HUTAN – Kinabatangan Orang-utan Conservation Programme

YEARLY ACTIVITIES – 2016

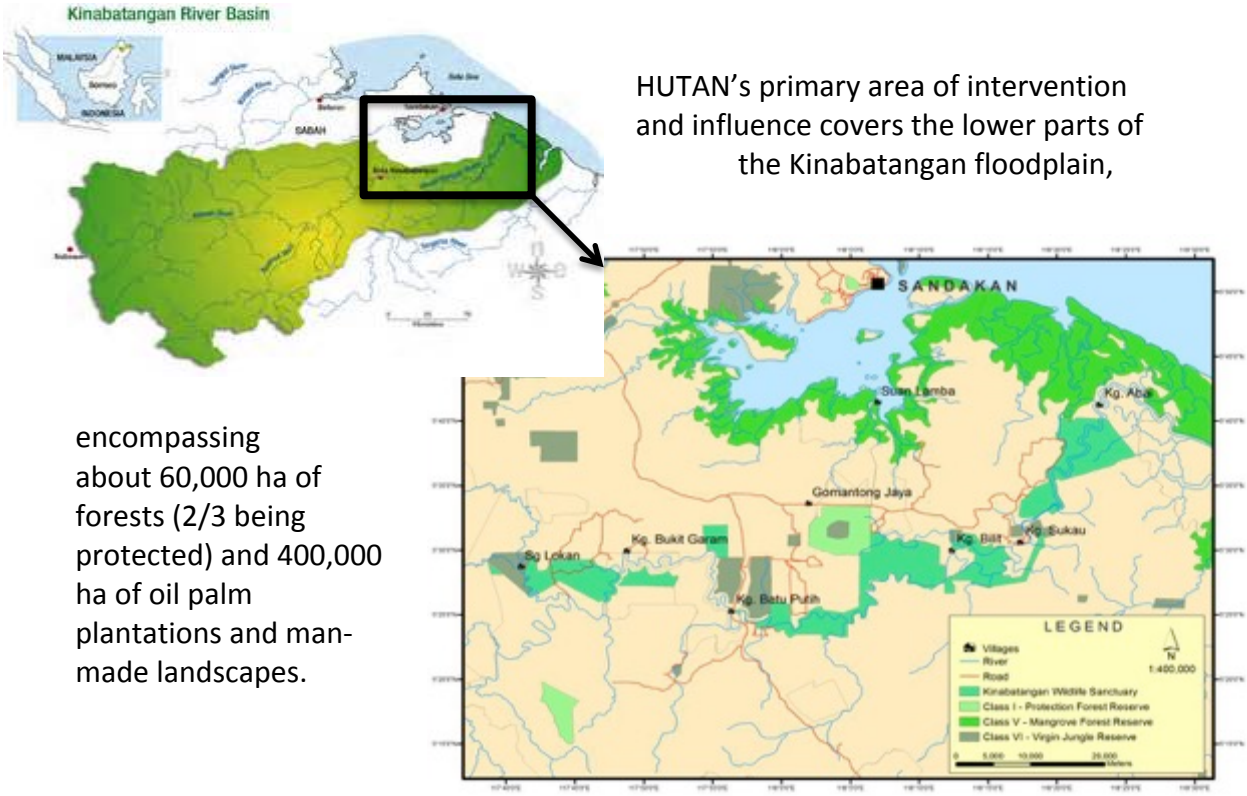
CONTENT

HUTAN

HUTAN is a French grassroots non-profit organisation created in 1996, to develop and implement innovative solutions to conserve orang-utan and other wildlife species in Sabah, Malaysia. HUTAN and the Sabah Wildlife Department (SWD) initiated the Kinabatangan Orang-utan Conservation Programme (KOCP) in 1998 to study orang-utan adaptation to forest disturbance and to design and implement sound conservation strategies for this species and its habitat.

Today our team is composed of more than 55 highly skilled staff hailing from the Orang Sungai community. To achieve our vision, we have developed a holistic strategy combining long-term scientific research, wildlife and habitat protection and management, policy work, capacity building, education and awareness, as well as community outreach and development.

KOCP's grassroots approach aims to engage the local communities in the management of their own natural resources by empowering them with the necessary awareness and knowledge and by developing proper mechanisms where their newly acquired skills can contribute to orang-utan and wildlife conservation and management. It is thus necessary to achieve a trust-based collaboration with not only the villages we are working with, but also with the local industry that is impacting wildlife habitat, and government agencies we depend on to conduct our activities across the state. For us, it appears that empowering selected community members in the management of their natural resources is the most promising approach to securing the future of Kinabatangan.



HUTAN's primary area of intervention and influence covers the lower parts of the Kinabatangan floodplain, encompassing about 60,000 ha of forests (2/3 being protected) and 400,000 ha of oil palm plantations and man-made landscapes.

In the Kinabatangan floodplain, HUTAN-KOCP is actively engaged in the development of a systematic conservation planning framework, involving private stakeholders such as oil palm plantations, government agencies and local communities. HUTAN has also created a training platform to enhance capacities of government and non-government staff in biodiversity monitoring and management, mapping and remote sensing, research techniques and etc.

Outside of Kinabatangan, we are engaging with a wide variety of partners to make landscapes and ecosystems found outside of protected forests more resilient to man-made disturbances and to secure a future for wildlife populations that are found there (via policy documents, improved land-use planning, training and capacity building, etc.). Internationally, HUTAN has developed a network of relationships with multi-lateral agencies and initiatives to reach a wider audience and target a global impact: IUCN Great Ape, Asian Elephants and Health SSC Specialist Groups, UNDP-UNESCO Great Ape Survival Partnership, Borneo Futures, Pongo Alliance, Round Table on Sustainable Palm Oil, etc.

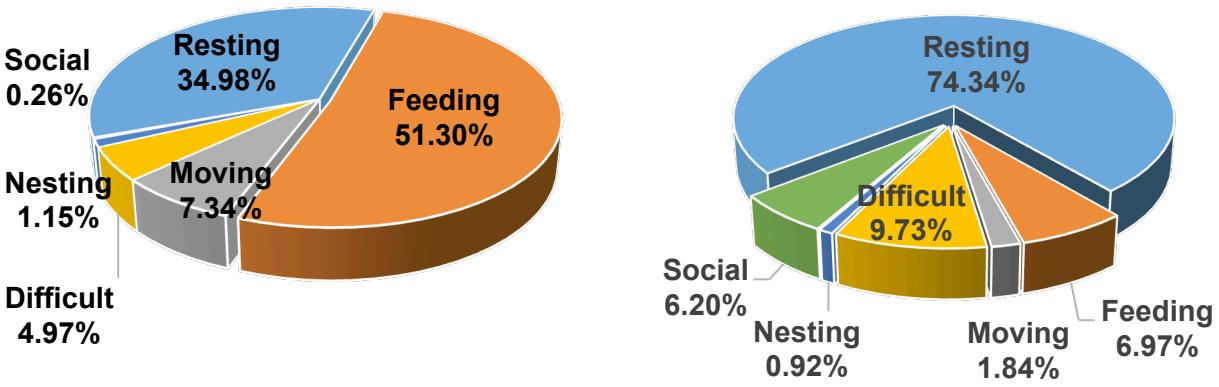
Hypsicalotes kinabalensis, Agamid lizard only known from Mt Kinabalu (three specimen)

Orang-utan conservation activities

Hutan's intensive Orang-Utan Research Site was established in 1998 in 8.7 sq.km of secondary forests in the Lot 2 of the LKWS near the village of Sukau. A team of nine intensively trained local research officers - Hutan's Orang-Utan Research Unit - take turns to track orang-utans in the forest and conduct eco-ethological observations. A wide range of data are collected on standardized datasheet including dietary observations, feeding behaviour, social aspects and ranging patterns.

In 2016, the OURs team spent a lot of time and efforts to locate and to follow new individuals, especially those living at the interface between forest and oil palm estates. Habituating naïve wild orang-utans (*ie* achieving a situation where the target individual is not disturbed anymore by the presence of human observers) is very challenging; this process takes several days at best to complete. Usual reactions of unhabituated orangutans to human followers include hiding for extended periods of time, or moving far and fast in the canopy. Additional signs of disturbance include kiss squeak and other alarm calls or breaking branches. At our site, we consider that an orang-utan is fully habituated when the feeding part of the time budget is 50% or more, and when animals don't show any sign of distress sign.

During 2016, we followed 22 wild orang-utans (total of 99 follows). We were able to obtain usable data (nest to nest follows) for a total of 136 full days (1,670 hours) of direct observations: eight fully habituated individuals, and 14 who were in the process of being habituated.



Time budget of undisturbed orang-utans (left: n=8 individuals; 1233 hours of direct observation) compared to disturbed individuals (right: n= 14 individuals; 436 hours) showing the increased proportion of time spent resting in unhabituated orang-utans.

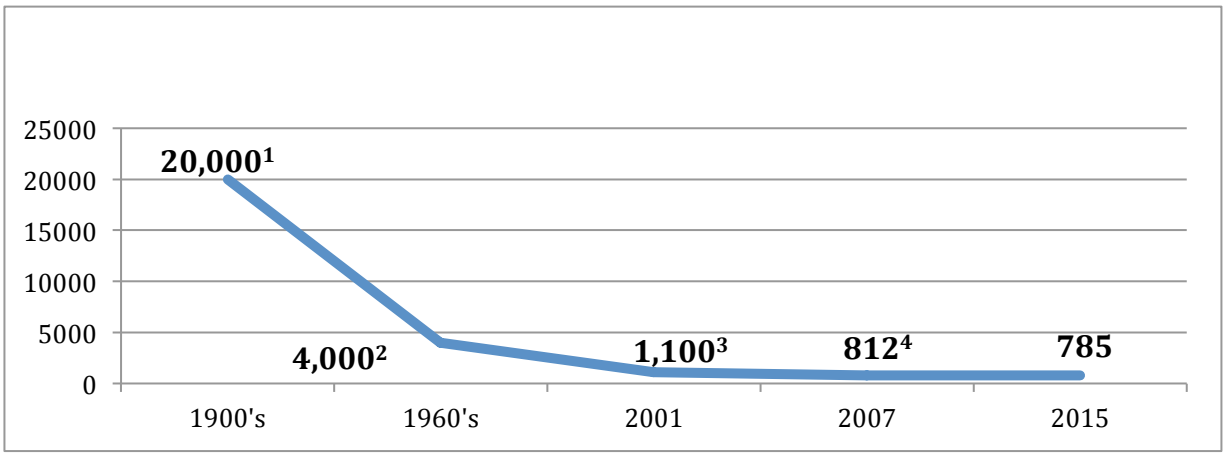
In 2016, we recorded a total of 71 plant species of 39 families consumed by 22 focal orang-utans. Orang-utans ate fruits (unripe fruits constituted 36% of the entire diet, and ripe fruits 22%), young leaves (26.5%), barks (12%) while the rest included seeds, flowers, and invertebrates. The most consumed plants in 2016 were *Ficus sp*. (16.2% of all feeding scans); *Spatholobus sp*. (9.5%); *Dracontomelon sp*. (8.3%); *Neolamarckia cadamba* (7.0%); *Artabotryos sp.* (5.7%) and *Diospyros sp*. (5.3%). These six taxa contributed for about 52% of the total time spent feeding by the observed orang-utans. Since 1998, a total of 327 plant species consumed by orang-utans have been recorded at our site.

Orang-utan movements at our study area in 2016.

Individual ranging patterns of wild orang-utans at Hutan's research site are measured with a GPS and mapped. Focal resident females' home ranges strongly overlap. Males' home ranges are larger than those of the females and often extend far beyond the boundaries of our research site. Generally, orang-utan home ranges at our research site are smaller than those documented at primary forest sites and with more overlapping.This situation could reflect a "compaction" effect due to the small size of most forest fragments left in Lower Kinabatangan.

In 2016, Julaina (adult resident female with a nine years old daughter named Felicity) was observed consorting with Kusai, one of the local dominant flanged males. Kusai is a regular visitor to our study site, especially when females are sexually attractive. During this courtship, the team observed several mating bouts between Julaina and Kusai (picture here). We are now monitoring Julaina to detect any sign of pregnancy.

The overall orang-utan density estimate for the year 2016 was 2.17 ind./km^2, with monthly fluctuations between 1.34 and 2.88 ind./km^2. This value compares well with the average value observed for the period 2006-2015: 2.1 ind./km^2. However, if the number of orang-utans seems to stabilize in our study area, the results of aerial and ground surveys conducted in 2015 and 2016 showed nevertheless a continuous decline of the overall orang-utan population in the lower Kinabatangan: see Graph below.



Estimated number of orang-utans living in Lower Kinabatangan over the past century.

[1] Goossens, B., Chikhi, L., Ancrenaz, M., Lackman-Ancrenaz, I., Audau, P., and M.W. Bruford. 2006. Genetic Signature of anthopogenic population collapse in orang-utans. *Plos Biology*, 4 (2): 285-291.

[2] Yoshiba, K. 1964. Report of the preliminary survey on the orang-utan in North Borneo. *Primates*, 5: 11-26.

[3] Ancrenaz, M., Gimenez, O., Goossens, B., Sawang, A., and I. Lackman-Ancrenaz. 2004. Determination of ape distribution and population size with ground and aerial surveys: a case study with orang-utans in lower Kinabatangan, Sabah, Malaysia. *Animal Conservation,* 7: 375-385.

[4] KOCP/SWD. 2007. Wildlife surveys in the Lower Kinabatangan Wildlife Sanctuary. SWD, Kota KInabalu.

In Kinabatangan, the orang-utan population is still declining because of forest conversion to oil palm agriculture and other types of land-uses, and the resulting fragmentation of the remaining habitat. Increasing the size of the forest available to the animals, and reconnecting isolated forest patches are the only ways to secure the future of this population.

KOCP is also investigating the behavior of orang-utans who are living at the interface between forest and oil palm estates. We combine direct observations with the use of camera traps, fecal collection for further DNA printing, and interview surveys with plantation workers to better understand this new dynamic. In 2016, the teams observed a very unique and non-reported behavior with three adult females who are living close to the plantations. Often, before leaving the forest and entering the plantations, these females would leave their young infant (aged between 1 and 2 years old) in a nest located in a tree. Then the female will enter the plantation alone and forage for food, looking for young shoots of palms and palm fruits (kernels). Half an hour to a few hours later, the female would come back to retrieve her young who has been waiting in the nest where he had been left alone.

Orang-utans that are living at the interface between forest and oil palm plantation move between these two habitats on a regular basis.

This observation might be motivated by an "anti-predatory" behavior if the mother considers the oil palm landscape as being a dangerous habitat for her young. This unique behavior has not been recorded previously by other orang-utan researchers.

Elephant conservation activities

- *How many elephants in Kinabatangan?*

In the late 1990's, we estimated from direct counts that about 80 to100 individuals were found in Lower Kinabatangan (KOCP, unp. data). In 2016, we were able to estimate from direct counting that the population was about 200 individuals. This figure represents a 100% increase of the population in just 15 years, representing a yearly rate of population growth of about 6.7%, which is a much higher rate than reported for any population of African forest elephants or Asian elephants.

- *Elephants and oil palm plantations.*

Elephants spend an increasing amount of time in the oil palm plantations that are bordering the forests of the LKWS. In 2016, the team assisted Miss Brittany Thompson (Master student from University of Amsterdam, the Netherlands) to better understand how the animals are using this landscape. Key findings showed that during the wet season, elephants spent the most time in plantation areas that were further away from the forest and from the rivers, and located close to cleared or newly planted oil palm areas. During the dry season however, they spent most of their time near main roads or fenced barriers, and they preferred underproductive oil palm areas (most probably because of the lower human presence in these areas).

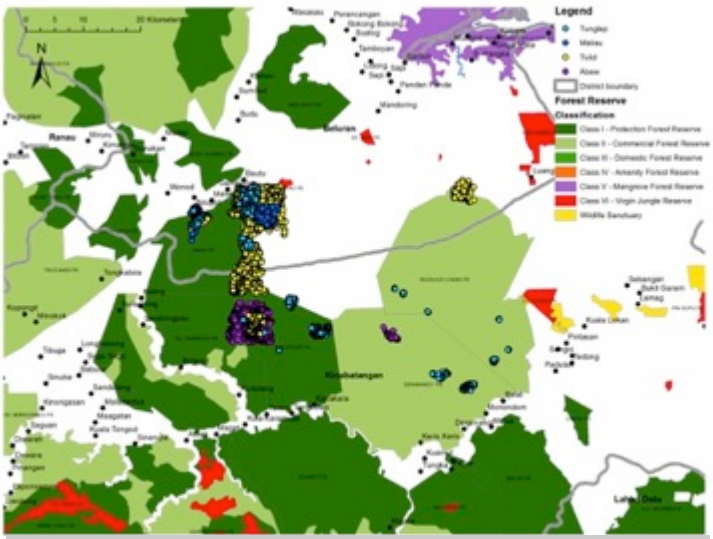
Most hotspots (*ie* locations with the highest visitation by elephants) identified from satellite data analysis are found in areas with relatively little fencing, suggesting that once elephants find refuge or resources in a plantation, they will use the area until it becomes too costly for them (in terms of human disturbance and resulting stress, or decline of food opportunities).

- *Human-Elephant conflict mitigation*

Hutan's Wildlife Surveys and Protection team (WSP) works on call 24/7 to help the Kinabatangan community minimizing wildlife conflicts, especially with crop-raiding elephants, using non-harmful methods. The team regularly conducts night patrols in villagers' fields to detect the presence of elephants and to chase them away gently. WSP also helps maintaining electric fences donated by Hutan to protect local crop fields and cemeteries (elephants like to uproot grave stones). In 2016, the team saw a drastic increase in attempts by elephants to enter villagers' crop fields and village areas . This is thought to be caused by the disruption of traditional elephant routes, especially around the village of Sukau .

Similarly, elephant conflicts have dramatically increased in industrial oil palm plantations in the Kinabatangan region and have extended to nearby districts. Hutan and other NGOs have been assisting the Sabah Wildlife Department to develop a landscape planning approach to mitigate human-elephant conflicts in the Kinabatangan region. The work of PhD student Nurzhafarina Othman provides long-term data and information on "conflict hot-spots" in local villages.

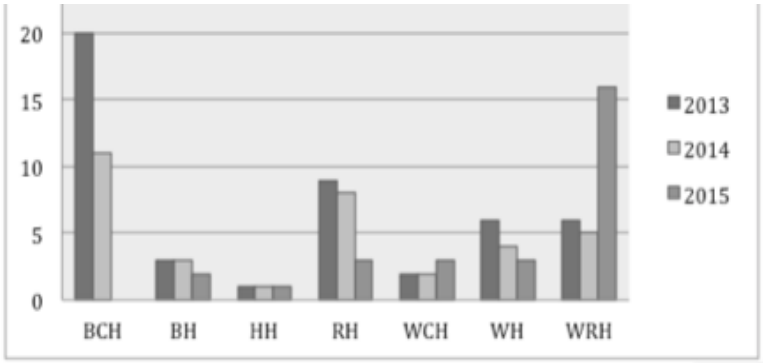
Hutan was also invited, along with other NGOs, to assist four villages of the Beluran and Telupid districts in Central Sabah recently afflicted by elephant conflicts, following 20 years of elephant absence in their area. In 2016, a total of four workshops were held with these communities to share experience of human-elephant conflicts and to discuss long-term solutions . A series of training sessions are planned in 2017 to equip these communities with efficient elephant conflict mitigation skills.



Map showing elephant movements and conflict sites in Telupid area.

Hornbill conservation activities

In March 2012, Hutan started to conduct monthly surveys of the eight hornbill species present in the Lower Kinabatangan. Data are collected six times per month from a boat along a fixed stretch of the Kinabatangan River and include group size and structure as well as nesting site locations. This monitoring aims at understanding migration patterns, existence of specific breeding seasons and other information that will support a sound management strategy for these hornbill species.



Graph showing the detection of large groups of hornbills over a three-year period of river monitoring

Over the years, hornbill sightings have been decreasing regularly, especially for the helmeted, white-crowned and wreathed hornbill species. Our assessment showed that the main cause of this decline seemed to be the lack of suitable nesting sites (natural cavities in large living trees) in the logged-over secondary forests of the Kinabatangan. In order to improve the chances of long-term survival of the most threatened Kinabatangan hornbill populations, Hutan has initiated two complementary approaches to increase the number of available nesting sites:

(1) "Repairing" natural tree cavities that had been used in the past by breeding hornbill pairs, but cannot be used anymore following the closure of the nest entrance or the collapse of its floor.

On the left side, active cavity used by OPH in August 2015 – Right side: the same cavity almost entirely sealed following bark regrowth in November 2016 (before restoration by the Team)

(2) Building artificial hornbill nest boxes: since 2013, five prototype nest boxes were set up in the LKWS in collaboration with the Chester Zoo and the Association Beauval Nature. The artificial nest boxes were monitored with camera traps. Although the boxes attracted nearly all hornbill species, only the pied oriental hornbills bred successfully in these artificial nest boxes (n=2 pairs). A study comparing the humidity and temperature in natural nest cavities and the artificial nest boxes showed that while both these parameters remained remarkably stable in natural cavities, they greatly fluctuated in the artificial nest boxes. New nest box designs are now being tested to address this issue.

A new design of artificial nest box using waterproof plywood, sawdust and fiberglass opening.

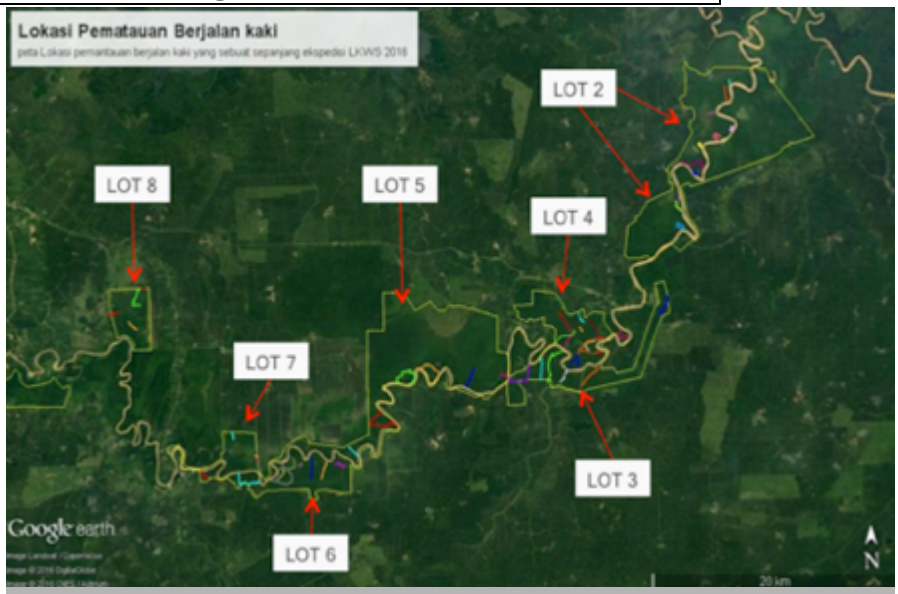
Due to the illegal trade of his horn ("red ivory"), the Helmeted hornbill is now "Critically Endangered" under the IUCN Red List. Since 2014, Hutan monitors a pair of Helmeted Hornbills nesting in a natural tree cavity at one of our field sites (this natural nest is currently the only known breedingsite for the helmeted hornbill in the world). In early 2016, a chick emerged from the nest and left the area with its parents. The pair returned to Pangi toward the end of the year, without their chick.

Very rare picture of a wild juvenile helmeted hornbill (living in Pangi)

Hutan's hornbill project is carried out in collaboration with Ms Ravinder Kaur, currently conducting her PhD at the University of Malaya about hornbill breeding ecology in the Kinabatangan.

Wildlife monitoring activities

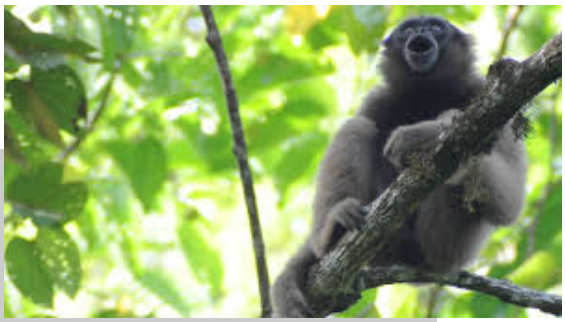
In 2016, the KOCP "Wildlife Survey and Protection" team conducted wildlife surveys in seven of the ten Lots of the LKWS in order to (1) document the status of wildlife species in the area; (2) document population trends; (3) provide recommendations to the government to better address existing threats to local biodiversity. The results of our surveys will be gathered in a special report and are summarized below.



Map showing the approximate location of the field expeditions undertaken by WSP in the LKWS during 2016.

- Gibbons (*Hylobates muelleri*)

Gibbon density estimates for the seven Lots surveyed fin 2016 averaged 0.53 groups/km^2, which represents a six-fold decline the early 2000's.



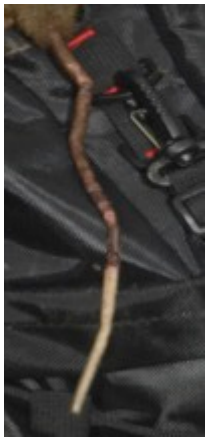
Our surveys show a six-fold decline of gibbon density in Lower Kinabatangan over a 15 years period. Major threats faced by gibbons in the area are forest loss and fragmentation due to conversion to agriculture (primarily palm oil). Gibbon populations in Kinabatangan are today on the verge of extinction. Reconnecting isolated forest fragments is a key management strategy if we want to secure a viable gibbon population in lower Kinabatangan.

- Amphibians

We recorded 22 different species of frogs during these surveys, adding a new species to our previous baseline assessment and bringing the total number of frog species for Lower Kinabatangan to 32. Fewer species were recorded in oil palm plantations (6 species) than in natural types of forest (average of 14 species for the three natural types: dry; riparian and semi-inundated). Our results confirm the strong differentiation between frog assemblages in forests and non-forest sites.

Frog surveys indicate that commensal frog species and habitat generalists dominate the non-forest sites; forest-dwelling species do not seem to be adapting in these disturbed habitats.

- Small mammals



Grey tree rat, characterized by the white coloration of the tip of its tail.
Only six records for this species exist in Sabah.

The team also trapped and released small mammals. The most common species captured were large tree shews, *Tupaia tana* (31 individuals); plantain squirrels, *Callosciurus notatus* (30) and common tree shews, *Tupaia glis* (25). The grey tree rat (Lenothris canus) was recorded for the first time in the Lower Kinabatangan.

The most degraded sites were characterized by a lower diversity of their rodent community, but had a larger presence of commensal and invasive species like the common house mouse and Asian house rat.

- Primate monitoring along riverbanks

Since 2007, Hutan monitors population trends for 6 primate species (orang-utan, proboscis monkey, maroon langur, silver langur, long-tailed macaque and pigtail macaque) with monthly surveys along a 20km stretch of the Kinabatangan River near Sukau. These monthly surveys produce encounter indexes that are compared over time. Results show that while populations of proboscis monkeys seem to have remained stable over the past 10 year, populations of silver langur and maroon langur have alarmingly declined over this period.

These conclusions were supported by the results of our boat surveys conducted during the field expeditions. Abundance of proboscis monkeys fluctuated between 0.54 group/km of river in Pin Supu FR and 1.83 group/km of river in Lot 6. Overall, more groups were sighted in the lots located upriver, but in average the groups were of smaller size than in the lower parts of the survey area: size of One Male Units averaged 12.5 ind./unit downriver vs 9.1 ind./unit upriver. This size difference may be the result of habitat fragmentation. These results compare well with our baseline data and the results produced by the general proboscis survey undertaken by Dr Ikki Matsuda and colleagues (including KOCP) in 2015.

In the contrary, sightings of leaf monkeys from the river (both silver and red leaf-monkeys) have declined regularly over the past few years: in 2016, our average encounter rate was 0.08 group/km for *R. cristata* and less than 0.01 group/km for *R. rubicunda*, with only one sighting recorded during the year.

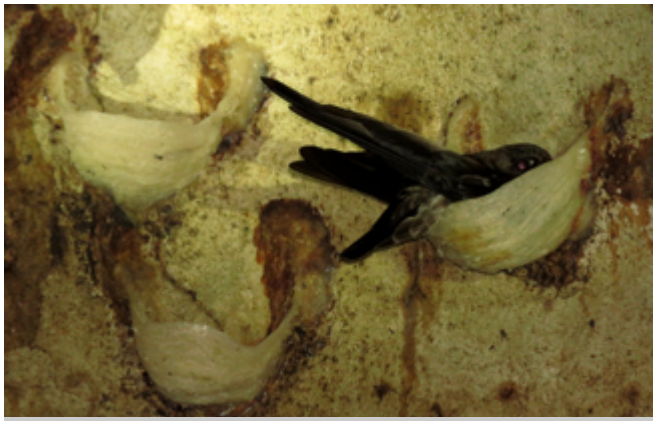
- Other species

A total of 152 bird species of 43 families were recorded during these field expeditions (out of the 310 species inventoried in the Kinabatangan), including 82 species classified as "rare", 32 "fairly common" species and 38 "common" species. Five Bornean endemic species were recorded.

We also conducted our first spider inventory and recorded 64 species of spiders . The total number of spider species in the Kinabatangan is unknown.

These survey results show that while the Kinabatangan's reputation is rising worldwide as a biodiversity hotspot, many forest-dwelling wildlife populations suffered a drastic decline since our last surveys in the 2000's, while populations of commensal and invasive species are increasing. It is most likely that the still ongoing forest loss and fragmentation are causing these trends. Retaining the remaining forests and improving habitat connectivity therefore appear as necessary steps to prevent wildlife population extinctions in the short term, and to preserve the region's unique biodiversity.

The Pangi Swiflet Recovery Project



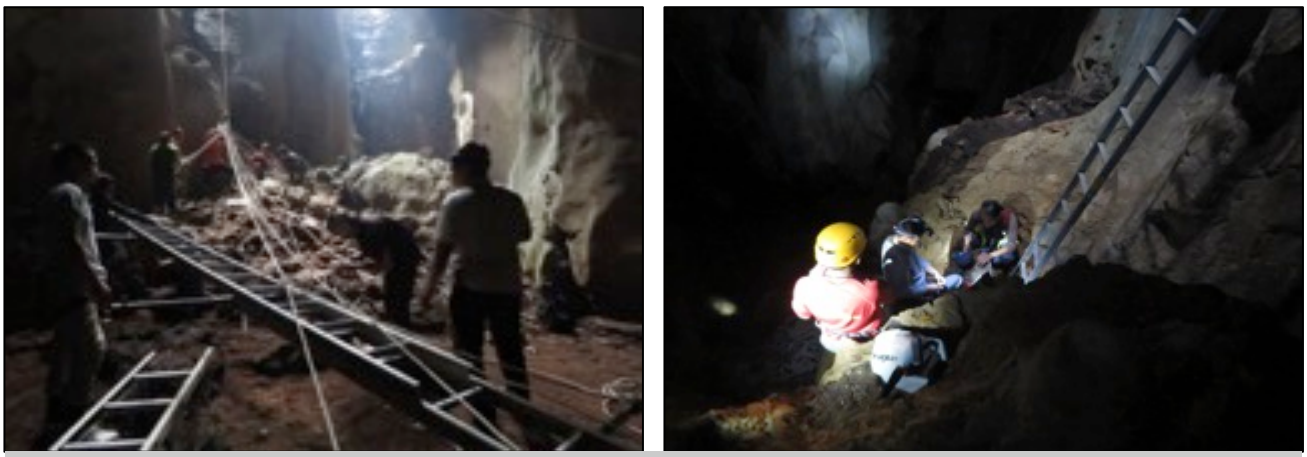
Edible nest swiflet (*aerodramus fuciphagus*) hatching in her nest made up with the bird 's pure saliva.

Historically, the trade of edible swiftlet nests has once been one of the main sources of income for the Kinabatangan communities. During the past two decades however, changes in cave ownership status, the abandonment of sustainable traditional harvesting methods as well as rampant theft of nests still containing hatchlings resulted in the drastic decline of the Kinabatangan swiftlet populations and to local extinction.

In December 2009, Hutan and the SWD decided to work cooperatively to develop a recovery programme to ensure the recuperation and the long-term conservation of the edible nest swiftlet population in the Pangi Forest Reserve near Sukau. This long-term project aims at combining conservation benefits with economic proceeds to the Sukau community through employment and sustainable harvest of the nests.

In 2016, we guarded the four bigger caves in Pangi FR still harbouring the largest breeding swiftlet colonies (33 caves in total, 13 only still are still home to breeding swiftlet pairs - although new additional caves are currently being colonized by the swiflets). New guard posts were built. Hutan hires 13 members of the Sukau community to guard the caves from nest thieves and other intruders. Throughout the year, the 13 Pangi staff spent their entire time in the forest, taking turns day and night to patrol the Forest Reserve. Monthly nest counts showed a maximum of 1,392 nests in 2016. This is a 35% increase in the number of swiftlet breeding pairs since 2015 (1,033 nests) and of 519% since the first nest count in 2011 (225 nests).

In order to minimize as much as possible any source of disturbance to the colonies, we don't harvest the nests commercially. However, once a year, the team cleans up the caves and removes all old and unoccupied nests. Because of their relatively poor condition, these nests don't have any financial value.

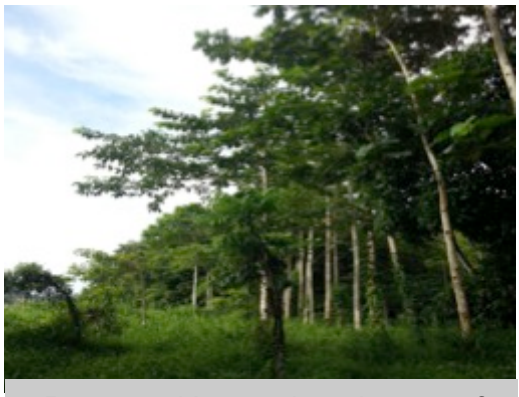


Team preparing ladder and scaffolding to reach the nests located on the roof top of the caves.

Forest Restoration efforts

Forest degradation and fragmentation in the Lower Kinabatangan are now one of the major threats to the long-term survival of most wildlife species in the area. Since January 2008 Hutan has engaged in a long-term project to rehabilitate crucial orang-utan habitat in the Lower Kinabatangan. The project aims at recreating a functional forest ecosystem along the Kinabatangan River.

Hutan now has 6 reforestation plots in the Lower Kinabatangan covering a total of 69.2 acres (28ha). In 2016, 30,582 new seedlings were planted in our 3 most recent plots. This is the highest number of trees ever planted in one year. The planted seedlings comprise of 38 native tree species which were identified by our orang-utan research team as the most favored orang-utan foods.



Four-year-old trees planted at one of the KOCP reforestation sites.

The reforestation team maintains each reforestation plot (cleaning and weeding) for 3 to 5 years after planting. Monitoring of the planted seedlings helps to determine their maintenance requirements and which species are more suitable for reforestation work in Kinabatangan. By the end of 2016, the average survival rate of the monitored seedlings was 81.23%.

Fruits of Ficus sp. (right) and Mallotus muticus (left) produced by four-year old seedlings planted at KOCP restoration plots

In 2016, the team initiated an ambitious project of restoring a new plot of approximately 200 acres of open grassland where the forest was destroyed by extensive fires in 1997. Planted seedlings originated from seven tree species: *Dillenia sp.; Ficus racemosa; Nauclea orientalis; Terminalia catapa; Mallotus muticus; Microccos crassifolia; Diospyros sp*. Several of these species start bearing fruits only three to four years after they are planted, attracting birds and other species of seed dispersers (see pictures). In turn, these seed dispersers favor the colonization of our plots by additional native plant species, such as *Syzigium sp.; Koordensidendron pinnatum; Dracontomelon dao; or Baccaurea stipulate*, whose fruits are heavily consumed by frugivorous species.


New plot recently planted with seedlings (left) – Monthly maintenance of the plots (right)

In 2016, Hutan also built a collection center for seedlings purchased from village home nurseries. Seedlings are purchased locally when they are less than a foot tall. They are then stored and taken care of at the collection center for a few more months, before being planted at the reforestation sites. With the creation this seedling collection centre, Hutan was able to increase its purchase of seedlings. A total of 30,970 seedlings were purchased from 18 village home nurseries, generating a total income of USD10,900 benefiting directly the local community. The KOCP Seedling Collection Center can accommodate up to 40,000 seedlings.

In 2016, the HUTAN reforestation team was composed of 8 women and 2 men from the village of Sukau. Very few women in the Kinabatangan villages have permanent jobs and Hutan is proud to offer them this opportunity. In addition to the eight permanent staff, the reforestation team offers the possibility to other women from the region to join the team for paid "internship" periods of one month. The trainees learn the basics of tree planting and seedling maintenance techniques.

Law Enforcement activities

Since 2005 Hutan works with the Sabah Wildlife Department on a model project to involve directly local community members in the management and protection of the Lower Kinabatangan Wildlife Sanctuary. The Sabah Wildlife Conservation Enactment 1997 allows the Sabah Wildlife Department to appoint selected members of the public as "Honorary Wildlife Wardens" (HWW). The HWW are originally trained by the SWD and work voluntarily to enforce the State wildlife law.

Hutan has included a core team of 7 full-time wardens in its Wildlife Surveys and Protection Unit. In 2016, additional wildlife wardens were appointed among Kinabatangan oil palm plantations and tourist lodges.

Last year, the Hutan's warden team conducted more than 200 patrols by boat and by car, in and around the LWKS (including day and night patrols). Several snares were detected and destroyed during their patrolling activities. Most of these snares were identified close to the edge between forest and oil palm plantations. These poaching practices target primarily wild boars and deer, but because they are non-selective, these devices also catch many other species, especially sun bears and clouded leopards, elephants and orangutans, to name a few of them

Together with the Sabah Wildlife Department, Hutan's wardens also conducted five market raids as part of a campaign to halt the illegal sale of turtle eggs (300 eggs seized) and roadblocks to detect and arrest illegal hunters and wildlife smugglers.

Raid led at the Sandakan market by SWD, police and WSP resulting in the seizure of turtle eggs.

Poaching and bushmeat trade is still rampant in the central parts of Sabah. Over the past two years, the SWD and partners conducted several raids at the weekly markets of the city of Nabawan to stop people from selling bushmeat illegally. In 2016, Hutan's wildlife wardens attended a (heated) dialogue session on illegal hunting organized by the Sabah State Court with communities of Nabawan.

Hutan's HWW also installed camera traps in the Lower Kinabatangan Wildlife Sanctuary to collect evidence on the presence of poachers entering the protected area through a nearby oil palm estate. This approach, and the subsequent collaboration of oil palm plantations, allowed to prevent further poaching activities in the area.

The Sabah High Court set up its Environmental Court in 2015 to better address environmental crime. The court organizes a series of training workshops in order to prepare judges as well as the prosecuting and investigating officers of relevant government departments. The KOCP HWW are contributing their experience of the ground to these training sessions.

Last but not least, Hutan's warden team also worked with the Sabah Wildlife Department's Wildlife Rescue Unit to rescue injured or stranded wildlife in the Kinabatangan.

The warden team during their patrolling activities

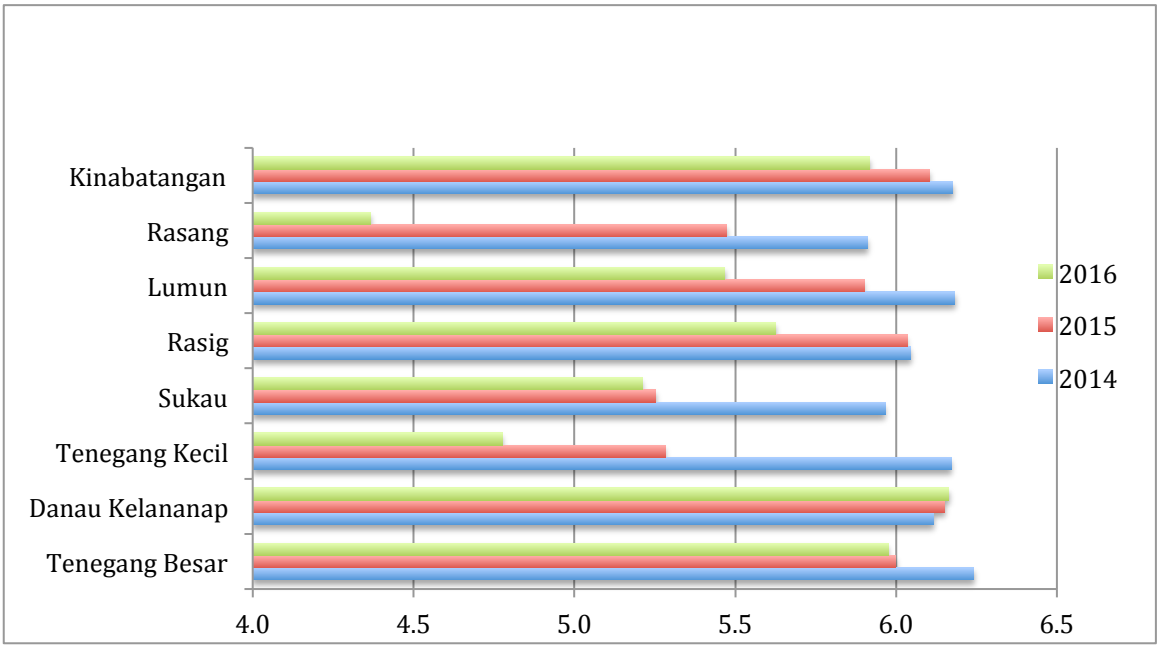
Water quality monitoring

Since 2013, Hutan's Wildlife Surveys and Protection Unit engaged a collaboration with the Kinabatangan River Spirit Initiative monitor the quality of the water of the Kinabatangan River, as a habitat for native freshwater fish species and a source of water for local communities. In 2016, the wardens continued to collect bi-monthly water samples at 21 fixed locations of the Kinabatangan River and its tributaries. Data collected included dissolved oxygen, pH, conductivity, turbidity, temperature, levels of nitrogen and phosphorus. Results showed repeated episodes, especially in the tributaries, of abnormally low levels of dissolved oxygen and pH, as well as high levels of nitrogen and phosphorus.

Hazbollah and Mahadhir taking water samplings and processing them back at the office.

Two sampled tributaries fell into "Class V: extremely poor quality – hazardous for human use" according to the Malaysian water quality classification. Surveys among local fishermen showed that fisheries have collapsed in these tributaries as well as in the main river. Fishermen complain that they have lost their source of income and had to turn to other activities for survival. These unhealthy levels of river pollution could be caused by palm oil mill effluents and the runoff of chemicals used in oil palm plantations such as fertilizers and pesticides.

Water quality in Kinabatangan is currently extremely low and in some places the water is becoming hazardous to human safety. As a result, the fisheries have completely collapsed, destroying what used to be the major source of incomes for the local community. Urgent measures are needed to restore a healthy freshwater ecosystem.



Graph showing the yearly average PH values in Kinabatangan and various tributaries over a three-year period. For some tributaries, PH is reaching values that are not compatible with freshwater species survival.

An innovative programme – Fishermen for Conservation – was established in 2004 by Hutan in collaboration with Sukau fishermen. It aims at substituting the use of tree bark and other forest produces in the construction of the traditional fish and prawn traps by non-forest based and longer lasting material (e.g. plastic wire mesh, recycled linoleum and PVC tubes). Since the project started, it has drawn very favorable reception from the fishermen. The plastic traps proved much more resistant in the water than the wooden ones and fishermen were able to reduce the costs of renewing their trap pool. Illegal tree felling and bark harvesting has dwindled within the LKWS as a direct result of this community initiative. More than 10,000 trees have been saved through this initiative over the years. In 2016, 3 community programmes promoting the "Fishermen for Conservation" initiative were organized in the Kinabatangan and Sandakan districts.

Education and awareness activities

In 2003, Hutan created a team dedicated to increase awareness on environment conservation issues in the Lower Kinabatangan. In 2007, this unit was renamed "Hutan Environmental and Awareness Program" (HEAP) and extended its scope to schools and communities throughout Sabah. HEAP's activities, including environmental education, community awareness programmes and capacity building, aim at strengthening the impact and effectiveness of the other Hutan units.

HEAP offers high-quality free environmental education programmes to primary and secondary schools throughout Sabah. These programmes are sanctioned by the Sabah Education Department and follow our 5-year education masterplan. Each programme is tailored to it specific audience and includes indoor activities (presentations, exhibitions, educational games, quizzes, puppet shows, essay and drawing competitions, etc.) as well as outdoor activities (e.g. camping, jungle trekking, tree planting, boat safaris, etc.).

In 2016, HEAP conducted a total of 49 environmental education programmes, for 27 primary and 22 secondary schools in 7 districts of Sabah. Hutan regularly invited other NGOs (Borneo Sun bear Conservation Centre, Green Semporna) and government agencies (Sabah Wildlife Department, Forestry Department and Environment Protection Department) to participate in these programmes. A total of 12,836 school children and 871 teachers participated in HEAP's education programmes in 2016. During the past 4 years (2013 to 2016), Hutan and SWD have conducted a total of 149 programmes throughout Sabah involving 31,742 pupils/students and 1,996 teachers: see table below (SK: Primary School – SMK: Secondary School).

	2013	2014	2015	2016	Total
Number of school programs	27 (11 SK- 16 SMK)	40 (20 SK - 20 SMK)	30 (16 SK - 14 SMK)	49 (27 SK - 22 SMK)	**146 programmes**
Number of pupils/students	8,058	6,825	4,023	12,836	**31,742 students**
Number of teachers	392	412	321	871	**1,996 teachers**
Yearly Audience	8,450	7,237	4,398	13,835	**33,920 participants**

In order to measure the impact of its environmental education programmes, HEAP conducts evaluation exercises through drawing an colouring for younger children and through questionnaires for the older ones. Teachers are asked to evaluate various aspects of the programmes.

In addition to school events, HEAP was involved in fifteen additional programmes across the state, including (not exhaustive):

- March 2016: Earth Hour in Semporna, organized by Green Connection.
- May 2016: Environmental Day in Kota Kinabalu, Yayasan Sime Darby.
- August 2016: Sukau Programme, organized by HUTAN and the Police Dpt.
- August 2016: "Rythms of Rimba", two-day festival organized in Sandakan.
- October 2016. Five days sensibilisation of the villages located within the Kinabatangan-Segama RAMSAR site, organized by SFD.
- November: Orang-utan week, organized by the SWD in Sepilok – Sandakan.

One of the highlights of the year was a documentary by RTM (Radio Television Malaysia) who spent more than ten days with HUTAN's various units. The three 25 min episodes were broadcasted by TV3, the most popular TV public channel in Malaysia. This documentary showed how a community-based conservation project, villagers and government agencies work together to resolve environmental issues in Kinabatangan.

Film crew from RTM working with KOCP and villagers at the Sukau graveyard to show possible elephant conflicts resolution techniques.

Capacity building

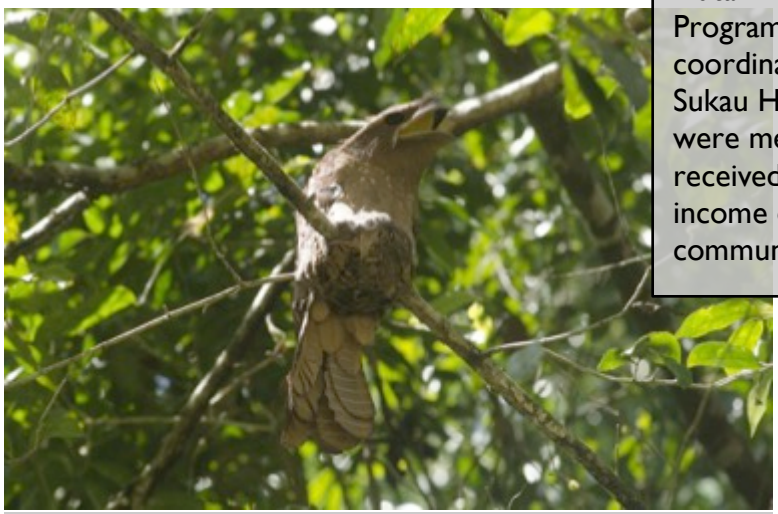
Since the inception of the Kinabatangan Orang-Utan Conservation Project, Hutan has been strongly committed to train its local staff and enhance their capacity in conducting conservation related work. In 2016, Hutan staff attended a total of 16 training programmes and courses , on topics including camera trapping, law enforcement for wildlife crime, water quality monitoring, tree climbing, plant identification, filmmaking, professional photography, climate change, administration, etc.

Five Malaysian undergraduate students from University Putra Malaysia (Bintulu Campus) and University Malaysia Sarawak conducted 3 to 5-month internships with Hutan. Two Malaysian PhD students have been conducting their field research with Hutan: Nurzhafarina Otham (registered at Cardiff University) on elephant conservation framework in Kinabatangan who is expected to defent her thesis by the end of 2017, and Ravinder Kaur who is registered for her first year of PhD about hornbill breeding ecology in Kinabatangan at University Malaya. Another PhD student, Felicity Oram, is attached to Hutan's orang-utan research team since 2013 to conduct her PhD research on "Abundance, Activity Budget and Feeding Ecology of orangutans, *Pongo pygmaeus morio*, in the fragmented forest landscape of the Lower Kinabatangan" at the University Malaysia Sabah. Her thesis will be submitted in 2017.

Hutan gave 4 training sessions on the design and implementation of wildlife monitoring plans to managers and employees of the rubber plantation "Bornion Timber" (mitigation of deer conflicts) and the oil palm company "Wilmar". The training delivered to managers and employees of "Wilmar" was on designing and implementing wildlife monitoring plans for their plantations. This training included techniques of orang-utan population surveys. In 2017, Wilmar will start monitoring orang-utan populations in the forested areas within their oil palm plantations in Sabah.

Hutan also trained forty international graduate students from the Miami University (US) in basic wildlife conservation and management.

Hutan has supported the Sukau Homestay Programme since 2002. In 2016, Hutan's field coordinator was re-elected as the chairman of the Sukau Homestay Programme. In 2016, 14 families were members of the Sukau Homestay and received a total of 624 tourists, generating an income of MYR214,476 (USD49,447) for the community.



Large Frogmouth (*Batrachostomus auritus*) on its nest.

Land acquisition: the (Keruak) Corridor Project

Over recent decades, increasing areas of riverine forests have been deforested and converted to agriculture along the Kinabatangan River, disrupting elephant migration routes, and thus resulting in the emergence of escalating human/wildlife conflicts.

The goal of this project is to secure landscape connectivity of the Lower Kinabatangan Wildlife Sanctuary by establishing and safeguarding strategic forest corridor that connect protected areas in Lower Kinabatangan.

Maintaining forested corridors that allow elephants and other species to move freely along the Kinabatangan River is the only long-term solution to reduce the human/elephant conflicts now affecting both villagers and large plantations in the area.

Since 2005, Hutan has worked to identify privately-owned forested lands that are crucial in re-connecting wildlife habitat fragments in the Lower Kinabatangan region. If these lands become available for sale, they are purchased with international donors' funds and gazetted as an extension of the LKWS, thus ensuring that they remain under natural forest cover for perpetuity.

In 2013, Hutan's partner, the British charity "World Land Trust" launched the "Million Pound Borneo Orang-Utan Appeal" a fundraising campaign aiming to secure a vital 430-acre forest corridor near Sukau. This corridor is composed of 39 privately owned properties and two State Lands. In 2016, 2 forested land parcels in the corridor were secured. The application to gazette the two StateLand parcels as Wildlife Sanctuary was also approved in 2016. Genting Plantations, a Malaysian oil palm company, agreed to allocate 7 parcels (110 acres) owned by the company in the corridor, for the purpose of wildlife conservation. A Memorandum of Agreement with the Sabah State Government will formalise this commitment.

Progress in 2016 brought the total number of properties already secured in the corridor to 38 parcels covering about 377 acres (152.6 ha) of prime orang-utan and elephant habitat .

Lobbying activities / Policies

In 2016, Hutan's "Field Manual: monitoring large terrestrial mammals in Sabah" published in 2013 has been translated by the Sabah Forestry Department into Standard Operating Procedures for Forest Management Units in Sabah.

Hutan is also currently part of a number of project committees and formal technical working groups aiming to improve Sabah's policy framework for biodiversity conservation. These include:

- Advisory panel for the Sabah Wildlife Department;
- Advisory committee at the Sabah Forestry Department for sustainable forest management planning of the Deramakot Commercial Forest Reserve (http://www.deramakot.sabah.gov.my);
- Advisory committee of the Malua BioBank Initiative (http://www.maluabank.com), a programme aiming at creating new investment models for biodiversity conservation in Sabah;
- Jurisdictional Certification Steering Committee of the "Sabah Jurisdictional Approach for Sustainable Palm Oil Production", a state government programme aiming at 100% RSPO certified oil palm production in Sabah by 2025;
- Technical Working Committee of the SFD - UNDP GEF's "Biodiversity Conservation in Multiple-Use Forest Landscapes" project in Kalabakan - Gunung Rara area. The land use plan for the entire area went through various modifications before being eventually finalized in 2016. The original proposed land use plan listed 180,000 ha of exploitation forest vs 52,000 ha in the current one; 40,000 ha of industrial tree plantation vs 5,000 ha now; 18,000 ha of fully protected forests vs 115,000 ha now; 30,000 ha of oil palm plantations and 50,000 ha of mosaic planting are now proposed in the current plan as well. The TWG insisted to retain a couple of viable wildlife corridors under natural forest. Two of these corridors have been identified and set up in the latest land-use planning. They cover respectively an area of 7,000 ha and 900 ha. Additional connectivity across this landscape will be provided by the identification and protection of all HCVF, including river reserves (riparian forests), forests on steep slopes and non-suitable land for agriculture production: http://www.my.undp.org/content/malaysia/en/home/operations/projects/environment_and_energy/80468_forestlandscapes.html.
- Pro tem Committee of the Bornean Elephant Conservation Alliance;
- Steering committee of the Keruak Wildlife Corridor Project aiming at securing landscape connectivity of the Lower Kinabatangan Wildlife Sanctuary by establishing and safeguarding strategic forest corridors that connect protected areas in the Lower Kinabatangan. The steering committee also includes 14 government agencies and is chaired by the Ministry of Tourism, Culture and Environment;
- Working group of the Infectious Disease Emergence and Economics of Altered Landscapes, a joint programme by the EcoHealth Alliance, SWD and UMS, aiming at mitigating threats from land-use transformations, climate change and emerging infectious diseases.

Today, 1.87 million ha of forest are fully protected in Sabah: this represents over 26% of the total land mass of the State. This figure doesn't take into account additional protected areas like HCV or indigenous conservation community areas. By 2025, the State government wants to fully protect 30% of the land mass. As such, an additional 400,000 ha of forest needs to be identified for full protection. Key connectivity areas that will reinforce the current network of protected forests need to be identified to enhance the resilience of this network. Data produced during surveys and field work are key information to drive these choices.

In 2016, environmental and social groups (both within and outside of the country) fiercely debated and opposed the project proposed by the government to build a bridge/highway in Sukau. Early 2017, the government finally decided to scrap off this project to safeguard the lower Kinabatangan and its potential for ecotourism. Because of this project, local NGOs came together under a same banner with an unified voice to develop the campaign "Save Kinabatangan". A document was prepared and shared with the authorities at the highest level at the end of 2016. A meeting has been scheduled between the "Save Kinabatangan" group and the Chief Minister of Sabah and its government to discuss this document and what needs to be done to manage the Kinabatangan efficiently.

International collaboration

Disseminating the results of our work is essential to influence policy makers, land users and land-use deciders, and society at large. In 2016, HUTAN continued its membership with several international initiatives, including:

- Great Ape Section of the IUCN Species Survival Commission (SSC) Primate Specialist Group;
- IUCN SSC Asian Elephant Specialist Group;
- IUCN SSC Wildlife Health Specialist Group;
- Scientific Commission - Great Apes Survival Partnership (GRASP-UNEP);
- Scientific Advisor, "PONGO Alliance" and "Orangutan Land Trust";
- RSPO: Hutan became a member of the Roundtable for Sustainable Palm Oil (RSPO) in April 2013. In 2016, Hutan continued to be a member of the RSPO's Biodiversity & High Conservation Value (BHCV) Working Group. Hutan also became a member of the RSPO's Compensation Task Force (CTF) which was formed under the BHCV Working Group.

In 2016, Marc was invited to lead a report published under the UNEP GRASP initiative entitled "Oil Palm paradox: sustainable solutions to save great apes". This report provides practical recommendations about land use planning and ways to manage oil palm landscapes that could improve significantly the chances of great ape survival in oil palm landscapes in both Asia and Africa. HUTAN strongly believes that engaging with the oil palm industry is urgently needed if we want to improve the chances of long-term survival of many ape populations in the two continents.

Marc Ancrenaz is also the co-founder of "Borneo Futures" an initiative dedicated to changing and improving the well being of living things in Borneo by sharing accurate information and raising awareness of the needs to preserve the planet's unique and natural environment for future generations (http://www.borneofutures.org). Among other achievements, BF has been instrumental to highlight the issues of forest fires in Kalimantan and the subsequent creation of the "peat Regency Agency" by the Indonesian government; to the listing of the Bornean orang-utan as "Critically Endangered" under the IUCN Red List; and to evaluate what are the real costs of deforestation for the island of Borneo.

Hutan staff and directors gave 24 lectures and presentations and have participated in more than 48 conferences, workshops and events in Malaysia and internationally in 2016. For example in 2016, HUTAN was invited to contribute to the symposium about landscape conservation organized by Woodland Park Zoo at the IUCN Park Congress in Hawaii; or at the Heart of Borneo International Conference.

In addition to oral lectures and communications, additional outputs produced by HUTAN also include scientific articles published in peer-reviewed journals. In 2016:

Abram, N.K., Meijaard, E., Wilson, K.A., Davis, J.T., Wells, J.A., Ancrenaz, M., Budiharta, S., Durrant, A., Fakhruzzi, A., Runting, R., Gaveau, D., and K. Mengersen. 2016. Oil-palm community conflict mapping in Indonesia: a case for better community liaison in planning for development initiatives. *Applied Geography*, 78, 33-44. http://dx.doi.org/10.1016/j.apgeog.2016.10.005

Abram N.K., MacMillan, D.C., Xofis, P., Ancrenaz, M., Tzanopoulos, J., Ong, R., Goossens, B., Koh, L.P., Valle, C., Peter, L., Morel, A.C., Lackman, I., Chung, R., Kler, H., Ambu, L., Baya, W., and A.T. Knight. 2016. Identifying Where REDD+ Financially Out-Competes Oil Palm in Floodplain Landscapes Using a Fine-Scale Approach. *PLoS ONE* 11(6): e0156481. doi:10.1371/journal.pone.0156481

Ancrenaz, M., Meijaard, E., Wich, S. and J. Simery. 2016. Palm oil paradox: sustainable solutions to save the great apes. UNEP/GRASP, Nairobi. 57 pp: http://www.un-grasp.org/videos-resources/publications/

Ancrenaz, M., Gumal, M., Marshall, A.J., Meijaard, E., Wich , S.A., and S. Husson. 2016. *Pongo pygmaeus*. The IUCN Red List of Threatened Species 2016: e.T17975A17966347.

Gaveau, D.L.A., Sheil, D., Husnayaen, Salim, M.A., Arjasakusuma, S., Ancrenaz, M., Pacheco, P., and E. Meijaard. 2016. Rapid conversions and avoided deforestation: examining four decades of industrial plantation expansion in Borneo. *Nature Scientific Reports*: 32017. DOI: 10.1038/srep32017.

Goossens, B., Sharma, R., Othman, N., Kun-Rodriguez, C., Sakong, R., Ancrenaz, M., Ambu, L.N., Jue, N.K., O'Neil, R.J., Bruford, M.W., and L. Chikhi. 2016. Habitat fragmentation and genetic diversity in natural populations of the Bornean elephant: implications for conservation. *Biological Conservation*. http://dx.doi.org/10.1016/j.biocon.2016.02.008.

Leendertz, S.A., Wich, S.A., Ancrenaz, M., Bergl, R.A., Gonder, M.K., Humle, T., Leendertz, F. 2016. Ebola in great apes – current knowledge, possibilities for vaccination, and implications for conservation and human health. *Mammal Review*, doi: 10.1111/mam.12082.

Marshall, A.J., Wich, S.A., and M. Ancrenaz. 2016. Fresh strategies to save orangutans. *Nature* (Correspondance), 535: 493.

Mathai, J., Duckworth, J.W., Meijaard, E., Fredriksson, G., Hon, J., Sebastian, A., Ancrenaz, M., Hearn, A.J., Ross, J., Cheyne, S., B.C.C., and A. Wilting. 2016. Carnivore conservation planning on Borneo: identifying key carnivore landscapes, research priorities and conservation interventions. *Raffles Bulletin of Zoology* Supplement, 33: 186-217.

HUTAN wish to thank our long-term partners who supported our activities in 2016:

More than 100,000 USD:

World Land Trust – Arcus Foundation

50,000-100,000 USD:

Houston Zoo – North England Zoological Society (Chester Zoo) - Woodland Park Zoo – Waterloo Foundation

25,000-50,000 USD:

Basel Zoo – USFW Great Ape Conservation Fund

5,000-25,000 USD:

Arizona Conservation Center (Phoenix Zoo) – AZA TAG – East Coast Zoological Society (Brevard Zoo) - Cleveland Zoological Society – Fondation Ensemble – Holonics Hospital – Zoo la Palmyre – Oregon Metroparks Zoo – Seaworld Bush Gardens Conservation Fund - Synchronicity Earth – The Orangutan Project – Utah Zoological Society – Wildlife Conservation Network - Zooparc de Beauval

<5,000 USD:

Apenheul Zoo – Intrepid Travel – Les Amis du Zoo de Vincennes – Toronto Zoo