

# FOOD HOARDING BEHAVIOUR OF PIKA (*OCHOTONA*) IN LANGTANG NATIONAL PARK, NEPAL

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## ABSTRACT

The study was conducted on food hoarding behaviour of pika in Langtang National Park (LNP). It was carried along transect of 53 Km length and 200m wide from 3000 masl to 5200 masl in two routes (Langtang route and Gosainkunda route) from 2011 to 2013. Behaviours of pika were recorded from 5:30 to 19:30 during summer and from 6:30 to 17:30 during winter using focal scan sample method. Total 684 hours behaviours were recorded in 129 days covering all the seasons. Seven dry hay-piles were observed and 12 incidents of transferring food were observed. Pikas in Langtang were very poor in food hoarding and this behaviour was observed only in subalpine area.

**Keywords:** Pika, subalpine, hay-pile, Langtang, Nepal

## INTRODUCTION

Food hoarding is an important component of adaptive strategies of many animals. The benefits derived from hoarding food include improving individual's chance of surviving period during food scarcity, allowing animals to optimize foraging and improving feeding criteria and enhanced animal's competitive status when forage for limited resource (Vander Wall, 1990). Pikas are generalist herbivore; they usually feed plants in two ways: instant feeding after cutting plants or their parts and transferring the feeding materials to construct hay-pile for winter usage. In instant feeding, pika feed again in two ways; if the plant is small and its leaves or other consuming parts would small and delicate, it feeds at the plant uprooted site (Koju *et al.*, 2013a). Pikas have high energetic demands than other mountain mammals (Kawamichi, 1976) as they do not hibernate, so they make multiple trips to collect plants and its parts during summer seasons (Beever *et al.*, 2003). Their daily caloric intake is equivalent to filling their stomach nine times in a day. Food intake is found to increase during pregnancy and lactation period (Smith & Weston, 1990).

The distribution of pikas depend directly on the availability of forage plant species (Kawamichi, 1968; Bhattacharya *et al.*, 2009). Pikas forage on various plant species. Koju *et al.* (2011) reported that 42 plants species consumed by pika in Gosainkunda route of Langtang National Park during rainy season. Those plants include herbs, shrubs and fruits. Khanal *et al.* (1999) reported that 33 plant species were found collected in their hay-piles in Bajura, far west Nepal. They spend around 23-25 percent of external time budget in feeding.

The hay-piles provide shelters to birds, lizards and insects and also help to increase in plant

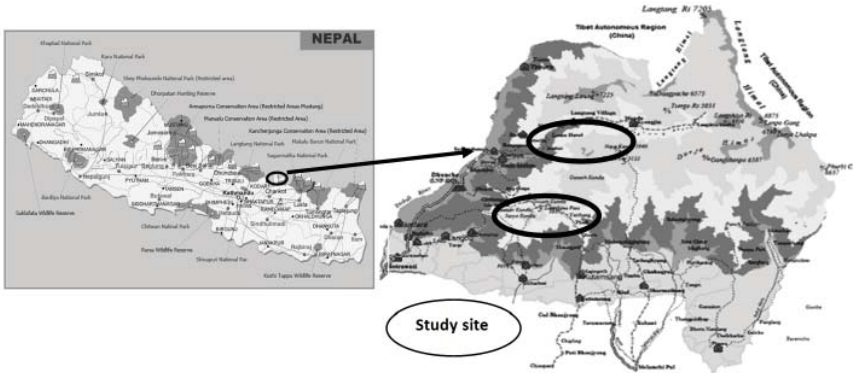
diversity by distributing seed and plants in microhabitat condition around the vicinity of the hay-piles (Primack, 1998). Various evidences have shown a good relation of livestock to pika's hay-piles. The domestic cows and horses generally locate Pika's hay-piles and start feeding the hays deposited there. This generally happens in winter when the pasture land is covered with snow (Melnikov, 1974). Shrews (*Sorex* species), the insectivorous small mammal generally hunt Pika's hay-piles for their diet in alpine region to feed upon insects present there (Naumov, 1974). Pikas act as allogenic ecosystem engineers through the formation of hay-piles that accelerate soil development and increase fertility in low productivity alpine and subalpine talus and boulder fields, where soils are often shallow, alkaline, and nitrogen impoverished (Mattson, 1980).

During late summer and early fall (July-September) haying starts with collecting of available meadow vegetation and storing them in their talus territories. It made up almost 55% of the pikas' surface activity. Pika stops carrying plant materials after haying sufficient amount and continues feeding until the ground is covered with snow. Haying ceased in such environment as absence of surface vegetation due to covered by snow. Pika individuals remain under snow packed feeding on vegetation from their hay-pile's at the beginning of February, and they also use lichens available below the snow. Surface activity was not seen again until May when spring vegetation begin to appear (Conner, 1983). In Colorado, USA, a *Ochotona princeps* population had the average hay-pile size 28 kg of fresh vegetation which represents 14,000 foraging trips during 8-10 weeks of the summer (Dearing, 1997).

### Study area

Langtang National Park (LNP) is located in the central Himalayas of Nepal between 85°15' E to 86°0'E and 28°20'N to 28°32'N. The Park headquarter is of 132.2 km in road distance form Kathmandu the capital city of Nepal. The park covers 1710 km<sup>2</sup> area. The Langtang National Park (fig.1) harbours 46 mammalian species. Langtang Lirung (7245 m) is highest point in the park. Langtang National Park was officially established in March 1976. Its land area includes three districts of Nepal, Rasuwa, Nuwakot, and Sindhupalchowk (DNPWC, 2013). The complex topography and composition of geology reflect the wide spectrum of vegetation type which range from 1000 m elevation to alpine region. Many plant species are endemic to Nepal such as *Rhododendran cownanaianum*, *R. lowndesii*, and *Picea smithiana*. It has small area of subtropical forest with predominantly sal species (*Shorea robusta*) just below 1000 m and covers the hill. Oaks, Chirpine, Mapple, fir, Blue pine, Betula, Bamboo, Hemlock, Spruce and various species of Rhododendrons are main forest species. Above there, alpine shrubs and grasses give way to rock and snow. The snowline in LNP lies at 5000 m above sea level while tree line is around 4500m (Kawamichi, 1968).

The forest types range from sub-tropical to alpine tundra vegetation. Larix (*Larix himalaica*), Oak (*Quercus semecarpifolia*), Chirpine (*Pinus roxburghii*), Maple (*Acer* sp.), Fir (*Abies spectabilis*), Blue pine (*pinus wallichiana*), Hemlock (*tsuga dumosa*), Spruce, many colorful flowering species like *Gentiana*, *Primula*, *Saxifraga* and various species of Rhododendron constitute the floral elements. This park accommodates significant faunal components like Snow leopard (*Uncia uncia*), Red panda (*Ailurus fulgens*), Musk deer (*Moschus chrysogaster*), Himalayan thar (*Hemitragus jemlahicus*), many birds and butterfly species (Chalise, 2010).



**FIG. 1. Map of study area, Langtang National Park, Nepal.**

## MATERIALS AND METHODS

The study was conducted along transect of 53 km length and 200m wide from 3000 masl to 5200 masl in two routes (Langtang route and Gosainkunda route) from 2011 to 2013. The behaviours of pika was observed and recorded by using focal scan sampling (Altmann, 1974) in time interval of one minute. Behaviour of pikas were observed from 5:30 to 19:30 during summer and from 6:30 to 17:30 in winter. Observation was done standing on vantage point. Binocular were used as required. During such observation the hoarding behaviours of pika was noted distinctly. The identified hay-piles were listed and the composition of plants in each haypile were recorded.

## RESULTS

Two species of pikas: *Ochotona roylei* and *O. macrotis* were observed in Langtang National Park. The behaviours of both the species of pika was observed/recorded for 684 hours during this study. On this total time, behaviour of *Ochotona macrotis* was observed for 459 hours covering 294 hours in summer and 165 hours in winter. External behaviour was recorded for 186.16 hours (63.32% of total time) and 18.38 hours (11.14%) respectively. Similarly, behaviour of *Ochotona roylei* was recorded for 155.2 hours and 32.1 hours with the percentage of activeness 68.98% and 14.27% respectively in summer and winter seasons.

The instant feeding of pika again differentiate in two ways; if the plant was small and its leaf or other consuming parts were small and delicate, it feeds at the plant uprooted site especially plants like *Sterallia alsine*, *Fragaria nubicola*, *Bistorta affinis*, Moss, lichens, *Poa* species, *Gramineae* species, *Potentilla* species, *Fragaria* species, *Juncus thomosnii* and others. These small sizes plants were consumed directly whole part without tearing them in smaller parts. Plants which are larger in size, with broad and large leaf; pika tears the leaf or cut the petiole and carry it to a few distance near big rock or open ground and feed there. After consumption carried plant parts, pika again repeat cutting the large part of plant similar way and move to same place for feeding

In study period both species of Pikas (*Ochotona roylei* and *Ochotona macrotis*) in Langtang were

not active in storing hay-pile. Only seven hay-piles were observed during winter season with dry vegetation of *Juncus thomosnii*, *Fragaria* species, *Argemone* species, *Ligularia amplexicaulis*, *Artimisia vulgare*, *Poa* species, *Rumex nepalensis*, *Graminae* species, and some very dry plant species that were unidentified (Fig 2).



**FIG. 2. Fresh hay-pile in summer/ rainy and dry hay pile in winter in LNP.**

Only Royle's pika (*Ochotona roylei*) was found at forest and its edge area and they were never observed carrying forage for winter hay-pile in any season. The transferring foods by pikas in Langtang were not observed above 3900 masl too. In rainy and summer season behaviour of transferring food were observed only for 12 times in 449 hour observation (fig. 3). They were recorded three times in Thadepati, six times in Phedi, one in Laurebina area and two in Langtang valley. All these area were in subalpine area with broken rocks above 3500 masl and below 3900 masl. Among these observations only two incidents were belonged to *O. macrotis* in Phedi.



**FIG. 3. Pika carrying plants to construct hay-pile for winter storage.**

Fresh hay-pile contained *Fragaria* species, *Potentilla* species, *Primula* species, *Ligularia amplexicaulis*, *Gramineae* species, *Juncus* species, *Rumex nepalensis* and *Poa* species (fig. 2). These all plants were consumed in highest frequency in subalpine habitat. The compositions of plants do not depend on sizes of plants. Pikas store and feed almost all plants which are available there as ground vegetations.

## DISCUSSION

Food hoarding or constructing hay-pile is another special character of pika to escape or avoid the inaccessibility of food in harsh season of the year. It is one of the adaptations for supply of winter food when habitat is usually covered by snow. In Khumbu, Sagarmatha (Mt. Everest) region food hoarding was never observed during winter by *Ochotona macrotis* and *O. roylei*. A single exception was a small hoard consisting of 14 plants pieces probably of *O. macrotis* found on 27<sup>th</sup> December, 1971 (Kawamichi, 1971a;1971b). In Api Nampa area Koju & Chalise (2013) reported the observation of a single old hay-pile with old pellets in 2012 which consisted five species of forage plants, two were from Poaceae family, *Fragaria* species, *Potentilla* species and *Rumex* species. The hay-pile materials were very dry and de-structured so further detail could not reveal. There was not any hay-pile recorded in the same season of successive years (Koju & Chalise, 2013). Khanal & Shrestha (2000) did not report about presence of hay-pile in Langtang but Khanal *et al.* (1999) reported 33 species of plants deposited in hay-pile of Royle's pika among 48 species of plants found around their home range in Bajura, far western region of Nepal. Abundance of Royle's pika of Uttarkhanda, Bhattacharya *et al.* (2009) reported very low hoarding capacity of pika. The scarcity or virtual absence of hoarding behaviour in *O. macrotis* and *O. roylei* is noteworthy (Kawamichi, 1971a;1971b). Similar report on absence of hoarding behaviour observed by Bernstein (1970) on *O. macrotis* of Tien-Shan Mountains, China.

*Ochotona hyperborean yesoensis* in northern Japan starts hoarding food for winter from late July to October and American pika (*Ochotona princeps*) start a month early June to October (Kawamichi, 1985). *Ochotona princeps* spends a considerable amount of time during summer caching vegetation. These caches (hay-piles) have been suggested to function as diet in winter and source of food for intermittent periods when the animal is unable to forage elsewhere, or in nonfood functions, e.g., nest sites (Dearing, 1997). *O. princeps* are asocial (Morrison, 2006) does not cooperate to build other's hay-pile. They were observed making up to 13 trips/hr for haying (Beever *et al.*, 2003).

Travina (1984) calculated that even at a modest density of ten to twelve pikas per hectare, storage amount of vegetation by pikas may up to 30 kg/hectare in Afghan pika (*Ochotona rufescens*). The stores of a Afghan pika may content up to 58 species of plants and weigh up to 5 kg (Sapargeldyev, 1987) remain exposed above the surface of the snow. Daurian pika (*Ochotona daurica*) accumulate hay-pile at the entrance (Kawamichi & Dawanyam, 1997) which they use mostly in breeding season for breeding purpose (bed) and also use as food in winter. *Ochotona curzoniae*, ecologically similar species to *O. daurica* also store hay-pile in its burrow which is most often used by different birds and mammals as source of insulation in winter and simultaneously used for food by pika (Smith & Foggin, 1999; Lai & Smith, 2003).

Dearing (1996) recorded that *Ochotona princeps* hording selection depend on morphology of plants. They prefer large size plants species for hay-pile. Leaf morphology and size effect in selection of food was also explained by Bhattacharyya *et al.* (2013) in his research of *Ochotona roylei*. Aho *et al.* (1998) had explained pikas as allogenic engineer of alpine ecosystem. Their team found that hay-pile soils had significantly higher carbon and nitrogen levels and lower C/N ratios than both adjacent soils and soils in the general study area. Su *et al.* (2003) had

explained on behaviour of hoarding hay-pile by Gansu pika (*Ochotona cansus*) in Gansu, China, observing 27 hay-piles in late fall of the year from meadow. In the Chelyk-Khem River valley, Travina *et al.* (2000) explained that Altai pikas begin to store plants between July 10 and October 21, a week earlier than northern pikas. A family of pikas in that place usually makes two to seven stores (stacklets) located 1-3 meters apart from one another in the same places from year to year. Broadbooks (1965) explained that *Ochotona collaris* from Washington State, USA are very active in hoarding hay-pile and they stored 40% of plants species available in their habitat. Field observations of Holmes (1991) made on *Ochotona collaris*, in Alaska determined that these pikas do hoarding food even though high risk of predation during foraging, they donot travel more than 10m for forage. Similar findings were explained by Morrison *et al.* (2004), which explained that due to predation risk, *Ochotona collaris* store poor quality food for winter.

In current research, both species of pikas in Langtang area were found not active in storing hay-pile. Only seven hay-piles were observed during winter season. *O. roylei* was found transferring and hoarding forage for nine times and *O. macrotis* for only two times. All the hay-piles and food transferring incidents were observed only in subalpine area. Thus, there is very weak food hoarding nature in pikas in Langtang and absence of food hoarding behaviour in forest dwelling and alpine talus dwelling pikas. The adaptation in this behaviour may be due to predation risk or sufficient alternative food availability for winter too. The foraging behaviour and haying nature of those two species as well as other species of pikas in Nepal is still unexplored in detail.

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