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# **Understanding the Distribution, Conservation and Threats to Pangolin** (*Manis* spp.)

## Uchita Lamichhane\*1, Basudev Pokhrel1

<sup>1</sup>Faculty of Forestry, Agriculture and Forestry University, Hetauda, Nepal \*Corresponding author (Email: uniqueuchita123@gmail.com)

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#### **Abstract**

This article is based on the study carried out in Rani Community Forest (CF) of Makwanpur district of Nepal to assess the distribution of and key threats to pangolin along with its conservation efforts at the community level. The methodology includes searching the direct and indirect signs of pangolin (burrows, footprints, faecal material). Simple random sampling method was applied for the collection of social information related to pangolin. 130 burrows (44 new and 86 old) were recorded during the survey. Distribution of burrows was clumped type and not uniform throughout all elevations. Most of the burrows were found in the elevation range of 500-600m. Most of the people had awareness about pangolin while only few respondents had seen it directly inside the community forest. It indicates that there was occurrence of pangolin in the community forest. Key threats to Pangolin were construction activities, drying water resource, rapid urbanization, habitat loss, lack of food, overgrazing, mining, deforestation, poaching, predation of associated animal species, and forest fire. Among them the construction activities were considered as biggest pangolin. Various community-based threat conservation programs were initiated by authorities of Rani Community Forest; however, these programs were still not effective for the conservation of pangolin.

#### **Keywords**

Pangolin; Distribution; Threat; Conservation

#### Introduction

The word "Pangolin" is derived from Malayan word "Pengguling", meaning something that rolls up. Pangolin, often called scaly ant eaters, is a nocturnal mammal covered with tough, overlapping scales. It is shy, non-aggressive, solitary and burrowing strange mammal (Dickman, 2001). Among four species of pangolins found in Asia, two are found in Nepal: Chinese Pangolin (Manis pentadactyla) and Indian Pangolin (Manis crassicaudata) (Baral and Shah, 2008; Jnawali et al., 2011). In Nepal, earlier it was found in 12 districts; but, according to a study, 43 districts are now home to pangolins (RSS, 2016). In Nepal, Chinese Pangolin is distributed from Eastern to Central region and Indian Pangolin in Shuklaphanta National Park, Parsa National Park, Chitwan National Park and Bardiya National Park (Shrestha, 2003; Suwal, 2011). In Makwanpur district, Pangolins are distributed from southern to northern part, and are also found in Rani Community Forest (6-7 in number, including both Chinese and Indian Pangolins) (Raut, 2015). Globally, pangolins are greatly poached for their meat and scales. Recently, Central Investigation Bureau of Nepal Police arrested two Chinese nationals, who were allegedly involved in smuggling 162 kg of pangolin scales from Africa (The Himalayan Times, 2018). Global conservation status of Chinese Pangolin is critically endangered, whereas Indian Pangolin is endangered (IUCN, 2017). Though many researches on pangolin has been done in recent years, information on distribution is still insufficient in Nepal (Chalise, 2008). In the same way, information on distribution in current study area is also insufficient. Lots of conservation efforts have been carried out, but most of them are somehow hindered by lack of knowledge about their distribution and threats (Challender, 2009). Therefore, this study would be helpful to locate the current distribution of pangolin within study area and at the same time present threats of pangolin would assist in controlling the threats. It would also be helpful to identify whether local communities were involved in conservation activities or not.

## **Methods and Materials**

## Study Area

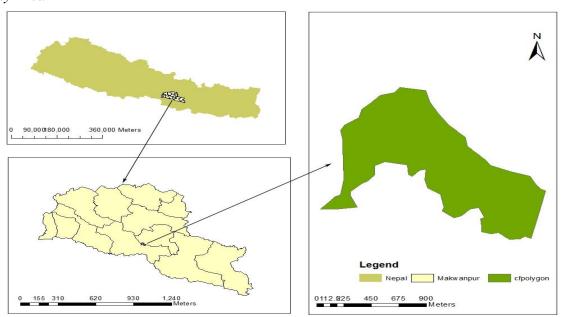


Figure 1: Map showing Rani Community Forest

The study was conducted in Rani Community Forest of Hetauda-6, Makwanpur, Province No.3. The representative GPS points of study area were X: 0309677, Y: 3033889. The total area of study site was 151.87 ha with total household of 787. The study area lied in southern aspect with the elevation range of 350-750m. Dominant plant species were Sal (*Shorea robusta*), Saj (*Terminalia alata*), Chilaune (*Schima wallichii*), Champ (*Michelia champaca*), Masala (*Eucalyptus* sp.), Sisoo (*Dalbergia sisoo*), etc.

## Data Collection

Under primary data collection, first of all the preliminary survey was carried out in the concerned area to understand the situation of pangolin in that area. The whole area of community forest was searched to spot direct and indirect signs of pangolin (burrows, foot tracks, faecal material). The sites having occurrence of pangolin was marked as positive and their geographical coordinates were recorded using global positioning system (GPS). Later the distribution map was developed using ArcGIS 10.3.1. The numbers of old burrows and new burrows were also counted. They were distinguished by the characteristics given in table 1.

Table 1: Difference between old and new burrow

Old Burrow	New Burrow
Soil deposited around burrow was not fresh.	Soil deposited around new burrow seemed to
	be fresh.
They were covered by leaf litter and cobweb.	They were not covered by leaf litter and cobweb.

Simple random sampling method was applied for the collection of social information related to pangolin. Using 10% sampling intensity, questionnaire survey was carried out by directly administering semi-structurally scheduled questionnaire, which was prepared before field visit.79 respondents were interviewed (users of Rani Community Forest). Semi-structured interviews were also conducted with experts, concerned authorities, user's group committee members, and local leaders to determine key threats to and various conservation programs related to pangolin. Secondary data was collected from various published and unpublished documents, articles, books, brochures, websites and other sources.

## Data Analysis

The data collected during field visit and survey was thoroughly analyzed using appropriate statistical tools depending upon the nature of data. Data was analyzed both qualitatively and quantitatively. Distribution pattern in the study area was determined by calculating the ratio of variance and mean  $(S^2/a)$ .

Variance =  $S^2 = 1/(n\sum (x-a)^2)$ Where, x= sample value, a= mean value If  $S^2/a = 1$ , Distribution is random If  $S^2/a < 1$ , Distribution is regular If  $S^2/a > 1$ , Distribution is clumped

Analytical technique for preference ranking of threats to Pangolin:

Average Ranking Score = x1.w1+x2.w2+....xn.wnTotal no. of respondents Where, w = weight of ranked position

n = no. of choice

x = response count for answer choice

Weights are applied in reverse. In other words, the respondents most preferred choice (which they rank #1) has the largest weight and their least preferred choice (which they rank in last position) has weight 1.

#### **Result and Discussion**

#### Distribution

Out of 130 burrows recorded, 86 burrows were found to be old burrows, whereas 44 burrows were found to be new burrows. Distribution map of pangolin with new and old burrow in the study area is shown in Figure 2.

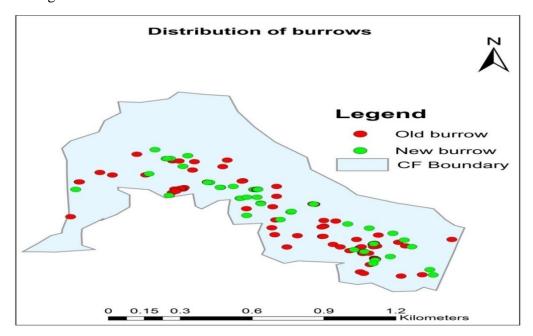


Figure 2: Distribution of burrows

Data in Table 2 shows the distribution pattern of pangolin through indirect sign (burrows). In the tabulated data, variance/mean = 20.022, which is greater than 1. So, distribution pattern was 'clumped' type in Rani Community Forest.

Table 2: Table showing variance

Elevation (meter)	Observed value (O)	Expected	(O-E)	$(O-E)^2$
	(No. of burrow)	Value (E)		
400-500	46	43.33	2.67	7.13
500-600	78	43.33	34.67	1202.01
600-700	6	43.33	-37.33	1393.53
Total	130			2602.67
Mean	43.33		Variance	867.56

Table 3: Number of burrows in different elevations

Elevation(meter)	Number of burrows
400-500	46
500-600	78
600-700	6

The table 3 shows elevation wise distribution of burrows. The maximum numbers of burrows were found between 500-600 meter above mean sea level, whereas minimum number of burrows were found between 600 m and 700 m in this community forest. Heath (1992) and Wu *et al.* (2004) indicated pangolin's preference of habitat up to 1550 m, while Chao (2001) and Chakraborty, Ramakrishna and Chakraborty (2002) recorded up to 2000 m. Out of 79 respondents, 26 respondents (33%) had seen pangolin directly, 41 respondents (52%) had heard about pangolin and 12 respondents (15%) didn't know about pangolin. 53 respondents (67%) had seen burrow of pangolin in this community forest, whereas 26 respondents (33%) had not seen any sign of presence of pangolin. This indicates that there was occurrence of pangolin inside this community forest.

## Threat Analysis

Key threats were identified through key informants survey and these key threats were taken as references (indices) for preference ranking as a questionnaire survey to the users of Rani Community Forest. The key threats which were identified inside this community forest are:

- Deforestation
- Poaching
- Mining
- Forest fire
- Scarcity of water resources
- Development construction activities
- Rapid urbanization resulting into habitat loss
- Predation of associated wild animal species
- Lack of food
- Overgrazing

These major key threats were ranked or prioritized by 67 users (who had knowledge about pangolin), which showed the results as represented in Figure 3.



Figure 3: Showing ranking score and ranking position of threats

As shown in Figure 3, among the major key threats, development construction activities had highest ranking score of 8.88. So, this threat could be considered as biggest threat to pangolin. According to Suwal (2011), forest fire, forest encroachment, poaching, and lack of public awareness were some of the risks that pangolin face today. Additionally, this research explored additional threats to the pangolin such as development construction activities, scarcity of water resources, lack of food, and so on.

## Community Based Conservation

The Rani Community Forest had initiated different activities for the conservation and management of pangolin and its habitat. Some of the awareness programmes were observed under this study and are shown in table 4.

District level pangolin conservation interaction program was conducted 2 times in year 2015 and 2017. Similarly, school level awareness programs were conducted in year 2015, 2016 and 2017. 2000 brochures were published in year 2015, 2016 and 2017, whereas in 4 places hoarding boards were placed in year 2015. Under this program, various activities were initiated that had helped to protect the habitat of pangolin as well as other wild animals. Some of the important activities were:

- Patrolling and surveying of the forest from time to time.
- Control of forest fire by constructing fire line inside forest.
- Control of grazing by implementing system of block wise rotational grazing.
- Restriction on entering inside block "2" and "3" of this CF.

- Networking and coordinating with neighboring CF by conducting local as well as district level protection networking group.
- System of reward to the conservation of pangolin.

Table 4: Different awareness programs conducted by Rani Community Forest

Program	Conducted	Financial	Year		
		Contribution	2015	2016	2017
District level pangolin conservation	2 times	Rs.30,950			
interaction program					
School level awareness	5 times	Rs.20,750			
Publication of brochures	2000 publications	Rs.25,500			
Placement of hoarding board	4 places	Rs.20,000			

Source: Division Forest Office, Makwanpur

Regarding effectiveness of such program, out of 79 respondents, 38 respondents (48%) said that various community-based conservation activities were effective for the conservation and protection of pangolin. 25 respondents (32%) claimed that various conservation programs conducted were not effective whereas 16 respondents (20%) said that they were unaware about the conservation program conducted by this CF.

#### Conclusion

It can be concluded that there was occurrence of pangolin, which 'clumped' through the indirect sign (burrow) in Rani Community Forest. Key threats identified were poaching, mining, deforestation, scarcity of water resources, development construction activities, rapid urbanization resulting into habitat loss, lack of food, predation of other wild animals and overgrazing. Among them development construction activities were ranked as biggest threat and forest fire as a least threat to pangolin. Recently, a road construction was inside this community forest, which could be the reason that construction activities were ranked as severe threat. Various awareness programmes were conducted at school as well as community level that had helped to protect the habitat of pangolin, but these programmes were still not found to be effective for the conservation of pangolin.

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