

The Conservation of clouded leopard *Neofelis nebulosa* (Griffith, 1821) in Bhutan

UGYEN PENJOR¹



Camera trap photo of clouded leopard *Neofelis nebulosa* in RMNP. (Photo courtesy: Royal Manas National Park)

Introduction

Classified as “Vulnerable” by the International Union for Conservation of Nature’s Endangered Species Commission (IUCN 2006, Srivastav and Nigam 2009), the clouded leopard *Neofelis nebulosa* is one of the world’s most enigmatic wild cats (Austin *et al.*, 2007) and faces many conservation challenges (Nowell and Jackson

1996). Compared to other species of the *Panthera* lineage, the clouded leopard has attracted little scientific and conservation attention (Wilting *et al.*, 2007). The cat’s secretive arboreal behavior and forest habitat (Nowell and Jackson 1996) has eluded study, thus very little is known about its conservation and status in the wild (Gordon *et al.*, 2007;

¹Forest Resources Information and Management System (FRMIS), Department of Forest and Park Services Royal Government of Bhutan.

^{*}Corresponding author’s email: upenjorfrmd@gmail.com

Povey *et al.*, 2009; Wilting *et al.*, 2007). Most information about the clouded leopard in south Asia comes from anecdotal sources (Grassman *et al.*, 2005; Rabinowitz *et al.*, 1987; Selous and Banks 1935), descriptive accounts (Selous and Banks 1935), sighting reports (Davies 1990; Mohamed *et al.*, 2009) and captive individuals (Nowell and Jackson 1996). Similarly, their taxonomy and phylogenetic status remain obscure (Wilting *et al.*, 2007).

Bhutan has the mammalian composition of two faunal regions, the Palearctic and the Indo-Malayan ranging from sub-tropical to temperate-alpine forest ecosystems (Sangay and Vernes 2008). Bhutan has been recognized as part of a biologically diverse conservation priority network (Tempa *et al.*, 2013), yet few efforts have been made to document the country's biodiversity in a scientific manner, let alone study the clouded leopard. Astoundingly, 11 felid species are found in Bhutan (Wangchuk *et al.*, 2004), which represents the richness of predator faunal diversity. Bhutanese efforts have detected common and large mammals, but missed rare and elusive felids like the clouded leopard. A camera trap study in Royal Manas National Park revealed the diversity of the felid species and provided insights as well as opportunities to further study of these species (Tempa *et al.*, 2013).

Specific natural history information vital for conservation of wild felids include habitat requirements, spatial-use patterns, social organization, reproduction, mortality, activity, and food habits (Lekagul and McNealey 1977; Nowell and Jackson 1996). This information can form specific criteria for effective management and to begin population viability analyses of these poorly known carnivores (Austin *et al.*, 2007; Grassman *et al.*, 2005).

Ecology and distribution

The clouded leopard is named for the black cloud-like ellipses or spots (Nowell and Jackson

1996) of its coat that provide camouflage in forest habitats. Males weigh up to 23 kg and females are significantly smaller, usually 11-21 kg (Pocock 1939; Prater 1965). While more closely related to "big cats", the clouded leopard is described as bridging gap between small and big cats (Guggisberg 1975; Rabinowitz *et al.*, 1987). It has proportionately short legs and a long tail (Sunquist and Sunquist 2002).

Clouded leopards are carnivores and their main prey includes gibbons, macaques, slow loris, small deer and wild boar (Banks 1931; Gibson-Hill 1950; Grassman *et al.*, 2005; Griffiths 1993; Guggisberg 1975; Hazarika 1996; Nowell and Jackson 1996; Payne *et al.*, 1985; Prater 1965; Rabinowitz *et al.*, 1987; Wang *et al.*, 1995). It also occasionally hunts birds and rodents (Grassman *et al.*, 2005). Other observations suggest primates, muntjac and Argus pheasant may be prey (Appel *et al.* 2012; Nowell and Jackson 1996). Rabinowitz *et al.*, (1987) recorded occasional domestic animal depredation. It was once thought that clouded leopard mainly hunts from trees, however, now the majority of hunting is believed to occur on the ground (Dinerstein and Mehta 1989; Grassman *et al.*, 2005; Rabinowitz *et al.*, 1987; Wang *et al.*, 1995). While a small predator, the clouded leopard can take down sizeable prey because of its strong legs, large canines and extreme gape (Grassman *et al.*, 2005).

The clouded leopard primarily utilizes tropical rainforest habitats, but can also be found in dry woodlands and secondary forests (Mohamad *et al.*, 2015, Ngoprasert *et al.*, 2012, Rabinowitz *et al.*, 1987). Their normal home range is estimated between 22.9 km² to 49.1 km² (Austin 2003; Austin 2002; Austin and Tewes 1999; Grassman *et al.*, 2005).

As a primary dweller of dense vegetation and remote habitat (Fletcher 2000), this medium sized felid is found throughout tropical and

subtropical forests ranging from Himalayan foothills through mainland Southeast Asia to China (Appel *et al.*, 2012; Choudhury 1993; Dinerstein and Mehta 1989; Ghose 2002; Mehta and Dhewaju 1990; Rabinowitz 1988; Wilting *et al.*, 2007). In Bhutan the species is believed to roam the dense evergreen and subtropical forest at 3000 m elevation (Wangchuk *et al.*, 2004).

Phylogenetic studies reveal that clouded leopards separated from the *Panthera* lineage approximately 6 million years ago (Wilting *et al.*, 2007). Biologists traditionally divided clouded leopards into four regional subspecies. There are however, two species of clouded leopards: *Neofelis nebulosa* found in mainland Asia, and *Neofelis diardi* found in Borneo and Sumatra (DeCaluwe 2012, Kitchener *et al.*, 2006).

Conservation status

Although officially protected in most countries, enforcement is weak (Nowell 2007). It is estimated that there are fewer than 10,000 individuals in the wild and that populations are declining and no single population contains more than 1000 animals (Sanderson *et al.*, 2008, Sunquist and Sunquist 2002).

Royal Manas National Park in Bhutan is the only protected area which has photographic evidence of clouded leopard (Tempa *et al.*, 2013). Anecdotal information and incidental sighting suggest occurrence outside Royal Manas National Park and in forests ranging up to 3000 m (Wangchuk *et al.*, 2004) but no evidence is available to substantiate these claims (Nowell and Jackson 1996).

Listed under Appendix I of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) (IUCN 2006), clouded leopards have also been given strict protection in Bhutan by listing it under totally

protected Schedule I species of the Forest and Nature Conservation Act of Bhutan, 1995 (RGoB 1995). Hunting and illegal trading of clouded leopard or its part is strictly prohibited under law and Bhutanese sentiments for the reverence of living beings further dissuades poaching and hunting. Poachers are penalized or imprisoned to a maximum of five years term depending on the gravity of crime (RGoB 1995).

Threats

Clouded leopards are victims of habitat destruction and illegal poaching (Nowell 2007). Their habitat in home range countries is experiencing the world's fastest rate of deforestation and fragmentation (Wilting *et al.*, 2007). Clear cutting of forests for use as agricultural lands, such as palm oil plantation, is primary threat in most Southeast Asian countries (Nowell and Jackson 1996). However, they are also hunted for their canines, pelts and bones for traditional Asian medicines and tonics (Nowell 2007, Rabinowitz 1988, Wang *et al.*, 1995). Further, habitat encroachment, anthropogenic interference, non-target hunting and reduced prey are potential threats to the clouded leopard (Rabinowitz 1988; Wang *et al.*, 1995).

Due to habitat destruction and overexploitation, clouded leopard populations were decimated with only three sightings in 40 years (Wang *et al.*, 1995) and are now assumed extinct (1997-2012, 128,394 camera trap days with zero capture) in Taiwan (Chiang *et al.*, 2015). Poaching is no less severe in Bhutan and several seizures of clouded leopard pelts in addition to tigers and leopards have been made in the southern districts of Bhutan (DoFPS 2011).

Research needs

Scientific information on wild clouded leopard is extremely limited (Austin *et al.*, 2006, Grassman *et al.*, 2005). No data is available due to lack of census, research and

monitoring to assess the population trend of clouded leopards in Bhutan. Further, due to increased land use and felling of primary forest (Rabinowitz 1988, Mohamad *et al.*, 2015) for local and commercial consumption, clouded leopards may be on a decline or occupy unfamiliar habitats. Such areas include private lands in fringe areas of protected zones, thus resulting in human-wildlife conflicts. There are no systematic studies of clouded leopard in fragmented forests of its range in Bhutan. Given the intensity of poaching activities and the current trend of habitat destruction in and around the region, it must be realized that even small local populations are vulnerable and should be monitored and protected. Unless a comprehensive study of the population status, demography and pattern of threat is investigated, no specific recommendations and action plan can be developed.

In recent years, felid research focused on tigers in Bhutan is generating valuable information on their habitat. But there is clearly a paucity of information and substantial deficiency in baseline ecological data of small felids, in spite of them playing an important role in forest ecosystems through regulating smaller terrestrial mammals and bird populations (Beschta and Ripple 2009).

Some literatures suggest management of predators as a conservation tool (Sergio *et al.*, 2008). Eradication of predators caused extensive invasion of fields by crops pests (including herbivores, rodents and other smaller mammals) resulting in human-wildlife conflict (Wallach *et al.*, 2010). Therefore, we can infer that predators are important not only to maintain ecological balance, but also to mitigate some man-animal conflicts. Effective conservation and management plans of predatory felids also require information on the population status, movement pattern, diet, habitat requirement and demography, as

well as population status and ecology of prey species (Grassman *et al.*, 2005).

It is particularly important to generate baseline information on area vulnerability and poaching magnitude. Studies should also focus on assessing the demography, and site-specific conservation measures to help initiate community-based conservation programs. Such studies will assist the Department of Forests and Park Services develop evidence-based conservation management plans for these elusive and vulnerable species.

It is recommended research on clouded leopard focus on the following:

- i. Assess the presence/absence, relative abundance and activity patterns of clouded leopard;
- ii. Evaluate prey species (Karanth *et al.*, 2004);
- iii. Identify and document known and possible threats to felids and their prey species;
- iv. Document poaching and trade dynamics to help develop management plans and programs for effective management.

Conclusion

Biodiversity conservation has long been accorded the highest priority in Bhutan (DoFPS 2011) and legislation and policy reflect the need for conservation and science-based sustainability studies (as mentioned in the National Forest Policy of Bhutan 2011). The constitution mandates Bhutan maintain 60% forest cover in perpetuity (Constitution of the Kingdom of Bhutan 2008). Bhutan has been internationally recognized for its conservation efforts through numerous awards such as Champions of Earth Award for the Asia Pacific Region, John Paul Getty Award for environment conservation and Kyoto Hall of Fame (Wangdi 2014).

In the face of rapid socio-economic development and population growth, many challenges

and threats to biodiversity remain. These are partially addressed by Bhutan maintaining ~51% of the country's total land area under the protected area network that encompasses all major ecosystems. These protected areas will likely assure the conservation and preservation of most of the country's flora and fauna. However, Bhutan cannot ignore habitats outside protected areas which are susceptible to poaching and fragmentation, and must recognize that protected areas do not include all of the prime habitat for many species and some of these areas have become poaching hotspots.

With poaching, habitat loss and illegal trade threatening the survival of elusive and poorly known felids, there is a need for comprehensive targeted assessments of clouded leopard populations across their distribution range (Srivathsa *et al.*, 2015). Understanding the spatial and temporal ecology of wild cats and their prey species is essential to convey the importance of conservation to local communities and wildlife managers (Austin *et al.*, 2006) and to develop action-based conservation management plans.

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About the author



Ugyen Penjor works with Forest Resources Management Division of the Department of Forests and Park Services. He is an alumnus of Indian Forest Service (IFS). Along with three officers in

FRMD, he is coordinating the first ever comprehensive and exhaustive National Forest Inventory (NFI) of Bhutan. He would like to work on cryptic and lesser known carnivore species in understanding their distribution and behavior. He is interested in understanding the economic and conservation priority overlap between forest and wildlife management.