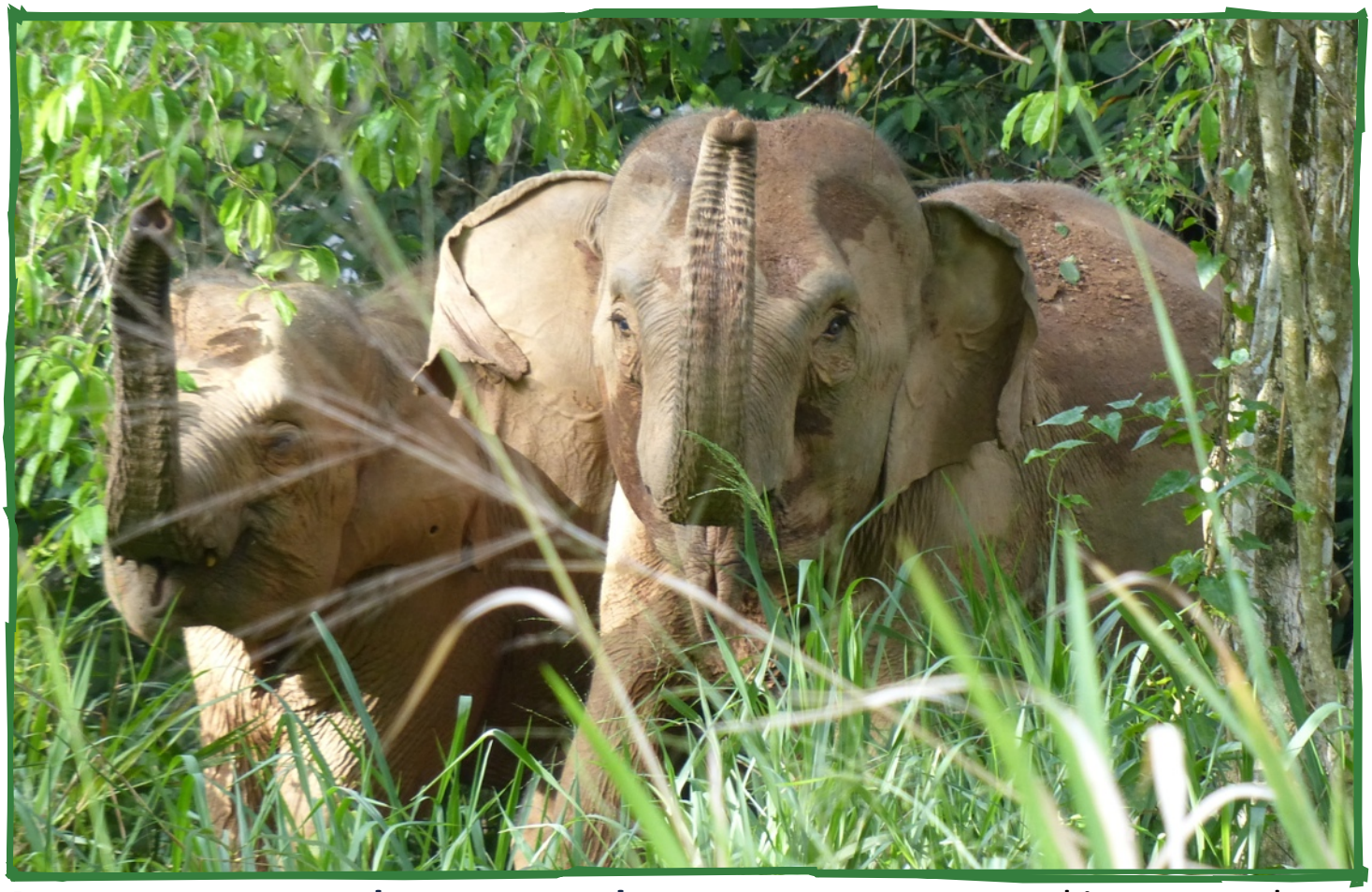
MEME Updates

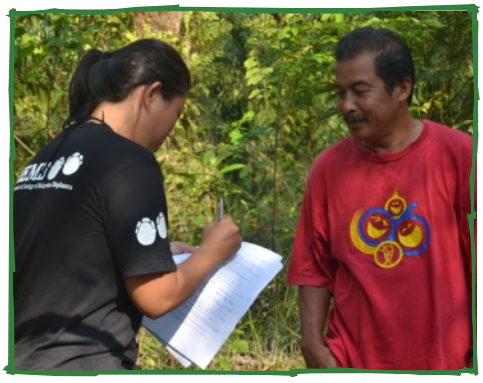
Management & Ecology of Malaysian Elephants

Issue 8 **Jan-Mar 2013**



Because we can only manage what we measure — working towards an evidence-based conservation of Malaysian elephants.

THE ELEMENT OF STRESS — Ee Phin takes on new challenges but fret not, she's never alone!



PEOPLE MATTERS —Ange shares her experience on the study of past and present elephant distribution.

ELEPHANT KNOWLEDGE: SEED DISPERSAL— Elephant as a key element of Malaysian tropical forests.

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PERHILITAN

Le bon sauvage and the myth of the noble beast

I recently read a student's paper saying '*as more forests are cleared and fragmented,* ***elephants have no choice but to encroach*** *into plantations in their search for food, water, and mates*'. This is a commonly held view of the human-elephant conflict, also widely repeated in the grey literature. This time, the student's paper invoked me the myth of the *bon sauvage*.

The myth of the noble savage appeared in 17th century's Europe, became very popular in the 18th and 19th centuries, and has to some extent impregnated part of conservation biology's philosophy in recent decades. The myth of the noble savage is an idealization of people living in traditional societies, attributing them a noble spirit and behavior - i.e. human evilness and greed are a corruption of our original good nature, result of our society's recent development. The myth of the noble savage has often led conservation biologists to believe that traditional human societies always lived sustainable lives in harmony with their environment. Nowadays, it is well known that stone-age human societies were responsible of the Late Quaternary Extinction Event, which wiped out over 90% and 70% of large mammal species in Australia and the Americas. Large mammals provide more food than small ones and were hunted first by early humans.

Large herbivores and carnivores come in conflict not only because it is inevitable (which sometimes is) but also as **part of their optimal foraging strategy**. Food for large herbivores is very limited inside of a primary tropical rainforest. When we clear or log forest patches and plant crops in their neighborhood, we are actually creating a habitat richer in elephant food (crops are excellent elephant forage, and so are the early succession plants growing in grasslands and disturbed forests). In this situation, elephants will often **choose to come out of** the forests we consider their legitimate habitats and will 'encroach' into human-dominated landscapes, resulting into the well-known human-elephant conflict.

Please don't misunderstand my words — this is not to say that elephants are to blame for the conflict, which they are not. Rather, this is a call to understand the behavioral and ecological drivers of the conflict. Elephants will often choose to raid crops even if they have well-conserved forests nearby, and this makes complete sense from an ecological point of view. Understanding these drivers is the a key step towards the effective mitigation of human-wildlife conflicts in the 21st century.

Ahimsa Campos-Arceiz
MEME's Principal Investigator
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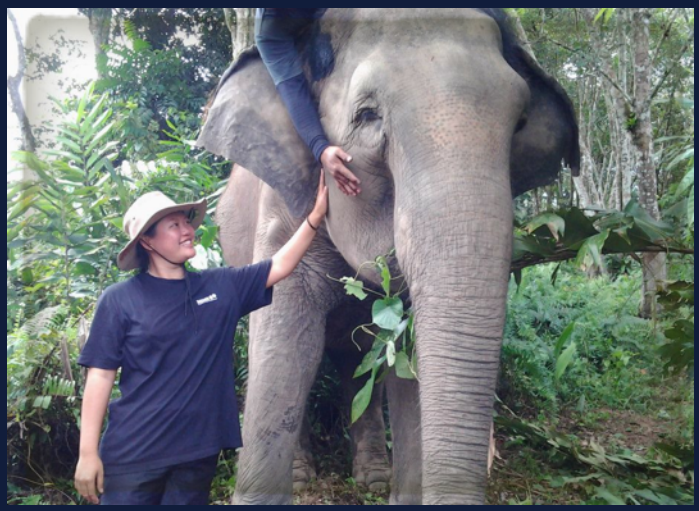
Elephant Distribution Survey in Perak

Since November 2012, I have been conducting a state-wide survey on the distribution of elephants and human-elephant conflicts (HEC) in Perak. One of the main aims of conducting the survey is to quantify and map the past and current distribution of elephants in Peninsular Malaysia. Since 1950's, Peninsular has lost more than half of its forest due to logging and conversion of land to agriculture and development. This forces elephants and other wildlife to be confined in fragmented protected areas and national reserves. Through this survey, a representative assessment of elephant distribution can be obtained which provides information about where the elephant's ranges are now and allows us to emphasize and strengthen mitigation efforts in known conflict areas that lead to HEC.

Photo credit: Lindsay Brooke

Though poaching is seen as the most serious threat to African elephants, HEC is the main threat faced by elephants in Asia. Intense forest fragmentation greatly reduces elephant's mobility compared with large fragments of continuous forest. As a result, elephants tend to roam into low–land plantations and villages adjacent to forests. This gives rise to HEC and it has become more prevalent over the decade as more land conversion takes place. Part of the survey also looks at how HECs has evolved through time and understand the intensity and its effects on villagers, farmers and plantation owners.

This survey is part of a larger-scale project carried out by the Elephant Conservation Group (ECG). Habitat loss and HEC are global phenomena and many other Asian countries suffer from the same fate: India, Sri Lanka and Indonesia just to name a few. ECG was formed through a collective effort of researchers from various countries to understand the current status of Asian elephants and plans to reduce HEC through effective mitigation efforts. Similar surveys are being conducted in other ECG participating countries that will provide a broader image and understanding of elephants and HEC distributions in Asia.



Ange Tan, MEME newest recruit seen with a captive elephant from Kuala Gandah Elephant Sanctuary.

Elephants are Gardeners of Malaysian Forests

By Ahimsa Campos-Arceiz

We often talk about the importance of preserving natural habitats for the conservation of elephants and other endangered wildlife. In this article we will discuss why preserving elephants is essential to conserve Malaysian forests. Elephant movers and shakers will be resumed in the next MEME Update. This article was originally published in the issue 66.3 of MNS's magazine the Malaysian Naturalist. We sincerely thank MNS for allowing us to reproduce the text here. Enjoy!

Seed dispersal — a key ecological process

As we all know, plants are rooted to the ground and cannot move from one place to another as animals do. There are only two times in a plant life cycle when it can move: during pollination, when the father genes travel to the location of the mother plant; and during **seed dispersal**, when the new individual (the seed) travels from the location of the mother plant to **its final destination**. This trip away from mother plant, decides the place where the new plant will spend the rest of its life, this is, whether it will live in a location good to germinate and establish, to find water and nutrients to grow, whether it will suffer the presence of many competitors and predators, and whether the plant will be able to find mates to reproduce. Seed dispersal thus, determines the fate of a new plant, and this is true for every single plant. Therefore, if we scale up the process, it is easy to understand that seed dispersal plays a very important role in determining the structure of tropical forests (e.g. where individual trees are), their biodiversity, and ultimately their maintenance and regeneration (Fig. 1).

Figure 1. In a Malaysian rainforest, every single tree had to travel as a seed from its mother plant to its current location. The combination of all these individual trips plays a fundamental role in generating the complexity and diversity of tropical forests.

Fruits are made to be eaten!

Plants and herbivores are involved in an evolutionary arms race in which plants invest considerable amounts of resources in developing all sorts of physical and chemical defenses to avoid being eaten, while herbivorous animals develop all sort of responses to override plant defenses. But there is a remarkable exception — **fleshy fruits**. Many plants actually invest a huge amount of resources in producing good looking, tasty, and nutritious tissues to be eaten by animals. We can say that fleshy **fruits are food gifts that plants offer to animals**.

Elephants are Gardeners of Malaysian Forests

Why would plants do that? Because animals have the mobility that plants lack and, in tropical rainforests, they can transport seeds much further than gravity or water, and, as a rule of thumb, the further a seed is transported, the higher its probability of surviving and becoming a new tree. This exchange of services (food in exchange of transport) is what we call a **plant-animal mutualism**.

Figure 2. Do you find durians, cempedaks, mangoes, mangosteens, rambutans, and other fruits attractive? That is because fruits evolved to be attractive for frugivorous animals, like us. Plants invest a large amount of resources in producing tasty and nutritious fruits expecting that frugivores will return the favor by dropping the seeds far away from the mother plant, in a place suitable for germination and establishment of the new individual.

There is no better seed disperser than an elephant!!

The **effectiveness** of a seed disperser is measured in three different components: (1) the quantity of seeds it can disperse, (2) the quality of the dispersal service it provides (i.e. where and how it drops the seeds, and how this affects seed survival and germination), and (3) the diversity of plants it can disperse. Most dispersers are good at one or two of these things — e.g. they either can disperse many seeds over a short distance or a few over long distances — but **megafauna** are unique in that they can do well all of these things. Elephants consume large amounts of food everyday and they can consume humongous amounts of fruits and seeds in one go (Fig. 3). Elephants seldom masticate their food and they have a very mild digestive capacity- one of the physiological constraints of very large body size-, therefore most of the seeds consumed by elephants will be defecated in viable conditions.

Figure 3. Over 150 mango seeds found in a single elephant dung pile in the Bago Yoma mountains of Myanmar. Besides mangoes, this pile contained seeds from three other plants (e.g. seeds of *Cordia* sp. at the right bottom).

Elephants are Gardeners of Malaysian Forests

Elephants defecate seeds kilometers away from the location where they consumed them (Campos-Arceiz *et al.* 2008), thus allowing seeds to avoid pathogens and competition near their mother tree and promoting the colonization of new locations, and they deposit seeds in a pile of moist and fertile dung, which is perfect to stimulate seed germination (Fig. 5).

And because elephants have the most diverse diets among herbivores, they provide this effective service to a wide array of plants and plant types. Particularly interesting is the fact that elephants are good dispersers of tiny seeds, such as those of grasses and forbs (Fig. 6) but they also consume the largest of all fruits and seeds, for which they are the only available disperser (Fig. 7).

For all these reasons, elephants have been dubbed as the mega-gardeners of forest (Campos-Arceiz & Blake 2011).

Figure 5. Seedling of sentol (*Sandoricum koetjape*) emerging from elephant dung in Taman Negara. Elephant dung protects seeds from seed predators such as bruchid beetles and provides the perfect conditions for seed germination, giving a head-start to seeds consumed by elephants.

Figure 6. Seedlings of small forbs sprouting in elephant dung in Temengor Permanent Forest Reserve.

Figure 7. Seed of *Borassus flabellifer* defecated by an elephant in Sri Lanka. *Borassus* fruits and seeds are among the largest that can be swallowed and defecated viable by terrestrial animals. In the absence of elephants, there is no other animal that can defecate *Borassus* seeds and thus provide an effective seed dispersal service.

Elephants are Gardeners of Malaysian Forests

What would happen if we lose the elephants?

We known that elephants are rapidly declining throughout their range, including in Malaysia. If they are so important for the maintenance of forest structure and diversity, what would happen if we definitely lose elephants from Malaysian forests? Recent studies suggest that elephants are unique and even animals like tapirs cannot replace their ecological function (Campos-Arceiz *et al.* 2012). In the absence of elephants we expect that many plants, especially those with very large fruits and seeds, would suffer from dispersal limitation, a situation in which seeds fail to disperse and the next generation of seedlings all grow near the mother plant. This generates plant clusters, increasing genetic structure of populations and making them very vulnerable to perturbations (e.g. if there is no dispersal, populations cannot recolonize available sites after a perturbation). Eventually, elephant-dispersed plants will decline considerably in numbers and distribution range, some of them becoming extinct. At the same time, plants dispersed by gravity, wind, or small animals, will face less competition in the forest and will manage to increase in numbers and occupy the vacant space left by elephant-dispersed plants. All these processes have profound implications in plant composition, with a substantial reduction of fleshy-fruit producing species, which in turns results in less food available for other animals that also consume fruits dispersed by elephants. Humans would be also affected people since elephants are probably the main dispersers of many wild fruits that people eat or could potentially eat in the future (e.g. durians, mangos, cempedak, sentol, and many others). Overall, the disappearance of elephants seed dispersal function would result in a simplification of ecological networks and a reduction of biodiversity in Malaysian forests. This is why we need to preserve elephants to conserve our tropical rainforests as we know them.

References

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Campos-Arceiz, A., Larrinaga, A.R., Weerasinghe, U.R., Takatsuki, S., Pastorini, J., Leimgruber, P., Fernando, P. & Santamaria, L. (2008) Behavior rather than diet mediates seasonal differences in seed dispersal by Asian elephants. *Ecology*, **89**, 2684–2691.

Campos-Arceiz, A., Traeholt, C., Jaffar, R., Santamaria, L. & Corlett, R.T. (2012) Asian tapirs are no elephants when it comes to seed dispersal. *Biotropica*.

The Wildlife Corridor Update

The camera trapping surveys in Bintang Hijau Corridor (Primary Linkages 8) are finally over. A total of 219 camera traps were deployed, but 17 were stolen - this suggests that poaching activity in the corridor is rather high (see Photo below).

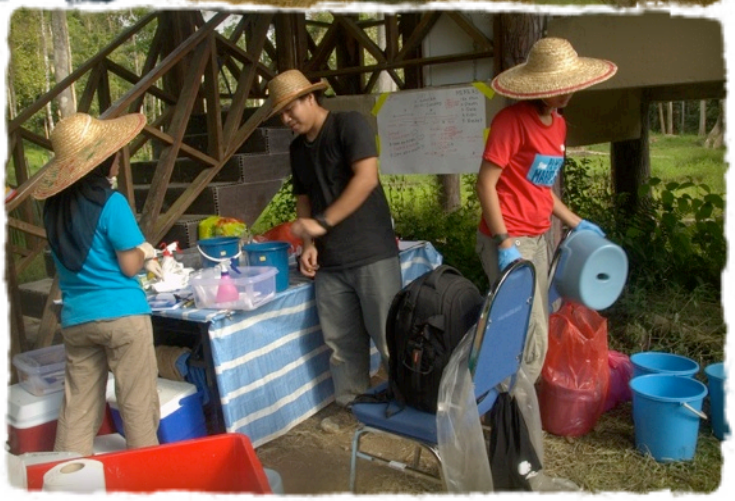
The camera trap photos are currently being catalogued and the total number of species recorded from the forest and highway viaducts will only be known by the end of April. After 12,299 trap nights, only 1 tiger was detected (Photo 2).

Nevertheless, there are still signs of breeding of threatened mammal species in this corridor (Photo 3, 4) and efforts must be made to reduce poaching and habitat conversion.

Reuben

Left: Malayan tiger *(Panthera tigris jacksoni)*
Top: Sun bear *(Helarctos malayanus)*
Bottom: Serow *(Capricornis sumatraensis)*

Diary from the Stress Zone



1-19 January 2013: Experiment on Dung Decay

A dung decay experiment was carried out at the National Elephant Conservation Center (NERC), Kuala Gandah, as part of Ee Phin's study on faecal hormone metabolites. The experiment was carried out successfully with team members: Steven Lim, Nurul Azuwa Othman, Long term volunteers-Rachel Tan, Wan Nor Fitri and Daia Kasim, together with help from staff of NERC (as above).

In total 80 dung piles were collected from 10 elephants and the samples will be analysed at UNMC's laboratory to compare the effect of time and environment degradation on hormone found in elephant dung. We wish to thank En. Nasaruddin Othman and the staff of NERC for their support for this experiment.

Photo Captions in clockwise: The team at work processing samples collected from the dung nursery; The toothpicks mark the spot where samples had been collected aka precious samples; The open air nursery for the dung decay experiment; The team getting ready to go out under the hot sun, to collect samples from decaying elephant dung.

Diary from the Stress Zone

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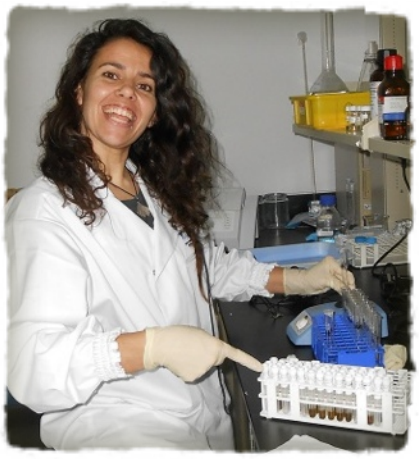

1 February 2013: Big applause for MEME's Newest Volunteer

MEME welcomed the arrival of **Ms. Alicia Solana Mena**, a volunteer from Madrid, Spain. Alicia will be staying in Malaysia for a year and will be helping with fieldwork and research. Alicia has extensive experience working with owls and wildlife recovery centers in Spain, and she brought along her enthusiasm and positive energy to share with the team. Let's wish her a adventurous and memorable stay with MEME in Malaysia.

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13 February - 8 March 2013: A working visit from Chester Zoo - establishing faecal endocrinology lab!

It is difficult to see and track Asian elephants in the thick Malaysian jungle, making it a big challenge to study these beautiful creatures. Besides using satellite GPS collars to monitor the movement of wild elephants, MEME is working with research partners including Chester Zoo, to find out how elephants are responding to anthropogenic disturbance and translocation to new areas.

Recently, after the Chinese New Year holiday, Chester Zoo's staff, **Ms. Rebecca Purcell** visited University of Nottingham Malaysia Campus (UNMC) to help MEME in establishing a faecal endocrinology laboratory. This is an important step for MEME to start monitoring hormones in elephant dungs. The study of faecal hormone is one of the tool used for non-invasive monitoring of wildlife's well-being and how they respond to the environment.

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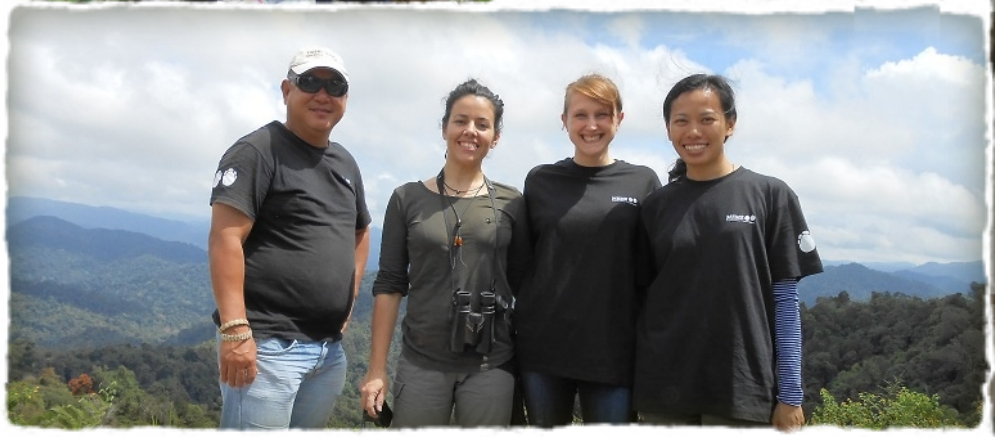
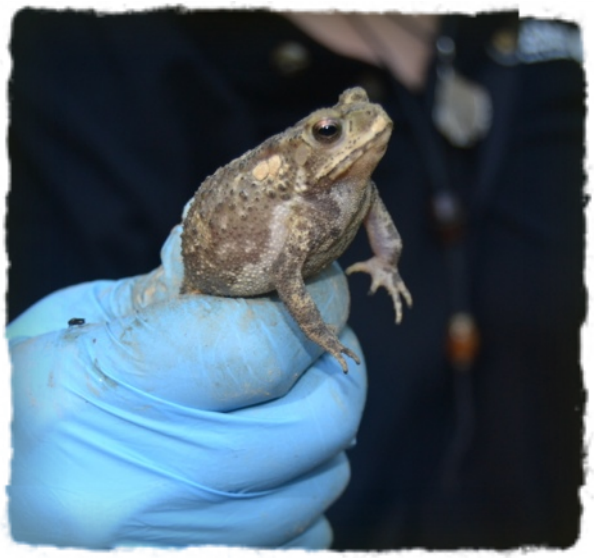
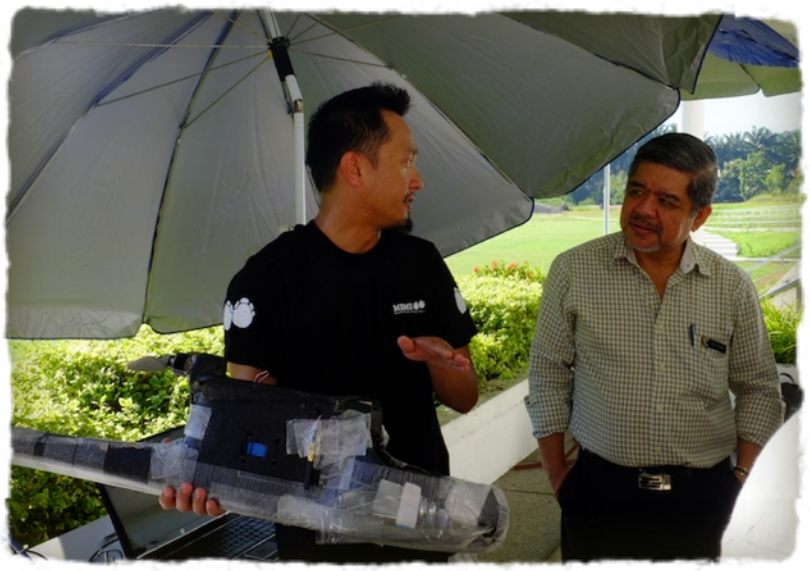
Ee Phin



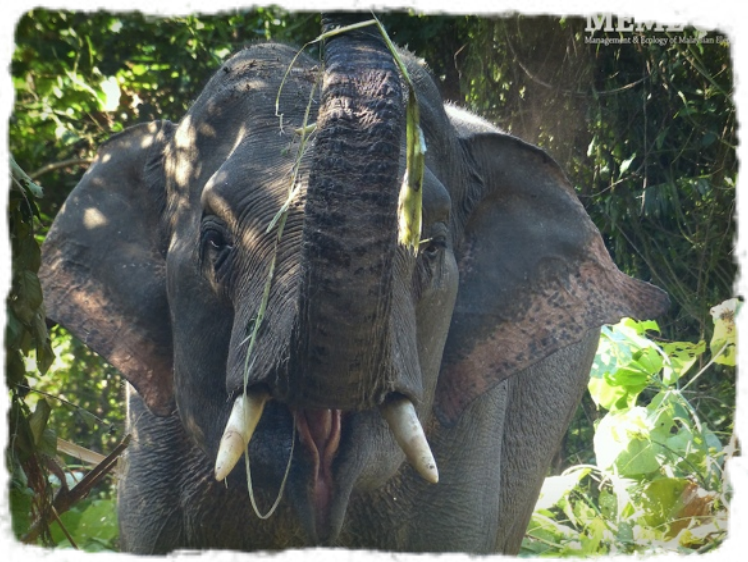


Frog found in elephant dung, a microhabitat in itself for flora and fauna!



Wee Siong giving a demonstration on conservation drones to PERHILITAN's Director General, YBhg. Dato' Rashid, also present were Datuk Misliah, Tuan Haji Mohd. Nawayai, Dr Sivananthan and En Nasharuddin.

Lindsay Brooke from University of Nottingham UK paid a visit to MEME again. Bringing much joy to the team as you can see!



Awang Putih, a translocated bull, providing precious information on elephant movements.

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