2023 REPORT

Marc Ancrenaz, on behalf of the HUTAN team
March 2024

HUTAN

Hutan means forest in Bahasa Malaysia.

In 1996, we decided to call our organization Hutan because we realized that forests were integral in our fight to save orang-utan and countless other species. Bornean forests, among the most intricate and delicate ecosystems globally, face significant peril.

Since the beginning, our goal has been to safeguard and restore Bornean forests, making them more resilient to the impacts of human activity. Over the years, we've realized that a forest is a living, breathing entity. Trees, the cornerstone of a forest, not only harbor diverse life forms but also serve as the bedrock of our existence. With approximately 300 trees per human being, their significance cannot be overstated. Yet, in our relentless pursuit of progress, we've lost touch with the profound connection we share with these silent sentinels.

Despite their importance, trees often go unnoticed in our daily lives. When was the last time we truly appreciated a tree's beauty and significance? When was the last time we touched a tree, smelt it, looked at its colors, felt its reassuring presence, and listened to its voice: the noise of the wind in its leaves, the popping of its fruits and creaking of its branches, or the call of its inhabitants? They are more than resources to be exploited; they are remarkable living beings with their language and presence.

While planting trees is crucial, it's only one piece of the puzzle. Forests are complex ecosystems that rely on countless interactions between trees, plants, fungi, animals, soil, air and much more. The quote by Aristotle, "the whole is greater than the sum of its parts", may very well apply to the forest, which is much more than a collection of trees.

Restoring a healthy forest is a long-term endeavor, one that requires time, dedication and care. By taking care of trees and forests, we're not just preserving nature; we're securing our future and future generations to come. This is one of Hutan's missions, and we're grateful for your support in our efforts.

HUTAN

All data presented in this report were contributed by the Hutan teams, including:

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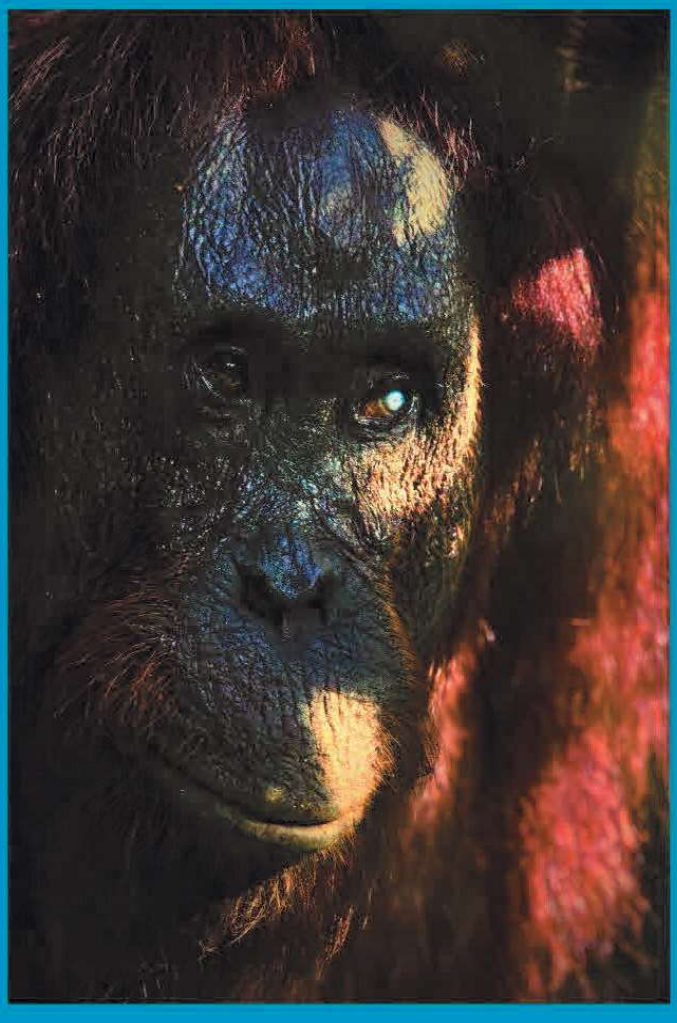
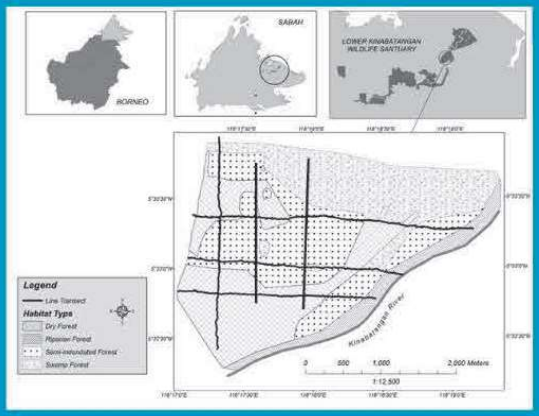


ORANG-UTAN RESEARCH

The Orang-utan Research team encountered and closely followed 15 wild orang-utans, securing 325 hours of direct observations on the animals at our intensive study site. We confirmed the presence of healthy resident females, including Mallotus (Jenny's second youngest daughter, 18 years old in 2023) and Muticus her 2.5-year-old daughter); Oceanne (9 years old, Jenny's latest daughter); Wawa (8 years old, Maria's latest daughter); Manis (14 years old), who gave birth to Paduk on 29.05.2023; and Felicity (Juliana's last daughter).

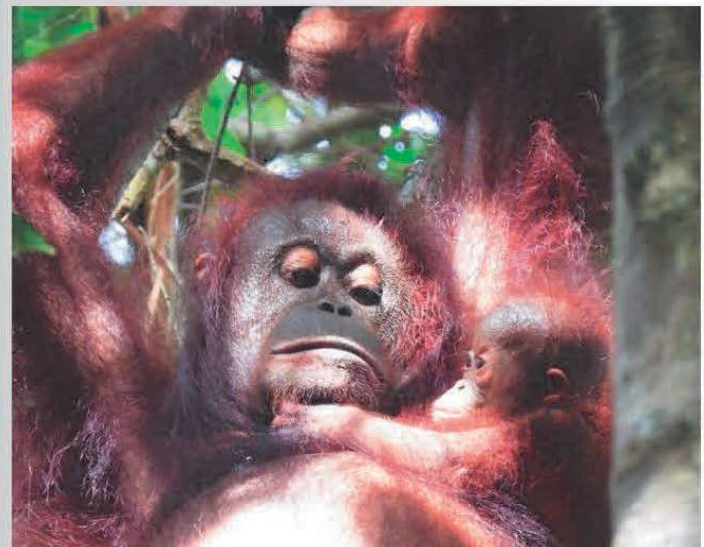
In terms of diet, the top five species consumed by orang-utans at our site included *Ficus sp.* (26.3% of feeding bouts), leaves of the climber *Spatholobus sp.* (13.6%), *Maranthes corymbosa* (13.1%), *Disopyros sp.* (ebene wood: 9.5%), and the fruits of the climber *Gnetum sp.*(8.6%). Most nests were identified in the ironwood tree (Eusderoxylon zwagerii), a hardwood belonging to the Lauraceae family.

Our site showed a slight increase in orang-utan density, with about 1.4 ind./km sq. This rise may be due to the younger females reaching maturity and attracting more males.



Orang-utan captured with one of our camera traps using a twig as an umbrella while walking under the rain

Manis and Paduk, her three months old baby

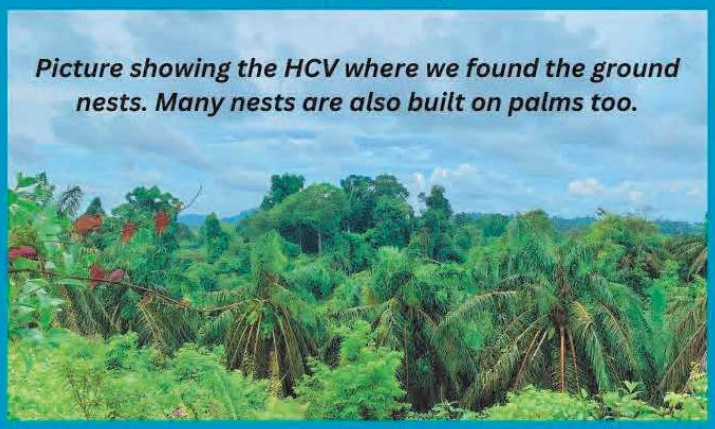


ORANG-UTAN GROUND-NESTING

In 2023, the orang-utan research team made a groundbreaking discovery: orang-utans building nests on the ground!

We found 34 of these nests within a Palm oil estate in a small area of less than 100 acres designated as a "High Conservation Value Forest" (HCVF), with few small trees and non-harvested mature palms situated atop a ravine, surrounded by newly planted immature oil palm plants. We have observed at least six different orang-utans in this HCV located about 100 m from our study site. These nests resemble those typically built in tree tops, featuring a structure of broken branches supporting a mattress of leaves, twigs, and other plant material. However, these nests are found on the ground. The animals construct these nests using a combination of materials such as ferns (present in 88% of the nests), twigs and small branches (45%), climbers (35%), or grass. Remarkably, some of these nests remain visible for up to six months.

This ground-nesting behavior has never been documented before in orang-utans, though it's common among African great apes. It underscores the species' resilience and adaptability.



Picture showing the HCV where we found the ground nests. Many nests are also built on palms too.

Collecting data on ground nests

ORANG-UTAN BRIDGES

Orang-utans cannot swim, and removing large trees along the river edges can create impassable barriers to them. These man-made barriers result in an intense orang-utan population fragmentation process.

Over the past two decades, Hutan has taken steps to address this issue by erecting 12 "orang-utan bridges". These bridges serve as vital connections between orang-utans living on both sides of the river.

In 2023, Hutan staff focused on repairing and replacing two 35 m- and 48 m-long bridges above the Menanggul and Resang Rivers, tributaries of the Kinabatangan River. We also collaborated with two local oil palm plantations and colleagues from conservation organization Orang Juga" to construct and install two new bridges above drains in their estates.

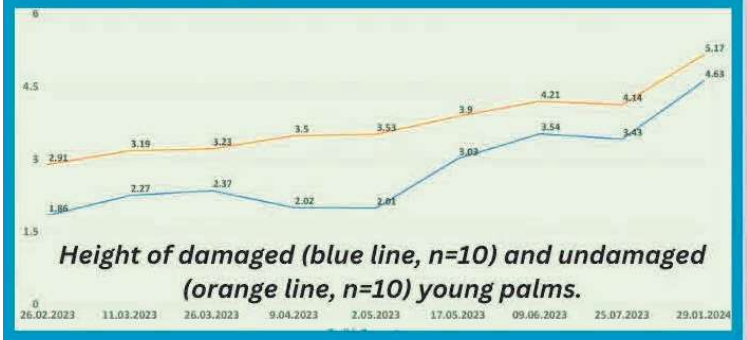
Although seeing an orang-utan using the bridges remains rare, our data show that individuals of all sexes and ages regularly cross where these bridges are installed.

The team is preparing an orang-utan bridge before erecting it above a tributary

ORANG-UTAN AND OIL PALM PLANTATIONS

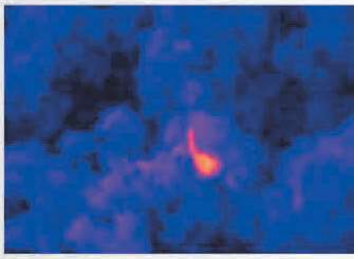
Orang-utans are increasingly venturing into oil palm plantations, leaving telltale signs of their presence, such as nests at the top of the palms or broken shoots.

While orang-utans mainly feed on mature fruits, which doesn't cause any significant losses to the plantation owner, they sometimes damage young, immature palms by pulling out and consuming the pith. To understand the impact of these attacks, we monitored the health and productivity of both damaged and undamaged palms. Surprisingly, our findings revealed that both damaged and undamaged palms exhibit similar growth rates (see graph). However, damaged palms could take up to a year to fully recover. This delayed recovery is attributed to insect infestation following the orang-utan attack.



Height of damaged (blue line, n=10) and undamaged (orange line, n=10) young palms.

Surveying and monitoring orang-utans is always a challenge, but at Hutan, we have been exploring innovative methods, such as drones, to make this process more effective. When lucky, we detect animals resting in their nests. In 2023, we realized that we could also detect orang-utan heat signatures using thermal imagery. We are currently testing this new approach.



REFORESTATION IN KINABATANGAN

In 2023, three Hutan teams were responsible for restoration and reforestation efforts:

- **The Tree Nursery and Collection Center** consisting of six women.
- **The Reforestation Monitoring, Biomass, and Biodiversity team** comprises six full-time and three part-time women.
- **The Genting Corridor Reforestation team** consists of four full-time and six part-time women and one man.

Very few women from the villages of Kinabatangan have permanent employment, and Hutan is proud to offer them this opportunity through its reforestation activities.

In 2023, our Collection Center purchased 25,473 tree seedlings from 67 species. We bought these seedlings for about $0.5 from 30 different family-operated nurseries in the village, which benefited more than $10,000 in 2023. Throughout the year, 24,568 trees (51 species) left the nursery, primarily used by the Trails project (20,024 trees, 30 species) and the Hutan reforestation plots. The Nursery also serves as an educational venue for the "Junior Rangers" or the "Anak Angkat Pokok" groups to raise awareness about trees among the younger generation.

The team recently initiated a small project to collect seeds from hornbill fecal samples during bird monitoring to identify what the birds eat. We then grow these seeds at the Nursery. Since 2019, we produced seedlings from 27 tree and vine species this way. Out of the 1,099 seedlings generated by this experiment, the team has already planted 571 plants in our dedicated "Hornbill Reforestation Plots".

Some "uninvited" guests feed on seedlings. We don't use any chemicals at the Nursery.

REFORESTATION IN KINABATANGAN

The team comprehensively assessed biomass and C content across 35 plots representing distinct habitat types: pure oil palm stands, natural forests, and reforestation areas. In each plot, we recorded data on herbs and bushes, standing trees, litter, and dead wood; the Simpson index revealed the highest tree diversity in the natural forest plots; interestingly, tree diversity is getting higher with the age of the reforestation plots.

Total biomass exhibited significant variation among the plots. The lowest biomass values were observed in the TRAILs agroforestry plots (av. = 7 Mg/ha, SD=3, n=4 plots). Indeed, these plots had been cleared of mature palms in 2022 before a mix of young palms and trees was reestablished on the bare soil in late 2022. Conversely, the oldest reforestation plots (298 Mg/ha, SD=100, n=11) showed comparable levels to natural forests (300 Mg/ha, SD=178, n=5). In terms of C content estimation, we obtained the following values (note that these values only provide a rough indication of the situation on the ground):

- TRAILs agroforestry plots: 7.3 ± 2.1 Mg.C/ha.
- Oil palm plots: 122.3 ± 37.4 Mg.C/ha.
- Reforestation plots less than 5 years old: 88.1 ± 30.6 Mg.C/ha.
- Reforestation plots over 5 years old: 146.7 ± 49.7 Mg.C/ha.
- Natural forest of LKWS: 162.2 ± 85.5 Mg.C/ha.

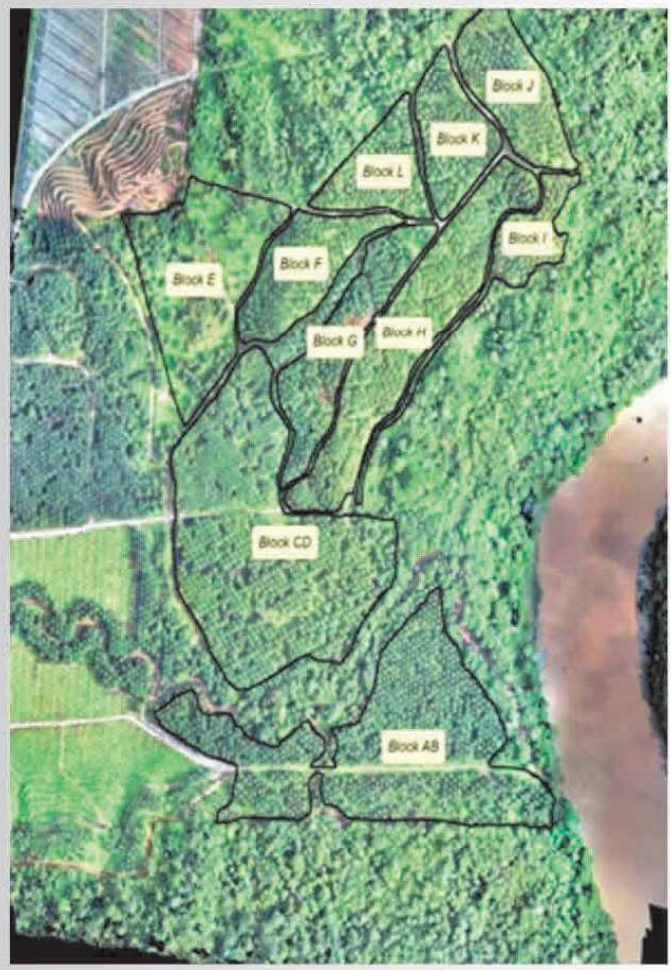
In 2023, a check on 46 acres of land planted between 2009 and 2014 revealed that as many as 7470 wild trees that had not been planted were growing in our reforestation plots. These newcomers brought in over 30 species, adding diversity to the 60 species already planted. This spontaneous growth resulting from wind or other physical and animal dissemination significantly boosted the diversity of our plots.

REFORESTATION IN KINABATANGAN

The Genting Corridor Reforestation team is tasked with restoring 110 acres to connect the Keruak Virgin Jungle Reserve to Lot 2 of the Lower Kinabatangan Wildlife Sanctuary. The corridor was fully planted in mid-2023.

Since 2019, 71,091 seedlings have been planted across the corridor. The team is currently focusing primarily on maintaining these seedlings. By the end of the year, 55,321 seedlings were still alive. The high mortality rate was mainly the result of the successive Covid-19-related lockdowns in 2020 and 2021. In 2023, we observed a mortality rate of 9.3% for the trees planted in 2022 (and still alive at the beginning of 2023); 3.1% for those planted in 2021, and 0.04% for those planted in previous years. The very low mortality rate for trees planted more than three years ago indicates that regular maintenance of the blocks can be discontinued after the third year post-planting. The overall mortality rate was higher in 2022 (4.2%) than in 2023 (0.9%), explained by more regular rainfall in 2023 and because the trees were older in 2023.

Monitoring our plots shows that despite the early stage of restoration of our plots, many animal species already use them: orangutans, elephants, otters, leopard cats, pangolins, bears, and many others.



	Block A - B	Block C - D	Block E	Block F	Block G	Block H	Block I	Block J	Blok K	Block L	Total
2019	16,494	14,600									31,094
2020			9,378	4,782							14,160
2021					3,800	3,200					7,000
2022	122	-	-	-	-	3,560	3,300	4,400	3,500	1,200	16,082
2023	71	998	676	286					674	50	2,755
Total	16,687	15,598	10,054	5,068	3,800	6,760	3,300	4,400	4,174	1,250	71,091

Table showing the number of seedlings planted by block and by year at the Genting Corridor.

PANGI SWIFTLET RECOVERY PROJECT

Two edible-nest swiftlets, the white-nest (*Aerodramus fuciphagus*) and the black-nest (*A. maximum*), roost and breed in the limestone caves of lower Kinabatangan. However, over-harvesting led to the local extinction of several populations. Since 2010, a team of young villagers has been guarding the limestones of Pangi to protect these birds. We are not harvesting the nests to minimize the disturbance and optimize the colony recovery.

White-nests used for the Chinese soup

Unedible nests by Glossy swiftlets (Collocalia esculenta)

Pangi in brief (2023):

- 18 full-time staff and six full-time interns.
- Five base-camps.
- 31 caves across Pangi.
- Less than 200 pairs breeding pairs in 2010; more than 5,000 pairs today.
- Daily and nightly patrols to stop poachers from stealing the nests

The Pangi teams spent a lot of time patrolling against and protecting the amazing biodiversity of the limestone ecosystem.

HUTAN ENVIRONMENTAL AWARENESS PROGRAMME

The overall mission of the Hutan Environmental Awareness Programme, or HEAP, is to strengthen the impact of Hutan's other Units by raising environmental awareness in Sabah, encouraging behavioral changes, and addressing the need for biodiversity conservation in general.

The year 2023 in a few numbers:

- HEAP outreach:
  - 15,627 students
  - 949 teachers
  - 5,671 members of the public
- Environmental Educational Programmes (EEP) in 21 primary and secondary schools in Sabah
- EEP in 11 International schools
- EEP at 7 Festivals and Celebration days
- 16 kids enrolled in the "Anak Angkat Pokok" initiative in 2018; 11 completed this long-term exposure program and "graduated" in 2023. They planted and nurtured 451 trees last year.
- More than 20 "Junior" and "Senior" Rangers follow monthly EEP.

Notable achievements for HEAP were being invited to the Borneo Sustainable Development Goals Summit in Kuching, Sarawak, and as keynote guests for the "Teen Eco Summit" hosted by the Columbus Zoo in Ohio, USA (November 2023). These recognitions underscore growing acknowledgment of HEAP outreach efforts locally and globally.

WILDLIFE SURVEY AND PROTECTION

The Wildlife Survey and Protection team (WSP), consisting of eight full-time researchers assisted by three interns, is responsible for biodiversity surveys and monitoring, human-wildlife conflict mitigation, and hornbill conservation activities. It also supports local NGOs and State agencies in law enforcement activities or animal rescue operations.

Monitoring and documenting population trends are essential to understanding how animal populations adapt to habitat fragmentation and degradation, which characterize all lowland habitats in Borneo. Understanding these trends is also useful for assessing how wildlife copes with and reacts to various management decisions. WSP deploys a combination of techniques to monitor wildlife population trends along permanent transects along the river, and in reforested areas, such as the Keruak (or Genting) Corridor or the TRAILs project. The TRAILs project is an experimental project of agroforestry (combining palms and native trees) in a nearby oil palm plantation. Hutan is also involved in biodiversity surveys to document wildlife population composition and status outside Kinabatangan.

SMALL MAMMAL MONITORING

Small terrestrial mammals (less than 1 kg) are essential to the trophic chains. They are vital species to monitor to understand wildlife dynamics in restored ecosystems better. We have initiated a long-term monitoring of Rodentia and Insectivora at the Keruak Corridor since 2019 and at TRAILs since 2023.

Keruak:

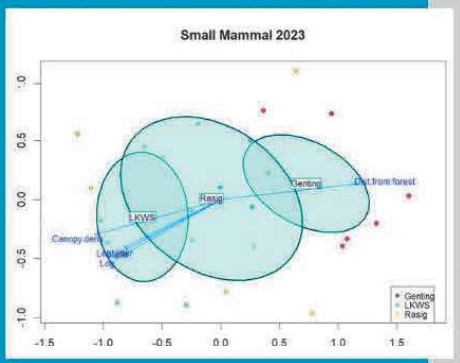
- Three habitat types: Oil Palm, Reforestation, and Natural Forest.
- 10 plots per habitat.
- 12 traps per plot
- 5 days of trapping

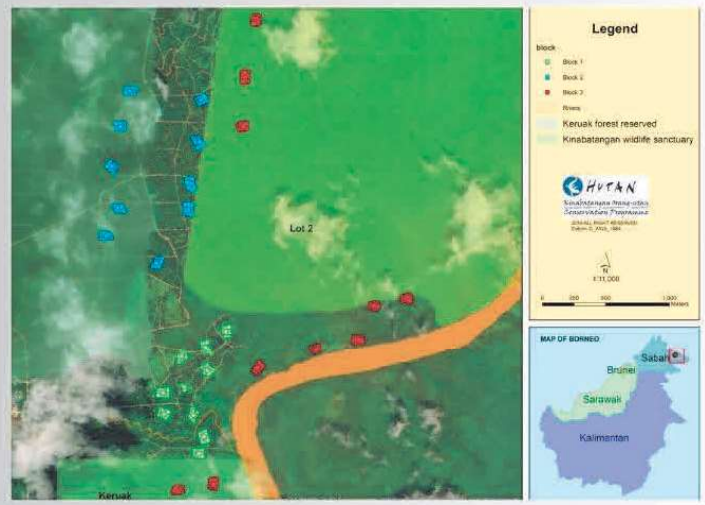
TRAILs:

- Three habitat types: Oil Palm, Restored Riparian, and Agroforestry.
- 5 plots per habitat.
- 10 traps/plot
- 5 days of trapping.

Results:

- Keruak: 215 captures - 14 species.
- TRAILs (riparian): 56 captures - 5 species.
- Treeshrews (Large, Lesser, Plain) prefer closed canopy. They are more characteristic of forest habitats than rats (Muller's, Tioman, Whitehead, Polynesian) that are more common in oil palm and early reforestation plots.
- Our data shows a slow colonization of the reforestation plots by forest-dependant species.





PRIMATE MONITORING

Over the past two decades, we have consistently monitored the number and species of monkeys spotted from a boat along specific river routes. Our findings indicate a steady decrease of sightings of Red Leaf Langurs, *Presbytis rubicunda*, while sightings of other species have remained relatively stable: Long-Tailed Macaques, *Macaca fascicularis* (av. of 0.92 group/km), Pig-Tailed macaques, *Macaca nemestrina* (0.10 group/km), Silvered Langurs, *Trachypithecus cristatus* (0.28 group/km), and Proboscis monkeys (0.82 group/km). Interestingly last year, the number of sightings of Proboscis monkeys spiked in December.

We have noticed preferences among monkey species when selecting trees as sleeping sites. Long-tailed macaques tend to favor trees like *Ficus sp.* and *Colona sp.*, while Proboscis monkeys are frequently found in *Octomeles sumatrana*, *Pterospermum sp.*, *Colona sp.*, or *Nauclea sp.*

In 2023, we saw several "morph" individuals of Silvered langurs, which means their furs lacks the usual melatonin pigmentation, giving them a very pale appearance.

In Menanggul River we had a rare encounter: a hybrid between Silvered langur and Proboscis monkey.

A pale morph of Trachypithecus cristatus

Hybrid between Proboscis monkey and Silvered langur

FROG MONITORING

For over ten years, we have been monitoring the evolution and trends of Anuran populations along permanent transects in characteristic habitats of the Kinabatangan.

We have identified 40 species of frogs and toads in the forests of Lower Kinabatangan.

At the Genting corridor, we have recorded 27 species between 2019-2023:

- Oil palm: 15 species
- Reforestation plots: 13 species
- Forest: 21 species

For the past two years, we witnessed an increasing presence of *Fejervarya cancrivora*, or crab-eating frog, a carnivorous mangrove specialist frog, in the oil palm plantations near Sukau (picture below).

This finding suggests that the range of certain species is widening, potentially competing and posing a threat to other species. We link these new observations to several factors, such as changes in climate and weather patterns, along with human-induced habitat disturbances.

Rare capture of a banded linsang (*Prionodon linsang*)

CARNIVORE MONITORING

Goals:

1. To document the dynamic of recolonization and use of reforestation plots by carnivore species.
2. To identify critical environmental features that affect carnivore species composition in different habitat types.
3. To look for the rare and elusive flat-headed cat (*Felis planiceps*)

- Three locations:
  - Forest island inside an oil palm estate, 200m away from the forest
  - Genting Wildlife Corridor
  - Kinabatangan tributaries (three)
- Number of camera traps: 46
- Active Deployment days: 3,357
- Pictures: 40,189


Malayan sun bear

- Total of carnivore species detected in 2023: 12.
- Most widespread species: Island (Common) palm civet (*Paradoxurus hermaphrodites*) - Malay civet (*Viverra tangalunga*) - Leopard cat (*Priolainurus javanensis borneoensis*).
- More species detected at the edge between the forest and the oil palm plantations.
- Detection of two rare species:
  - Clouded leopard (*Neofelis diardi*) in the forests of Lower Kinabatangan Wildlife Sanctuary (LKSW).
  - Banded linsang (*Prionodon linsang*) in the Reforestation area of the Genting Corridor.

Project		Kinabatangan Tributary Project (212 days)			Keruak Wildlife Corridor Project (1261 days)			Forest Island Project (1884 days)	
Scientific Name	**Local Name**	**Menanggol**	**Tenegang**	**Resang**	**Reforestation**	**Oil Palm**	**Forest**	**Forest Edge**	**Forest Island**
Prionailurus javanensis borneoensis	Bornean Leopard Cat		X	X	X	X		X	X
Neofelis diardi	Clouded Leopard				X		X		
Mydaus javanensis	Sunda Skunk					X	X		
Lutrogale perspicillata	Smooth-clawed Otter		X	X			X	X	
Urva brachyurus	Short-tailed Mongoose						X	X	X
Martes flavigula	Yellow-throated Marten							X	X
Prionodon linsang	Banded Linsang				X				
Helarctos malayanus euryspilus	Bornean Sun Bear				X		X	X	X
Paradoxurus hermaphrodites	Island Palm Civet	X	X	X	X	X	X	X	X
Viverra tangalunga	Malay Civet	X	X	X	X	X		X	X
Arctictis binturong	Binturong							X	X
Hemigalus derbyanus boiei	Banded Civet				X		X	X	X
Total carnivore species recorded		**2**	**4**	**4**	**7**	**4**	**7**	**9**	**8**

USING DRAGONFLIES AND BIRD AS BIO-INDICATORS

Dragonflies and damselflies (Odonata) are essential components of aquatic ecosystems and very selective in their choices of water quality. As such, they are used to assess water quality and biodiversity. Out of the 370 species found in Borneo, 178 occur in Sabah.

In early 2023, we followed a dragonfly training course organized by the Sabah Forestry Department. Then, we started documenting the elemental composition of these insect communities with the intention of utilizing some of these species as indicators of habitat disturbances and recovery across the Lower Kinabatangan.

More than 200 species of birds occur in Kinabatangan. The results of our bird monitoring show significant differences in bird community between forest, restoration and oil palm plots. Some species are strongly related to open areas (e.g. Common Myna, Mossy-nest Swiftlet, Chestnut Munia, Spotted Dove or Buff-banded Rail) while other species are only found in closed canopy (e.g. Spiderhunter, Trogon).

The blue dasher (*Brachydiplax chalybea*) - upper left- and the variable wisp (*Agrionecmis sp.*) - up. right-, are both indicator species of habitat disturbances: they are often found in ponds, drains and and exposed areas typical of urban and agricultural lands.

VISUAL EVALUATION OF SOIL STRUCTURE

Healthy soils are crucial in supporting functioning ecosystems and sustaining wildlife populations. To better understand the relationship between soil health and biodiversity, we utilize a straightforward citizen-science approach across various habitat types. We visually assess ten parameters, including earthworm activity, vegetation cover, battering layer, humus thickness, root presence, and depth, or ground compaction, to gauge overall soil condition.

Our evaluation confirmed significant disturbances and compaction in the soil at the TRAILs agroforestry sites, characterized by minimal humus, shallow roots, and a lack of earthworm activity. These observations stem directly from plowing and tillage activities conducted in 2022 when the old palms were removed before the new replanting cycle. While soil in mature oil palm plots still shows signs of compaction, there are indications of some recovery, including deeper roots, a thin layer of humus, and some earthworm activity.

Encouragingly, restoration plots demonstrate signs of soil improvement. For example, riparian reforestation plots (aged between two and four years), exhibit an average humus depth of 9.2 mm, significantly higher than the 1.4 mm observed in mature oil palm plots and 0.7 mm at TRAILs. The increased earthworm activity in these plots suggests that planting native trees can positively impact soil recovery within an oil palm setting.

ELEPHANT CONSERVATION

The Hutan Wildlife and Survey Protection team regularly participates in Human Elephant Conflict mitigation activities in Sukau and other communities. We primarily assist our colleagues from Seratu Aatai (SA), a local group created by Dr Nurzhafarina Othman, also based in Sukau. In 2023, WSP acted as a mentor to this newly operational group in the area.

The team had to intervene in several areas, including the Yu Kuang oil palm concession and the Melangking oil palm plantation close to Sukau. We were also involved in mitigation activities in several villages like Sukau, Bilit, Abai, Telupid, Litang, and others. Socialization and discussion with communities affected by elephants are essential strategies to promote peaceful coexistence. As such, Hutan and SA organized several community discussions in Sukau (September), Litang (November), Telupid and other areas affected by elephants.

The team assisted SA, the Sabah Wildlife Department, and the Danau Girang Field Center in catching and translocating or radio-collaring six elephants during the year.

Research activities included running line transects for dung counts, density estimates in Lower Kinabatangan, and a search for fresh dung and collection for further hormonal analysis. This study intends to estimate the elephant stress level and its differences between a natural habitat (forest) and an oil palm plantation. The results are not available yet.

Elephant capture in an oil palm estate

HEC mitigation at night

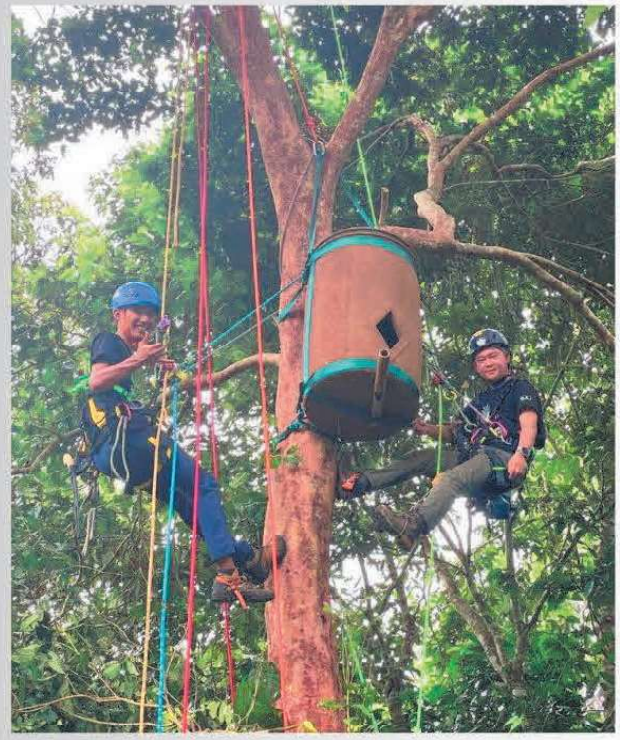
HORNBILL CONSERVATION

Kinabatangan is home to Borneo's eight hornbill species. Most of these birds are threatened by habitat loss, hunting, or lack of suitable nesting sites.

Last year, together with GAIA, a local Malaysian hornbill conservation project, we repaired and installed 7 artificial nest boxes (six of them outside of Kinabatangan). Over the past ten years, our teams have built and erected 41 artificial nest boxes. Today, 22 of these boxes are still in the forest. Over the years, our nest boxes have produced six Rhinoceros and four Oriental pied hornbill chicks.

The regular river monitoring shows seasonal fluctuations in hornbill sightings. The team counted hornbills every three months along permanent river transects, totaling 368.4 km across the year for an overall kilometric index of 1.54 bird sighting/km. Hornbill sightings were more frequent along the small tributaries (Tenegang and Menanggul) than the Kinabatangan River: 3.45 sightings vs 1.23 sightings/km. By far, sightings of Oriental Pied hornbills are the most frequent (0.87 sighting/km overall), followed by Black hornbill (0.23 sighting/km), Bushy Crested (0.14), Rhinoceros and Wrinkled (0.12), and White Crowned hornbill (0.05): see Graph.

Ficus sp. is a vital keystone resource for hornbills. As such, the team monitors the fruit productivity of 32 fig trees belonging to 10 species along the river. Data from this botanical assessment and monitoring should indicate whether and how the presence and fructification events influence bird abundance fluctuations in Kinabatangan.

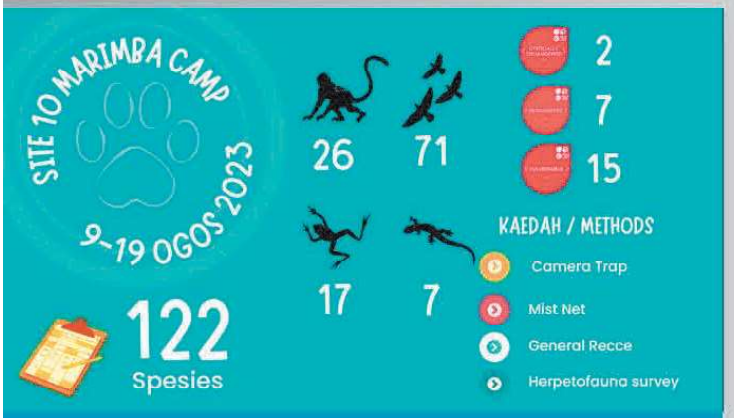


Hornbill sightings along the Kinabatangan River (320 km) and small tributaries (48.4 km): OPHB: Oriental Pied - BHB: Black - BCHB: Bushy Crested - RHB: Rhinoceros - WKHB: Wrinkled - WCHB: White Crowned Hornbill

FIELD EXPEDITIONS

Documenting the conservation status of wildlife is crucial for assessing the effectiveness of management strategies. In 2023, our teams conducted wildlife expeditions across Lots 1 to 4 of the LKWS, investigated orang-utan presence in several HCV forests within oil palm concessions, and participated in two major wildlife expeditions in Inikea and Rawog.

During these surveys, we usually employ various monitoring methodologies, including camera traps, gibbon surveys, day and night-time recces, bird and frog surveys, small mammal trapping and bioacoustics.



Inikea is located in the Kalabakan area, in the upper catchment of Kinabatangan. Ten days of combined efforts in Inikea recorded 71 bird species, 26 mammals, 17 frogs, and five reptiles (see infographics above).

Over 64 days of deployment, camera traps captured 40 independent events and 14 species. The wildlife community is typical of degraded forests at an early regeneration stage.

The Sungai Rawog Conservation Area (SRCA) covers approximately 4,500 ha within the KTS Plantations in the upper Kinabatangan catchment area. It is one of Sabah's largest wildlife conservation areas carved out of active production forests.

One week of combined efforts recorded 126 species, including 85 bird species, 32 mammals, five frogs, and four reptiles. Thirteen of these species were endemic, and five fully protected. Over 529 days, camera traps positioned at four different salt licks captured 27 species through 576 independent events. Notable findings included Orang-utan geophagy at salt-licks, the sighting of a Marble cat (*Pardofelis marmorata*, a first record for the area), and 17 records of Bornean Banteng, a rare Bovid species decimated by poaching.

The densities of Gibbons (0.67 group/km.sq) and Orang-utan (1.4 ind./km.sq) and the relatively low wildlife abundance detected during fieldwork indicate that while SCRA hosts a diverse range of wildlife, wildlife populations haven't fully recovered yet from past logging and human disturbances.

Orang-utan geophagy behavior

Female tambadau licking soil at the salt-lick

IMPROVING POLICY FRAMEWORK FOR WILDLIFE POPULATIONS

Our approach to improving policies for wildlife conservation is to share field information and contribute to developing official documents, laws, or plans (below, some of the initiatives with Hutan involvement).

- March 9-10th 2023, we participated in the "International Hornbill Conservation Workshop" in Kota Kinabalu. This workshop aimed to discuss the status of hornbill conservation in Sabah and develop a Hornbill State Action Plan.
- We are contributing to the development of two new IUCN "Best Practices Guidelines": Great Ape Surveys, and Orangutan wild-to-wild Translocations.
- Attended as a member of the Scientific Commission, the 3rd GRASP Council Meeting at UNESCO, Paris, December 11th-14th.
- Produced Draft Nomination Dossier for the "Kinabatangan Biosphere Reserve".
- Produced of the Draft for the "Kinabatangan Tourism Report"
- Development of the Management Plan for the Lower Kinabatangan Wildlife Sanctuary.
- Best Management Practices for Orang-utans in oil palm plantations: the document was launched during a high-profile event in Sandakan) and is available in English and Bahasa Malaysia.

Book chapters and scientific articles published in peer-reviewed journals in 2023:

Meijaard, E., Unus, N., Ariffin, T., Dennis, R., Ancrenaz, M., Wich, S., Wunder, S., Goh, C.S., Sherman, J., Ogwu, M.C., Refish, J., Ledgard, J., Sheil, D., Hockings, K. 2023. Apes and agriculture. Frontiers in Conservation Science. 4:1225911. doi: 10.3389/fcosc.2023.1225911

Massingham, E.J., Meijaard, E., Ancrenaz, M., Mika, D., Sherman, J., Santika, T., Pradipta, L., Possingham, H.P., Dean, A.J. 2023. Killing of orangutans in Kalimantan – Community perspectives on incidence and drivers. Conservation Science and Practice, https://doi.org/10.1111/csp2.13025

Massingham, E.J., Wilson, K.A., Meijaard, E., Ancrenaz, M., Santika, T., Friedman, R., Possingham, H.P., Dean, A.J. 2023. Public opinion on protecting iconic species depends on individua wellbeing: Perceptions about orangutan conservation in Indonesia and Malaysia. Environmental Science and Policy, 150. https://doi.org/10.1016/j.envsci.2023.103588

Meijaard, E., Sheil, D., Shrman, J., Chua, L., Ni Matullah, S., Wilson, K., Ancrenaz, M., Liswanto, S., Wisch, S.A., Goossens, B., Kuhl, H.S., Voigt, M., Rayadin, Y., Kurniawan, Y., Trianto, A., Priatna, D., Banes, G.L., Massingham, E., Payne, J., Marshall, A.J. 2023. Restoring the orangutan in a Whole- or Half-Earth context. Oryx, 57(5), 566-577. https://doi.org/10.1017/S003060532200093X

Pringle, S., Davies, Z.G., Goddard, M.A., Dallimer, M., Hart, E., Le Goff, L., Langdale, S.J., Abad, S., Ancrenaz, M., et al. 2023. Robotics and autonomous systems for environmental sustainability: monitoring terrestrial biodiversity. UK RAS Network White Papers, 36 pp. DOI: 10.31256/WP2023.4

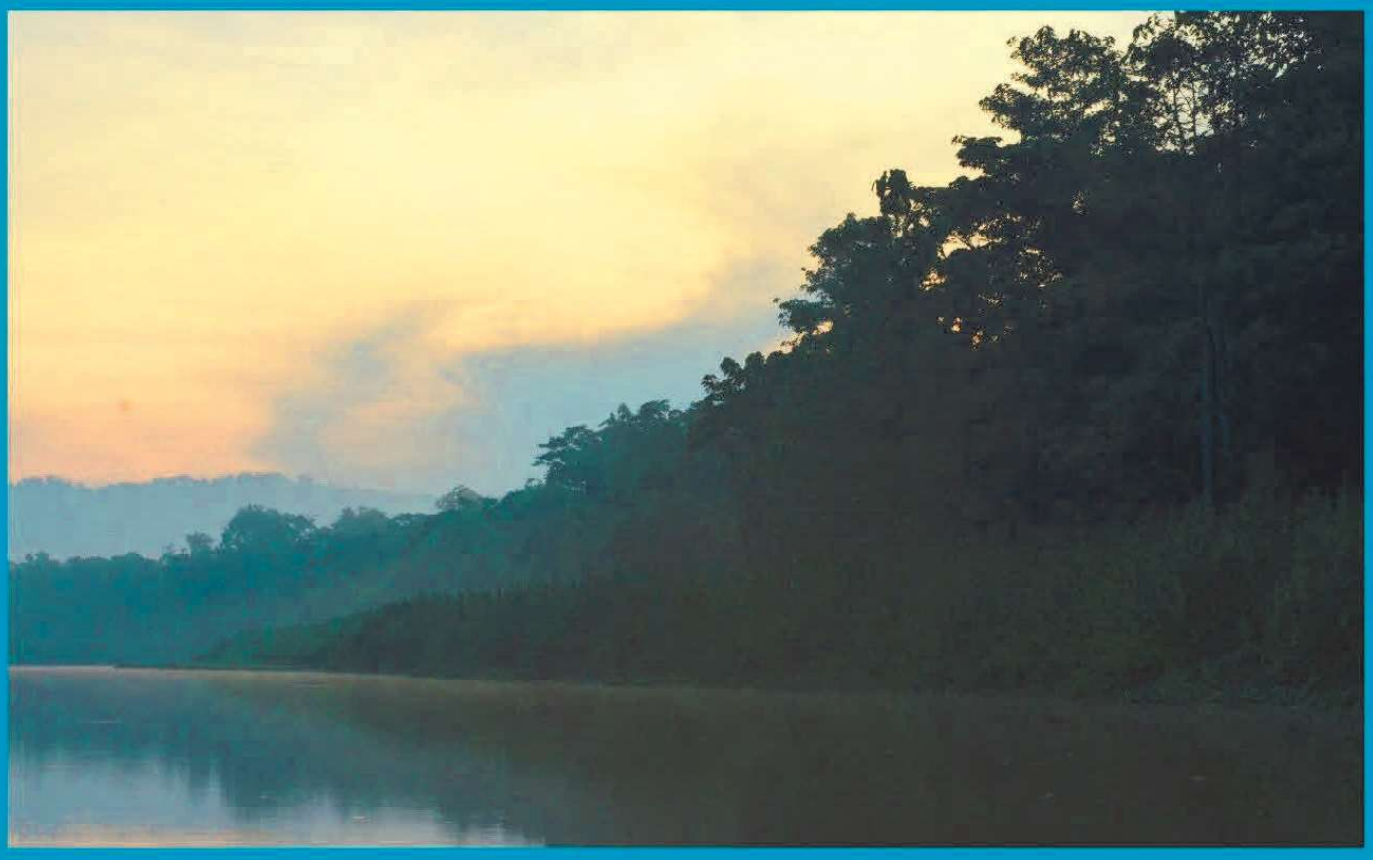
Meijaard, E., Dennis, R.A., Ni'Matullah, S., Ancrenaz, M., Wich, S., Sherman, J. 2023. Bornean Orangutan (Pongo pygmaeus) – Methods for 2023 update of IUCN Red List (Pongo spp.) ranges.

Meijaard, E., Dennis, R.A., Ni'Matullah, S., Ancrenaz, M., Wich, S., Sherman, J. 2023. Tapanuli Orangutan (Pongo tapanuliensis) – Methods for 2023 update of IUCN Red List (Pongo spp.) ranges.

Hope Carried on Wings

It is early,
And the light fog, still,
Over the river,
Before it lifts, dissipates,
Carrying with it,
Dreams of life aquatic,
Life hidden,
Beneath the opaque surface,
Beneath the water, thick with sediment,
The murk, muck,
Life, invisible if not for,
The tales of tired fisherfolk,
Of catch, minuscule, meagre,
Of loss, time, friends,
A streak of red,
A flap of blue,
Overtakes our vessel,
A good omen says my guide,
With a look of relief,
As we go on our way.

Tun-Min Poh



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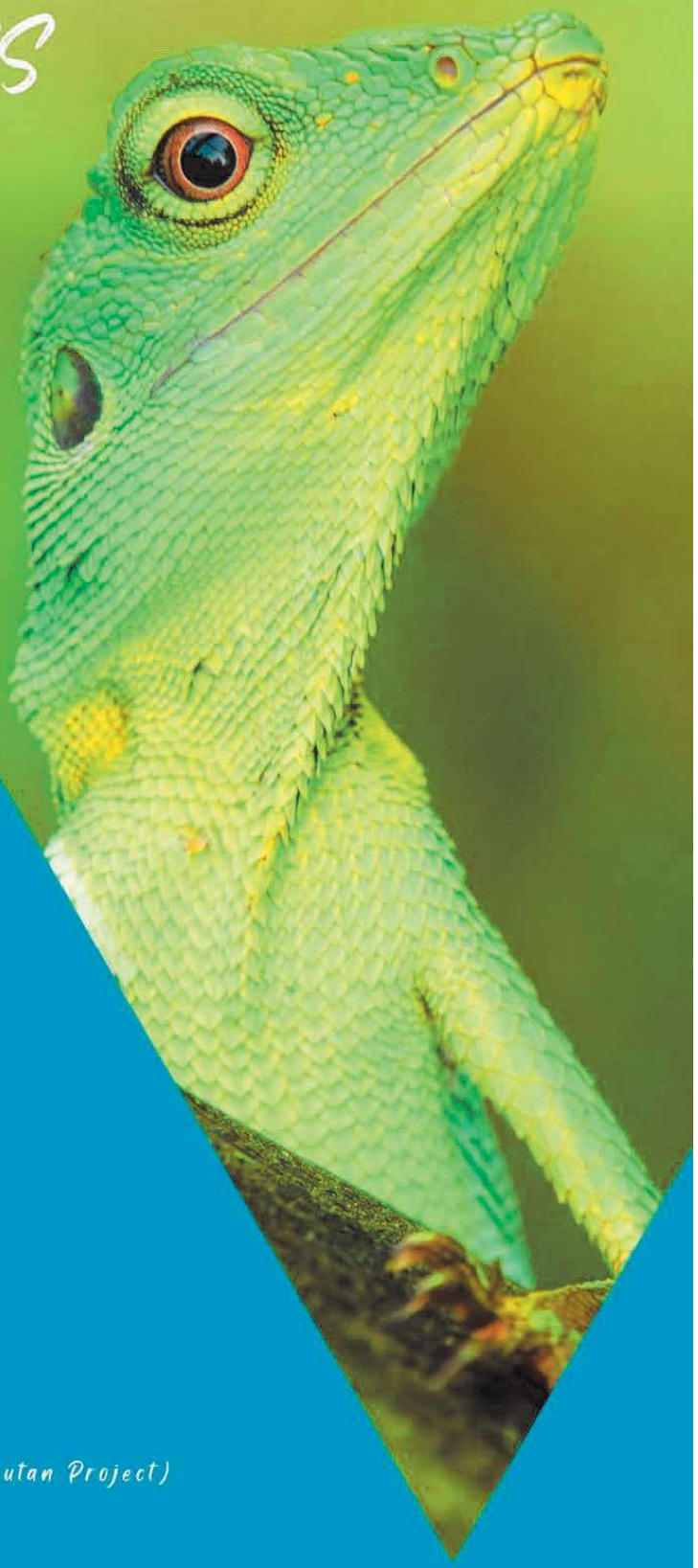

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