Long-term wildlife monitoring in the Rasig Corridor.

(Results for the first year: 2019)

Executive summary

This report presents some of the preliminary results of the first year of the long-term biodiversity monitoring undertaken in the Rasig corridor. With this project, our goal is to document whether forest corridors are an effective tool to sustain populations of wildlife in an oil palm context.

In 2019, our aim was to establish baseline data that could be compared with in the future. We also wanted to test various techniques and assess their potential use in the future in terms of required resources, replicability and reliability. Data collected in 2019 are currently being analysed by a Malaysian student who is pursuing her MSc at Manchester University, UK. Thus, this report is a descriptive exploration of what was achieved in 2019, rather than a final analysis.

As it was expected, our preliminary results for 2019 showed that species richness and abundance was higher in the forests bordering the Rasig corridor than in the corridor itself or the nearby active oil palm plantations. However many species are increasingly using the Rasig corridor. This shows that even at its earlier stages, a corridor (forested or covered with palms) is an essential element to sustain the dynamic and functionality of animals' communities. The results acquired during the first year of our reforestation efforts are also very encouraging, with very high survival and growth rates of seedlings that were planted during the year.

To be meaningful, this monitoring needs to be pursued on the long-term, over several years.

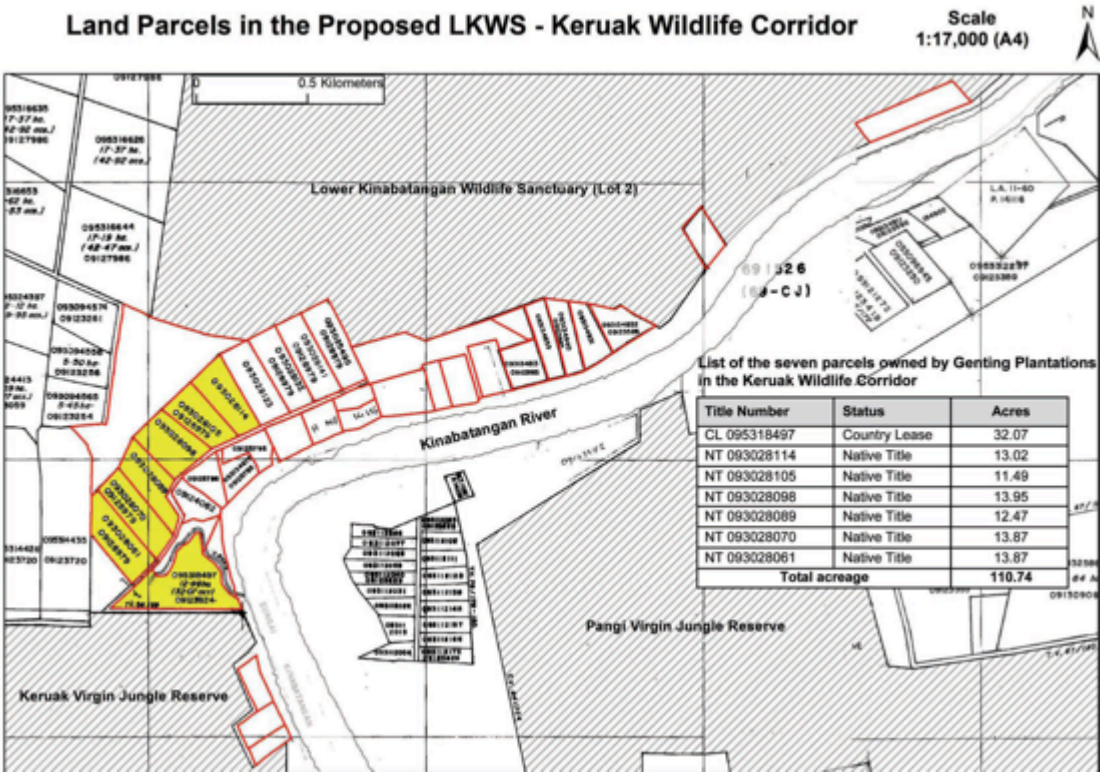
Colugo or flying lemur, *Galeopterus borneanus*, spotted and photographed by the Reforestation team within the Rasig corridor

Preamble

Habitat fragmentation is one of the major threats to the survival of wildlife populations in the Lower Kinabatangan. Since 2013, HUTAN and its partners have pioneered a strategy to acquire privately-owned land parcels and create corridors for wildlife that link together patches of isolated forests.

A first corridor located along the Kinabatangan River, called "Rasig Corridor", was finalized in 2019. This corridor is linking Lot 2 of the Lower Kinabatangan Wildlife Sanctuary (LKWS) with the "Keruak Virgin Jungle Forest reserve". It consists of 31 forested parcels: at the time they were acquired, 29 were privately-owned (182.34 acres) and two were state land (130 acres). Seven additional parcels were belonging to Genting Plantation and were planted with oil palms (110.74 acres). On August 27th, 2018 Genting and the Sabah Wildlife Department signed an official Memorandum of Agreement and these seven parcels were reallocated to finalize the creation of the "Rasig" corridor: Map 1.

The HUTAN Reforestation team is currently restoring these parcels by planting and maintaining seedlings of native trees.



Map 1 shows the parcels of the "Rasig" or "Keruak" Corridor (the periphery of the corridor is indicated by the red line; the yellow parcels are belonging to Genting Plantations and are planted with mature oil palms).

Goals of the "Rasig Wildlife Monitoring"

The overall goal of the "Rasig Wildlife Monitoring" is to better understand the value of forest corridors in an oil palm context for biodiversity and nearby ecosystems.

With this particular monitoring we try to answer the following questions:

- What is the biodiversity value of a forest corridor (what species use and benefit the most from these corridors: survival, movement, food)?
- What is the dynamic of wildlife colonization processes of these corridors?
- What is the optimum design of a corridor (size, length, shape, location, tree composition, planting regime and replanting strategies)?
- What is the potential impact of corridors on surrounding plantations?

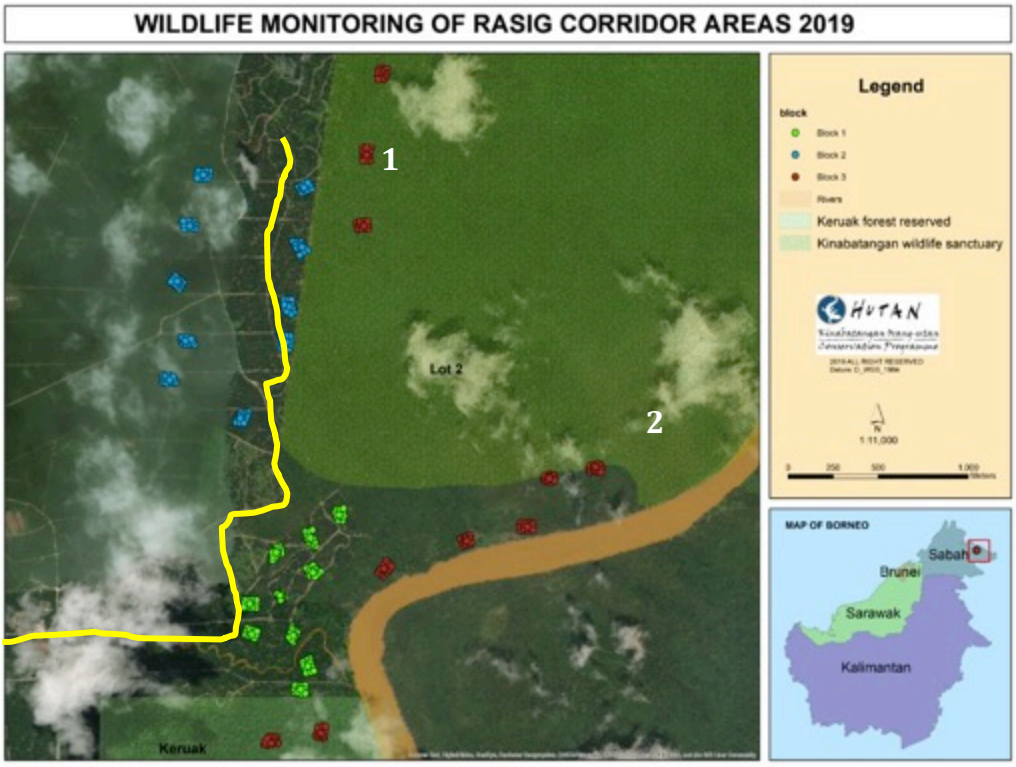
Of course, answering these questions is a long-term endeavor that will require several years of continuous monitoring.

The first year of the study aimed to establish the baseline data and test various methodologies that will be used subsequently to assess the success of the corridor. For 2019, our main objectives were:

- To determine the cost effectiveness of various survey techniques, and their relevance for wildlife assessment;
- To compare a multi-taxa species composition and species richness between three treatment areas:
    - (1) non-exploited parcels planted with palms in the process of being restored with native trees;
    - (2) active oil palm plantation;
    - (3) logged-over and disturbed forest;
- To identify key biodiversity features that affect species composition in the three treatment sites;
- To analyse the results of this preliminary study to design and refine the long-term monitoring methodology that will be used to asses the impact of forest corridor on biodiversity;
- To monitor the results of our replanting strategy and adapt our reforestation activities accordingly;
- To use the "Rasig monitoring" as a training platform for local students and researchers.

Methodology.

The study area incorporates the Rasig corridor and surrounding areas*, i.e.* protected forests of Keruak and Lot 2 of the LKWS, and oil palm estates bordering the forest: Map 2.



Map 2: Location of the study area showing the position of the wildlife plots in the three treatment areas (the yellow line shows the road used for night survey; numbers 1 and 2 the locations used for gibbon call surveys).

1. Monitoring of large animal species

Our target species include primarily fully protected species (sun bear, orangutan, elephant, clouded leopard, proboscis monkey) and game species (deer, wild boar). Direct and indirect sightings were recorded on a *ad hoc* basis during field activities and during specific recce-walk surveys following the standardized methodology commonly used in Sabah[1]. Gibbon call surveys were also carried out in two locations within Lot 2 of the LKWS: one location was close to the Rasig corridor while the second was close to the oil palm plantations

[1] Ancrenaz, M. 2013. *Field Manual: Monitoring large terrestrial mammals in Sabah. Part 1: Planning, developing and implementing a wildlife strategy – Part 2: Field activities*. Sabah Forestry Department, Sandakan, Sabah. 153 pp.

Additional information is also recorded from camera traps and interview surveys with local staff and oil palm workers working in nearby parcels.

2. Monitoring small species of wildlife

Small species monitoring was conducted using a plot sampling approach. Each wildlife plot constituted of four parallel 40 m long transects interspaced by a distance of 20 m: Figure 1.

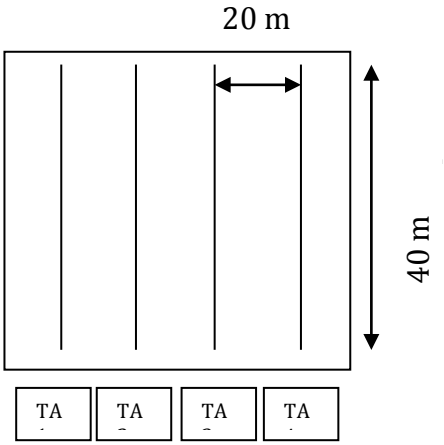


Figure 1: Structure of a wildlife plot

From March to August 2019, we established ten plots in three treatment sites (a total of 30 plots):

- *Treatment 1*: parcels 23 and 31-36, under mature oil palms and being replanted by the HUTAN Reforestation team;
- *Treatment 2*: active oil palm plantation located in the upper part of the study area;
- *Treatment 3*: degraded forest of Lot 2 of the LKWS, Rasig corridor and Keruak FR.

In each plot, we combined several techniques:

- *Small mammal trapping.*

Traps were set up at a 20 m intervals along the 40 m transect line (for a total of 12 traps per plot). At each trap location, we assessed micro-environmental conditions by allocating a qualitative score of presence (0)/absence (1) to the following variables:

  - canopy height and cover (quantified from pictures taken with a camera),
  - vegetation connectivity (Presence/Absence),
  - presence of water body, dead wood, log, and vine density (Presence/Absence).

Each trap was baited with palm oil kernel, coconut or ripened banana. Traps were checked twice a day, in the morning (around 0800 hrs) and in the evening (1700 hrs) for five days and five nights, consecutively. Captured individuals were identified at the species level without anesthesia or direct handling. Captured individuals were released immediately following positive species ID. This approach was selected to reduce the stress to the animals and minimize the risk of possible death. However since the animals were not marked, we could not use the "Capture-Recapture" analysis. In 2019, the team conducted a set of two surveys at each sampling plot.

- *Amphibian and reptile survey.*

Visual and acoustic encounter surveys were conducted along the established 40-metre transect within each plot between 1800hr and 2100hr. We recorded presence of individual species along the transects: every 60 meters (ie one 40m long line and the space between two consecutive lines), we started a new list of Presence/Absence

species. Then a kilometric index of encounter was calculated to evaluate semi-quantitative abundance of frog species. Frog identification was done from calls and direct sighting (following manual handling if necessary).

- *Bird survey.*

These surveys were conducted early morning before the small mammal trapping. For each plot, the team reached the survey point located in the middle of the plot and spent 15 minutes recording species either sighted or heard within the plot.

- *Night survey.*

Night surveys were conducted from a vehicle along a pre-establish segment of road totaling 15.8 km.

- *Camera trapping.*

We deployed Panthera V3, V4 and V6, and Reconyx RX 890 units with passive infrared motion sensors from March to August 2019. Each camera was located in the approximate middle location of each plot, and was left for 6 weeks. Camera units were mounted on trees at about 0.3 m above ground. Successive camera stations were separated by at least 1 km, and the exact location of each camera was recorded with a Garmin GPS MAP 64 S using WGS84 Map.

3. Monitoring reforestation efforts

The HUTAN Reforestation team is in charge of restoring the part of the Rasig corridor covered with palms. Recreating a forest within an oil palm landscape requires planting and maintaining seedlings of native trees, but also the monitoring these seedlings. The team is collecting regular data about species planted, survival rate, growth rate, signs of wildlife damages, etc.

Results.

Data collected in 2019 is currently being analyzed by Amanda Shia, a Malaysian student, who registered for a MSc on "Zoo Conservation Biology" at Manchester Metropolitan University, UK. Amanda is evaluating the efficiency of the various techniques that were used in the field and looking for ways to improve the analytical process of the results. Final interpretation of the results will be available later this year after the completion of Amanda's MSc. We will then be able to refine the entire monitoring strategy depending on these results.

Consequently, this report is a preliminary description of our results for the year 2019.

- *Large mammal monitoring*

    - Non Human Primates

Gibbon (*Hylobates funereus*) surveys were carried out on three consecutive mornings at the two selected locations in September and in October 2019 (n=12 independent survey counts). The overall average of calling groups was 2.0 calling groups/km^2. More groups were heard in September than in October (average of 9 groups *vs* 3). Gibbon density was higher in the front site (location nb 2) than in the back site (location nb 1). Until now, we still have no evidence that gibbons are using the Rasig corridor to move between Lot 2 and the Keruak FR.

Several orangutans were detected within the Rasig corridor and around it in Lot 2 and Keruak FR. Some individuals were spotted by the HUTAN team of researchers during field activities, without being identified. The camera traps captured pictures of several individuals, especially when orangutans were walking on the ground in the Rasig corridor.

The HUTAN Orangutan research team followed two individuals in and around the Rasig corridor area:

- An unflanged male followed for seven consecutive days was named Rasig. This individual spent most of his observation time between Rasig and Lot 2 of the LKWS;
- A adult male with small flanges, called Mandur, was followed for five full days in the Rasig corridor;

These preliminary results indicate that orangutans are already using the Rasig corridor to move back and forth between Lot 2 of the LKWS and Keruak FR. In the future, the team intends to habituate and follow resident individuals who are living in Keruak FR and Lot 2 of the LKWS to document how the animals are using the corridor.

Mandur, adult male followed for 5 consecutive days in the Rasig corridor

Both species of macaques (*Macaca fascicularis* and *M. nemestrina*) are common visitors of the corridor. These two species are adapting fairly well to human-man landscapes. A harem of proboscis monkeys (*Nasalis larvatus*) was spotted several times close to the Kinabatangan River within ther Rasig corridor, as well as a group of red leaf monkeys (*Presbytis rubicunda chrysea*). Last but not least, a slow loris (*Nycticebus menagensis*) were spotted at night several times in the corridor. In total six species of primates (out of the ten identified in Lower Kinabatangan) have been spotted inside the corridor so far.

- Game species

Wild boars are the commonest game species sighted in the Rasig area: these animals are commonly observed during field activities, as well as their signs of their presence: footprints, upturned ground. Rusa deer were mostly found in the more hilly parts of the Rasig corridor, as indicated by the results of our camera trapping. However at night, they would venture inside the replanting area located downhill to feed on young saplings. Mouse deer were also regularly present in the corridor, as indicated by the preeenc of footprints and pictures taken by camera traps (see section below).

Orangutans are regularly detected (direct sightings or camera traps) walking on the ground in the Rasig corridor

A female deer, *Cervus unicolor*, and her young captured at night by a camera trap.

Wild boar, *Sus barbatus*, are a regular visitor of the Rasig corridor

- *Small mammal trapping.*

Two successive trapping sessions were conducted from May 8th to June 29th (total of 379 captures with 12 species) and from July 6th to August 1st (350 captures with 15 species). In total, 17 species of mammals were captured, belonging to six families: Table 1.

Table 1: Total number of captured individuals in three treatment areas during two repeated capture sessions.

	Family	Scientific name	Common name	Nb of individuals
1	**MURIDAE**	*Maxomys rajah*	Rajah maxomys	1
2		*Rattus tanezumi*	Asian house rat	16
3		*Maxomys whiteheadi whiteheadi*	Whitehead's maxomys	2
4		*Rattus tiomanicus sabae*	Tioman rat	133
5		*Niviventer cremoniventer kina*	Dark-tailed tree rat	6
6		*Sundamys muellari kina*	Muller's rat	196
7		*Rattus exulans*	Polynesian rat	6
8	**TUPAIIDAE**	*Tupaia gracilis gracilis*	Slender treeshrew	2
9		*Tupaia tana kretami*	Large treeshrew	134
10		*Tupaia minor caedis*	Lesser treeshrew	22
11		*Tupaia longipes*	Plain treeshrew	117
12	**SCURIDAE**	*Calloscirius notatus*	Plaintain squirrel	78
13		*Calloscirius prevostii pluto*	Prevost's squirrel	2
14		*Sundascirius lowii lowii*	Low's squirrel	1
15	**ERINACEIDAE**	*Echinosorex gymnurus albus*	Moonrat	5
16	**GEOEMYDIDAE**	*Cuora aboinensis kamaroma*	Malayan box turtle	1
17	**VIVERRIDAE**	*Arctogalidia stigmatica*	Borneon striped palm civet	8

The five most commonly captured species were the Mueller's rat (n=196 captures), the large treeshew (n=134), the tioman rat (n=133), plain treeshrew (n=117) and the plantain squirrel (n=78), representing a total of 90.2% of all captures. The rank abundance analysis caught in the traps showed that the Mueller rats the most responding species to capture: Figure 2.

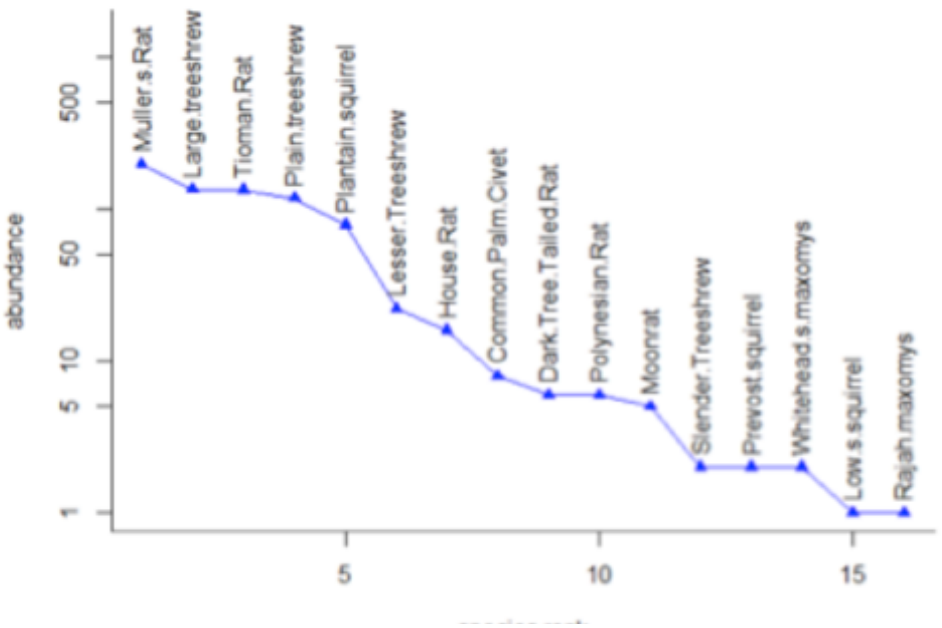


Figure 2: Rank abundance of small mammals caught during

two trapping sessions at three treatment areas.

The proportion of captures of nocturnal and diurnal species was roughly equivalent with 365 nocturnal and 356 diurnal individuals. Nocturnal species included seven rodents (Muridae: n=360 captures) and the moonrat (n=5 captures), while diurnal species were represented by 4 species of treeshrews (n=275) and three squirrels (n=81). An additional two species not targeted in this study were captured: a Malayan box turtle and a bornean striped palm civet (8 captures).

Results per treatment area show some interesting trends (see Table 2):

- Overall, 187 captures were achieved in Block 1 (Rasig under mature palms), 252 in block 2 (active palm plantations) and 290 in Block 3 (forest);
- More rodents were captured in Block 2 (active oil palm plantations) than in the other two blocks;
- Invasive and commensal rat species (tioman and house rats) are more frequent in highly disturbed blocks (rasig and palm plantations) than in the forest;
- More treeshrews were captured in Block 3 (forest) than the two other blocks;
- Since animals were not marked, the same individuals could be recaptured several times during our capture sessions.

Overall, more species were recorded in the forests of Block 3 (n=14 species) than the Rasig Corridor or the palm plantation (n=6 species for both blocks).

Table 2: Number of small mammal captures in three treatment blocks (two successive capture sessions)

Local name	BLOCK 1	BLOCK 2	BLOCK 3
Common Palm Civet	2	3	3
Plantain squirrel	28	40	10
Prevost squirrel	0	2	0
Moonrat	0	0	5
Rajah maxomys	0	0	1
Whitehead's maxomys	0	0	2
Dark Tree Tailed Rat	0	0	6
Polynesian Rat	2	2	2
House Rat	7	7	2
Tioman Rat	56	76	1
Muller's Rat	60	95	41
Low's squirrel	0	0	1
Slender Treeshrew	0	0	2
Plain treeshrew	2	0	115
Lesser Treeshrew	0	0	22
Large treeshrew	31	26	77

Despite our efforts to minimize the stress to the animals, a total of 16 individuals died during these two capture sessions: five animals during the first phase and 11 during the second phase. This shows the sensibility of small mammals to trapping. Plantain squirrel were particularly vulnerable with six deaths being recorded during our captures.

Moonrat, *Echinosorex gymnurus albus*, captured only in the forest block

Treeshrews, insectivorous species especially abundant in the forest block

- *Amphibian and reptile surveys*

A total number of 17 species of frogs belonging to 14 genus and five families were identified during frog surveys. More species were recorded in the forests of Block 3 (13 species), than active palm plantations (9 species) or Rasig (6 species): Table 3.

Table 3: Frog species identified in each survey block

Family	Genus	Spesies	Block 1	Block 2	Block 3
BUFONIDAE	Ingerophrynus	divergens			X
DICROGLOSSIDAE	Fejervarya	limnocharis		X	X
	Limnonectes	finchi		X	X
MICROHYLIDAE	Chaperina	fusca		X	X
	Kaloula	baleata		X	
	Metaphrynella	sundana			X
	Microhyla	borneensis		X	X
		perparva			X
RANIDAE	Amnirana	nicobariensis	X	X	
	Chalcorana	megalonesa	X	X	X
	Hylarana	pulchrana	X	X	X
RHACOPHORIDAE	Kurixalus	appendiculatus	X		X
	Nyctixalus	pictus			X
	Polypedates	colletti			X
		leucomystax	X	X	
		macrotis	X		

	Rhacophorus	harrissoni	X
	unknown	unknown	X

Only two species of frogs were found in the three different blocks: the white-lipped frog, *Chalconara megalonesa*, and the rough-sided frog, *Hylarana pulchrana.* Indicator species of disturbance and commensal species were more commonly found in oil palm plantations and in the Rasig corridor than in the forest plots. For example, the white-lipped frog, the cricket frog, *Amnirana nicobariensis*, or the four-line tree frog, *Polypedates leucomystax*, were more than ten times more frequent in disturbed areas than in forested areas: Table 4.

In the contrary, seven species of frogs were only found in the forest of Block 3. Most of these species were tree frogs that strongly depend on forest for breeding.

Environmental conditions encountered in the Rasig corridor are still not favorable enough to allow for a swift colonization of forest-dependent frog species.

Table 4: Kilometric index of species encounter in three different treatment areas.

	Species	Block 1	Block 2	Block 3
1	Amnirana nicobariensis	0.9	1.8	
2	Chalcorana megalonesa	7.7	10.5	1.8
3	Chaperina fusca		1.4	
4	Fejervarya limnocharis		3.2	
5	Hylarana pulchrana	0.9	0.5	5
6	Ingerophrynus divergens			0.5
7	Kaloula baleata		0.5	
8	Kurixalus appendiculatus	0.5		3.2
9	Limnonectes finchi		0.5	0.5
10	Metaphrynella sundana			5
11	Microhyla borneensis		0.9	2.3
12	Microhyla perparva			1.8
13	Nyctixalus pictus			0.5
14	Polypedates colletti			1.4
15	Polypedates leucomystax	1.8	1.8	
16	Polypedates macrotis	0.5		
17	Rhacophorus harrissoni			0.9
	unknown			0.9

The species accumulation curve indicates that not all species present on the treatment areas have been identified during our surveys yet. However the curves also shows that fewer species are expected to be found in oil palm plantations (active or not) than in forest areas: Figure 4.

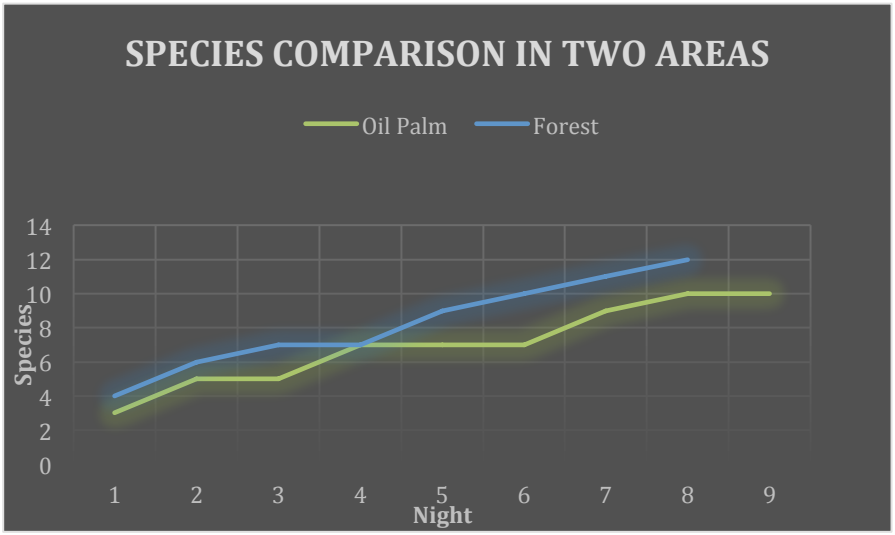


Figure 4: Species Accumulation Curve in two different treatment areas: oil palm (active or not) and forest

The common frilled tree frog, *Kurixalus appendiculatus*, easily recognizable by her rough legs

The matang narrow mouth frog, *Microhyla borneensis*, endemic species that is found in forests and oil palm plantations

- *Bird surveys.*

Two treatment areas were distinguished for bird surveys: 10 plots located in treatment area 2 (active oil palm plantations) and 10 plots located in the forests of the Rasig corridor (areas 1-3). The team surveyed these 20 plots twice.

Overall, we recorded a total of 43 species belonging to 20 families: 43 species were recorded in the forested area, and only 18 species in the oil palm estate: see complete list in Annex I. Most birds recorded in the oil palm habitat are colonizer and generalist species, mostly feeding on insects and living below the forest canopy.

Oriental Magpie Robin (*Copsychus saularis adamsi*), a common endemic in degraded forest and oil palm plantations

Sacred Kingfisher (*Todiramphus sanctus*), very scarce migant spotted in the forest but not in the oil palm plantations

- *Night survey.*

A total of seven mammals (and three nocturnal birds – two owls and the night heron) were spotted during the night surveys:

Felidae	*Felis bengalensis*	Leopard cat
Viverridae	*Viverra tangalunga*	Malay civet
	Paradoxurus hermaphrodites	Common palm civet
Suidae	*Sus barbatus*	Bearded pig
Cervidae	*Cervus unicolor*	Rusa deer
Elephantidae	*Elephas maximus borneensis*	Bornean elephant
Lorisinae	*Nycticebus menagensis*	Slow loris

Leopard cats were the commonest species spotted during these surveys with an average of 1 sighting for 5 km. These species are generalist species that can adapt fairly well to significant habitat disturbances.

Leopard cat, a common apex predator roaming at night in oil palm plantations

Oriental bay owl (*Phodilus badius*), mostly found in forests

- *Camera trapping*

A total of 30 camera traps were deployed: 6 Panthera and 24 Reconyx units. All these units were refurbished camera and several of them faced severe dysfunction during their deployment. However a variety of medium-size animals were captured, such as mouse deer, civets and cats, eagles and pheasants.

Crested serpent eagle foraging for small preys in the palm area of the Rasig corridor

Malay civet, a common visitor of all habitat types of the Rasig corridor

- *Reforestation efforts.*

During the year, the HUAN Reforestation team planted 31,815 seedlings belonging to 29 different tree species and 18 tree families. The overall survival rate was 79.35% at the end of the year, a very encouraging result considering the exceptionally dry and hot season encountered in 2019.

The monitoring intends to determine what tree species are the most suited for replanting exercises within an oil palm context. We consider that tree species with a survival rate superior to 75% are good candidates for recreating forest corridors in an oil palm estate. We are particularly interested in species that are producing edible fruits for wildlife, such as *Ficus sp*. , *Nauclea sp.*, or *Dracontomelon sp*., or in fast growing species that will quickly establish a forest corridor with a semi-close to close canopy, such as *Terminalia catappa, Octomeles terminalia, Pterospermum sp.,* or *Colona serritafolia.*

The main cause of mortality recorded in 2019 was the extensive drought that hit Kinabatangan for several months during the year. Predators such as wild boars or deer are responsible in delayed growth, while some invertebrates killed a few seedlings (less than 10% of the total mortality rate).

Some of the seedlings planted in early 2019 were already 3 m high at the end of the year. The development of a diverse, complex and multi-dimensional habitat below the crown of the palms will attract an increasing number of seed dispersers such as birds

or small mammals. In turn this will result in the growth of new plant species that were not included in our first wave of replanting. Our monitoring will also document this dynamic process.

Last but not least, we are also using the Rasig Reforestation Plot for education and awareness rising. During the year, numerous guests visited our plots to plant a tree, such as school children, workers from Genting Plantations or guests from Malaysia, Japan, USA, UK or France for example.

Annex I. List of species encountered during bird surveys.

B1	
FAMILY	**SPECIES**
ACCIPITRIDAE	Crested Serpent Eagle
	Wallace-hawk Eagle
ALCEDINIDAE	Collared Kingfisher
	Sacred Kingfisher
BUCEROTIDAE	Black Hornbill
	Pied Hornbill
	Rhinocheros Hornbill
CISTICOLIDAE	Dark-necked Tailorbird
	Red-headed Tailorbird
	Rufous-tailed Tailorbird
COLUMBIDAE	Emerald Dove
	Green Pigeon
	Imperial Pigeon
	Litte green Pigeon
	Spotted Dove
CORVIDAE	Slender-bill Crow
CUCULIDAE	Greater Coucal
	Lesser Coucal
	Plaintive Cuckoo
DICAEIDAE	Orange-bellied Flowerpecker
ESTRILDIDAE	Chestnut Munia
	Dusky Munia
	Tawny-brested Parrotfinch
EURYLAIMIDAE	Black&yellow Broadbill
MUSCICAPIDAE	Orentail Magpie Robin
	White-crowned Shama
NECTARNIIDAE	Bronze-throated Sunbird
	Crimson Sunbird
	Olive-backed Sunbird
PASSERIDAE	Eurasian-tree Sparrow
PHASIANIDAE	Jungle Fowl
PICIDAE	Maroon Woodpecker
PYCNONOTIDAE	Cream-vented Bulbul
	Grey-cheeked Bulbul
	Olive-winged Bulbul
	Yellow-vented Bulbul
RALLIDAE	White-breated Waterhen
RHIPIDURIDAE	Pied Fantail
STURNIDAE	Common Myna
	Hill Myna
TIMALIIDAE	Bold-stripd Tit-Babbler
	Chestnut winged Babbler
	Chestnut-rumped Babbler

B2	
FAMILY	**SPECIES**
ACCIPITRIDAE	Crested Serpent Eagle
ALCEDINIDAE	Collared Kingfisher
CISTICOLIDAE	Red-headed Tailorbird
	Rufous-tailed Tailorbird
CUCULIDAE	Greater Coucal
	Lesser Coucal
ESTRILDIDAE	Chestnut Munia
	Dusky Munia
MUSCICAPIDAE	Orentail Magpie Robin
	White-crowned Shama
NECTARNIIDAE	Crimson Sunbird
RHIPIDURIDAE	Pied Fantail
STURNIDAE	Common Myna
	Cream-vented Bulbul
	Yellow-vented Bulbul
TIMALIIDAE	Bold-striped Tit-Babbler
	Chestnut winged Babbler
	Chestnut-rumped Babbler

Annex II: List of trees planted at the Rasig Corridor during the year 2019.

Family	Species	Local name	Nb planted	Survival rate % (nb of trees alive)
Anacardiaceae	Dracontomelon costatum	Sengkuang	866	77% (668)
Annonaceae	Meiogyne sp.	Karai	97	100% (97)
Apocynaceae	Alstonia sp.	Pulai	142	44% (63)
Combretaceae	Terminalia catappa	Ketapang paya	5,344	90% (4,806)
Datiscaceae	Octomeles sumatrana	Benuang	34	88% (30)
Dilleniaceae	Dillenia excelsa	Simpoh laki	2,972	75% (2,218)
	Dillenia borneensis	Simpoh gaja	294	46% (16)
Dipterocarpaceae	Dipterocarpus validus	Keruing kasugoi	6	0% (0)
Ebenaceae	Diospyros sp.	Kayu malam	660	92% (668)
Euphorbiaceae	Mallotus muticus	Mallatus paya	8,704	67% (5,814)
	Croton oblongus	Lokon	390	91% (335)
	Glochidion borneensis	Obah nasi	650	89% (578)
	Exoecaria indica	Apid apid	1,088	43% (427)
Lauraceae	Litsea sp.	Medang	3	67% (2)
Moraceae	Ficus sp.	Tangkol hijau	3,237	90 % (2,918)
Myrtaceae	Syzygium fastigiatum	Obah jangkang	470	64% (300)
	Eugenia sp.	Obah puteh	85	100% (85)
	Eugenia cerriseformis	Obah merah	6	100% (6)
	Eugenia malaccense	Makopa	6	100% (6)
Rhizophoraceae	Carallia brachiata	Meransi	26	100% (26)
Rubiaceae	Nauclea subdita	Bangkal Aiskrim	2,913	96% (2,806)
	Nauclea orientalis	Bangkal daun besar		
	Neoauclea bernadoi	Bangkal mera		
Sapindaceae	Nephelium sp.	Rambutan	60	100% (60)
Sterculiaceae	Pterospermum sp.	Bayor	2,262	87% (1,963)
	Heritiera littoralis	Dungun laut	40	10% (4)
Tiliaceae	Colona serratifolia	Lamba	283	87% (246)
	Microccos crassifolia	Kerodong damak	440	74% (366)
Verbenaceae	Vitex pinnata	Kulimpapa	286	90% (257)
TOTAL planted			**31,815**	
Total alive at the end of 2019			**25,244**	
Average Survival rate			**79.35%**	