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Habitat Preferences of the Chinese Pangolin (*Manis pentadactyla*) in Southern Sankhuwasabha, Nepal

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Abstract

A field survey was conducted in September - October 2023 to assess the habitat preferences of pangolins in Madi Municipality, Sankhuwasabha. Using six (500 m × 500 m) transect strips across forest and cropland habitats, 20 pangolin burrows were recorded, 16 in forests (bamboo, Nepalese alder, grassland) and 4 in croplands (millet, paddy, tea). Most burrows were found in grey soils and near water sources, indicating specific habitat preferences. These findings suggest that conservation efforts should prioritize forest habitats and areas near water sources to ensure the protection of pangolin populations.

Keywords: Burrow distribution, Habitat preference, Pangolin, Sankhuwasabha, Soil type

Introduction

Pangolins, the world's only scaled mammals, face an existential threat from extensive poaching for their meat and scales and rapid habitat destruction (Duckworth et al., 2008; Molur, 2008). In Nepal, two species, the Chinese Pangolin (*Manis pentadactyla*) and the Indian Pangolin (*Manis crassicaudata*), are recorded (Shrestha, 1981). Despite being protected under CITES Appendix II and Nepal's National Park and

Wildlife Conservation Act of 1973, their populations continue to decline drastically (CITES, 2000).

Effective conservation strategies against these pressures, as well as emerging threats from climate disasters, are severely hampered by a lack of fundamental ecological data. These solitary, nocturnal mammals primarily feed on ants and termites (Prater, 1971; Heath & Vanderlip, 1988; Suwal, 2011) and have low reproductive rates (Shrestha, 2003). The detailed information on their specific habitat preferences within eastern regions of Nepal remains rare. This knowledge gap is particularly in the Sankhuwasabha district, where pangolin presence is reported but their ecology specially habitat preferences have never been scientifically studied.

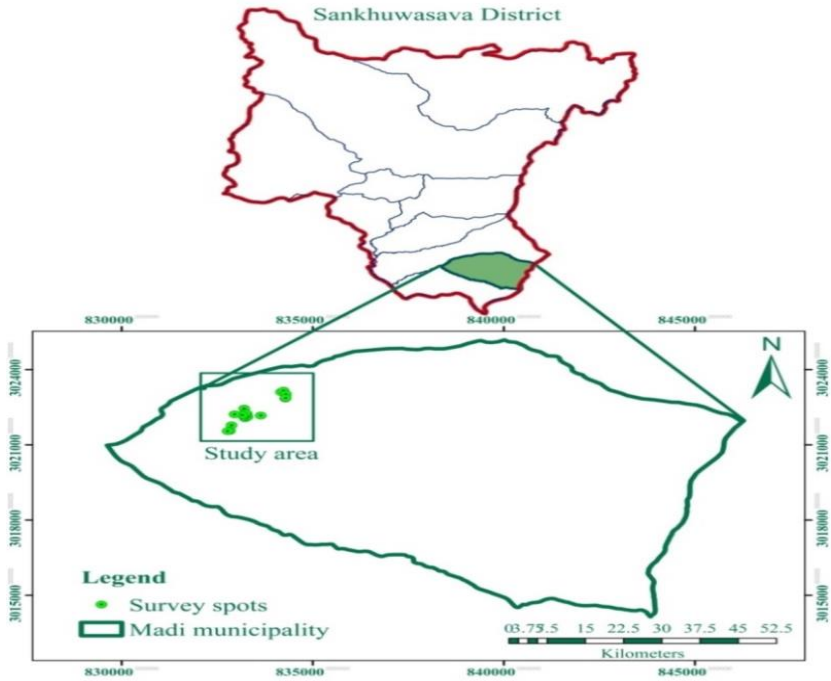
Therefore, the objective of this study is to identify and characterize the habitat preferences of pangolins in the southern part of Sankhuwasabha district. By providing the first systematic ecological assessment in this region, this research aims to generate essential baseline data to inform evidence-based conservation actions and land management policies, contributing to the long-term survival of these threatened species in Nepal.

Methods and Materials

The research was conducted in Madi municipality, located in the southern part of the Sankhuwasabha district, Nepal (Figure 1). This region, situated in the Mid-Hill Zone of Nepal, is characterized by significant variations in altitude, landscape, and climate (ICIMOD, 2016). The study site encompasses a mosaic of landscapes, including forests, grasslands, terraced farmland, and human settlements. Geographically, the area is positioned between 27°20' N and 27°30' N latitude and 87°32' E to 87°49' E longitude, with elevations ranging from 1,000 to 1,900 meters above sea level. The local soil has a porous and sandy texture, with colours varying from grey and brown to brownish-black.

Figure 1

Map of the study area



The study was carried out in September and October 2023, focusing on two primary land-use types: forests and cultivated lands. A systematic strip transect method (Buckland et al., 2001) was employed for the survey. Within each land-use type, three representative survey sites were selected, each covering an area of 500 m × 500 m (25 ha). The forest sites comprised distinct sub-habitats: a bamboo-dominated forest, a Nepalese alder (*Alnus nepalensis*) forest, and a grassland area. Similarly, the cultivated land sites were selected in areas of millet cultivation, paddy fields, and a tea garden. Within each 500 m × 500 m site, five parallel linear transects, each 500 m in length, were established. These transects were spaced 100 m apart to ensure representative coverage of the plot. Burrows were observed by walking at a slow and steady pace along the centerline of each linear transect, within a 20 m belt on both sides. The resulting width of the surveyed strip is 40 m for each transect.

The survey focused on identifying and characterizing newly constructed pangolin burrows. Newly constructed burrows were observed if they had freshly excavated soil at the entrance, lacked vegetation growth or cobwebs within the opening, and showed minimal signs of weather-induced erosion. For each newly identified pangolin burrow, geographical coordinates (latitude and longitude) were recorded using a GPS device (Garmin eTrex 10). The colour of the surrounding soil was noted, and classified as grey, brown, or brownish-black. The data were analyzed using Microsoft Excel 2010.

Results and Discussion

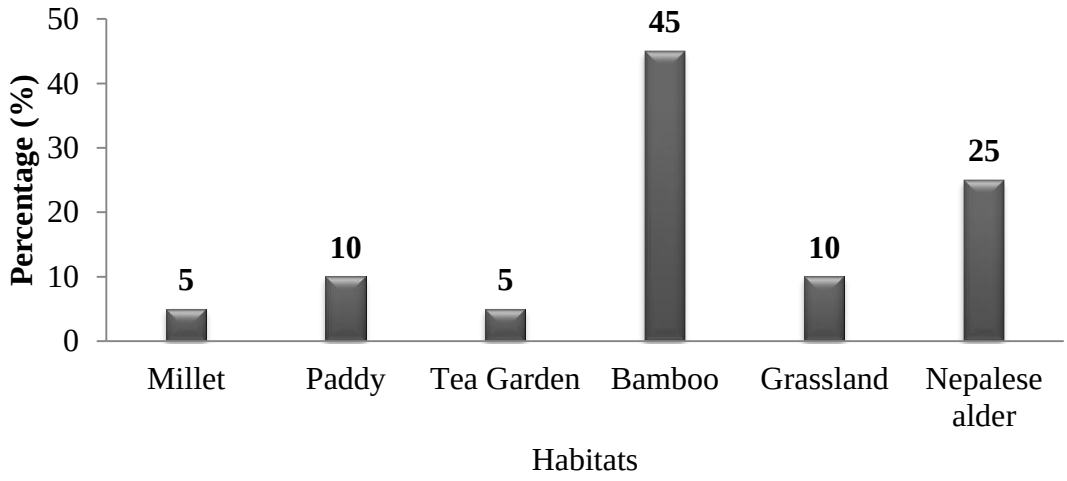
Throughout the study period, a total of 20 pangolin burrows were documented (Table 1). A strong preference was observed for forested areas, which contained 80% (n=16) of all recorded burrows, compared to agricultural land, which contained only 20% (n=4).

Among the different habitat types, bamboo forest was the most preferred habitat for pangolin, accounting for 45% (n=9) of all burrows. Nepalese alder habitats had 25% (n=5) of the burrows, while grassland accounted for 10% (n=2).

Burrows were least common in agricultural areas, with only one burrow found in a millet field (5%), two in paddy fields (10%), and one in a tea garden (5%) (Figure 2).

Figure 2

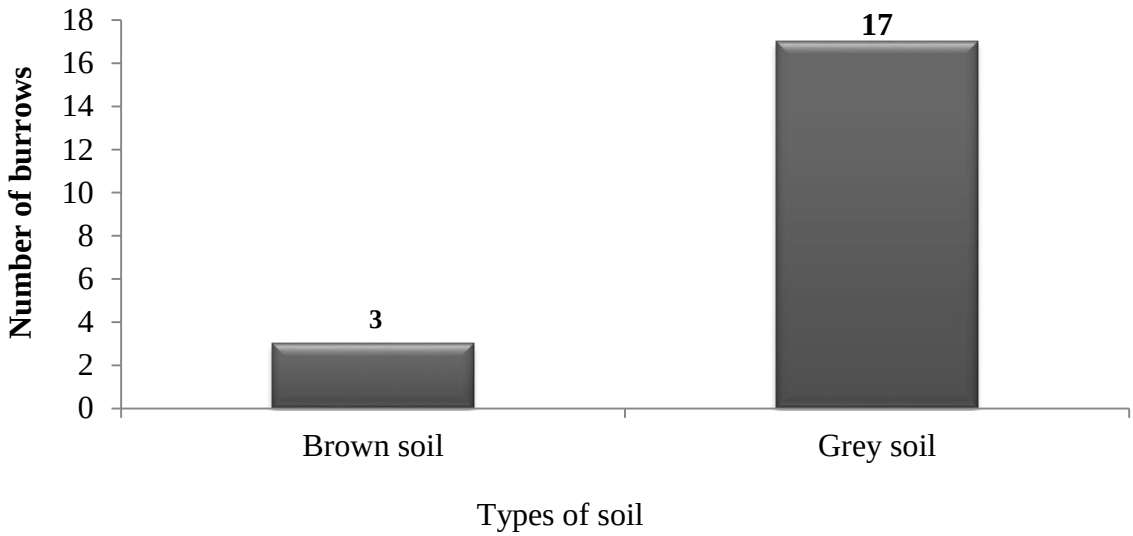
Number of burrows recorded in different habitat types



Analysis of the burrow substrate revealed a clear preference for a specific soil type. The vast majority of burrows (85%, n=17) were located in grey soil, while only 15% (n=3) were found in brown soil (Figure 3).

Figure 3

Proportion of pangolin burrows found in brown soil versus grey soil



Furthermore, a majority of the burrows (60%, n=12) were situated in close proximity to water sources, such as streams and ponds, with the remaining 40% (n=8) located away from these areas.

The present study revealed that the preferred habitat for Chinese pangolins (*Manis pentadactyla*) is a forest environment, which aligns with previous research (Gurung, 1996; Acharya, 2001; Bhandari & Chalise, 2014; Katuwal et al., 2017; Suwal et al., 2020; Dhami et al., 2023; Panta et al., 2023). This preference is likely driven by the dual ecological requirements of abundant food and secure shelter. Forests provide a rich biomass of ants and termites (Swart et al., 1999; Ellwood et al., 2002; Okwakol and Sekamate 2007; Ackerman et al., 2009; Lee et al., 2017) and offer essential cover from both natural predators and human disturbance. Conversely, the observed scarcity of burrows in cropland areas supports the conclusion that human-dominated landscapes are

less suitable, likely due to a combination of reduced prey availability, lack of protective cover, and direct anthropogenic pressures (Sharma et al., 2020b).

A key finding from this research was the pangolins' preference for grey soil, which is abundant in the study area. This contrasts with earlier studies that identified a preference for brown soil (Suwal, 2011; Bhandari & Chalise, 2014; Suwal et al., 2020). It indicated that, as long as the soil has the right texture for digging and maintaining a stable burrow, its specific color may be less important than the presence of essential resources such as food and forest cover.

The present study found that burrows were documented at elevations between 1276 m and 1494 m. This finding is highly consistent with the optimal altitude ranges reported in other studies from the mid-mountain regions of Nepal (Thapa et al., 2014; Dorji, 2017; Sharma et al., 2020a; Wu et al., 2020; Acharya et al., 2021; Suwal et al., 2021), likely because this elevation band offers the best combination of climate, vegetation, and prey availability.

The present study revealed that 60% of the burrows were situated close (within 20 m) to water sources. This finding aligns with research by Shrestha et al. (2021) and Dhami et al. (2023), which also showed a strong association between burrows and water, suggesting that such environments support high numbers of ants and termites. Additionally, pangolins require direct access to water for drinking and to help regulate their body temperature (Suwal, 2011; Katuwal et al., 2013). These findings show that pangolins choose their habitats based on several important factors, mainly forests that offer enough food, and water.

Conclusions

The present study in Madi municipality, Sankhuwasabha, confirms that Chinese pangolins have highly specific habitat requirements. It shows a definitive preference for forest environments, particularly bamboo and Nepalese alder stands, over agricultural

lands. The pangolins' choice to selectively burrow in grey, sandy soils and near water sources also influences their local distribution.

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Appendices

Appendix - I

Habitat Preferences of the Chinese Pangolin (*Manis pentadactyla*) in Southern Sankhuwasabha, Nepal

Table 1

Burrows distributed along different attributes studied

Cropland	Millet field	Transects	1st	2nd	3rd	4th	5th
		Number of burrow	-	-	1	-	-
		Soil colour	-	-	Brown	-	-
		Soil type	-	-	Sandy	-	-
		Insect colony	-	-	-	-	-
		Altitude	-	-	1392 m	-	-
	Paddy field	Transects	1st	2nd	3rd	4th	5th
		Number of burrow	-	1	-	-	1
		Soil colour	-	Grey	-	-	Grey
		Soil type	-	Sandy	-	-	Sandy
		Insect colony	-	Ant	-	-	-
		Altitude	-	1420 m	-	-	1443 m
	Tea plant filed	Transects	1st	2nd	3rd	4th	5th
		Number of burrow	1	-	-	-	-
		Soil colour	Grey	-	-	-	-
		Soil type	Sandy	-	-	-	-
		Insect colony	Ant	-	-	-	-
		Altitude	1494 m	-	-	-	-

Appendix I: Habitat Preferences of the Chinese Pangolin (*Manis pentadactyla*) in Southern Sankhuwasabha, Nepal

Table 1 (Continue)

Burrows distributed along different attributes studied

Forest	Bamboo field	Transects	1st	2nd	3rd	4th	5th
		Number of burrow	2	2	1	2	2
		Soil colour	Grey, Brown	Grey	Grey	Grey	Grey
		Soil type	Sandy	Sandy	Sandy	Sandy	Sandy
		Insect colony	-	-	-	-	-
		Altitude	1361 m, 1402m	1417 m, 1425 m,	1436 m	1447 m, 1463 m	1472 m, 1474 m
	Grassland	Transects	1st	2nd	3rd	4th	5th
		Number of burrow	-	1	-	-	1
		Soil colour	-	Grey	-	-	Grey
		Soil type	-	Sandy	-	-	Silty
		Insect colony	-	-	-	-	-
		Altitude		1332 m			1377 m
	Nepalese alder	Transects	1st	2nd	3rd	4th	5th
		Number of burrow	1	-	1	1	2
		Soil colour	Grey	-	Grey	Brown	Grey
		Soil type	Sandy	-	Sandy	Sandy	Sandy
		Insect colony	-	-	-	Ant	-
		Altitude	1276 m	-	1317 m	1368 m	1414 m, 1415 m

Appendix - II

Photo plates

Burrows of cropland


Millet field


Tea plant fie


Paddy field

Burrows of forest

Burrows at bamboo field

Burrows at Nepalese alder field Burrows at grassland field