

Developing release protocols for trade-confiscated Sunda Pangolins (*Manis javanica*) through a monitored release in Cat Tien National Park, Vietnam.

Organisation: The Carnivore and Pangolin Conservation Program (CPCP)

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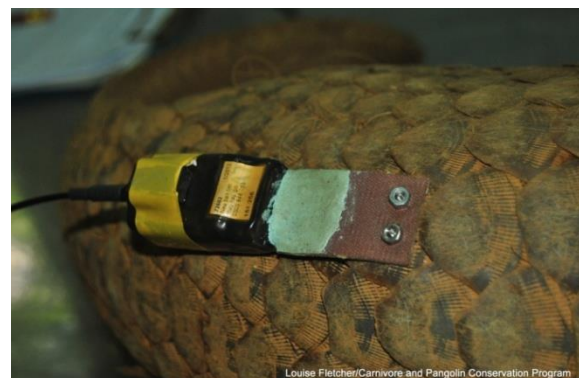
The Sunda pangolin (*Manis javanica*) is one of the most exploited species in Southeast Asia and is illegally traded in huge quantities. Despite many recent advances in the husbandry for this species, much of the ecology and biology of this unusual mammal remains unknown. Forest Protection Department (FPD) Rangers often release pangolins into protected areas with no post-release monitoring and no data to confirm that this is a viable placement option. This project aimed to clarify whether release into a protected area is a viable placement option through a monitored release and in doing so simultaneously generated data on the ecology, biology and wild behaviours of this species. This data can be used to improve the effectiveness of both in-situ and ex-situ conservation activities.

Objectives:

1. To improve the ability to accurately assess the health and reproductive status of trade-confiscated Sunda Pangolins.
2. To initiate and develop a genetic reference library so that the provenance of trade-confiscated Sunda Pangolins can be compared and analyzed, once samples from all range countries have been collected.
3. To investigate and verify whether release into a protected area in Vietnam is a viable placement option for fully-rehabilitated trade-confiscated Sunda Pangolins.
4. To improve the rehabilitation of Sunda Pangolins confiscated from the trade.
5. To improve the capacity of FPD Rangers to independently carry out appropriate release programs, that includes post-release monitoring, as well as basic health checks and quarantine.
6. To improve the capacity of Vietnamese conservationists by training them in international standard field techniques.

Comprehensive health checks of the six individuals identified for release were conducted in May 2012 with the support of fully qualified veterinarians from Animals Asia Foundation. They included:

- Faecal floats to check for gastrointestinal parasites
- Biochemical and hematological analysis to monitor for stress, immune response and organ function
- Physical examination



Figures 1 & 2: Pangolins undergo a health check and transmitter attachment while under aesthetic

Genetic samples from all Sunda Pangolins have been analysed at The Centre for Natural Resources and Environmental Studies (CRES) in Hanoi. A report is being generated at is expected by the end of April. Furthermore, hair and scale samples have been taken from a two other individuals: one confiscated juvenile brought to Cat Tien National Park (CTNP), and one resident male inside the park.

Four animals from CPCP have been released into CTNP (3 females and 2 male) with a survival rate of 80%. Data on home range size, den site selection and activity patterns have successfully been collected with an aim to publish the results in *The Journal of Wildlife Rehabilitation*. Releases have been conducted with an aim to reinforce any depleted population in CTNP with male and female ranges overlapping in an attempt to increase the population and genetic diversity of Sunda Pangolin in the park.



Figures 3 & 4: P27 and P3 being released into the forest in CTNP

While in the park two animals have died, one juvenile brought to the park after being bought from the trade; the second a released individual (P27). Post mortems have been conducted on both of them. Mortality of individuals from the trade is notoriously high (70%) and deterioration is rapid. The confiscated animal showed symptoms of neurological issues (commonly seen through head trauma within the trade), while P27 had suffered a dramatic weight loss after being released for four months (the transmitter fell off after two months, before he was relocated). However, neither displayed evidence of infection, ulceration or gastrointestinal parasites. Although disappointing, this was an opportunity to remind FPD staff that an immediate release into a protected area after confiscation is a poor placement option.

CPCP researchers have worked with three FPD Rangers for the entirety of the project, along with members of the park's Scientific Department and staff at the National Park Rescue centre to improve the rehabilitation of Sunda Pangolins received at the park.

All FPD staff are trained in using radio tracking to locate an animal's sleep site using homing; taking bearings of an animal's location using triangulation; and identifying and recording periods of activity at night. Staff at CTNP Rescue Centre have been trained in the protocol for attaching a transmitter to an animal; treating injuries on confiscated animals and conducting post mortems where necessary. All this training is supported with both a comprehensive husbandry guideline and radio tracking protocol and a short guideline outlining the most parsimonious procedure for the rehabilitation and release of Sunda Pangolins which is nationally feasible while still following the 2002 IUCN *Guidelines for the Placement of Confiscated Animals* and the 1998 IUCN *Guidelines for Re-introductions*.



Figures 5, 6 & 7: FPD Ranger training (from left to right) in locating a pangolin using VHF radio telemetry; transmitter attachment; and conducting post mortems.

One recent graduate from Ho Chi Minh University has been working with the project since August 2011 and has been trained in the areas of camera trapping, radio tracking, pangolin rehabilitation and night spotting. Three volunteers have received training in radio tracking, each staying with the project for a two week period and the CPCP team have presented work to Master students studying conservation and biological sciences at Ho Chi Minh University, increasing their understanding of the field techniques involved with post release monitoring.

The activities of both the field team in CTNP and the captive team in Cuc Phuong National Park (CPNP) have been used to raise awareness about the threat facing pangolins in Vietnam. The facebook page now has over 1,400 followers, the blog (<http://sundapangolin.wordpress.com/>) has received 3,525 hits since it was established in March 2013 and videos of the releases are available to watch on www.youtube.com (http://www.youtube.com/watch?v=Zp3139_Nae8; and <http://www.youtube.com/watch?v=vCjz2V6cxoM>). CPNP has been filmed by one Vietnamese organisation regarding the rehabilitation and release of Sunda Pangolin and has recently been visited by a journalist from CNN. At CTNP researchers have been interviewed by provincial journalist <http://www.dddongnai.vn/a/news?t=8&id=1027272>. The team have also been to two local secondary schools and presented talks to the students, as well as talks to International Schools from Ho Chi Minh that have visited the park. Articles have also been presented on both the ZSL blog page (<http://www.edgeofexistence.org/edgeblog/?p=7294>) and the IUCN blog (<https://portals.iucn.org/blog/2014/02/15/happy-world-pangolin-day-releasing-pangolins-in-vietnam/>) and preliminary results on both the captive care and releases have been presented at the IUCN SSC Pangolin Specialist Group conference in Singapore in July 2013. A final one day workshop in CTNP is scheduled for the beginning of May and will involve local stakeholders to disseminate the results and hold open discussions about responsible placement options for confiscated pangolins.

Results and Conclusions:

1. Evaluating the success of a release program as a viable placement option.

Two indicators were used to evaluate the success i) the survival of the individual one month after release ii) the establishment of a stable home range.

The project recorded an 100% survival rate (n=4) for the one week immediately following release, (due to a transmitter drop the fate of two of these individuals after this time frame remains unconfirmed) and a 100% survival rate three months after release (n=2). However, four months after release a mortality was recorded (P27).

A post mortem revealed no sign of gastrointestinal parasitism or ulceration, however, individual idiosyncrasies may have meant he found it difficult to locate adequate den sites (he utilised the same den site for a number of consecutive nights, returning to it on several occasions). There is also the potential that he encountered another wild male (found nearby *after* P27's release) which may have been an added stressor (but this cannot be confirmed).

Studies on other released species indicate a level of dispersal post release, the extent of this exploratory behaviour depends on many factors, including: resource availability; connectivity to other suitable habitat; similarity between source and release sites; interactions with conspecifics; and individual variation (Parlato & Armstrong, 2012). Release locations were identified based on surveying the area for a number of characteristics including:

- Number of tree hollows (13-24cm diameter).
- Number of termite and ant nest.
- Habitat type.
- Presence of other pangolins, predators or hunting.

The establishment of a stable home range and the location of this home range in relation to the release site assessments is one indication of what factors are important considerations when releasing Sunda Pangolin.

Table 1. Showing the maximum distance travelled from the release site and the length of time taken to establish a stable home range (measured by plotting the cumulative number of location fixes against range size, the point of asymptote represents the establishment of a stable home range(Gautestad and Mysterud, 1995))

Animal ID	No. of tracking days	Max distance moved from release site (m)	No. of days to establish a stable home range
P33	22	486	19
P34	12	313	-
P27	44	569	14
P3	7	248	-
P26	21	228	-

The data suggests that the characteristics used to identify suitable release sites are adequate to ensure the successful release of individuals. For those who were tracked for more than two weeks they established stable home ranges (although future, seasonal fluctuations would be expected) and no individual ventured more than 600m away from the initial point of release.

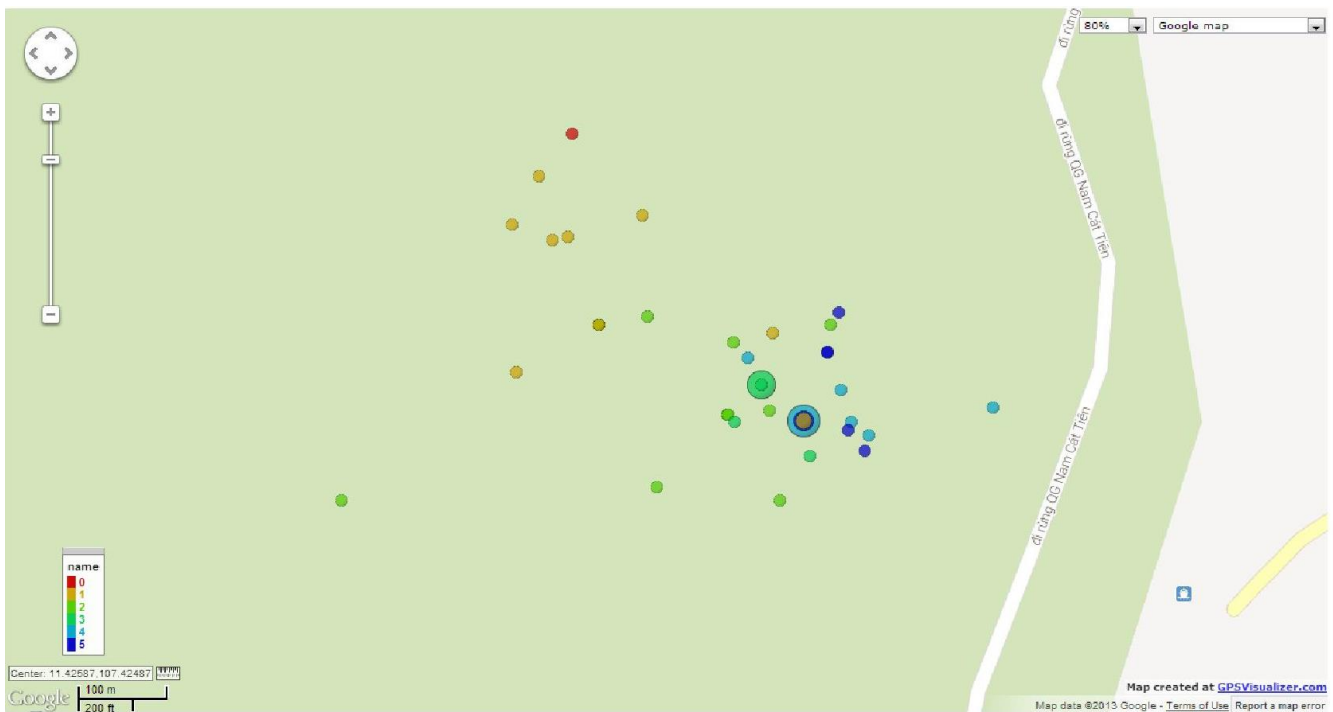


Figure 9: GPS location of sleep sites in the weeks post release for P27 (male). The red dot represents the release location. Those sleep sites to which P27 showed a higher fidelity are represented by larger circles.

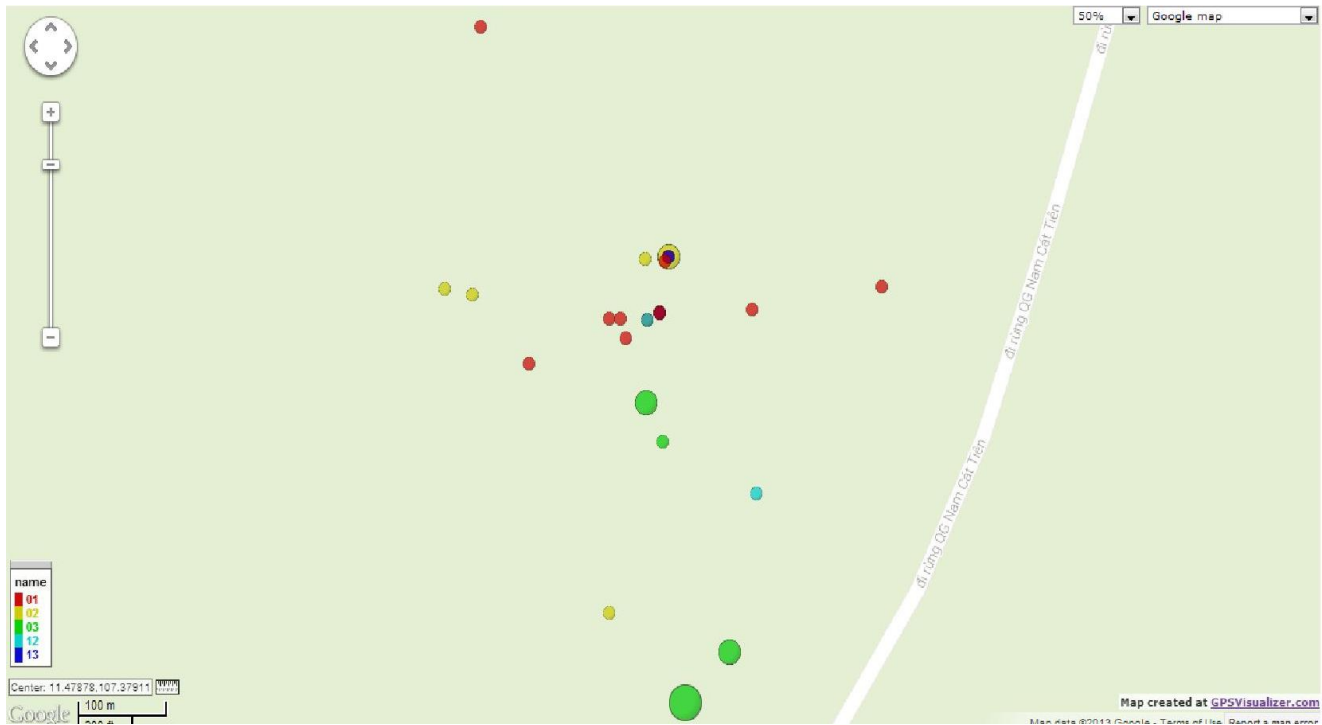


Figure 10: GPS locations of sleep sites in the weeks post release for P33 (female). Those sleep sites to which P33 showed a higher fidelity are represented by larger circles. The GPS locations in weeks 12 and 13 were obtained using camera traps.

2. Improving knowledge on the conservation requirements of Sunda Pangolin.

To broaden knowledge in this areas information was collected on:

- Characteristics of the sleep sites and the microhabitat
- Distance between sleep sites
- Home range size and sleep site fidelity

Table 2. Sleep site data for the female individuals: P33 (n=9); P34 (n=2); P3 (n= 5); and the male: P27 (n= 19).
 *secondary forest and seasonal wetland.^a on two occasions den sites were used for 7 and 8 days continuously

	P33	P34	P3	P27	P26	Total/Over all average
Location:						
Above ground	8	2	3	3	2	18
Climbed tree	1	1	2	2	0	6
Tree hollow	7	1	1	1	2	12
Ground level/underground	0	0	2	12	3	17
Root hollow	0	0	0	5	2	7
Under fallen deadwood	0	0	2	5	1	8
Dug burrow	0	0	0	2	0	2
Unknown	0	0	0	3	0	3
Sleep site characteristics:						
Mean trunk circumference (cm)	292	-	337	463	399	372.75
Mean diameter of den site entrance (cm)	46	-	28	26.3	18.75	29.76
Microhabitat:						
Secondary forest	8	0	5	16	5	34
Bamboo forest	0	1	0	2	0	3

Edge habitat	1*	0	0	0	0	1
Sleep site movement:						
Mean distance between new sleep sites (m)	91.6	-	243.8	87.2	111.4	133.5
Mean no. of consecutive nights used	1.8	-	1	2.3 ^a	4	2.28
Home range size (ha)	2.6	-	5.5	16	0.87	6.2

On several occasions individuals slept under a fallen tree log, or up a tree. This suggests that pangolins can utilise sleep sites with a variety of characteristics, however, all sites were covered and provided shelter, suggesting that release site assessments can look for potential sleep sites other than those just provided by tree hollows.

All releases were conducted in secondary evergreen forest. This often contained, or was neighbouring, areas of bamboo forest, which pangolins ventured into on more than one occasion. However, in terms of post release monitoring bamboo forest is a problematic area; due to the dense vegetation there is high amounts of attenuation making sleeping sites harder to accurately locate.

The relatively small distances moved between den sites and the resulting relatively small home ranges (compared to those recorded by Lim, 2008, and those observed in the Chinese Pangolin, *Manis pentadactyla*) would typically indicate an animal's ability to exploit a limited resource (Hinde, 1956), however, with released individuals it may just represent a heightened level of cautiousness within a new environment. This is an important consideration in the case of this project where the animals released have been in captivity for up to three years, those rehabilitated and released in a much shorter time frame may show different behaviours.

Follow up activities:

Stemming from the work conducted so far, future activities should be focussed on the following objectives:

- Refining the transmitter design and attachment to reduce drop off rate.
- Establishing a viable population in CTNP by releasing animals with consideration of sex and proximity to other individuals.
- Studying a wild population with which to compare the data obtained from this project and determine what "abnormal" behaviours may look like, which can be used as indications that a released animal need to be recaptured and brought back to captivity.

The work from the release program has also provided the opportunity to evaluate current methods used to survey for pangolin and make recommendations about how they can be improved.

From spending 47 nights in the forest (in areas where pangolin have been released) and 30 hours of night spotting CPCP have had two sightings of individuals (one a released individual and the other a wild individual). Furthermore, over a one year period there have been just three sightings reported by staff members at a study site in Cat Tien National Park.

The project has seen success in obtaining camera trap photographs of Sunda Pangolin. For instance when relocating an individual when radio tracking has ended, camera traps were put up at all previously used den sites and baited with the diet the individuals received in captivity. Although this was successful it required a large camera trapping effort to obtain a small number of photographs (i.e. an effort of 336 to obtain one photograph).

The low number of confirmed sightings through camera trapping and night spotting, combined with the fact that Sunda Pangolin leave very few signs of presence (they do not dig their own burrows like the Chinese Pangolin) means that estimating abundance or gathering further ecological data is problematic.

According to hunter interviews (Newton et al. 2008) the most successful way of tracking a pangolin is through the use of a dog. Conservation dogs have been used in a variety of habitats for a wide variety of species, with recognised success. There is no reason as to why they would not work for the conservation of Sunda Pangolin, however, no one can identify a location where their use can be tested. Through CPCP's release program we have *a priori* knowledge of the home ranges and distribution of six animals providing the opportunity to test the applicability of conservation dogs as a reliable method for surveying for Sunda Pangolins.