

**A PRELIMINARY
ASSESSMENT OF
SUNDA PANGOLIN
TRADE IN SABAH**

**SANDRINE PANTEL
NOORAINIE AWANG ANAK**

A TRAFFIC SOUTHEAST ASIA REPORT

TRAFFIC
the wildlife trade monitoring network



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Cover: Close-up of Sunda Pangolin *Manis javanica* scales
Photograph credit: Chin Sing Yun/TRAFFIC Southeast Asia

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Sandrine Pantel and Noorainie Awang Anak

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Sunda Pangolin *Manis javanica*

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EXECUTIVE SUMMARY

Pangolins are one of the most commonly encountered mammals in Asia's wildlife trade (Shepherd *et al.*, 2007). This is exemplified by the alarming volumes that have been seized in East and Southeast Asia, as reported by the media, publications and enforcement agencies themselves. It is reasonable to assume that these represent only a small portion of the pangolins being traded, especially considering that detection of illegal trade requires a high level of enforcement; a characteristic often absent in the region. Very little is known about the four extant species of pangolin in Asia, and the Sunda Pangolin *Manis javanica* is no exception (Duckworth *et al.*, 2008).

It is assumed from the few observations and studies which have been conducted and, from what is known about African pangolins, that the Sunda Pangolin has a very low reproductive and replacement rate. This factor, when considered in conjunction with the extremely high levels of harvest to supply the trade, raises serious concerns for the continued survival of the species.

This report presents the results of an interview-based survey carried out among pangolin hunters on the west coast of Sabah, as well as an analysis of logbooks, covering a period of 20 months, confiscated from a criminal syndicate involved in the trade of pangolins and obtained during a raid carried out by the Sabah Wildlife Department (SWD).

Based on these data, together with the results of discussions with professionals in the wildlife conservation and wildlife law enforcement fields in Sabah and throughout Southeast Asia, it can be concluded that the trade of pangolins is very well established in this state, wildlife-trading syndicates are well developed, organized and connected to the international trade network. Pangolin hunters are secretive and usually reluctant to provide information; they come from a variety of social backgrounds and generally hunt the animals opportunistically, as a secondary income activity. Considering the large volumes of pangolins recorded in the logbooks, it is obvious that a large number of people are willing to catch pangolins to supplement their income.

In Sabah, pangolins are protected by law. However due to lack of financial resources, poor staffing and low capacity in enforcement agencies, there has been limited action by the authorities against high profile, well organized and experienced pangolin trading criminals.

Based on the findings of this study and previous surveys conducted in the region, the authors make the following recommendations:

- Enforcement efforts should be strengthened and strongly supported by NGOs and donors. Support is particularly needed as follows:
 - Covert work to provide SWD reliable and timely information for follow-up actions
 - Capacity building and financial support to ensure that enforcement teams are well equipped and trained for maximum efficiency of actions at every level of the law enforcement chain.
- Educational and awareness-raising campaigns should be carried out to complement law enforcement efforts. These should include engagement with local communities on the conservation of pangolins, information on pangolins' role in the ecosystem and the threats they face. An outreach programme should be developed to enlist local communities into reporting wildlife crimes and stopping illegal activities.

- Additional surveys on the trade of pangolins should be conducted in Sabah, as well as in Sarawak and Kalimantan. The survey presented in this report is only scratching the surface of pangolin trade, being quite limited in terms of time and funding. More information is needed on hunting habits, local markets and links to the international trade to address the problem efficiently. Longer surveys can be costly, particularly in areas where access is difficult, but they are crucial to provide teams with sufficient time to build trust with local communities and collect quality data.
- Estimates of the species' relative abundance and distribution should be carried out in Sabah as well as in other parts of the Sunda Pangolin's range. It is not possible to quantify the full impact of the trade without accurate information of population status.
- Further studies are needed on pangolin habitat requirements and the protection of these habitats.

INTRODUCTION

Background

Sabah is the second largest state of Malaysia; it is located on the island of Borneo. Together with Sarawak, it constitutes the eastern part of Malaysia. Sabah shares borders with Sarawak and the Indonesian Province of East Kalimantan (Fig. 1) and represents about 10% of the total area of Borneo, the third largest island in the world. After Indonesia and Malaysia, the smallest country, in terms of area, represented on Borneo is Brunei Darussalam. Borneo has a very rich and diverse flora and fauna and is home to a high number of endemic mammals (Rautner *et al.*, 2005; WWF 2005). Major threats to biodiversity in Southeast Asia are dominated by deforestation, due to habitat conversion, illegal logging and forest fires, as well as hunting for bushmeat and wildlife trade (Sodhi *et al.*, 2004). According to WWF (2006), over-exploitation is the second largest direct threat to species after loss of habitat. Deforestation is occurring on Borneo at one of the world's highest rates, due to illegal logging, large-scale conversion of forest to oil palm and rubber plantations, pulp production and forest fire (WWF, 2008). Illegal hunting and wildlife trade are closely related to habitat destruction, as for example, logging roads provide better access to forested areas (WWF, 2005; Sodhi *et al.*, 2004) and are described by Rautner *et al.* (2005) as widely spread throughout the island.

There are eight species of pangolin found in the world, only one of which, the Sunda or Malayan Pangolin *Manis javanica*, is found in Sabah. Sunda Pangolin is distributed across Southeast Asia from Myanmar to Indonesia (Fig. 2) (Duckworth *et al.*, 2008). Few studies have been carried out on the species and there is little information available on distribution and no published estimates of population density (Lim and Ng, 2007; Duckworth *et al.*, 2008, Newton *et al.*, 2008). According to Wu *et al.* (2004a, 2007), pangolins are at very high risk of extinction due to over hunting, trade and biological and ecological characteristics such as their low reproduction rate and reclusive nature. Females generally give birth to only one offspring per year (Lim and Ng, 2007; Macdonald, 2001; Nowak, 1999). This, when compared to the high volumes reportedly seized by the authorities in the region, has led to serious concerns over population trends. The Sunda Pangolin was added to the IUCN Red List of Threatened Species in 1996 within which it was listed as Lower Risk/near threatened. Due to high levels of hunting and other factors, such as habitat degradation, in recent years, the conservation status of the species was assessed to have genuinely deteriorated and in 2008 the species was re-evaluated as Endangered and the population considered to be in decline (Duckworth *et al.*, 2008).



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A large Sunda Pangolin *Manis javanica* tries to escape capture by climbing a tree

Fig 1:
Location of Sabah

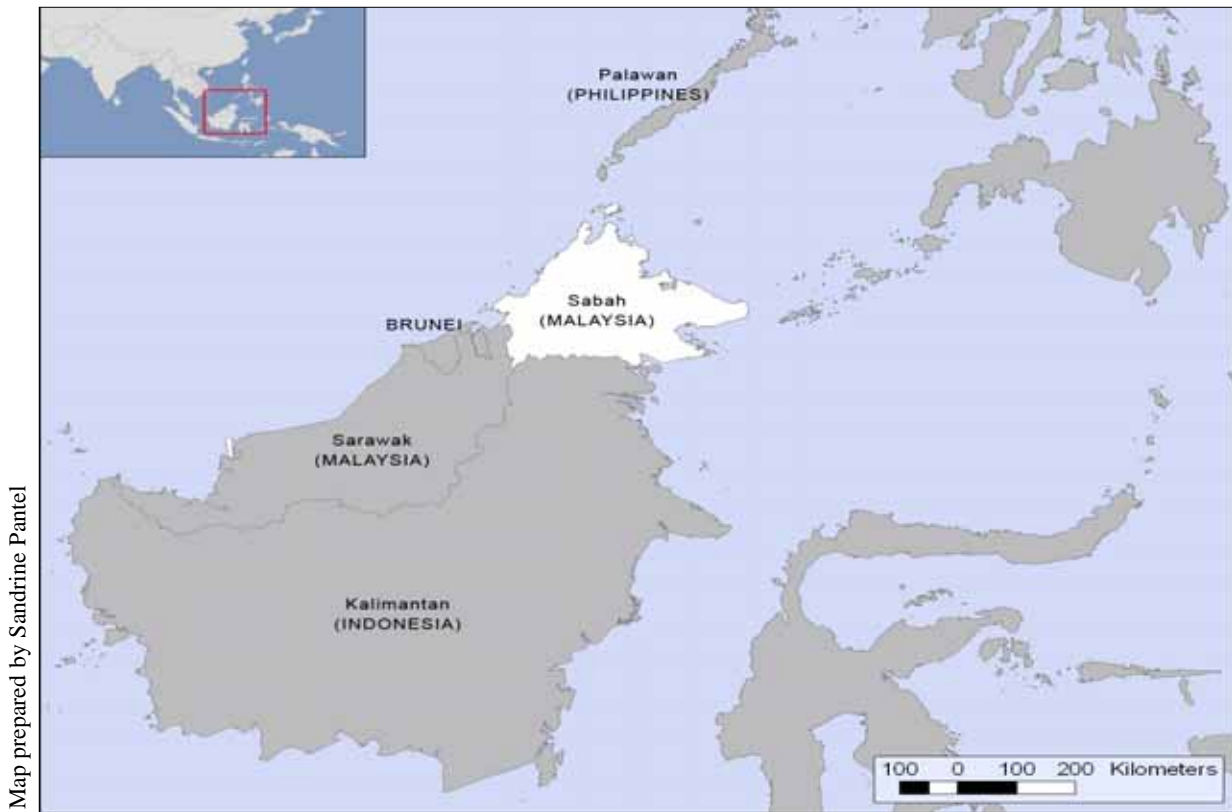


Fig. 2:
Distribution of the Sunda Pangolin *Manis javanica*.



Source: IUCN (International for Conservation of Nature), 2008

No specific surveys have been conducted on the Sunda Pangolin in Sabah. Although relatively common in the State as reported by Duckworth *et al.*, 2008, the species has been observed on very few occasions during the course of wildlife inventory surveys. Published examples include a few sightings and camera trap records made near Keningau during mammal inventories carried out by Sabah Parks in Crocker Range Park (Yasuma *et al.* 2003). One sighting was recorded during a survey of the Sungai Pinangah Forest and Sungai Imbak Virgin Jungle Reserves (Boonratana, 1997). The species has also been recorded at natural salt licks in the Deramakot forest reserve, a commercial-logging reserve on the upper Kinabatangan River (Matsubayashi *et al.*, 2007). Although the species appeared on fewer than five photographs of the 649 taken, the authors referred to it as common in the area. The Institute for Tropical Biology and Conservation (ITBC), from the Universiti Malaysia Sabah (UMS) conducted a small mammal study on the island of Pulau Gaya. A young male pangolin was captured in one of their traps and camera traps set up on the island also provided records of pangolin presence (Azniza Mahyudin, pers. Comm., 11 March 2009). A pangolin was also spotted during a mammal inventory survey in Mount Silam, on the East coast of Sabah, along a road, at night (Ketol *et al.*, 2009).



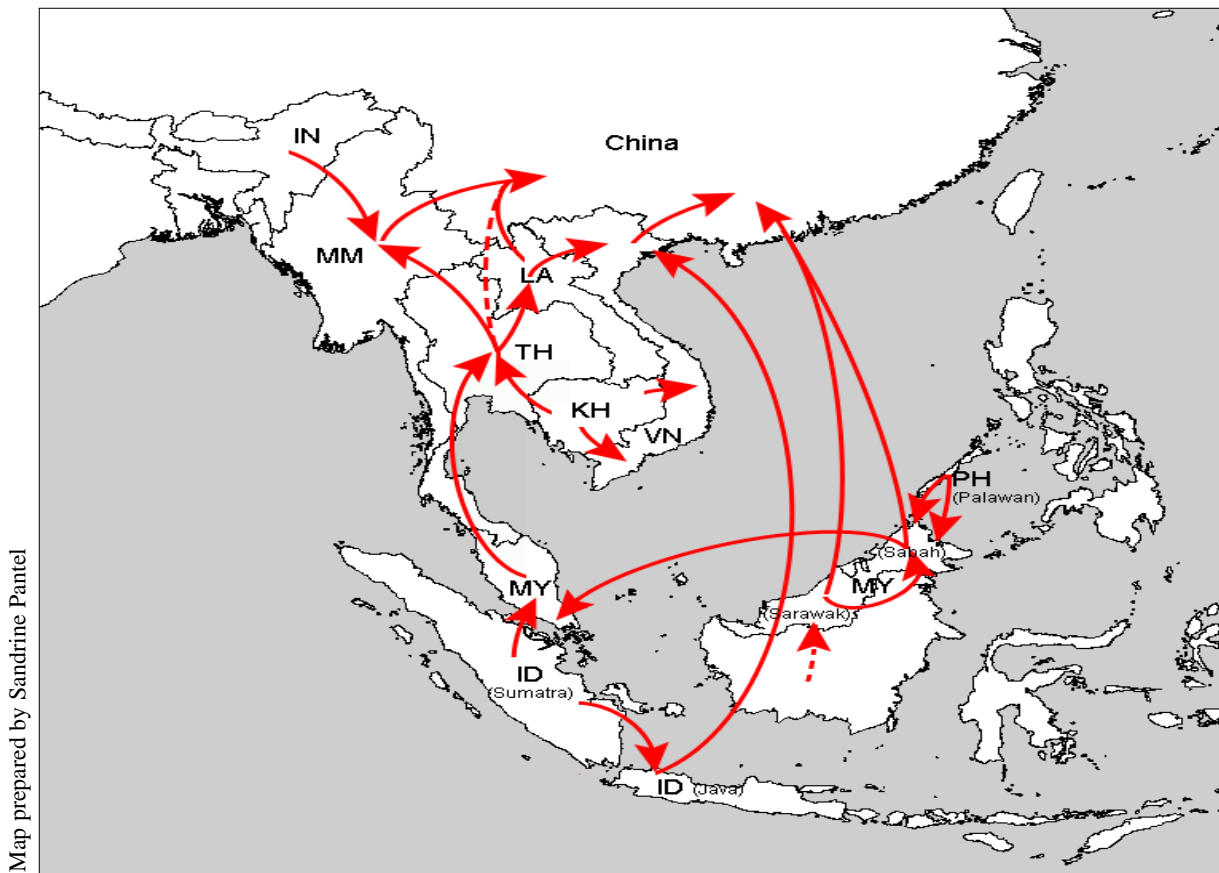
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A large Sunda Pangolin *Manis javanica* smelling the air searching for signs of danger

The pangolin trade has a long history in Southeast Asia, with reports of exports from Java dating back to 1925 with Herklots (1937) noting that animals were imported to China to supply the domestic market. Asian pangolins are currently collected and traded at an alarming rate, throughout their range, to supply the extremely high demand from consumers mainly in China, for meat, as delicacy, and scales, for use in traditional medicine (TRAFFIC, 2004, 2008a). Seizure data gathered from the press and enforcement authorities in Southeast Asia, between 2000 and 2007, indicated that about 30 000 pangolins were seized in this region and during this period (Yun & Pantel, 2009). It is widely recognized that the number of seized specimens only represent a small fraction of the actual illegal trade. This is particularly true in a region where

enforcement is low. Wu *et al.* (2004a and 2007) estimated that there has been a drastic decrease in Chinese Pangolin *M. pentadactyla* populations since the 1960s following the demand for medicine and food. Populations of the Sunda and the Chinese Pangolin are also thought to be depleted in Indochina (Shepherd *et al.*, 2007) making it very likely that the trade is currently supplied largely by animals harvested in Indonesia and Malaysia. Viet Nam also plays an important part in the trade, as a destination, or more often as a transit country for most of those pangolins harvested in Indonesia (Newton *et al.*, 2008; TRAFFIC, 2008a), while Thailand and Myanmar provide routes for pangolins collected in Peninsular Malaysia and India (Fig. 3). Although the main bulk seems presently to be sourced in Indonesia and Malaysia, collection in Cambodia, India, Lao PDR, Myanmar, Philippines and Thailand should not be underestimated, and specific studies should be conducted to assess the volumes harvested. Recent seizures in China also indicate that pangolins could start being sourced from African countries.

Fig. 3: Overview of pangolin international trade routes in Asia



Map based on recent surveys organized by TRAFFIC as well as seizures data.

Pangolins main defence when threatened by predators is to roll up into a ball making them extremely easy to catch by humans (Lekagul and McNeely, 1977; Health 1992; Nowak, 1999; Macdonald, 2001). The opportunistic capture of pangolins hence requires no special skills; anybody who manages to locate a pangolin can easily capture it without the use of a weapon or trap. The additional combination of high price for pangolins and low income levels of people living in pangolin areas, mean they probably represent an easy, lucrative and thus attractive target for poaching.

Examples of large seizures made by enforcement agencies over the past two years include two incidents in Viet Nam in February and March 2008 comprising a total of 23 tonnes of frozen pangolin meat and scales (TRAFFIC, 2008b), and one in Sumatra, Indonesia, in July 2008 consisting of 14 tonnes of frozen pangolins (TRAFFIC, 2008c). Viet Nam also seized two tonnes of pangolin scales in August 2009, in a shipment originating from Indonesia (Thanh Nien, 2009). Since the zero quota, decided in 2000, Malaysia and Thailand have recorded regular seizures of live pangolins within or passing their borders. The largest seizure in Malaysia, for year 2009, took place on 18 December, when police in the peninsular state of Kuantan caught two men attempting to sell 130 individuals (The Star, 2009). It is to be noted that the transportation of live pangolins takes place under inhumane conditions with the animals being confined in tightly wrapped bags and without access to food or water. As a result, when these are confiscated by the authorities they are likely to be in very poor health due primarily to the physiological stress of such conditions. Furthermore, the subsequent release of confiscated individuals is usually done without planning or monitoring and, in addition to having very low chances for survival, they may represent a health risk to local wild populations (Clark *et al.*, 2009).

During the 2008 pangolin trade study conducted by TRAFFIC in Peninsular Malaysia anecdotal evidence suggested that whilst the trade was already established on the Peninsula, it was spreading to Sabah and Sarawak due to a decline of pangolin population in Peninsular Malaysia (Chin Sing Yun, in litt., 20 April 2009). A reliable source also indicated to TRAFFIC that pangolins were brought to Johor Bahru in the south of the Peninsular from Kudat in Sabah where they are being added to the flow sourced from the Peninsular trade network (Chris Shepherd, pers. comm., 4 March 2008). A survey on the trade of the Philippine Pangolin *M. culionensis*, a very similar species endemic to the Philippine island of Palawan, was organized for TRAFFIC by the Katala Foundation Incorporated (KFI). This study highlighted potential connections between the Philippines and Sabah, mainly via Kudat and Sandakan (Schoppe and Cruz, 2009). In a study on gibbons and orang-utans, Nijman (2005) reported trade routes between Indonesia and Malaysia on the island of Borneo; however, connections seemed to be stronger between West Kalimantan and Sarawak than between East Kalimantan and Sabah. This being said, potential links between Sarawak and Sabah were highlighted by the 2008 TRAFFIC survey with pangolins sent from Limbang, in Sarawak and then onto China via Tawau, Sabah (Chin Sing Yun, in litt., 20 April 2009). This study also uncovered pangolin hunting and trade activities in the Indonesian province of West Kalimantan (TRAFFIC, unpublished data). Trade networks in this region appeared thus to be complex and the role of Sabah has not yet been well documented. Information such as this contributed to the decision to organize this study in Sabah.

Legislation

In Sabah, the Sunda Pangolin is listed as a Protected Animal, in *Part I of Schedule 2 of the State's Wildlife Conservation Enactment 1997*. This means that, whilst hunting is not totally prohibited, a hunting licence, issued by the Director of Wildlife, is required. A hunting licence cannot be issued unless the applicant or any other person entitled to hunt under that licence already possesses a valid firearm licence authorising the possession or use of an appropriate firearm "for the purpose of hunting under the licence". Moreover, the applicant should "be in possession of suitable firearms permitted to be used under the licence; competent to use the firearms; and able to identify the animals of the species listed in Part I of Schedule 1, Part I of Schedule 2 and Schedule 3."

According to Tuuga (2009) the Sabah Wildlife Department (SWD) has never issued such a hunting licence. Hunting without a licence is punishable by five years imprisonment or a fine of MYR50 000 (USD14 151.40 at 2009 rates) or both. It is however to be noted that indigenous minorities have specific native customary rights in Sabah, and as such are allowed to hunt without a licence for their own consumption. The sale of this offtake would remain, however, totally illegal. The difficulty for enforcement teams is therefore to make the difference between both intentions.

The *Wildlife Conservation Enactment 1997* also states that it is illegal to possess a protected animal or product made from a protected animal without the proper legal documentation. Violation of this law is punishable by a fine of MYR30 000 (USD8490.84 at 2009 rates) or imprisonment for three years or both.

Malaysia became party to the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) in 1978 and was the first Southeast Asian country to do so. In Sabah the implementation of CITES for all terrestrial fauna is the responsibility of the SWD.

All species of the genus *Manis* (pangolins) were listed in Appendix II of CITES in 1975. In 2000 a zero annual export quota was established for specimens of Asian species removed from the wild and traded for primarily commercial purposes (CITES, 2000).

To support the implementation of CITES in Malaysia and regulate the import and export of wildlife, the parliament recently passed the *International Trade in Endangered Species Act 2008*, known as Act 686. The Act came into force on 28 December 2009 and enforcement will start mid-2010, giving the public and business a grace period of six months to comply with the new regulations.

Since no hunting permit has ever been issued by the authorities in Sabah and no international commercial trade of pangolin or pangolin products is permitted; it can be said that the hunting or possession of pangolins or products derived from them, for commercial purpose, is illegal in Sabah.

Pangolins are also protected by law in other parts of Malaysia and its neighbouring countries. They are listed in the *Wildlife Protection Ordinance 1998* in Sarawak and in the *Wildlife Protection Act 1972* in Peninsular Malaysia. In Indonesia, pangolins are protected under the *Conservation on Biodiversity and Ecosystems Act No. 5 of 1990* and the *Government Regulation on Conservation on Flora and Fauna No. 7 of 1999*. In Brunei Darussalam, the international trade of pangolins is regulated under the *Wild Fauna and Flora Order 2007*. This Order was passed to support the implementation of CITES in Brunei Darussalam. However, pangolins are not listed under the *Wildlife Protection Act 1978* (Laws of Brunei), making the collection of pangolins legal in Brunei Darussalam. In the Philippines, the collection and trade of wildlife is regulated through the Republic Act No. 9147, known as the Wildlife Resources Conservation and Protection Act. Pangolins have been listed as Endangered in the Palawan Council for Sustainable Development (PCSD) *Resolution No. 06-309-A*, “A Resolution Approving the List of Terrestrial and Marine Wildlife in Palawan and their Categories Pursuant to Republic Act 9147”. A summary of the legislation relevant to pangolins in Malaysia and neighbouring countries is presented in table 1.

Table 1:
Summary of legislation protecting pangolins in Malaysia and neighbouring countries

Location	Legislation
International	Appendix II of CITES, a zero annual export quota was established in year 2000
Malaysia	<i>International Trade in Endangered Species Act 2008</i> , also known as Act 686
Sabah	Protected Animal in <i>Part I of Schedule 2 of the State’s Wildlife Conservation Enactment 1997</i>
Sarawak	<i>Wildlife Protection Ordinance 1998</i>
Peninsular Malaysia	<i>Wildlife Protection Act 1972</i>
Indonesia	<i>Conservation on Biodiversity and Ecosystems Act No. 5 of 1990</i> <i>Government Regulation on Conservation on Flora and Fauna No. 7 of 1999</i>
Brunei Darussalam	<i>International trade regulated by the Wild Fauna and Flora Order 2007</i> Not listed under the <i>Wildlife Protection Act 1978</i> (Laws of Brunei)

Table 1:

Summary of legislation protecting pangolins in Malaysia and neighbouring countries (*continued*)

Location	Legislation
Philippines Palawan	Republic Act No. 9147, also known as Wildlife Resources Conservation and Protection Act Listed as Endangered in PCSD <i>Resolution No. 06-309-A</i> , “A Resolution Approving the List of Terrestrial and Marine Wildlife in Palawan and their Categories Pursuant to Republic Act 9147”

METHODS

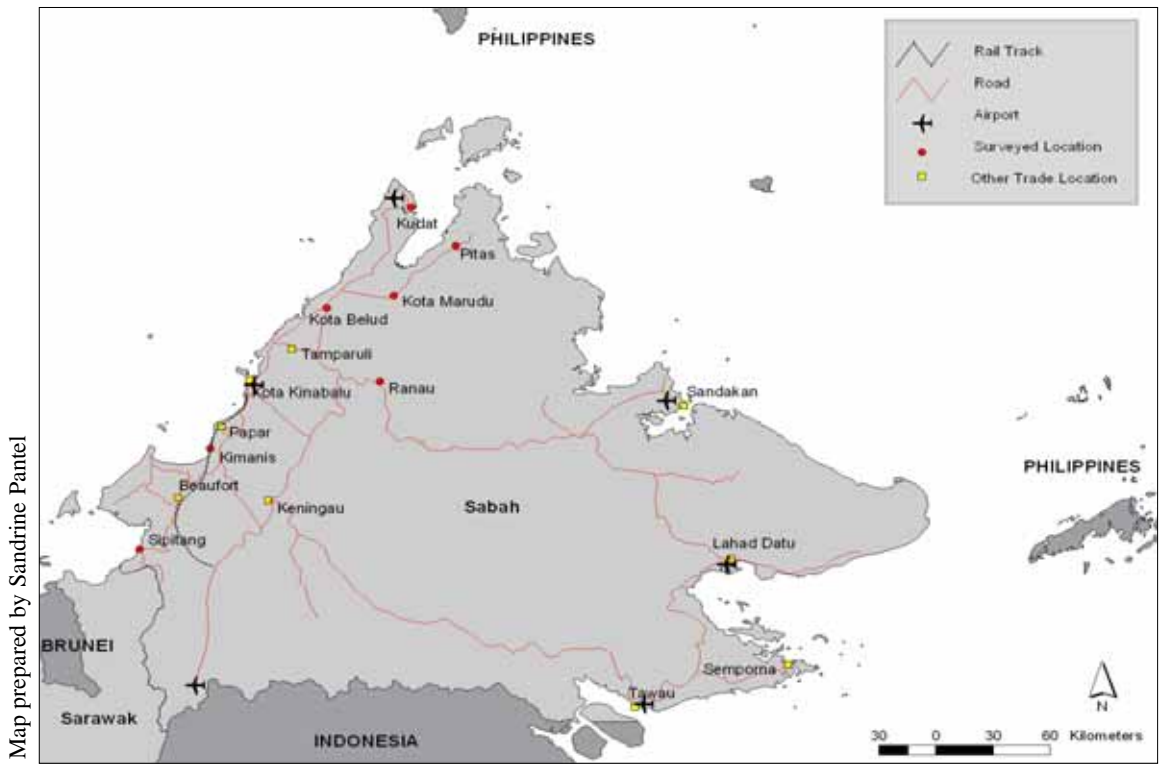
Data Acquisition

The authors met with experts in Sabah prior to organizing the survey. Informal consultations on the trade and status of the species were held with SWD, Sabah Park, WWF-Malaysia (Borneo Programme) and ITBC. These interviews provided information on pangolin hunting activities around Keningau and Kota Marudu on the west coast of Sabah and Lahad Datu and Tawau on the east coast (Fig. 4). The experts were not aware however, of any pangolin hunting or trading activities in the Kinabatangan area (central Sabah). They reported that pangolins are sold to middlemen and brought to transit points along the Sabah coastline where small boats bring the specimens offshore for transfer onto larger vessels.

Semi-structured interviews were conducted between 19th and 29th October 2009. The survey was limited in time due to a lack of resources. Traveling in Sabah can quickly become expensive mostly due to transportation costs. The interview targets were pangolin hunters and traders. Participants were selected using a snowball sampling approach (Warchol *et al.*, 2003). Given the limited time and resources available for this survey, the team decided to focus their efforts only on the west coast. Interviewees were selected in the vicinity of Sipitang, Kudat, Kota Marudu, Pitas, Kota Belud, Ranau and Kimanis (Fig. 4). Questionnaires were developed using the same model employed during the 2008 pangolin survey conducted by TRAFFIC in Peninsular Malaysia (Chin and Pantel, 2009). A few additional questions were added, most of which related to pangolin behaviour following the recommendations of participants at the workshop on Conservation and Trade of Pangolins Native to South and Southeast Asia, held in Singapore in 2008 (Pantel and Chin, 2009). Two researchers carried out the interviews, all conducted in Bahasa Malaysia; the national language. The surveyors found that it was extremely difficult to obtain information since people were reluctant to admit involvement in illegal activities for fear that they would be reported to the authorities. The team also felt that it was not always safe asking questions about this business as some respondents made it clear they had guns.

During a warehouse raid carried out in February 2009, a team from SWD recovered logbooks containing information on pangolin sources, volumes and price. Two types of logbooks were used by the dealers, those with a brown cover contained records for a warehouse located in Kota Kinabalu (Tuuga, pers. Comm., 10 March 2009) others had a pink cover bearing the name of the source location (Fig. 5). TRAFFIC was generously given access to copies of these for analysis.

Fig. 4:
Main towns where pangolins are traded



Map prepared by Sandrine Pantel



Noorainie Awang Anak/TRAFFIC Southeast Asia

Fig. 5:
Logbooks recovered by SWD from a warehouse in Kota Kinabalu (Feb. 2009)

Analysis

Interview Survey

Due to the small amount of data recorded during the field survey, simple descriptive statistics were used.

An average of currency conversion rates was computed using OANDA Historical Exchange Rates webpage (<http://www.oanda.com/currency/historical-rates>) for October 2009, when the survey was carried out. The rate used to translate prices recorded during the interview survey was: USD1 = MYR3.41.

Logbooks

The logbooks provided data recorded by the trading syndicate between May 2007 and January 2009. Not all the entries in the logbooks were complete, but the data entered generally included date of transaction and the number and weight of pangolins. Additional information, such as location and first name of the provider was also noted for some transactions. Weights were most often recorded by individual, but on occasion the weight of a group of individuals was recorded along with the number of individuals making up that group.

The total weight of pangolins received by the dealer was calculated for each month and all of these records were included. An analysis of pangolin weight distribution was then calculated using only those records where the individual weight of each animal was listed. Box plots were used to assess monthly weight variation and a frequency distribution analysis was carried out on the complete set of individual measurements to allow for the potential distinction between males and females or juveniles. The logbooks did not contain any information on gender or other physical characteristics apart from weight.

Although the results should be considered carefully as the measurements were conducted by a third party; given the extremely large dataset, it was considered that potential errors might be negligible. Although these logbooks brought disastrous conservation news, they represent a unique occasion to examine a very large dataset of Sunda Pangolin measurements.

Pangolin prices were only available for December 2008; hence an average of currency conversion rates for that month was used. The average conversion rate computed by OANDA Historical Exchange Rates for December 2008 was USD1 = MYR3.56.

RESULTS AND DISCUSSION

Interview Survey

Profile of Interviewees

A total of 13 people were interviewed during this survey. The low number of respondents was due to the short nature of the survey and the reluctance of potential respondents to admit hunting pangolins or providing information on pangolin hunters. Only seven of the interviewees admitted to hunting pangolins. Another six did not admit hunting pangolins but stated that they were aware of the trade and able to provide information on it. However, from tips provided by initial contacts and general feeling from the survey, the team suspected that all respondents were actually hunting or had been hunting pangolins. Two interviewees told the surveyor that they used to hunt pangolins but had stopped for a variety of reasons which included knowledge that the activity was illegal, effective enforcement efforts from SWD and the high penalties prescribed by the law. Interviewees came from different backgrounds including factory worker, business owner, security guard, clerk, farmer, hunter and student. They came from different ethnic groups: out of the 13, seven were Dusun, three from Brunei Darussalam and the rest Bajau, Iban and Rungus. From the team observations, most of the collectors were from ethnic minorities.

Five of the seven pangolin hunters reported that they hunted opportunistically. Similar results were found in Sumatra, Indonesia (Sopyan, 2009) and in Peninsular Malaysia, with most of the hunters interviewed declaring that they only hunted pangolins in an opportunistic manner (Chin and Pantel, 2009), generally relying on other activities for their main source of income. Trade networks become more organized at the level of middlemen and international exporters (Sopyan, 2009). Two of the opportunistic hunters interviewed stated that they only collect pangolins for personal consumption. However, the surveyor learnt from a reliable source that one of these also plays a role as a small scale middleman, buying one to three animals per week. The other five hunters admitted hunting pangolin to supply the trade. All those interviewed suggested that pangolins are generally sold to middlemen since the meat was said to be quite tasteless and difficult to prepare, but above all because the price offered is very high compared to that of other species hunted for wild meat.

Four of the pangolin hunters, who admitted that they hunt purely to sell what they catch, reported that they have been involved in the business for less than ten years (Table 2). The other three did not provide an answer to this question. Only one reported spending more than 50% of his time hunting (Table 3), but this included the hunting of other species such as deer (for personal consumption), Slow Loris *Nycticebus* spp. and freshwater turtles (mainly Southeast Asian Box Turtle *Cuora amboinensis*) for sale. An additional three hunters reported that they also hunt deer, mousedeer *Tragulus napu*, *T. kanchil* and Wild Boar *Sus scrofa*, with one of these stating that this was for his own consumption. Only one hunter reported that he only targets pangolins and stated that he spends about 10 to 25% of his time hunting and has done so for the last five to ten years. Three of the hunters who sell their catch to middlemen reported that they can make 10 to 25% of their income from the trade; the remaining two stated income levels of between 25 and 50% (Table 4).

Table 2:

Number of years spent hunting pangolins as reported by poachers interviewed in Sabah (2009)

Years	Total
<1	1
1-5y	1
5-10y	2
(No response)	3
Total	7

Table 3:

Percentage of time/day dedicated to hunting by interviewees in Sabah (2009)

Time involved	Total
10-25%	2
25-50%	2
50-75%	1
(No response)	2
Total	7

Table 4:

Percentage of income from hunting activities, in Sabah (2009), obtained by poachers interviewed

% income	Total
10-25%	3
25-50%	2
(No response)	2
Total	7

Capture and Trade

All interviewees reported that they search for pangolins at night with frequency of hunting varying from less than once a month to every day. Two hunters stated that they go out in search of the animals three to four times a week, and two reported that they hunt less than twice a week. One of the hunters indicated that he hunts every day and another, less than once a month (Table 5). One of the hunters who reported that he hunts three to four times a week stated that he sometimes goes looking for pangolins at the end of the day straight after leaving his workplace if he notices signs of the animals.

Table 5:

Pangolin hunting frequency, as reported by poachers in Sabah (2009)

Frequency	Total
<1/month	1
<2/week	2
3-4/week	2
Everyday	1
(No response)	1
Total	7

Most of the hunters reported that on each night of hunting they would not expect to catch more than one pangolin, if any (Table 6). One hunter reported that he had once found seven pangolins in one night. This same hunter stated that he goes out looking for pangolins every night and generally finds between one and four pangolins on each trip.

Five of the hunters reported looking for pangolins in forested areas close to their village and one stated that he hunts in an orchard (Table 7). However it is important to note that this survey was not conducted adjacent to any oil palm plantations and therefore it is not possible to compare these results with those from Peninsular Malaysia, where it was observed that pangolins occur both in natural and man-made habitats, such as oil palm and rubber plantations. Humphrey and Bain (1990), Francis (2008) and Duckworth *et al.* (2008) all state that although the preferred habitat of the pangolin is forest, they may also be found in rubber and oil palm plantations, gardens and near human settlements.

Table 6:

Number of pangolins likely to be found during a hunting expedition, as reported by poachers interviewed in Sabah (2009)

No. Pangolins	Total
1	4
1-2	1
1-4	1
(No response)	1
Total	7

Table 7:

Type of habitat where poachers reported hunting pangolins, in Sabah (2009)

Habitat	Total
Forest	5
Orchard	1
(No response)	1
Total	7

Five of the seven hunters reported that they use tracking techniques (Table 8). Four stated that they follow the path left by pangolins and two said that they look for signs of disturbed ants' nests. Fig. 6 provides examples of signs left by pangolins, as indicated by the interviewees. It is interesting to note that Chin and Pantel (2009) and Heng and Olsson (2009) found that tracking is generally carried out during the day and only by skilled and experienced hunters. One of the hunters interviewed in Sabah said he would walk along the roadside, hoping to see a pangolin crossing the road, a method which seems to match the observation of Francis (2008) that pangolins are most often seen at night along roads. This method could provide an inexperienced hunter with their best chance of catching an individual. Two hunters indicated that they track the animals with torch lights, whilst one reported hunting pangolins with his dog. It should be noted that the eyes of a pangolin reflect little light (Francis 2008; Newton *et al.*, 2008). Torch lights are therefore probably used more to search for other species (as has been reported in Viet Nam, Newton *et al.*, 2008), or to look for signs of pangolin presence. In Peninsular Malaysia hunters reported listening for noises and then using the torch light to locate the source of the sound (Chin and Pantel, 2009). In Sumatra, Indonesia it was also reported that hunters

usually track pangolins at night, using lamps or trained dogs. During the day they smoke active dens while pangolins are resting inside (Sopyan, 2009).

Table 8:
Techniques reportedly used to catch pangolins by interviewees in Sabah, 2009

Technique	Total
Tracking	5
Net	3
Torch light	2
Hunting with dog	1
(No response)	2
Total	7

Fig. 6:
Signs indicating pangolin presence according to interviewees in Sabah (2009)



a. Tree bark damaged by a pangolin



b. Evidence of digging by a pangolin

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The next most commonly employed technique was the use of nets ($n = 3$, Fig. 7a and 7b). These are not species-specific, although hunters did say that they try to put the nets where they see signs of pangolins. In Cambodia it has been reported that hunters use nylon snares most often, with the next most commonly employed methods being tracking using signs and the use of trained dogs (Heng and Olsson, 2009). Traps consisting of nets or wire cages are also used in Peninsular Malaysia (Chin and Pantel, 2009).

Four of the hunters interviewed reported that they use only a single technique (either torch light, tracking or hunting with a dog) with the remaining four employing two or three techniques (nets as traps and tracking, with or without torchlight). The hunters do not therefore appear to rely entirely on trapping. Two of the non-hunters stated that, according to their information, hunters use dogs and nets to trap pangolins. Six hunters declared they hunt for pangolins after rain, but not during any specific

season. One hunter reported that he hunts only during dry weather and when the moon is full (i.e. less than once each month). It was also reported in Peninsular Malaysia that hunting is not seasonally-dependant (Chin and Pantel, 2009). In Cambodia, however, studies have determined that hunters are more likely to catch pangolins during the dry season since it is easier to access forested areas and the farmers have more time for hunting activities (Heng and Olsson, 2009). However Conservation International has recently conducted additional studies and results might differ slightly from the ones presented during a 2008 Singapore workshop on Conservation and Trade of Pangolins Native to South and Southeast Asia, held in Singapore in 2008 and organized by TRAFFIC and Wildlife Reserves Singapore. Hunters in Palawan reported that it is easier to hunt pangolins in summer, when slash and burn practices occur (Schoppe and Cruz, 2009). Newton *et al.* (2008) found the opposite in Viet Nam, with hunters reporting that the rainy season was best for pangolin hunting.

Fig. 7a & b:
Net used to trap pangolins as shown by poachers in Sabah (2009)



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Five hunters stated they might catch juveniles and six reported that they would not cease their hunting activities during the breeding season. However, when questioned, interviewees were either unaware of any breeding season (n=9) or believed there is none (n=4).

The average size of pangolins caught by the hunters interviewed was 5.2 kg (n=6) and the largest individual caught was 13 kg (average for maximum weight reported was 10.8 kg). In Peninsular Malaysia, the average weight of pangolins caught, as reported by the interviewees; was five kilogrammes with a maximum of 11 kg, giving similar results.

Captured pangolins are sold to middlemen (n=6) with prices per kg, for a live animal, reportedly varying between MYR50 (USD15, at Oct. 2009 rates) and 115 (USD34, at Oct. 2009 rates). There are informal reports of middlemen calling in at oil palm plantations on the East coast of Sabah, offering MYR60 (USD18, at Oct. 2009 rates) per kg to the workers (Pan, 2007). According to SWD (Augustine Tuuga, pers. Comm., 10 March 2009) pangolins are currently sold at MYR95 (USD27, at Oct. 2009 rates) per kg. One hunter reported that scales are sold from between MYR150 to 180 (USD44 to USD53 at Oct. 2009 rates) per kg, whilst another stated that juveniles are preferred, especially newborns or foetuses which can fetch up to MYR2000 (USD585 at Oct. 2009 rates) per individual. It

was noted in Peninsular Malaysia that different factors influence the price of pangolins, resulting in large variations: from MYR30 (USD9 at Oct. 2009 rates) to MYR330 (USD97 at Oct. 2009 rates) per kg, depending mainly on the season, the middlemen, law enforcement actions and the location (Chin and Pantel, 2009). The price in Sarawak in 2008 was reported to be of MYR90-100 (USD27-30, at 2008 rates) per kg (Chin Sing Yun, in litt., 20 April 2009).

Five hunters reported that prices had increased over the last five years (Table 9), with four specifically stating that this was because pangolins are becoming harder to find. Despite this, four of the hunters reported an increase in the number of pangolins caught both over that year (2009) and the preceding five years (Table 10). The two others did not provide information on this. The increase in pangolin prices is a general trend recorded all over supplying and consuming countries in South and Southeast Asia, with the accepted cause being an increase in demand from consuming countries, in conjunction with a decrease in populations (e.g. Wu and Ma, 2007, Newton *et al.*, 2008; Heng and Olsson, 2009; Schoppe and Cruz, 2009).

Table 9:
Pangolin price fluctuation over the last five years, as reported by poachers interviewed in Sabah (2009)

Price fluctuation	Total
Increase	5
Don't know	1
(No response)	1
Total	7

Table 10:
Trends in pangolin captures in 2009 and during the last five years, as reported by poachers interviewed in Sabah

Trends in pangolin caught	2009	2005-09
Increase	4	4
Don't know	2	2
(No response)	1	1
Total	7	7

Ecology and Use

Among the 13 interviewees, only three provided information on pangolin birth frequency, stating that pangolins give birth only once a year (Table 11) which is in accordance with past research on the species (MacDonald, 2001; Duckworth, 2008). Another three interviewees reported that the animals produce two offspring (Table 12). Two participants reported that females are generally seen with young at the end or the beginning of the year, with one noting that it was not common to see females with offspring. Other interviewees did not provide information on this. Lim and Ng (2007) reported that maternal care is likely to occur between September and January. In Palawan, however, farmers reported seeing female pangolins with young generally as early as August (Schoppe and Cruz, 2008).

No specific trend was reported in the gender seen or even collected (males: two, females: one, do not know: ten). The interviewees were generally well aware of the diet of the pangolin, with four reporting that the species eats ants, five stated that the diet consists of ants and termites, four included other insects such as bees and wasps and one stated that mosquitoes formed part of the diet.

Table 11:
Birth frequency for the Sunda Pangolin as reported by people interviewed in Sabah (2009)

Birth Frequency	Total
Don't know	10
Yearly	3
Total	13

Table 12:
Size of Sunda Pangolin litter as reported by the people interviewed in Sabah (2009)

No Young	Total
1	3
2	3
Don't know	7
Total	13

Nine interviewees provided information on the use of pangolins; five said the meat is used for food and eight reported some medicinal properties. Among the latter, treatment for asthma was the most commonly stated medicinal use (n=5), two people specified that the meat is consumed for this purpose and one said that the scales are used for this. Two stated that pangolin scales are worn for protection as pendants. Four interviewees stated that the scales are used in traditional medicine but did not specify for which condition, one did report that scales are used in the treatment of backache. One person said that pangolin meat helps to cure arthritis, whilst another answered that the gall bladder can be used as medicine, but did not specify for which treatment. One hunter described how the scales are removed, reporting that the animal is soaked in hot water and left until the scales can be removed using pliers or simply pulled out with the fingers, a method observed by Sopyan (2009) in Sumatra, Indonesia. Pangolins are shipped frozen from Sumatra to China and Viet Nam Sopyan (2009), but in Peninsular Malaysia, they are generally shipped alive, in blue bags (Chin Sing Yun, pers. comm., 2008) to be sent by land through Thailand to China. The method used for the storage and transport of pangolins out of Sabah might potentially provide information on subsequent trade routes and destinations.

Awareness of legislation and conservation

Twelve of the interviewees stated that it is illegal to hunt pangolins with only one of those who admitted to being a hunter saying that he did not know that pangolin hunting is prohibited. Seven of the interviewees had already heard about enforcement cases where suspects had been arrested and two referred to cases in Peninsular Malaysia which had been reported in the news. Three made reference

to a specific case in Sabah, where a couple were arrested for buying pangolins, jailed for three months and fined MYR12 000 (USD3505 at 2009 rates).

Twelve respondents stated that they believe that pangolins will become extinct, with only one choosing not to give an opinion on this. The reasons provided were: over collection (n=6), forest clearance and forest fires (n=4), demand for food (n=2) and lack of enforcement or monitoring (n=2). One of the hunters stated that it is very difficult for them to stop hunting because the demand is great and the price offered is so high.

Logbooks

Volume of Pangolins Collected

The logbooks seized by SWD in February 2009 contain data for the period between May 2007 and January 2009. No data were recorded between August 2007 and February 2008 and for June 2008. No information is available to assess whether the missing data reflects a gap in trading activities during these months, or simply that those logbooks were not recovered during the raid. A summary of all information recorded in the recovered logbooks indicates that a total of approximately 22 200 pangolins were killed between May 2007 and January 2009 to supply this syndicate. It is suspected that most of these pangolins were alive when they arrived at the syndicate's facility, as the dealers took care to indicate in the logbooks when pangolins were dead or frozen. In only one case were pangolins reported to be frozen. In addition to the recording of whole animals, a total of 834.4 kg of pangolin scales were also listed in the logbooks. The total weight of pangolins traded was summarised by month. The total number of individuals traded was estimated using a mean weight calculated each month for the records where pangolins were weighted individually (Table 13). Based on data recorded during 2008, the traders appeared to be most active during the second part of that year. Since no such trend was reported by the collectors this requires further investigation.

Table 13:

Pangolin traded between May 2007 and January 2009 as recorded in Kota Kinabalu logbooks, Sabah (source: logbooks seized by SWD in February 2009)

	May 07	Jun 07	Jul 07	Mar 08	Apr 08	May 08	Jul 08	Aug 08	Sep 08	Oct 08	Nov 08	Dec 08	Jan 09
Weight (kg)	973.5	6622.8	7394.6	291.6	262.8	1466.2	8264.1	11191.8	11592.3	13711.8	12972.8	13266.4	20164.6
Mean (kg)	5.4	5.0	4.9	5.7	5.6	6.3	4.6	4.8	4.7	4.9	4.9	5.0	5.8
No. estimated	179.1	1336.4	1502.8	51.0	46.8	233.8	1779.4	2318.5	2447.7	2789.1	2641.3	2628.6	3478.0

The logbooks with the location name of Keningau, Kota Belud, Kota Marudu and Ranau only contained records for April, May and December 2008 (Table 14). At these locations the weight was indicated per individuals for each record. It is thus possible to provide an actual number of individuals. No information is available to indicate whether some logbooks were missing or no pangolins were supplied from these locations outside the months of April, May and December 2008. Based on the information available, transactions recorded at these sites involved 772 animals, with Keningau (380) and Marudu (263) being the most active locations.

Table 14:

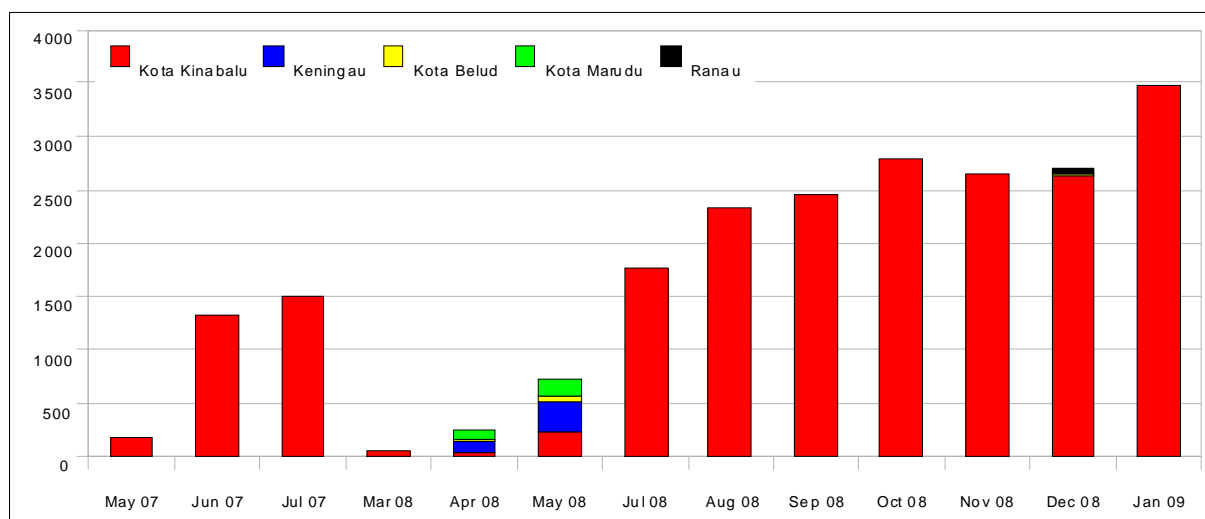
Total weight and number of pangolins supplied from four locations in Sabah (source: logbooks seized by SWD in 2009)

Locations	April 08	May 08	Dec 08	Sub-Total
Keningau				
Weight (kg)	563.0	1564.5	0.0	2127.5
No. individuals	102.0	278.0	0.0	380.0
Kota Belud				
Weight (kg)	68.0	294.9	107.3	470.2
No. individuals	11.0	51.0	17.0	79.0
Kota Marudu				
Weight (kg)	634.2	1096.1	0.0	1730.3
No. individuals	102.0	161.0	0.0	263.0
Ranau				
Weight (kg)	0.0	0.0	237.6	237.6
No. individuals	0.0	0.0	50.0	50.0
Sub-total				
Weight (kg)	1265.2	2955.5	344.9	4565.6
No. individuals	215.0	490.0	67	772.0

The estimated numbers of pangolins supplied directly to the Kota Kinabalu warehouse and the actual numbers supplied from four other locations are summarised monthly, in figure 8. It should be noted that these figures are only estimations to provide the reader with an idea of the amplitude of the trade and should not be considered as authoritative numbers as the authors had no control over the way the measurements were performed.

Fig. 8:

Estimated number of pangolins traded between May 2007 and January 2009 by a single syndicate in Sabah (source: logbooks seized by SWD in 2009)



According to the name on the logbooks and locations listed for certain records, the sources or destination points included: Kota Kinabalu, Keningau, Kota Belud, Kota Marudu, Ranau, Tawau, Tamparuli, Sandakan, Sipitang, Papar and Beaufort. Two routes were indicated and these bear a possible relationship to shipments between Kota Kinabalu to Sandakan and Kota Kinabalu to Tawau.

Prices were only recorded in the Ranau logbook for December 2008. Pangolins were purchased by the dealer at a price between MYR115 (USD32, at Dec. 2008 rates) and MYR119 (USD33, at Dec. 2008 rates) per kg and scales for MYR180 (USD51, at Dec. 2008 rates) per kg. The first names of a small number of people were recorded in conjunction with these transactions, and it is possible that these refer to first level middlemen or hunters. Using a rounded price of MYR100 per kg, it can be estimated that the syndicate invested MYR11 274 090 (USD3 376 355, at 2008 rates) for the purchase of live pangolins between May 2007 and December 2008. Using a price of MYR180 per kg, it can be estimated that an extra MYR150 192 was invested in scales. These figures when combined, give an average of MYR571 214 (USD171 067, at 2008 rates) per month or MYR19 040 (USD5702, at 2008 rates) per day. It should be noted that prices may vary with time and location, that juvenile pangolins might be sold for higher values and that some logbooks might be missing, particularly as there are no entries to indicate any activity between August 2007 and February 2008. It is impossible to calculate the level of profit made by the syndicate through the sale of the animals recorded in the logbooks since no re-sale prices are available. It is however easy to imagine that gains would be quite high.

Seizures

A number of enforcement actions against the illegal collection or trade of pangolins were conducted by SWD between 2001 and October 2007 (Table 15). According to Tuuga (2009) most of the seizures were made at the level of collectors and involved live pangolins or scales. Only one seizure was recovered at a higher level in the trade chain. In 2005 a lorry was stopped during a police roadblock between Sandakan and Kota Kinabalu and 530 frozen pangolins stored in polystyrene boxes were recovered. According to the data presented by Tuuga (2009) at a pangolin workshop, in Singapore, another four enforcement cases involving pangolins seizures were carried out in 2007 and one in 2008. When compared to the number of pangolins illegally collected as recorded in the seized logbooks, these figures highlight the difficulties encountered by the Department to combat the illegal collection and trade of the species. For example, the average of pangolins traded by this syndicate per month (approximately 22 200 pangolins over 21 months) exceeds the total of animals seized by SWD between 2001 and 2007.

Table 15:

List of pangolin seizures made by SWD between 2001 and October 2007

	2001	2002	2005	2006	2007	Total
No. of cases filed	1	1	2	11	3	17
No. of pangolins	1		530 (frozen)	100	23	654
Amount of scales		54 kg	35 boxes	2 baskets + 300 g	200 g	
Amount of meat				3 pieces		

Source: Data sent to TRAFFIC by Sabah Wildlife Department in 2007

Pangolin Measurements

Wu *et al.* (2004b) carried out body weight measurements on 20 individuals of the Sunda Pangolin and 43 individuals of the Chinese Pangolin and found a range of 1600 – 7000 g and 1500 – 8750 g respectively. Females of the Chinese Pangolin were lighter than males with a weight range of 1500 – 5725 g and an average of 3482 g (± 1305) compared to 2150 – 8585 g and a mean of 4532 g (± 1350) for males. A similar difference between genders was also reported by Health (1992) with an adult body mass ranging from 2350 (young, sexually mature female) to 7000 g (large adult male). Although no gender comparison is provided for the Sunda Pangolin, Wu *et al.* (2004b) did not find any significant differences in body weight between both species. We therefore suggest that body weight differences similar to those found in the Chinese Pangolin could be expected between males and females of the Sunda Pangolin.

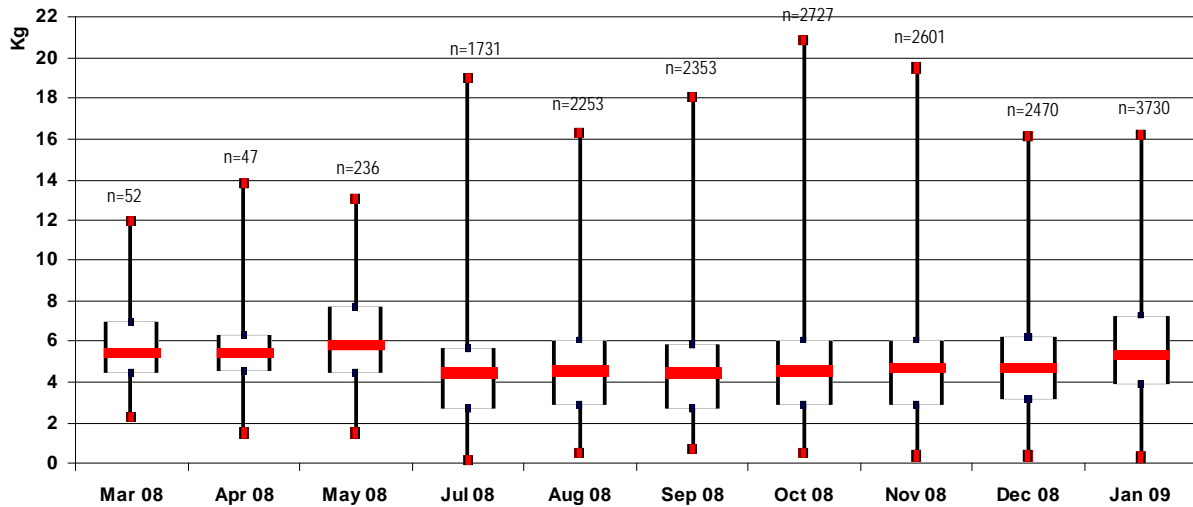
Descriptive statistics performed on the entire set of individual measurements provided a dispersion of the body weight month by month (Table 16). The interquartile range varied from 2.7 to 7.7 kg, with the lowest value in July and the highest in May (Fig. 9). The minimum value varied from 2.3 in March to 0.2 kg in July. This could be due either to a difference in sample size, as the number of pangolins collected suddenly increases sharply in July; or to the birth of pangolins during the summer. As revealed during interview surveys conducted in both Sabah and on the Malaysian Peninsula, pangolin hunters do not appear to target any specific age group or gender. However it should be noted that the ratio of male/female collected could still be influenced by species behaviour in relation to hunting techniques.

Table 16:
Descriptive statistics on the weight of pangolins traded in Sabah (source: logbooks seized by SWD in 2009)

	Mar 08	Apr 08	May 08	Jul 08	Aug 08	Sep 08	Oct 08	Nov 08	Dec 08	Jan 09
Min. Wt (kg)	2.3	1.5	1.5	0.2	0.6	0.7	0.6	0.4	0.4	0.3
Q1 (kg)	4.5	4.6	4.5	2.7	2.9	2.7	2.9	2.9	3.2	3.9
Median Wt (kg)	5.5	5.5	5.9	4.5	4.6	4.5	4.6	4.7	4.7	5.4
Q3 (kg)	7.0	6.4	7.7	5.7	6.1	5.9	6.1	6.1	6.3	7.3
Max. Wt (kg)	12.0	13.8	13.1	19.0	16.3	18.1	20.9	19.5	16.1	16.2
n	52	47	236	1731	2253	2353	2727	2601	2470	3730

Fig. 9:

Box Plot representing the weight distribution of pangolins traded in Sabah (source: logbooks seized by SWD in 2009)

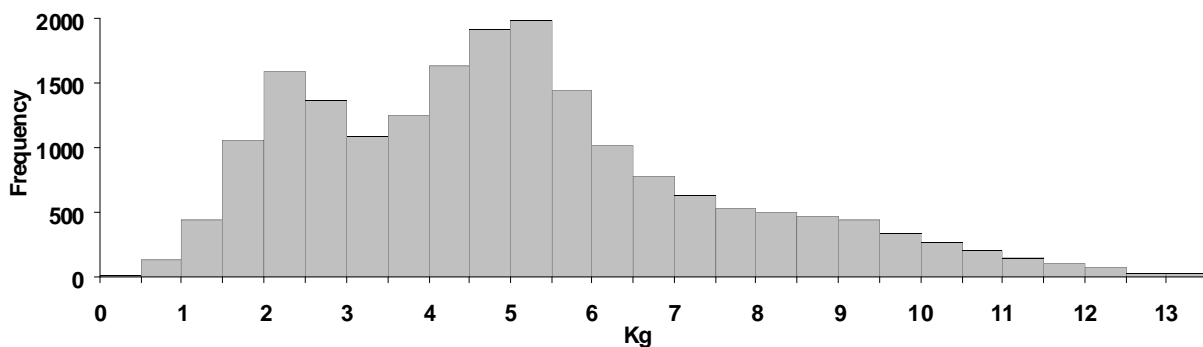


These figures confirm the occurrence of extremely large individuals (with weights up to 20 kg), as reported by interviewees during the survey carried out in Peninsular Malaysia. However these animals remain outliers which are neither seen nor captured frequently.

An examination of the weight distribution by intervals of half a kilogramme (Fig. 10) reveals two peaks; the first between two and two and a half kilogramme and the second between four and a half and five and a half kilogramme. This could potentially be identified as weight distribution of females and males or as different age categories. Data recorded by Wu *et al.* (2004b), showed a larger overlap between genders. In the absence of any information on gender or other specific measurement, it is therefore difficult to draw any specific conclusions. Based on Wu *et al.*'s (2004b) measurements, if we consider records below 1.5 kg to be those of juveniles, the proportion of this group represents about three per cent of the sample (572 records out of 19 552). This obviously only represents a guess and further studies on pangolins biology are required to understand how each age group is represented in the trade.

Fig. 10:

Histogram showing the frequency distribution of the weight of pangolins traded in Sabah (source: logbooks seized by SWD in 2009)



CONCLUSION AND RECOMMENDATIONS

The surveyors reported that interviewees were reluctant to provide information, possibly translating to some fear of enforcement action. Longer field studies would provide more time for the team to establish trust with local people. From the different types of information collected in Sabah, as well as comparison with data collected in Peninsular Malaysia, a certain number of conclusions can be drawn. As was found in Peninsular Malaysia (Chin and Pantel, 2009), most of the people collecting pangolins in Sabah are likely to do so in an opportunistic manner. Although the number of people interviewed was too low to draw an accurate picture of the situation, it is anticipated that three scenarios exist: people who are not professional hunters, but will collect pangolins when opportunistically encountering a specimen; these can be from different backgrounds, from factory or plantation workers to clerks and business owners. Another category is made up of hunters who do not target specifically pangolins but will catch one if encountered. Finally, a small number of skilled and experienced hunters might be specialised in catching pangolins. A report by the World Bank (2005) determined that pangolins were an important source of cash income. It was found that hunters generally view pangolin hunting as a bonus, a way to quickly access cash rather than as an activity to provide their family with a regular income. This can easily be explained by the high risk involved in using a selective hunting strategy for elusive species such as the pangolin. These animals are difficult to find and hunters generally catch only a small number at a time. The large number of people opportunistically looking for pangolins might thus represent a higher risk, or be at least as important as the pressure exercised by specialised hunters.

In most cases, hunters catch pangolins to supply the trade rather than for personal consumption, which is generally the case for high profile species such as tiger, rhino and bears. However, these gains are only short term, and cannot increase the standard of living of the harvesters over the long term (Corlett, 2007). Like other pangolins, Sunda Pangolin is believed to have a very low reproduction rate, making it highly vulnerable to over-harvesting (IUCN, 2010). According to TRAFFIC (2008), pangolin hunting is not critical to livelihoods, mostly due to the irregular nature of the catch. In a study conducted by Bennett *et al.* (2000), it was found that wild meat was only available in 13.9% of evening meals of rural people in Sabah. Wild meat was mainly made of Bearded Pig *Sus barbatus* (53.7%) and deer (42.9%). This reinforces that pangolins, if hunted for subsistence, would not account for much of the local communities' diet.

Given the profile of pangolin collectors, the fastest way to curb pangolin hunting would appear to be through the application of strict enforcement, in combination with the raising of awareness amongst local communities. The latter would help targeting opportunistic collectors by educating people on the role of pangolins in their ecosystem and the threats encountered by the species. Strict enforcement will target hunters and traders practising illegal activities. Options such as finding alternative livelihoods are unlikely to be the most effective solution in this instance, since pangolin hunting does not generally represent the primary income source for most hunters.

In Sabah, pangolins are already protected by legislation. The main problem seems to be a lack of enforcement which is possibly linked more to a lack of funding, capacity and staffing than will. The interviewer and the consultant were both informed that, for example, patrol boats remain in harbour since SWD has no money for fuel. Tuuga (2009) reported that the Department has a too limited number of staff to cover the whole of Sabah. SWD informed the team that wildlife criminal syndicates

are already well developed and can be very dangerous. They also shared the need for timely information on potential shipment and warehouse locations, which is essential if enforcement action is to be effective.

During TRAFFIC's visit to Sabah in March 2009, the SWD was receiving training on information collection to facilitate more the effective prosecution of wildlife criminals. More recently, in November 2009, TRAFFIC, in collaboration with SWD, organized a regional judiciary workshop on wildlife crime in Kota Kinabalu. Efforts in organizing such events must be maintained to ensure that capacity is strengthened at every level of the law enforcement chain. The workshop on Conservation and Trade of Pangolins Native to South and Southeast Asia, held in Singapore in 2008 and organized by TRAFFIC and Wildlife Reserves Singapore, recommended the production of a handbook to summarize all relevant information and provide support for enforcement agencies.

To complement enforcement actions, awareness programmes should be developed to educate the local communities about pangolin conservation, the importance of the species in its ecosystem and the threats that it faces. Change in people's behaviour towards wildlife cannot be expected without understanding of conservation issues (Ntiamoa-Baidu, 1995). It is hence widely recognised that enforcement efforts should be supplemented by education and awareness raising campaigns for best effectiveness (United Nations, 2003; IUCN-UNEP-WWF, 1980). SWD has already appointed several people from the private sector, government agencies, non-governmental organizations and villages to become Honorary Wildlife Wardens. The education of local communities could be carried out in collaboration with the wildlife honorary wardens and plantation owners. Potential collaboration could also be sought from plantation owners to ensure their staff are not hunting protected species on their land.

As highlighted in this report, the illegal trade of wildlife does not stop at State or even international boundaries. The role of the ASEAN Wildlife Enforcement Network (ASEAN-WEN) is crucial in ensuring collaboration of the different countries represented on the island of Borneo to combat the illegal trade of pangolins, both within the island and beyond. For example, in January 2009, ASEAN-WEN's first Special Investigation Group Workshop on Trafficking in Big Cats and Pangolins was held in Bangkok at Thailand's International Law Enforcement Academy. It was organized by the Royal Thai Police Natural Resources and Environment Crime Suppression Division, and gathered senior investigators from Cambodia, Indonesia, Laos, Malaysia, Thailand, Viet Nam, China and the United States. The workshop was facilitated by the Royal Thai Police, INTERPOL, the ASEAN-WEN Program Coordination Unit and the ASEAN-WEN Support Program. It aimed at improving cross-border intelligence sharing and investigative cooperation in order to tackle the illegal trade of these species.

Additional trade surveys should be organized to understand better the links between the different countries and States in Borneo and consumer countries. Donor support is extremely important to ensure that sufficient time can be spent in the field. Travel in Borneo can be difficult, time consuming and costly in comparison to other study sites, but adequate investment in such studies is crucial if high quality and reliable data are to be obtained.

Little is known of the distribution and population status of the Sunda Pangolin in Sabah, as is the case across its range. In the absence of proper population estimates, it is difficult to evaluate the full impact

of the trade, however pangolins have been described as having a very low reproduction rate (e.g. Lim and Ng, 2007; Health, 1992) and the volumes traded by a single syndicate, as described in this report, are sufficient to raise concerns on the sustainability of the harvest. Estimates of pangolin relative densities should be conducted urgently across Southeast Asia to allow a better understanding of the impacts of this trade.

Finally, although not within the scope of this study, rapid loss of habitat has been recorded as an important threat to the survival of pangolins (Duckworth *et al.* 2008). A better understanding of the needs of the pangolin in terms of its habitat requirements is crucial if adequate habitat protection is to be achieved. The Heart of Borneo is a cross-boundary initiative aiming, among other things, at protecting large areas of forests through a network of protected areas (Rautner, 2005). More than 22 million ha of forest (representing 25% of the island's landmass) are targeted in this programme and include sites within Brunei Darussalam, Indonesia and Malaysia. It is to be hoped that this endeavour will benefit the conservation of pangolins and other species.

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ANNEX 1

Field Datasheet

Date:	Latitude:	Longitude:
	Location:	Recorder:

Information on Interviewee

Race: _____

Principal occupation: Hunter Farmer Plantation Worker Other Specify: _____

Main source of income: _____

1. Do you collect pangolin? Yes / No
 If **No**, are you aware of pangolin hunting/trading activities? Yes / No (go to “Traditional ecological knowledge”)
 If **Yes**:

2. How often you collect pangolin? Regular Opportunistic

3. Purpose of collecting pangolin Self subsistence Traditional Medicine Trade Other

4. Role in the trade: Collector Middle man Exporter Other Specify: _____

6. How long have you been active in the trade? <1y 1y-5y 5-10y >10y

7. Time involved in hunting/trading activity: <10% 10-25% 25-50% 50-75% >75%

8. Percentage of income from the trade: <10% 10-25% 25-50% 50-75% >75%

9. Other species hunted/traded? (please specify): _____

Notes: _____

Information on Pangolin Capture

Capture effort (time spent to catch one specimen):
 Average pangolins captured in one go:
 Frequency of capture effort: Everyday 3-4 times/week < 2 times/ week Every 2 weeks

Location(s) where taken from wild:
 Habitat where captured: Forest Palm oil Rubber estate Other (specify): _____

Capture technique:	Day	Night
Traps (specify type)		
Hunting with dog		
Tracking (indicate signs)		
Use of torch light		
Other (specify)		

When is it easier to find pangolins? Before rain During rain After rain Dry weather

Season for capture: Yes / No If **Yes**, Season: _____

Young captured: Yes / No Stop capture during breeding season: Yes / No

TRAFFIC, the wildlife trade monitoring network, works to ensure that trade in wild plants and animals is not a threat to the conservation of nature.

For further information contact:

The Director
TRAFFIC Southeast Asia
Unit 3-2, 1st Floor
Jalan SS23/11, Taman SEA
Petaling Jaya, Selangor
Malaysia
Telephone: (603) 7880 3940
Fax: (603) 7882 0171
Email: tsea@po.jaring.my

The Executive Director
TRAFFIC International
219a Huntingdon Road
Cambridge CB3 0DL
United Kingdom
Telephone: (44) 1223 277427
Fax: (44) 1223 277237
Email: traffic@traffic.org
Website: www.traffic.org

