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Wild yak *Bos mutus* in Nepal: rediscovery of a flagship species

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Abstract: Wild yak *Bos mutus* is believed to have gone extinct from Nepal. Various searches in the last decade failed to document its presence. In Humla district, far-western Nepal, we used observation from transects and vantage points, sign survey on trails, and informal discussions to ascertain the presence of wild yak in 2013 (May–June) and 2014 (June–July). Direct sightings of two individuals and hoof marks, dung piles, pelts, and head of an individual killed in 2012 confirmed its presence. The wild yak has an uncertain national status with confirmed records only from Humla district. Further research in the higher Himalayan regions of Humla and other districts is urgently needed to evaluate wild yak status combined with immediate conservation actions to protect the remaining individuals.

Keywords: *Bos mutus*; ethnobiology; Humla; Limi Valley; transects.

Introduction

Wild yak (Przewalski, 1883) *Bos mutus* is the largest mammal of high elevation in Asia (Smith and Xie 2008). It inhabits remote high-elevation meadows and alpine steppes in rolling to mountainous terrain on the Tibetan plateau and the neighboring Ladakh region of India in low densities (Harris and Leslie 2008, Namgail 2009), with altitudinal distribution varying from 3000 m to almost 6000 m (Harris and Loggers 2004, Leslie and Schaller 2009). It has also been believed to inhabit the lower elevation Altai ranges in Mongolia (Olsen 1990).

The possible fossil of wild yak discovered in Nepal (Olsen 1990) provided historical evidence of the species' presence in the country. Schaller and Liu (1996) also stated the occurrence of the wild yak in Nepal. Wild yak is said to inhabit the areas north of the Himalayas (Jerdon 1874, Hinton and Fry 1923), which also include Limi Valley. Skins and horns were sporadically discovered by explorers in the Himalayan and trans-Himalayan region of the country. These include evidence of three horns of the species (around four decades old) that can still be found in Lo Manthang (two pairs of horn) and Tsaile (one pair of horns) of Upper Mustang (observed by the first and second author). However, the authenticity of such is open to question, given the difficulties of telling "wild" from "domestic yaks" from such old remains and the possibility that each relic may have originated elsewhere. Miller et al. (1994) has pointed the possibility of wild yaks penetrating northwestern Nepal from Tibet, which is a reasonable possibility considering the geographical proximity these two lands have. However, because of the lack of a concrete evidence of its presence, Jnawali et al. (2011) rightly assessed its status as "data deficient" and "possibly regionally extinct" in Nepal.

Its current national status has been a matter of great debate for around three decades now. Several research efforts, including the Upper Mustang Biodiversity Conservation Project, intended to put an end to this debate but provided no conclusive evidence of wild yak presence in Nepal (Edwards et al. 2006). The wild yak is currently listed as "vulnerable" in The IUCN Red List of Threatened Species (Harris and Leslie 2008) and as "data deficient" in Nepal (Jnawali et al. 2011). Given the high possibility that the species still inhabits the higher Himalayan regions and specifically the claims that it still occurs in the remote Chyakpalung area of Limi Valley in the Humla district of Nepal (Phunjok Lama and Pasang Lama 2014, personal communication), more extensive search efforts were made in 2013–2014.

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Materials and methods

Study area

Humla district lies in the northwest corner of Nepal and shares an international border with the Tibetan Autonomous Region (Tibet) of China (Figure 1).

Humla is bordered on the east by Mugu district and on the south by Bajhang and Bajura districts. It has 27 Village Development Committees (VDCs), which are areas delineated geographically and not committees of people (District Development Committee [DDC] 2010). We visited Dandaphaya, Khagalgaon, Muchu, and Limi VDCs during the study. However, our main focus area for the field surveys was Limi VDC.

Limi Valley, known as the Hidden Valley, is the northernmost region of Limi VDC and has remained largely isolated from the outside world because of its remoteness. It is a high, narrow mountain valley that runs northeast to southwest. The area is geographically connected to Tibet and remains cut off from other parts of Nepal during the winter months (Goldstein 1974). The area seems to allow easy movement of wildlife between Tibet and Nepal because of the presence of the landscape with similar ecosystems on either side and the absence of physical barriers. Many other areas in Nepal lying close to Tibet have formidable natural obstacle for wildlife, the Himalayas. Limi River is the largest river in the area and has different tributaries like Sakya Khola, Geu Khola, Ngin Khola, and Talung Khola (Ghimirey and Acharya 2014).

Methods

The study area was selected based on personal communication with local people during previous visits in 2008 and 2011 (Khatiwada and Ghimirey 2009, Friends of Nature 2011). Plausible locations of wild yak presence were defined based on extensive discussions with local people in the area. Line transects (average 1 km) followed existing trails in the target areas, given that rugged and steep terrain prevented other approaches (or transect designs). Transect walks were conducted by a four-member team moving at 2–3 km/h while searching for wild yak on either side of the transect line (Nichols and Karanth 2005) with the aid of binoculars (Pentax 8×40; Pentax binoculars, Ricoh Imaging Americas Corp, Denver, CO, USA) and spotting scope (Celestron Ultima 80, 20–60×80; Celestron spotting scope, Celestron LLC., Torrance, CA, USA). Any direct and indirect evidence of wild yak was noted along with the typical habitat features of the location. Frequent vantage point observations were made from points selected based on local people's suggestions about possible wild yak presence. Valleys were scanned from vantage points by four people with binoculars and a spotting scope to search for wild yak (Sutherland 1996). The scanning processes were repeated twice to minimize error.

Strip transect surveys were separately conducted for dung, hoof marks, body remains, fur, and other evidence of wild yak in 2013 (Laing et al. 2003). Transects were each <1 km and had a visual field 5 m each side, thus a 10-m-wide strip.

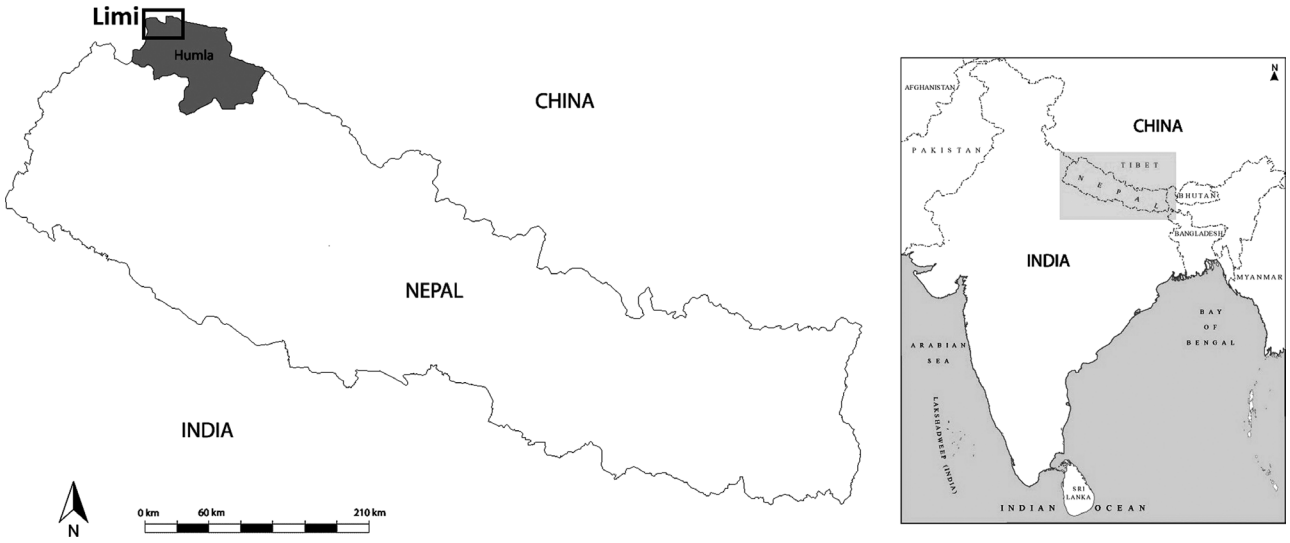

Figure 1: The study area, Limi Valley, lies at the northwesternmost corner of Nepal.

Informal discussions with herders and villagers were conducted to seek information about wild yaks in the area, such as ethnospecies relation, past sightings, hunting, and medicinal use of its body parts. These informal discussions along with observations and indirect evidence (around the settlements) also provided information on threats to the species.

Results

A total of 50 and 100 km were walked in 2013 and 2014, respectively, in line transects, whereas strip transects totaled 12 and 38 km, respectively. A pair of wild yak was sighted on three independent occasions during the 2014 field study and constitutes the first authentic records in Nepal for 30 years (Figure 2).

Identification and confirmation

The 2013 survey found the following evidence of wild yak presence in the area: a head from a wild yak killed in 2012, a fresh dung pile, a pelt, and hoof marks. The pelt was recorded at Tungling village, which was from an individual killed the previous year (Figure 3). The color of the pelt was uniform black and was found to have been stored in the corner of one of the houses.

Old wild yak horns were also occasionally encountered in the Chyakpalung area. Hoof marks (size: 16 cm×16 cm) were recorded in Geu dhangbo in Geu valley. The shape and the dimension were compared with those of the domesticated yak *Bos grunniens*, which are smaller in size. The average dimension of hoof marks from a domesticated yak is 12 cm×12 cm, with the largest record made by our team being 13 cm×14 cm (personal observation, 2013 and 2014). Dung piles of wild yak were also found and compared with domestic yak dung. Three wild yak dung piles were recorded and were two to three times larger compared with those recorded of domestic yak. In addition, a wild yak skull with horns is kept in a monastery in the village of Dzang. This skull was taken from an individual killed 1 year earlier (i.e. 2012), which had ventured into human settlement (Pasang Lama, personal communication; Figure 4). The features of the head, primarily the horns, were also compared with that of domestic yaks. The horns were considerably larger than domestic yak and had a characteristic shape and backward bend.

A summary of all the indirect evidence recorded for the species is presented in Table 1.

The 2014 field survey resulted in photographs and video footage of wild yaks in addition to indirect evidence. The species was identified based on the photographs

Figure 2: The first photographic evidence of wild yak in Nepal.

Figure 3: Wild yak pelt/hide at Tungling.

Figure 4: Dzang monastery still has a head from wild yak killed 1 year ago.

Table 1: Indirect evidence of wild yak recorded during the study.

Evidence	GPS points	Elevation (m)	Location	Remarks
Head with horns	30°14′26.53″ N 81°35′43.41″ E	4024	Dzang	One year since death (Figure 4)
Hoof marks and dung	30°21′22.58″ N 81°32′42.63″ E	4927	Geudhangbo	Fresh (1–2 days old)
Skin	30°15′26.53″ N 81°39′07.94″ E	4149	Tungling	One year since death (Figure 3)

and video footage (Paul Buzzard, James Burton, Farshid Ahrestani, Karan Bahadur Shah and K. Shankar 2014, personal communication). The features identifying the species as wild yak were as follows: long fringe of body hair, voluminous tail, whitish muzzle, all-black color, handlebar horns, and its behavioral reaction upon being closely approached by people, i.e. being wary of and running away from people (Jerdon 1874). Domesticated yaks do inhabit the study area. However, during the season of the field surveys, the majority of domestic yaks were herded at lower elevations. In addition, both the direct and the indirect evidence of wild yak was successfully differentiated based primarily on size. Genetic analysis would provide indisputable identification (Rich Harris and David Mallon 2014, personal communication).

Population status and distribution

During 2013, local people stated that five to 10 wild yaks lived in Humla. Three observations of a pair of wild yaks were made during June and July 2014: on June 11, at the westernmost end of Geu Khola Valley (Figure 5; 30.3577° N, 081.5338° E; elevation: 4980 m), and on July 9 and 10 at 5108 m (30.3853° N, 081.5677° E). The second sighting location was only approximately 4 km from the first sighting location. The two individuals in the three sightings were comparable in appearance, which suggests that only two individual wild yaks were involved. They might have come to the very remote lake in this area, which is seldom visited by people.

Local people believe that subdominant male yaks, unable to compete with stronger males for mating with wild females in Tibet, travel across the border to Humla to mate with domesticated female yaks. These males are reported to roam alone most of the time and generally approach the domesticated female yaks during the months of July–August (Pasang Lama 2014, personal communication).

The valleys of Geu Khola (Figure 5), Sakya Khola, and Margeu Khola are the most important refuge for the wild yak in Humla district according to the experienced herders in the area. Of these, Geu Khola Valley is the most important.

Figure 5: The Geu valley is an important refuge for wild yak in the study area.

Table 2: Use of body parts of wild yak in the study area.

Sample no.	Body part (s)	Use	Value/belief	Price (USD)
1	Head with horn	Adorned with ornaments and kept at the entrance	Status symbol Chases evil spirits	1000/head with horn
2	Meat	Eaten cooked as well as dry (raw)	Gives more power as it eats highland medicinal herbs	8/kg
3	Fur	a. Rubbed on wounds b. Kept at home c. Made into *chaamar* (tail fur)	Cures any wounds Protects home from lightning An important accessory used to greet gods during some Hindu rituals	NA
4	Blood	Drunk fresh or chewed after clotting	Relieves stress	NA

Ethnobiology and conservation threats

Wild yak is known as *dong* in the local Tibetan language (Jerdon 1874, personal documentation 2013 and 2014). Domestic yaks are intricately connected with people of highland societies as beasts of burden and for protein. Thus, wild yak is a familiar animal for most of the people in the higher Himalayas. Local people believe that rubbing wild yak's fur on wounds can heal them and that consuming clotted wild yak blood lowers stress levels in humans. Wild yaks face various threats in the study area. Wild yak meat is readily consumed by local people because it is believed to contain herbal plants high in nutritional and medicinal value. Further, wild yak meat is consumed by locals both as medicine and as a delicacy. Table 2 provides information on the use and economic value of different body parts of wild yak.

According to the local people, male wild yaks in search of domesticated female yaks pose extreme difficulty to herders: the wild yaks become very aggressive if approached during such situations. The herders hence kill these male wild yaks to be able to milk their female yaks. Three wild yaks were killed for this particular reason in the past 5 years. Two old yak traps (not operational) made of stone and connected with a hole were observed (Figure 6). The wild yak trap consists of a pit trap in the center and two linear stone walls extending 300 m in length on both sides of the pit trap. The pit trap is constructed with a stone lining along the walls for support. The two extending linear stone walls are used to guide the wild yak chased by people from all directions toward the pit trap, into which it ultimately falls. It is then killed by use of spears and guns. However, the method has become outdated. No operational traps were recorded in the area.

Poaching for money and food competition with domestic livestock are evident threats for the species. The heads of wild yaks are also traded in Tibet, which could possibly be the primary reason behind all the retaliatory killings.

Figure 6: An old trap targeted for wild yak.

Discussion

The charismatic wild yak may offer a potent flagship species for the conservation of the trans-Himalayan ecosystem, as it is a specialized and characteristic inhabitant of this ecosystem, has a prominent aesthetics combined with a large body size, and is intricately related with humans since ancient times (Smith et al. 2012). The species was reported from Humla district in 2008, 2010, and 2011 (Central Department of Botany [CDB] 2010, personal observation). CDB (2010) singles out upper Humla as the stronghold of wild yak based on discussion with local people. The current study provides strong evidence about the presence of wild yak population in Humla. The two sighted individuals are possibly two old males because old bulls of wild yak remain mostly solitary or in small groups of three or four (Kinloch 1892). Our observations are in line with the observations made by Berger et al. (2014), where two-thirds of the 93 male groups of wild yaks in the Kekexili Reserve (Tibetan Qinghai Plateau, China) consisted of one to two individuals. Before removing the species from nationally "data deficient", more surveys are required to ascertain whether or not the wild yaks are resident in the area. Local people have also suggested the trans-boundary movement of wild yak from Tibet to Mugu district, east of

the present study area (Lopsang Lama 2014, personal communication). These claims, however, should be verified. There could be other unknown sites in the remote Himalayan and trans-Himalayan regions where migration of wild yak from Tibet to Nepal for some definite period of time might still occur. The number of wild yaks migrating to Nepal is difficult to estimate, but probably low. Upper regions of Mugu and Dolpa districts might constitute other possible refuges based on their trans-Himalayan landscape with alpine grasslands and shrublands providing suitable habitat for this large bovid (Shrestha and Bawa 2014). Although the human population in Limi is shrinking (DDC 2010), the threats to wild yak survival remain. These threats are likely to eradicate any small remaining population of wild yak soon. Therefore, the long-term survival of the species in the country is uncertain. In this light, it is time for conservation organizations to immediately invest in establishing an appropriate population baseline and to initiate relevant conservation actions as soon as possible before its status in the country truly classifies "extinct".

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References

Berger, J., E. Cheng, A. Kang, M. Krebs, L. Li, Z. Lu, B. Buqiong and G.B. Schaller. 2014. Sex differences in ecology of wild yaks at high elevation in the Kekexili Reserve, Tibetan Qinghai Plateau, China. J. Mammal. 95: 638–645.

CDB. 2010. Kailash Sacred Landscape Conservation Initiative feasibility assessment report – Nepal. Central Department of Botany, Tribhuvan University, Kathmandu, Nepal. pp. 207.

District Development Committee (DDC). 2010. District Annual Report. District Development Committee, Simikot, Humla.

Edwards, P., R. Suwal and N. Thapa. 2006. Upper Mustang Biodiversity Conservation Project. Final Report of the Terminal Evaluation Mission. United Nations Development Programme. pp. 71.

Friends of Nature. 2011. Documentation of Poaching and Trade of Key Wildlife Species of Humla District, Nepal. WWF Nepal, Kathmandu, Nepal. pp. 35.

Ghimirey, Y. and R. Acharya. 2014. Status and ethnobiology of mountain weasel *Mustela altaica* in Humla District, Nepal. Small Carniv. Conserv. 51: 64–67.

Goldstein, M.C. 1974. A report on Limi Panchayat, Humla District, Karnali Zone. INAS J. 89–101.

Harris, R.B. and D. Leslie. 2008. *Bos mutus*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.2. Available at www.iucnredlist.org. Accessed January 13, 2014.

Harris, R.B. and C.O. Loggers. 2004. Status of Tibetan plateau mammals in Yeniugou, China. Wild Biol. 10: 91–99.

Hinton, M.A.C. and T.B. Fry. 1923. Mammal survey of India, Burma and Ceylon. Report no. 37. J. Bombay Nat. Hist. Soc. 29: 399–429.

Jerdon, T.C. 1874. The mammals of India: a natural history of all the animals known to inhabit continental India. J.Wheldon, London. pp. 335.

Jnawali, S.R., H.S. Baral, S. Lee, K.P. Acharya, G.P. Upadhyay, M. Pandey, R. Shrestha, D. Joshi, B.R. Lamichhane, J. Griffiths, A. Khatiwada and R. Amin (compilers). 2011. The status of Nepal mammals: the national red list series. Department of National Parks and Wildlife Conservation, Kathmandu, Nepal. pp. 266.

Khatiwada, J.R. and Y.P. Ghimirey. 2009. Status of snow leopard (*Uncia uncia*) in Humla District, Western Nepal. Scient World 7: 49–52.

Kinloch, A. 1892. Large game shooting in Tibet, the Himalayas, northern and central India. Thacker, Spink, and Company, Calcutta, India.

Laing, S.E., S.T. Buckland, R.W. Burn, D. Lambie and A. Amphlett. 2003. Dung and nest surveys: estimating decay rates. J. Appl. Ecol. 40: 1102–1111.

Leslie, D.M. Jr. and G.B. Schaller. 2009. *Bos grunniens* and *Bos mutus* (Artiodactyla: Bovidae). Mammal. Spec. 836: 1–17.

Miller, D., R. Harris and G. Cai. 1994. Wild yaks and their conservation on the Tibetan plateau. In: (R. Zhang, J. Han and J. Wu, eds.) International congress on yak. Gansu Agricultural University, Lanzhou. pp. 27–34.

Namgail, T. 2009. Mountain ungulates of the trans-Himalayan regions of Ladakh, India. Int. J. Wilder. 15: 35–40.

Nichols, J.D. and K.U. Karanth. 2005. Monitoring tigers and their prey. Center for Wildlife Studies, Bangalore, India. pp. 193.

Olsen, S. 1990. Fossil ancestry of the yak, its cultural significance and domestication in Tibet. Proc. Acad. Natl. Sci. Phil. 142: 73–100.

Schaller, G.B. and W. Liu. 1996. Distribution, status, and conservation of wild yak *Bos grunniens*. Biol. Conserv. 76: 1–8.

Shrestha, U.B. and K.S. Bawa. 2014. Economic contribution of Chinese caterpillar fungus to the livelihoods of mountain communities in Nepal. Biol. Conserv. 177: 194–202.

Smith, A. and Y. Xie. 2008. A guide to the mammals of China. Princeton University Press, Princeton, New Jersey. pp. 576.

Smith, R.J., D. Verissimo, N.J.B. Isaac and K.E. Jones. 2012. Identifying Cinderella species: uncovering mammals with conservation flagship appeal. Conserv. Lett. 5: 205–212.

Sutherland, W.J. 1996. Ecological census techniques. Cambridge University Press, Cambridge, UK. pp. 446.