Jenny is fully habituated and is also regularly featured in documentaries filmed at our site. The mole located in the upper right side of her mouth is a sure sign to recognize her in the forest.

We estimate Jenny to be in her early 40's. Indeed, we have already identified at least five of her offsprings:

- Unnamed individual identified by genetic paternity analysis (born in the late 1980's?)
- Etin, a male born around 1996;
- Mallotus, a male born in 2005;
- A baby who died after two days of a cleft palate, born in 2013;
- Ocean, female born in 2014.



Jenny and Ocean, her last daughter born in September 2014.

Jenny was also the first orang-utan to be shown at London Zoo (see drawing below): she arrived there on November 25th, 1837. On March 28th, 1938, Charles Darwin came to the zoo to see Jenny, his first encounter with a great ape.

She made a profound impression on the scientist who wrote: *"Let man visit orangutan in domestication, see its intelligence when spoken to - as if it understands every word said - , see its affection to those it knew - see its passion and rage, sulkiness and very actions of despair - ... and let him boast of his proud preeminence. Man in his arrogance thinks himself a great work, worthy the interposition of a deity. More humble and I believe true to consider him created from animals"*. Jenny died after Darwin's third visit to see her, about a year later.

