

The status of pangolins in the Ke Go-Khe Net lowlands of Central Vietnam

D. Willcox & Do Thanh Hao
Carnivore & Pangolin Conservation Program (CPCP), Cuc Phuong National Park



Figure 1. Ke Go Nature Reserve. View from Bac Toc hill.

Pangolins (Pholidota: Manidae), are only distributed in Africa and Asia and represent an unusual and poorly studied order of mammals. The order contains eight species in total, four of which are found in Asia: Sunda pangolin *Manis javanica*, Chinese pangolin *M. pentadactyla*, Indian pangolin *M. crassicaudata* and Philippine pangolin *M. culionensis* (Gaubert and Antunes 2005). Vietnam is home to two pangolin species: *M. javanica* and *M. pentadactyla*. Both species are endangered and are severely threatened within their range countries (Duckworth *et al.*, 2008a; 2008b). Vietnam is one of the few countries which has populations of two species, and is therefore a priority country for pangolin conservation in Asia.

Key threats to Vietnam's biodiversity include the loss and degradation of natural habitats; overexploitation of wildlife and plants for sale into the illegal wildlife trade and invasive species (Sodhi *et al.*, 2004; Sterling *et al.*, 2006). Pangolins are one of the most sought after mammals in Asia and are illegally traded in huge volumes to satisfy demand for their meat, body parts (particularly their scales) to be used in traditional medicine and for the skin trade. An illegal shipment of over 20 tonnes of frozen pangolins and scales was intercepted in 2008 in Vietnam illustrating the huge level of unsustainable trade that is driving Vietnam's, and the region's, pangolin populations towards extinction.

Unfortunately as well as being some of the most threatened animals in Southeast Asia, they are also some of the least known in terms of their ecology and suffer from a limited number of focused conservation initiatives addressing their conservation. All Asian pangolin species remain poorly studied with little known about even their most basic ecological and conservation requirements. This is preventing both effective *in situ* and *ex situ* conservation activities for these endangered mammals.

Field records of both *M. javanica* and *M. pentadactyla* indicate they are a relatively widespread species with no specific habitat requirement being found in most habitat types and at all elevations (Newton *et al.*, 2008; Duckworth *et al.*, 2008; Lekagul and McNeely 1977) Although probably once relatively common, through the above threats they have been decimated to small and fragmented populations in the wild. Identifying protected areas with viable populations of these species to focus *in situ* conservation interventions is of the utmost importance.

Central Vietnam contains a range of highly diverse and endemic mammalian taxa, forming part of the Greater Annamites Ecoregion which consists of the Annamite mountain range spanning the western border of Vietnam, associated foothills and the Annamese lowland areas, (Baltzer *et al.*, 2001). The Ke Go-Khe Net lowland forest complex supports one of the largest remaining tracts of lowland evergreen forest in the Annamese Lowlands Endemic Bird Area (Le Trong Trai *et al.*, 2001) and contains a number of globally-threatened mammal and avian taxa including Ha Tinh langur *Trachypithecus laotum hatinhensis*, gaur *Bos gaurus*, Southern serow *Naemorhedus sutramaensis*, giant muntjac *Megamuntiacus vuquangensis* white-winged wood duck *Cairina scutulata* and Imperial pheasant *Lophura imperialis* (Le Trong Trai *et al.*, 1999).

Previous social survey work in the area provided unconfirmed reports of both the Sunda pangolin and Chinese pangolin co-existing within the Ke Go-Khe Net Lowlands (Newton *et al.*, 2008; Le Trong Trai *et al.*, 1999). The area contains suitable habitat and falls within the presumed distribution of both species. Population declines in both species were also reported for the Ke Go-Khe Net Lowlands, with the Chinese pangolin thought by local hunters to be nearing local extinction (Newton *et al.*, 2008).

This survey was designed to clarify the distribution and status of both the Chinese and Sunda pangolin within the Ke Go-Khe Net lowlands and the results of this survey are presented here.

Methods

Study area

The Ke Go - Khe Net Lowlands is one of the largest patches of lowland broadleaf evergreen forest in the Annamese Lowlands covering 48,401 ha (Le Trong Trai *et al.*, 1999). At the edges of southern extent of the landscape there are a number of small eucalyptus and rubber plantations. There are also patches of scrub and grassland where forest has been cleared at both the edges and also in some parts of Ke Go Nature Reserve (Figure 2). Ke Go Nature Reserve experiences selective logging, with heavy disturbance

across an estimated 76% of the total land area (Le Trong Trai *et al.*, 1999). There has been no timber harvested legally from the Khe Net NR since 1997 when a zero quota was issued from local government. However, local people have continued to intensively extract timber and NTFPs from the area.



Figure 2. Extensive clearing and then overgrazing by domestic buffalo has resulted in some parts of the Ke Go-Khe Net lowlands being reduced to grassland and scrub.

The topography of the Ke Go-Khe Net Lowlands is undulating hills, not reaching much over 500 m. The landscape is dissected by a network of permanent rivers and streams, many of which run in to the man-made reservoir that borders Ke Go Nature Reserve in the north (Le Trong Trai *et al.*, 1999). The wet-season is characterised by regular rainfall and extends from August-October, with a mean annual rainfall from 481.2mm to 680.0 mm. From November-March the area experiences a dry-season with very little rain. Temperature ranges from an average of 25.4°C in July to 10.8°C in January.

The landscape straddles two provinces, Ha Tinh in the north and Quang Binh in the south. The northern section comprises Ke Go Nature Reserve, established in 1996 (18⁰ 00'-18⁰ 09'N and 105⁰ 50'-106⁰ 07'E); whilst the southern extent comprises Khe Net Nature Reserve (18⁰ 02'N-105⁰ 58'E). There were approximately 50,000 people living in the buffer zone of Ke Go-Khe Net Lowlands in 1999 (Le Trong Trai *et al.*, 1999; 2001) of mainly Kinh ethnicity with small numbers of Muong and Nguon minority groups. Many of these households are responsible for the main threats to the area which include hunting, timber extraction, firewood collection, and oil extraction mainly from *Cinnamomum parthenoxylum* and other Lauraceae trees (Le Trong Trai *et al.*, 1999).

Field Survey Effort

To obtain field records for pangolins, three methods were used; nocturnal spotlighting walks, diurnal searches for tracks/signs of pangolins and camera trapping. Field surveys were conducted over two main periods October – November 2006 and January – June

2010. The initial survey in 2006 was designed to search for species of small carnivore however, as two of the main field methods used (camera trapping and nocturnal spotlighting walks) are identical to those used in the more recent survey for pangolins (2010), the results have been included for this report.

Field surveys covered all major habitat types with particular focus on the lightly and heavily disturbed primary lowland broadleaf evergreen forest with less time in eucalyptus/rubber plantation and patches of scrub and grassland. In total, the survey team conducted approximately 113 hours of night-spotlighting (split equally between Khe Net NR and Ke Go NR); and 165 hours of diurnal tracks and sign surveys. A total of 1782 camera trap days (26 camera traps) were conducted from 21st October 2006 to 24th March 2007 and 23rd January 2010 to 7th July 2010.

Night-spotlighting and diurnal tracks/sign walks

Human-made trails were followed in the forest for both diurnal and night walks selected by local hunters with knowledge of the forest. Trails were selected that passed through both secondary and primary forest, with very little time spent in plantations or grassland/scrub areas.

26 diurnal walks were carried out lasting an average of 6 hours (ranging from approximately 1½ - 9 hours) starting at roughly 0800 each morning. During these walks the team looked for spoor (faeces), footprints, and pangolin burrows and other possible signs of pangolin activity (e.g. exposed termite mounds) along and near the main trails.

39 spotlighting walks were carried out lasting an average of 3 hours (ranging from 1-6 hours) starting at roughly 1900 each evening. LED Head-torches were utilised to detect the eye shine of mammals by scanning trees along the trails. When eye-shine was detected, a stronger spot-light (1,000,000 candle power) was used to help confirm the identity of the species.

Camera trapping

Eleven DeerCam DC 300 camera traps loaded with ISO 200 film were set in 12 sites during 2006-07. Four DeerCam DC 300 (also loaded with ISO 200 film), nine Cuddeback Capture, one Cuddeback Excite and one Bushnell Trophy Cam (all three models are digital) were set in 17 sites during 2010. Several cameras had to be relocated during the study due to ongoing anthropogenic disturbances.

The following settings were applied to all camera traps: 15 second delay between pictures for film cameras and 30 second delay for digital cameras (except for the one Bushnell model which was set to a 15 second delay), sensor at high/auto-high sensitivity, cameras aimed at a tree or large rock to limit detection distance; all faced either north or south to avoid poor photo quality and to maximize the sensors performance. Silica gel was packed inside the cameras to reduce moisture. Metal roofs were attached to some of the cameras to prevent rain water from penetrating inside the camera. Some of the new digital cameras also had steel cases designed to help reduce theft and rainwater penetration. All traps were checked each month and a new 36 exposure film inserted and if digital,

memory cards removed and new ones put in. Any brush was also removed from 3 m in front of the camera traps to increase the sensors ability to detect animals.

In order to prevent people from detecting and stealing/breaking camera traps they were placed a minimum of 20 m from trails, we attached them to sturdy trees with steel cable, disguised them with fresh leaves, and also pasted alert plates on top of each camera trap with the following words: Research Equipment: Contains chemicals. Do not touch!

The survey team was careful to limit human odours at the sites and natural and artificial lures were used to attract animals to the camera traps' detection zone. Fixed distances of 2.5 m to 3 m were set between the camera trap and a 'target log'. Baits were then applied to these 'target logs' including Hawbaker's weasel lure, Hawbaker's Wild cat lure, Kishel's crossbreed lure, Kishel's weasel lure, dried fish, shrimps, honey, fish oil, raw duck egg, beef sausage and shredded fish.

Results

A total of 322 photographs of animals were taken over the survey, of which 298 were of mammals, 10 birds, 1 reptile, 10 people and 3 dogs. Three camera traps were stolen during the study. 10 species of mammal were seen on diurnal and spotlighting walks and 40 species of birds, 9 species of reptile and amphibian. No pangolin species were recorded either during the spotlighting walks or on the camera traps.

Threats to pangolins

The survey team frequently encountered evidence of illegal encroachment in both protected areas. Over 1200 snare traps (Figure 3), drift fence for funneling the animals into snare traps (approximately 2 kilometers in length), felled trees (19 trees ranging from 10 to 80cm diameter-at-breast-height), logged timber (136 individual pieces, ranging from 2 - 4m in length, see Figure 4) anthropogenic clearings (ranging from 10m² to 75m²), logging camps (15) and hunting camps (2) were recorded throughout the area. In addition to this illegal loggers (72), hunters (3) (and their dogs, 3) and NTFP collectors (3) were also encountered on a regular, often daily, basis. Approximately 121 domestic buffalo were also recorded. Whilst most buffalos were involved in dragging illegally harvested timber out of the forest, some appeared feral and may even be breeding inside the Nature Reserves (several young calves and juveniles were observed).



Figure 3. Example of the type of snare trap commonly found in the Ke Go-Khe Net Lowlands. This photo was taken at a hunters' camp in the Ke Go Nature Reserve.



Figure 4. A collection of illegally harvested wood, waiting to be transported out of the forest in Khe Net Nature Reserve.

Selective logging was evident in all five areas surveyed and most of the primary forest left in the Ke Go-Khe Net Lowlands is very physically disturbed. Illegal selective logging of large hardwoods, important as natal dens for *M. javanica* (Lim and Ng 2007) was observed directly throughout the Ke Go-Khe Net Lowlands.

Local people reported that hunting pressure increased in the wet season (August to October), when animals are more active. Wild meat was both reported to be consumed by local households and also sold to wholesale wildlife traders operating in the area.

Trade-confiscated pangolins are frequently found to have severe leg wounds caused by cable snare traps (Clark *et al.*, 2008), and it is reported to be one of the more favoured hunting methods for pangolins in Ke Go-Khe Net (Newton *et al.*, 2008), so they are known to be vulnerable to this hunting method. The high numbers of cable snare traps found throughout the survey therefore represent a severe threat to the persistence of both species in the Ke Go-Khe Net Lowlands.

Discussion

Despite a considerable survey effort (113 hours spotlighting and 1782 camera trap days) neither *Manis javanica* nor *M. pentadactyla* were recorded and no tracks/signs that could be confidently attributed to a pangolin were found. Nothing resembling a pangolin burrow was found, and burrows that were observed were too small in diameter and were most likely to be the work of rodent species. An opened up termite mound was found in one survey area, but it is impossible to confidently state that this was due to a pangolin and not another animal species, or even a person.



Figure 5. Slow loris (*Nycticebus coucang*). Observed during spotlighting exercises in Ke Go Nature Reserve.

The camera traps and spotlighting transects obtained records for a number of other terrestrial and arboreal mammal species (e.g. small-toothed palm civet *Arctogalidia trivirgata*, Asiatic brush-tailed porcupine *Atherurus macrourus*, Malayan porcupine *Hystrix brachyura*, slow loris *Nycticebus coucang* (Figure 5) and common palm civet *Paradoxurus hermaphroditus*), yet there were no observations of either pangolin species. Though camera traps are a reasonably cost-effective way of producing a high survey effort, they clearly lack the ability to detect pangolin species when they are extremely rare and/or exist at low densities. Despite the Carnivore and Pangolin Conservation Program successfully using spotlighting techniques when surveying for *M. javanica* in the South of Vietnam (U Minh Ha National Park), no pangolin observations were made during this survey. The large number of hours dedicated to spotlighting in the Ke Go-Khe Net Lowlands and the lack of records has demonstrated that this technique is evidently only suitable for when pangolins exist in higher densities, as *M. javanica* does in U Minh Ha National Park.

Ke Go-Khe Net is within the known distribution of both species (Duckworth *et al.*, 2008a; Duckworth *et al.*, 2008b; Newton *et al.*, 2008), yet this survey failed to provide confirmed field records for either species. Anecdotal reports and informal discussions with experienced hunters gave further backing to previous reports (Newton *et al.*, 2008) that *M. pentadactyla* might be nearing local extinction. Whilst proving that a nocturnal and elusive species is locally extinct will always be difficult, the behaviours and ecology reported of *M. pentadactyla* (ground dwelling and sleeps in burrows), would seem to make it more vulnerable to hunting (e.g. snare traps, dogs) and therefore at greater risk, than the more arboreal *M. javanica*. The lack of any records for *M. javanica* would also seem to indicate that this species is also facing a population decline in this area and is now extremely rare.

The two main threats to pangolins (illegal hunting and logging) are not unique to the Ke Go-Khe Net Lowlands and are representative of the problems that can be found in many of Vietnam's protected areas. It is therefore likely that both *M. javanica* and *M. pentadactyla* are in similar situations throughout Vietnam and are in danger of extinction at a national level. There is now an urgent need for increased taxon-specific conservation measures for what is one of Asia's most endangered groups of animal. Current survey methods are inefficient at detecting pangolins when the species are rare and/or exist at low densities and methodologies that are able to detect and monitor wild populations of these two threatened species need to be developed and implemented urgently.

The Ke Go-Khe Net Lowlands should still be considered an important area for conservation because the habitat type (lowland evergreen broadleaf forest), is one that is becoming increasingly rare in Vietnam and across the region. Removal/reduction of threats, such as hunting and logging, would significantly aid the conservation of this important ecoregion and would allow this site to become part of any future re-introduction program for either pangolin species, as well as other threatened taxa that were once associated with the area.



Figure 6. Snare traps and cooking pots found in a hunters' camp. Ke Go Nature Reserve.

Conservation Recommendations

1. Improve Field survey methods

The results of this survey have demonstrated the ineffectiveness of standard surveying techniques such as camera trapping and spotlighting for monitoring pangolins, when they are extremely rare and/or at low density. As this situation is likely to be similar in most protected areas in Vietnam (due to widespread hunting pressures and illegal logging), there is a need to develop an effective way of monitoring Vietnam's threatened pangolin populations. Effective taxon-specific surveys for this highly endangered group of animals are urgently needed, as the results of this survey would suggest that pangolins are likely to be avoiding detection in the more standard biodiversity surveys. The use of trained dogs to monitor or survey rare and elusive animals has been used with remarkable success in a number of field studies (e.g. Rolland *et al.*, 2006). This technique should be trialled immediately, with dogs trained to search for and find pangolin faeces and burrows.

2. Strengthen protection of animals by the local Forest Protection Department officers

If protected areas in Vietnam are to fulfil their role for wildlife conservation then they need to become far more effective and managed in a way that promotes wildlife protection above financial profit. Training programs for local staff on species identification would be valuable but in reality one simple measure that requires minimal additional training would make a significant positive impact on the current situation: regular patrolling in the core zone with trap removal throughout the forest.

3. Immediate protection of *M. javanica* populations in the South of Vietnam

Future *M. javanica* surveys in Vietnam and other *in situ* conservation activities for this species need to focus on populations in South Vietnam, most notably those in Cat Tien National Park and in the U Minh wetlands. Previous CPCP surveys have indicated that the U Minh wetlands are likely to have some of the healthiest populations of *M. javanica* in the country and are therefore a priority area for the species conservation.

4. Identification of priority sites for *M. pentadactyla* conservation

The ecology and behaviours of *M. pentadactyla* makes it the more threatened of the two pangolin species. There is an urgent need to identify priority sites for the conservation of *M. pentadactyla*, as there is no knowledge of where the healthiest wild populations are in Vietnam. Once sites are identified, surveying work should be undertaken immediately and protection measures (e.g. snare trap removal) initiated in order to save this highly threatened species.

References

- Baltzer, M.C., Nguyen Thi Dao and Shore, R.G. (Eds). (2001). Towards a vision for biodiversity conservation in the forests of the lower Mekong Ecoregion complex. WWF Indochina/WWF US, Hanoi and Washington D.C.
- Duckworth, J.W., Steinmitz, R., Anak Pattanavibool, Than Zaw, Do Tuoc & Newton, P. (2008a). *Manis pentadactyla*. In: IUCN 2010. IUCN Red List of Threatened Species. Version 2010.2. <www.iucnredlist.org>. Downloaded on 17 August 2010
- Duckworth, J.W., Anak Pattanavibool, Newton, P. & Nguyen Van Nhuan (2008b). *Manis javanica*. In: IUCN 2010. IUCN Red List of Threatened Species. Version 2010.2. <www.iucnredlist.org>. Downloaded on 17 August 2010
- Gaubert P, Antunes A (2005) Assessing the taxonomic status of the Palawan pangolin *Manis culionensis* (Pholidota) using discrete morphological characters. *J Mammal* 86: 1068–1074
- Le Trong Trai, Nguyen Huy Dung, Nguyen Cu, Le Van Cham, Eames J. C. and Chicoine, G. (1999). An Investment Plan for Ke Go Nature Reserve, Ha Tinh Province, Vietnam: A Contribution to the Management Plan. BirdLife International Vietnam Programme, Hanoi, Vietnam
- Le Trong Trai, Tran Hieu Minh & Do Tuoc. (2001). Nghiên cứu Khả thi Thành lập Khu Bảo tồn Thiên nhiên Khe nét tỉnh Quảng Bình, Việt Nam. BirdLife International in Vietnam & Forest Inventory and Planning Institution. February 2001.
- Lekagul, B and McNeely, J.A. (1977). Mammals of Thailand. Bangkok, Thailand: Association for the Conservation of Wildlife.
- Lim NTL, Ng PKL (2008) Home range, activity cycle and natal den usage of a female Sunda pangolin *Manis javanica* (Mammalia: Pholidota) in Singapore. *Endangered Species Research*. 4:233–240
- Newton, P., Nguyen, Van Thai., Robertson, S. and Bell, D. (2008). Pangolins in peril: using local hunter's knowledge to conserve elusive species in Vietnam. *Endangered Species Research*. 6: 41-53
- Rolland, R.M., Hamilton, P.K., Kraus, D.S., Davenport, B., Roxanne M. Gillett, M.R. and Wasser, S.K. (2006). Faecal sampling using detection dogs to study reproduction and health in North Atlantic right whales (*Eubalaena glacialis*). *Journal of Cetacean Research and Management*. 8(2):121–125
- Sodhi, N.S., Koh, L.P., Brook, B.W., and Ng, P.K.L. (2004). Southeastern Asian biodiversity: an impending disaster. *Trends in Ecology and Evolution*. 19 (12): 654-660.

Sterling EJ, Hurley MM, Le MD (2006) Vietnam - a natural history. Yale University Press, New Haven, CT