

Altitudinal variation in bats, understanding people's perception to bats and creating bat conservation awareness in Sagarmatha (Everest) Zone, Eastern Nepal



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Cover Photo:

Front Cover: Santoshi Pokhrel handling *Eonycteris spelaea* at Haleshi, Khotang district

Back Cover: Participants of Open Art competition at Okhaldhunga (Up)

Dibya Dahal delivering Lecture to School children at Okhaldhunga (Down)



Lighting inside the Haleshi Main Cave, Khotang district which has affected the bat colony

All Photos by: Sanjan Thapa and Dibya Dahal

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Summary

Twenty-seven species has been recorded from Eastern Nepal. There are 16 districts in this region among which seven districts had been surveyed. Sagarmatha zone was untouched for bat survey. Bat conservation activity was not started yet. The project aims to understand level of knowledge about bats importance in the local people residing the area, document comparative records of the bat species diversity, population and their habitats in Sagarmatha (Everest) Zone and adopt an awareness creation action to schoolchildren for the conservation of bats and nature for the substantial and long lasting time. Eight sites of four districts in Sagarmatha zone was selected as study sites. Schedule survey, Mist netting, Echolocation study, roost search, GIS Mapping, Open-Art competition and Awareness programme were methods deployed. Six species were recorded. Pre-Awareness schedule survey was conducted amongst 168 participants. Open-Art Competition and Awareness Programme were conducted amongst 101 and 418 schoolchildren in seven and eight schools, respectively. The level of knowledge regarding bats and their importance of ecosystem services was very low. Second phase of the project is remaining in which bat echolocation study will be more focused.

1. Introduction

1.1. Background

Eastern Nepal is highly diversified with bats assemblage in Nepal. Bat studies have been carried out in most of the areas but occasionally in Eastern Nepal. Twenty-five species has been recorded from this part of the country (Acharya et al. 2010). Baral and Shah (2008) indicated 22 species of bats can be found from Eastern Nepal .Thapa (2010) added *Scotozous dormeri* and Dahal (2011) added *Pipistrellus ceylonicus* to the bat list of the country from Sunsari district in Eastern Nepal and therefore, the total number reaches 27. Among this new updated figure, six species have been reported only from Eastern Nepal, namely, *Myotis blythii*, *Eptesicus serotinus*, *Kerivoula hardwickii*, *Taphozous longimanus*, *Scotozous dormeri* and *Pipistrellus ceylonicus*.

Eastern Development Region of Nepal consists of 16 districts among which seven districts have been touched for bat survey, namely, Sankhuwasabha, Taplejung, Terhathum, Ilam, Jhapa, Morang and Sunsari. Among these locations, Sankhuwasabha district has been most widely surveyed and Terhathum district is least widely surveyed.

Rhinolophus ferrumequinum, *R. rouxi*, *R. luctus*, *R. pearsonii*, *Hipposideros armiger*, *Pipistrellus circumdatus* (now *Arielulus circumdatus*), *Philetor brachypterus*, *Eptesicus serotinus* are reported from Num, Sankhuwasabha district. The specimen of *Eptesicus serotinus* has been reported only from Num in Nepal. Specimen of *Myotis blythii* has been collected only from Tumlingtar, Sankhuwasabha district in Nepal. Also specimen of *Scotomantis ornatus* had been reported from Sankhuwasabha district. These specimens are deposited at FMNH (Koopman, 1983). *Rhinolophus lepidus* was recorded from Ilam district (Mitchell, 1980).

Specimens of Six species were collected from eastern Nepal that had been deposited at Hungarian Natural History Museum, HNHM and Zoological Museum of Moscow State University, ZMMU: An adult male of *Rhinolophus affinis* was collected on 1 April, 1996 from Tawa, Taplejung at 1200m; Two adult males and an adult male of *R. sinicus* were collected on 5 April and 7 April , 1996 from above of Yamphudin at 2650m and Mamankhe at 1700m respectively; An adult female of *R. pusillus* was collected on 1 April, 1996 from Tawa, Taplejung at 1200m; Two adult females of *R. pearsonii* were collected on 7 April , 1996 from Mamankhe at 1700m; An adult female and an adult male of *Myotis muricola* were collected on 12 and 13 April, 1996 from Lam Pokhari and Tinjure Phedi, Terhathum district at 3000m and 2900m respectively; five adult males and seven adult females of *Kerivoula hardwickii* on 7 April, 1996 from Mamankhe at 1700m (Csorba et. al, 1999).

Four species namely *Megadarma lyra*, *Scotophilus heathii*, *Pipistrellus sp.* and *Taphozous sp.* has been recently recorded from Sunsari, Morang and Jhapa districts of eastern Nepal (Thapa, 2009). The *Taphozous sp.* has been identified to *T. longimanus* (Thapa et al., 2010) and *Pipistrellus sp.* has been further distinguished as *P. coromandra*, *P. tenuis* and *Scotozous dormeri* (Thapa, 2010; Thapa et al., in press). Fourteen species of bats are

recorded from Sankhuwasava, Taplejung and Ilam districts of eastern Nepal (Acharya, 2010). Three species namely *Pipistrellus coromandra*, *Cynopterus sphinx* and *Hypsugo sp.* has also been recorded from Sankhuwasava district of eastern Nepal (Dahal and Thapa, 2010).

1.2. Objectives

- Understand level of knowledge about bats importance in the local people residing the area,
- Document comparative records of the bat species diversity, population and their habitats in Sagarmatha (Everest) Zone,
- Adopt an awareness creation action to schoolchildren for the conservation of bats and nature for the substantial and long-lasting time.

1.3. Rationale

Each species has its own role in the environment. The people of Nepal have a negative attitude towards bats and little knowledge of their ecological importance regarding ecosystem services such as: healthy forest maintenance and pest control in agriculture and therefore has nullified attempts for their conservation. During our self funding survey in different districts of Eastern Nepal, we noted that people used to kill bats for bushmeat, treatment for Tuberculosis, Asthma, Arthritis etc., treatment for Babesiosis (cattle red urination). Therefore, it has become necessary to aware the local people for the conservation of bats as well as nature for their good health and well being.

In Eastern Nepal, there are altogether 16 districts among three zones namely; Mechi, Koshi and Sagarmatha. Bat researches have been initiated to seven among ten districts of Mechi and Koshi districts (Csorba et al., 1999, Acharya, 2010 at Taplejung; Mitchell, 1980 and Acharya et al., 2010 at Ilam; Mitchell, 1978 and Thapa, 2008; 2009 at Jhapa; Koopman; FMNH, 1973; 1993; Bates and Harrison, 1997; Acharya, 2010 at Sankhuwasabha: Csorba et al., 1999 at Terhathum; Thapa, 2009 at Sunsari and Morang) and even monitoring is continued at Sankhuwasabha District (Dahal and Thapa, 2010), Sunsari (Dahal, 2012). However, not even a single step of bat survey has been organized within Sagarmatha (Everest) Zone. Road constructions and other developmental activities have been soared within Eastern Nepal which may have affected the bats habitat. Therefore, it requisites the documentation of the species from this area before the species and their habitat is lost and damaged.

Occurrence of species has been recorded from around 70m above sea level to 4154 m a.s.l. in Nepal. Sagarmatha Zone constitutes an elevation range of around 70m a.s.l. to 8848m a.s.l. Hence, the altitudinal variation affecting species diversity, their population can be represented well for the distribution of bats in the Himalaya from this zone.

1.4. Limitations of the study

This project covers only two specific locations in each district that is in total eight sites from four districts. Therefore, the bat assemblage of the area cannot be established.

The school lecture programme could only be conducted at seven schools which is even less than the half of the targeted number, because of winter vacations, holidays and availability of only one school within the project sites and no co-operation from a school at Rumjatar, Okhaldhunga. Pre-project schedule survey was conducted amongst locals as schools could not arrange meeting with parents of schoolchildren in short time. Bat documentary show could not be organized due to unavailability of projector in school and mainly due to power cut (load shedding). School children hesitated to perform the Bat drama and therefore the activity was replaced by lecture programme.

Bat detector analysis could not success as very few bats were seen flying in nights and only social calls of bats were recorded.



A view of Salleri, Solukhumbhu

2. Study Area and sites

Sagarmatha Zone lies at the western border of Eastern Nepal. It is situated in between Janakpur Zone (Central Nepal) and Koshi zone (Eastern Nepal). It comprises of six districts namely; Saptari, Siraha, Udaypur, Khotang, Okhaldhunga and Solukhumbu. Last four districts were chosen as the study area. Two sites each in a district were the study sites: namely Halesi, Mahadevsthan-4 and Arkhoule-3, at Khotang; Rumjatar and Kholaghara, Barnalu-1 of Okhaldhunga; Salleri and Faplu of Solukhumbu and Bhulke, Katari V.D.C.-8 and Simle, Katari V.D.C.-5 at Udayapur.

Annual rainfall of Diktel, Khotang district in 2010 is 1685.4 mm. Annual rainfall of Okhaldhunga district in 2010 is 1573.9 mm. Annual rainfall of Salleri, Solukhumbu district in 2010 is 1734.5 mm (DHM, 2010). Annual rainfall of Udayapur Gadhi, Udayapur district in 2009 is 1528.6mm (DHM, 2009). Maximum temperature record is 26.9°C and minimum temperature record is 5.5°C of Okhaldhunga district in 2010. Maximum temperature record is 31.4°C and minimum temperature record is 13.2°C of Udayapur Gadhi, Udayapur district in 2010 (DHM, 2010).

Halesi, Mahadevsthan-4

This site is located at 27° 11' 33.2" N 86° 37' 20.4"E at an elevation of 1373m a.s.l. in mid-hills. *Schima walichii*, *Alnus nepalensis*, Chiuri (*Bassia butyracea*), figs (*Ficus* sp.), Bamboo dominated the vegetation. The area was dry during January-February. There are caves and this village is a religious place for the Hindus as well as Buddhists.

Arkhoule-3

The site is located at 27° 12' 38.4" N 86° 40' 17.2"E at an elevation of 1195m a.s.l. in mid-hills. *Schima walichii*, *Alnus nepalensis*, Mauwa, Karam, Bhorlo, and Nundhike are dominated vegetation. The agriculture field comprise paddy, Maize, Millet, Silam, peas (Bakkula). There are caves and the area was moist with numerous streams during January-February.

Rumjatar

The site is located at 27° 18' 10.7" N 86° 22' 53.7"E at an elevation of 1360m a.s.l in mid-hills. *Elaeocarpus sphaericus*, Orange and bananas as well as other citrus fruit trees were found in the area. Bakaino, Kutmiro, Khaneu, *Ficus* spp. dominated the vegetation. The agriculture field comprised of Millet and Maize. This is a populated Tar (plain) with domestic airport.

Kholaghara, Barnalu-1

The site is located at 27° 13' 14.4" N 86° 33' 6.4"E at an elevation of 1246m a.s.l. in mid-hills *Alnus nepalensis*, *Schima walichii*, *Castanopsis indica*, bamboos dominated the vegetation. Mustard, barley etc. were cultivated in agriculture field. A small Thotne stream flows down in which small hydropower project is established.

Salleri-5

The site is located at $27^{\circ} 30' 20.1''$ N $86^{\circ} 35' 18.1''$ E at an elevation of 2410m a.s.l. It is dominated by Rani salsa (*Pinus wallichii*). It is a metropolitan town in highland and is the Headquarter of Solukhumbu district.

Faplu

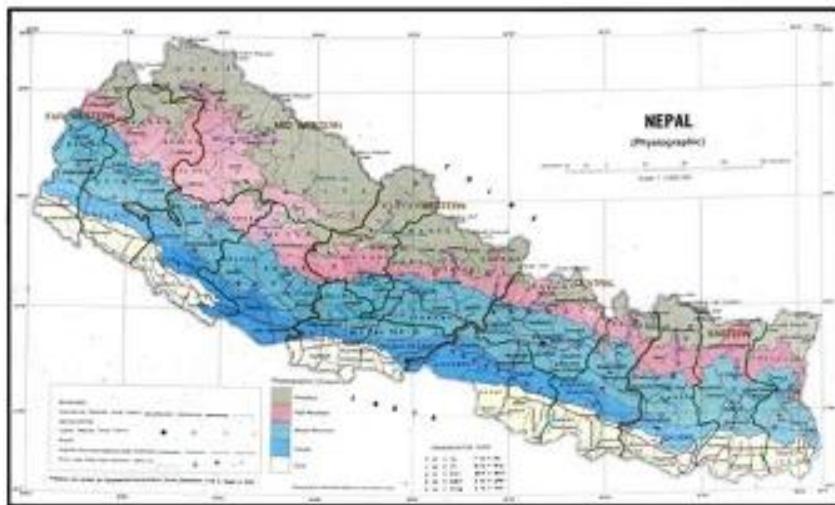
The site is located at $27^{\circ} 30' 49.4''$ N $86^{\circ} 35' 4.6''$ E at an elevation of 2493m a.s.l. The vegetation is dominated by Dhupi Salla, Patle Katus. It is a nearby small-town north to Salleri with domestic airport.

Simle, Katari-5

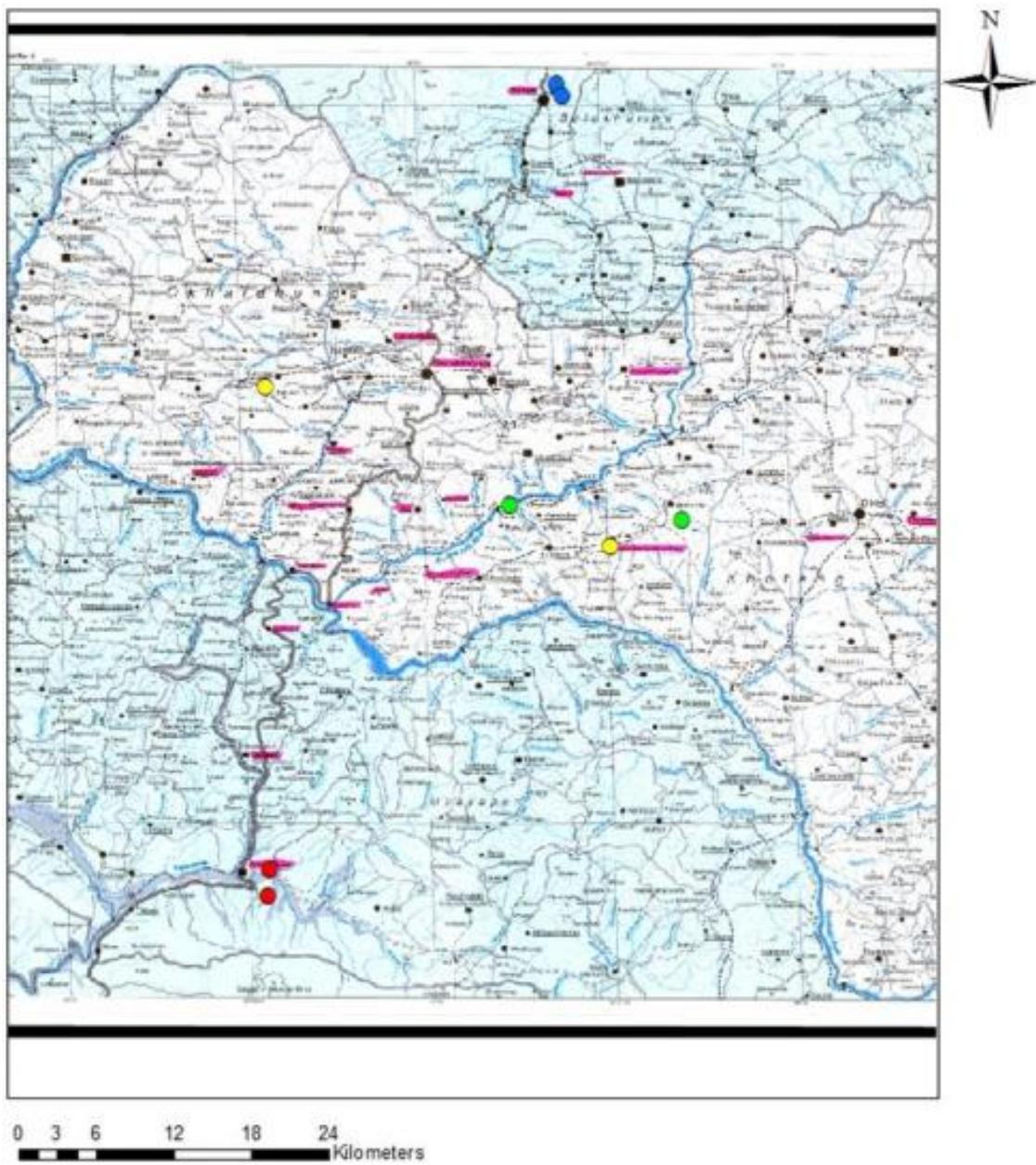
The site is located at $26^{\circ} 58' 3.4''$ N $86^{\circ} 23' 5.3''$ E at an elevation of 202m a.s.l. in Inner-Tarai. The village comprises of few dispersed houses in between agriculture field and surrounded in north, east and west sides by forest dominated by *Shorea robusta* and Thaakal.

Bhulke, Katari-8

The site is located at $26^{\circ} 56' 58.2''$ N $86^{\circ} 23' 1.4''$ E at an elevation of 206m a.s.l. in Inner-Tarai. The Village comprises of mango trees, Bakaino, banana, coconut, Supari, *Ficus* spp. in between agriculture farm where paddy, pulses (Musuro, Khesari etc.). This village is more populated in comparison to Simle.



Map 1. Physiographic Map of Nepal and Sagarmatha zone.



0 3 6 12 18 24 Kilometers

Legend

	river		Bhulke		Faplu		Gupteshwor		Halesi
	road		Simle		Salleri		Kholaghari		Rumjatar

Map 2. Map showing eight project sites in four districts of Sagarmatha zone. (Note: similar color mark denotes similar elevations).



Left: Haleshi Bazaar Right: a view of Arkhoule



Left: Okhaldhunga Right: terrace at Rumjatar



A view of Faplu Airport



Views of Kholaghara, Barnalu-1, Okhaldhunga



A view of Sunkoshi River and Harkapur, at simle, Katari-5, Udayapur Okhaldhunga from Ghurmi, Udayapur



Katari Bazaar, Udayapur

3. Materials and Methods

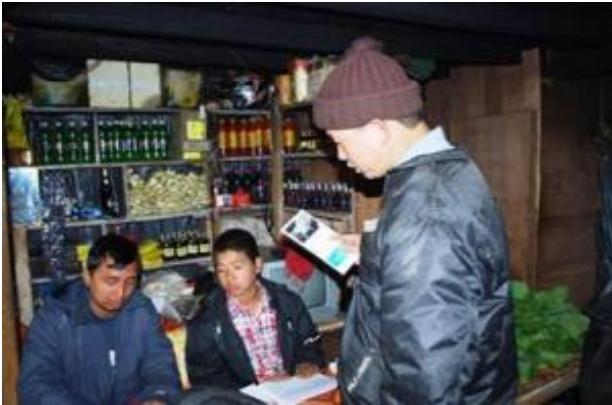
Following activities were conducted within January-February 2011.

- 3.1. **Schedule Survey:** A Pre-awareness schedule survey was conducted among locals at each site.
- 3.2. **Echolocation study:** Echolocation calls were recorded using bat detector Bat Box Duet and analyzed using bat sound analysis software Bat Scan 9 to identify flying bats in the evening.
- 3.3. **Roost Search:** Houses and caves were searched at the daytime during roost survey. Bats were captured by hands from roosts in some sites.
- 3.4. **Bats capture:** A single mist net 6m*3m was deployed randomly at roost surveyed sites during evening from 1700 hr to 2000 hr.
- 3.5. **Identification:** Spot identification was made on the basis of morphometrics and other characteristics tallying from taxonomic references and keys Srinivasulu et al. (2010) and Acharya et al. (2010).
- 3.6. **GIS Mapping:** A GIS map showing altitudinal variation of bat occurrence on the basis of data of GPS Locations was produced.
- 3.7. **Open Art Competition:** Twelve selected students from classes VI to VIII participated in the Pre-awareness Art Competition at each school. They were asked to draw whatever they know about bats.
- 3.8. **Awareness campaign:** After the Pre-awareness Art Competition, half an hour lecture on bats and their importance was delivered to those participants and additionally to other schoolchildren in schools. Poster and brochure on bat conservation were distributed to schools and locals.

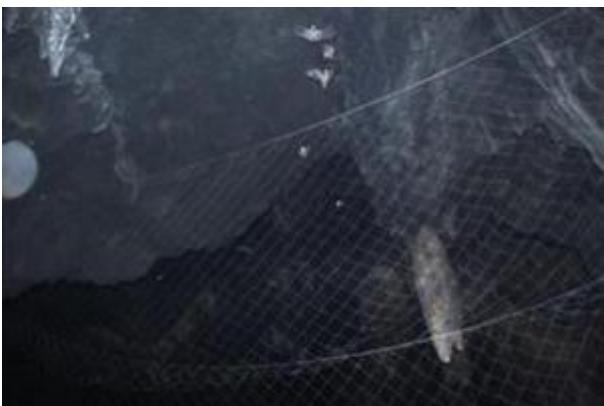


Pre-awareness Schedule Survey





Pre-awareness Schedule Survey



Mist netting at Halesi Main cave



Roost survey at Bhulke, Katari-8



Measuring bat at Bhulke, Katari-8



Roost survey at Bhulke, Katari-8



Opening bat detector and recording bat calls at Rumjatar

4. Results

Public perception on bats:

Altogether 168 schedule forms (See format in Appendix III) were filled as well as interview was conducted amongst local people of different community in the study area. During the pre-awareness schedule survey, a variety of people in occupation, age, sex and education was involved (see Annex I).

Q.1.What is bat?

In this question most of the informants either do not know bats or they think bat is a bird. They are confused with Barn Swallow *Hirundo rustica* and similar types of bird.

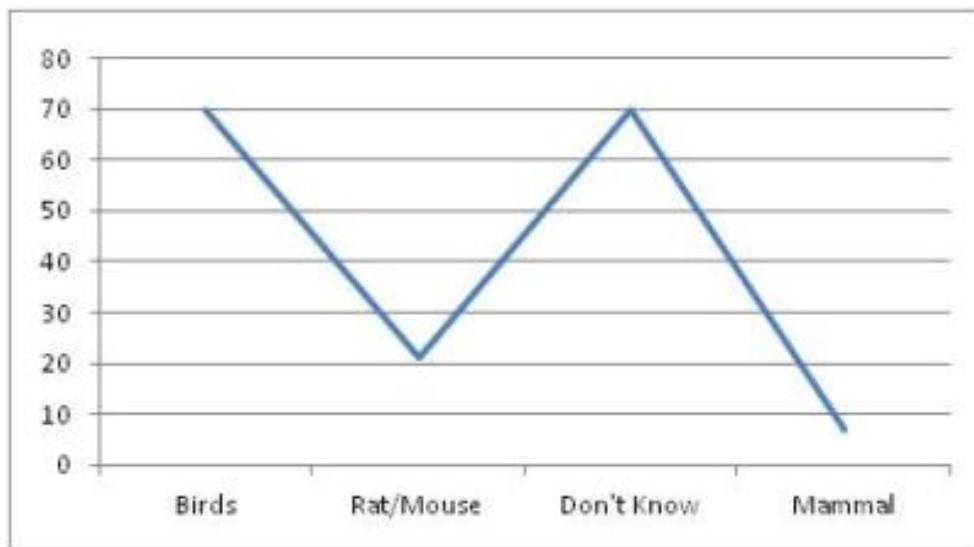


Figure 1. Line-chart showing public perception about bats.



Nests of Barn Swallow in an old house at Katari Bazaar, which was said to be roost of bats by locals.

Q.2. Which Season bats are seen the most?

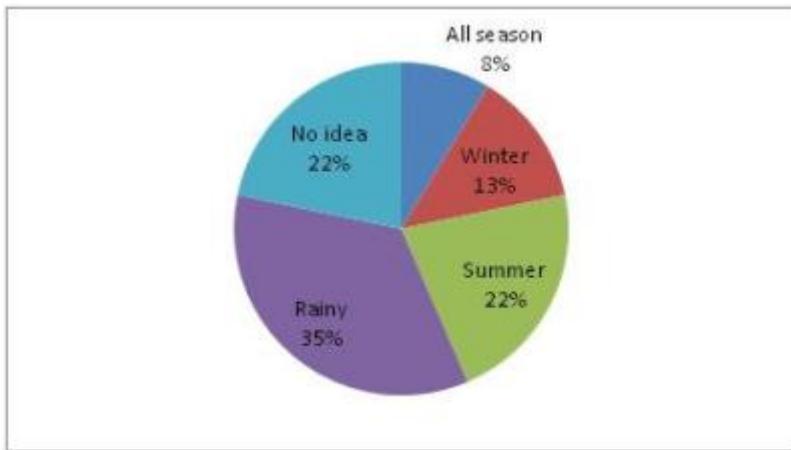


Figure 2. Pie-chart showing public perception on season of bats abundance.

Q.3. Where do bats live?

Majam Bdr. Rai of Saikho, Haleshi, Mahadevstahn-5, Khotang said he saw bats coming out of holes from cut down trees. Most of the informant answered bats live under banana leaves, hollows of bamboo and caves.

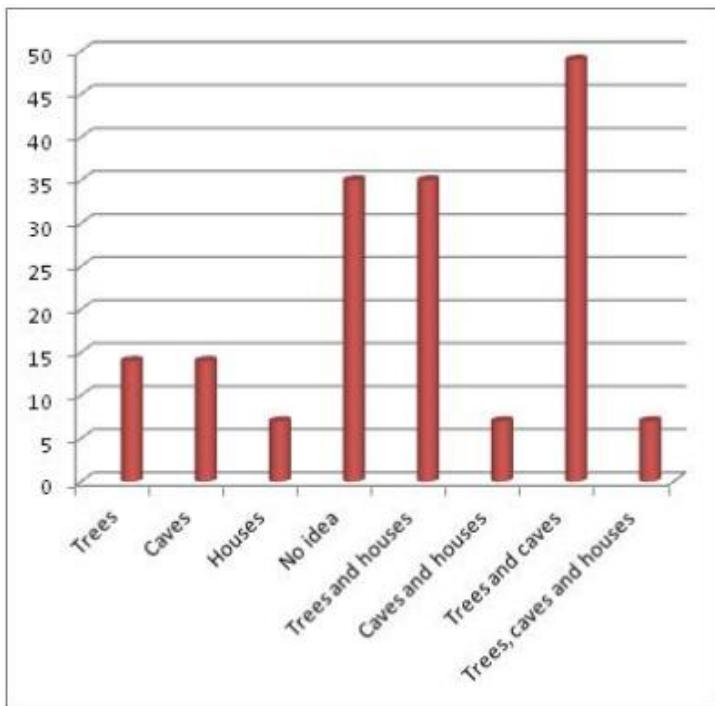


Figure 3. Column-diagram showing public perception on habitat of bats.

Q.4.Which colors of bats have you seen?

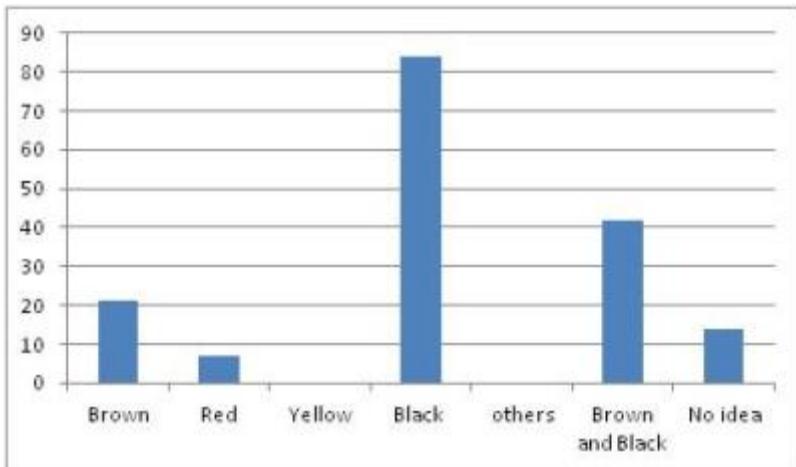


Figure 4 Column-diagram showing public perception on bats' colour.

Q.5. What do they feed upon?

They say bats fly around maize stockpiles. Hari Tilung Rai of Mahadevsthan V.D.C. -4, Haleshi, Khotang said that bats fly around chiuri trees especially in flowering and fruit ripening season. Many informants revealed bats enter inside the house when light is on and feeds on sandfly (Bhusuna in Nepali). From all the forms we concluded that people know bats favorably eats ripe fruits like Guava, Banana, pears, peach, Chiuri and they also feed on insects such as sandfly, moths, grasshoppers and leafhoppers. Kattak Bdr. Rai of Parigaun, Arkhaule-4, Khotang said bats eat flying termites too.

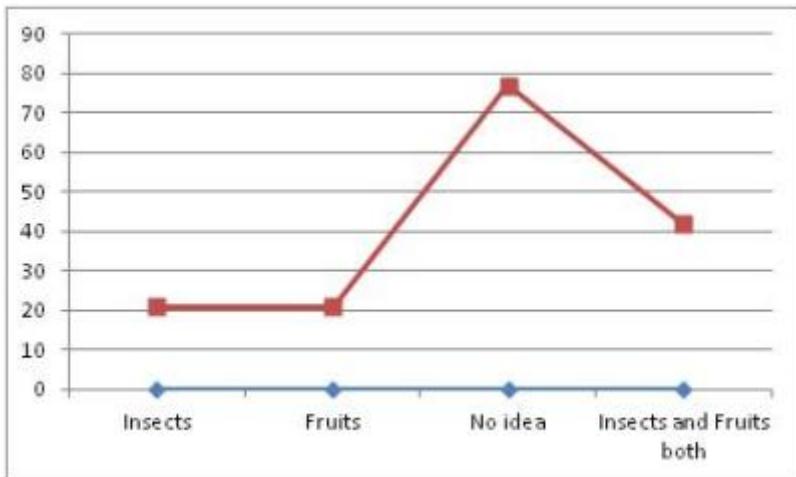


Figure 5. Line-chart showing public perception on bats' diet.

Q.6. Do you know advantages of bats?

People of Sagarmatha Zone do not know the facts about advantages of bats. Some individuals said that bats' guano was used in agriculture fields in the past at Kali Odar, Balakhu V.D.C., Okhaldhunga.

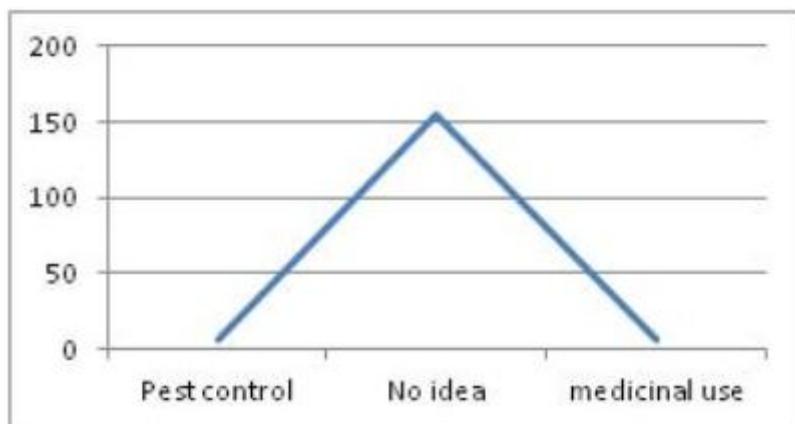


Figure 6. Line-chart showing public perception on bats' advantages.

Q.7. What are harms of bats?

Informants do not have idea of bat harms except fruit raiding. A few were complaining about ripe banana raiding.

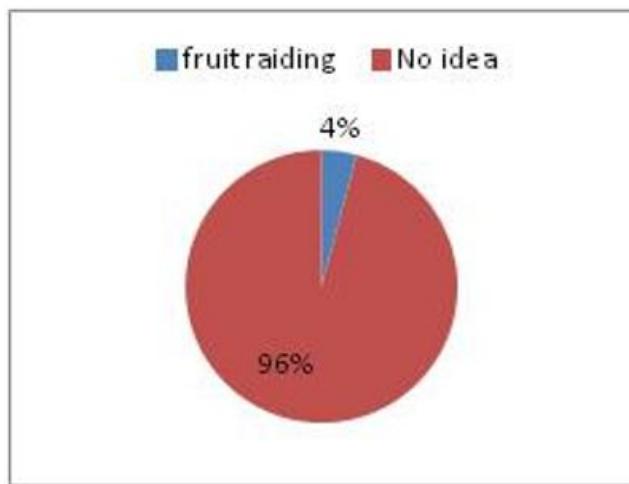


Figure 7. Pie-chart showing public perception on disadvantages of bats.

Q.8. Do people kill bats?

Most of the people said 'No' for killings of bat. Some people have specific reason for not killing bats. Majam Bdr. Rai of Saikho, Halesi, Mahadevsthan-5, Khotang said that sometimes bats flesh becomes poison. Sanad Gurung of Rumjatar-4, Okhaldhunga disclosed that older people scold children if they catch bats as they believe that bats transfer leprosy.

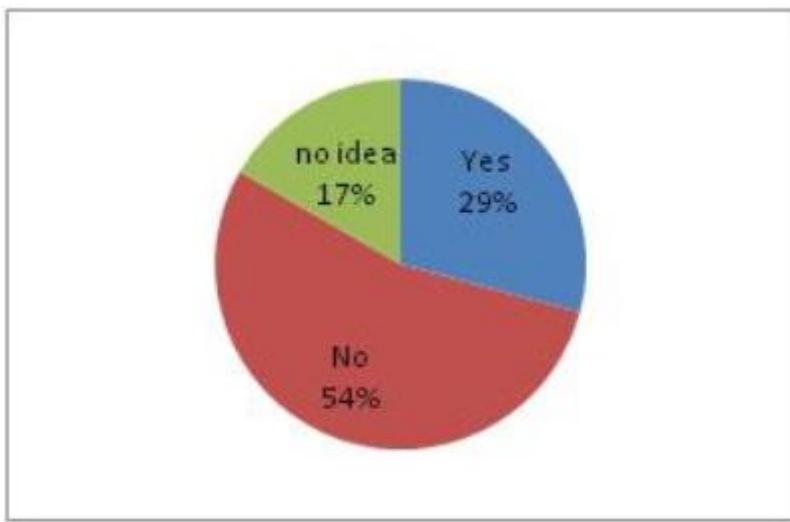


Figure 8. Pie-chart showing public perception on bat killings.

Q.9. Why they kill bats?

Most of the people do not have idea on reasons for bat killings. Rai community specifically Jero Rai at Gairijerung, Balakhu-1, Okhaldhunga and Bahing Rai of Kettuke, Okhaldhunga and Rai community of Khotang kill chiuri (*Bassia butyracea*) visiting fruit bats for bush meat. They kill by nets, bamboo sticks and majorly by catapult.

Majam Bdr. Rai of Saikho, Halesi, Mahadevsthan-5, Khotang revealed that bat flesh can cure child bed wetting. Chandra Bdr. Khatri of Simle, Katari-5, Udayapur disclosed that (Dhami-Jhakri) orders people to feed killed bats to diseased cattle. Some locals feed bats to cure babeosis in cattle. Kattak Bdr. Rai of Parigaun, Arkhoule-4, Khotang in addition killed bats and fed to save his dying ox, but the ox died.

Children, herders kill bats just for fun. Once, the bat roosting place is found in the home and other places, children and youngsters starts disturbing them and finally kills them.

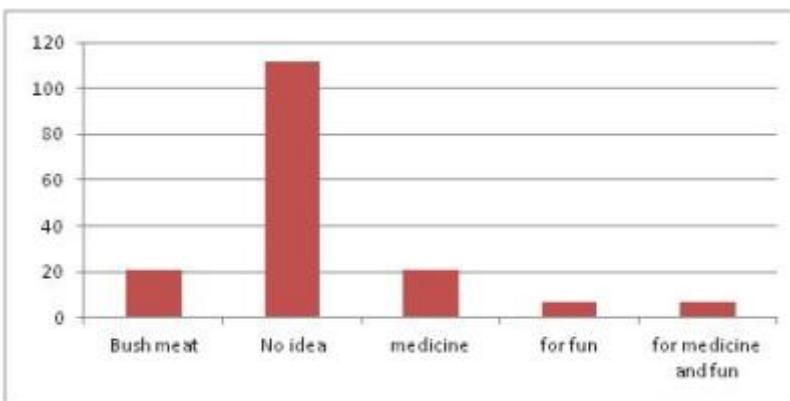
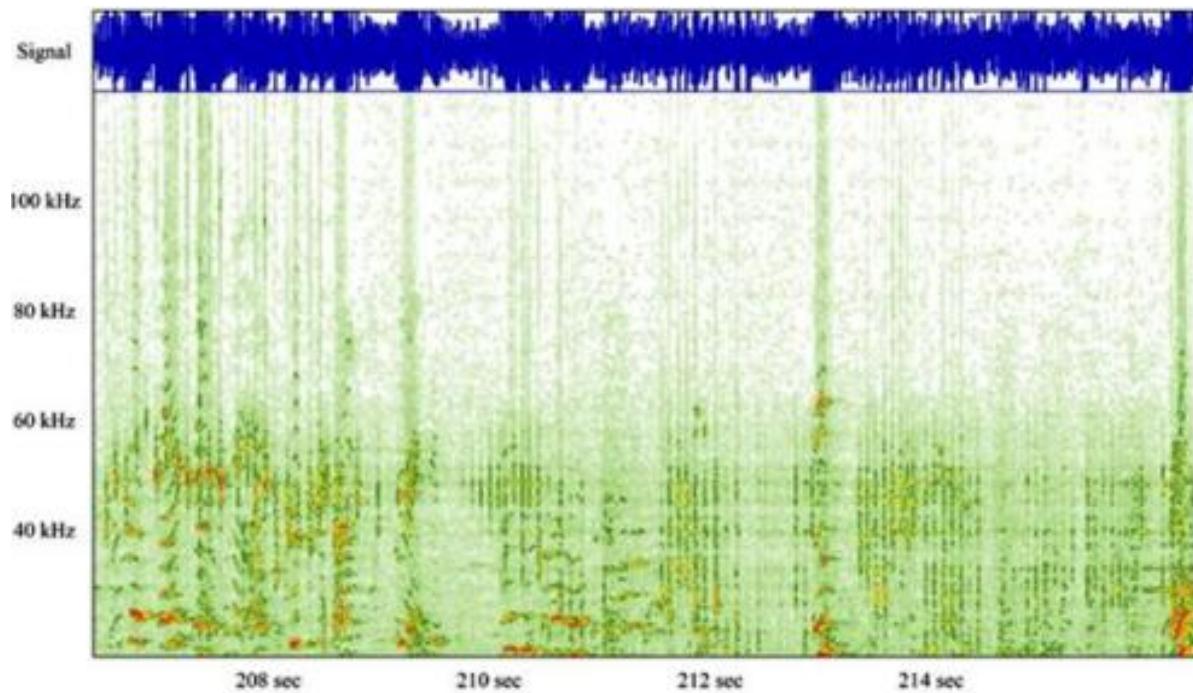


Figure 9. Column-diagram showing public perception on reason for bat killings.

Altitudinal variation and habitat of bats occurrence

Table 1. Elevation, place and habitat of bat species recorded.

Elevation	Place	Bat species observed/captured	Habitat
2493m a.s.l.	Phaplu, Solukhumbu	-	-
2410m a.s.l.	Salleri, Solukhumbu	-	-
1373m a.s.l.	Halesi Cave, Khotang	<i>Eonycteris spelaea</i> and <i>Rousettus leschenaulti</i>	Cave
1360m a.s.l.	Rumjatar, Okhaldhunga	<i>Cynopterus sphinx</i>	Banana leaf tent
1246m a.s.l.	Kholaghara, Barnalu-1, Okhaldhunga	<i>Hypsugo sp.</i>	Bamboo hollow
		<i>Hipposideros armiger</i>	Tunnel
1195m a.s.l.	Gupteswor Cave, Dukhseli, Arkhoule-3, Khotang	-	-
206m a.s.l.	Bhulke, Katari-8	<i>Pipistrellus sp.</i> and (signs of <i>Cynopterus sphinx</i>)	Bamboo hollow
202m a.s.l.	Simle, Katari-5	-	-



Spectrogram of bat calls recorded at Katari Bazaar, Udaypur district



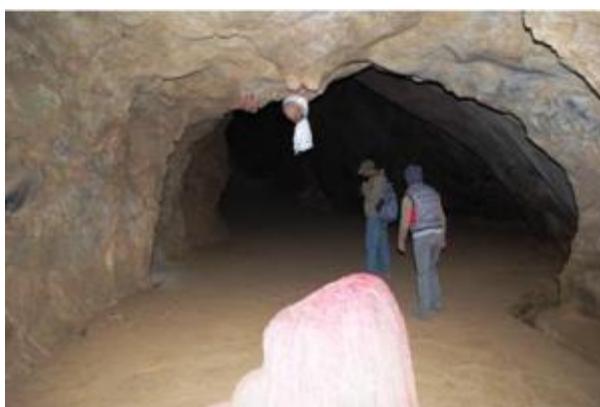
Main Cave at Halesi, Khotang district



Sign of previous roost of *Cynopterus sphinx*



Entrance gate of Basaha cave, Halesi



Inside Basaha cave



Bhairav cave, Halesi



Observing bat colony inside Bhairav cave



Bat guano in Bhairav cave



Entering inside Dungdela cave, Halesi



Inside Dungdela cave



Tunnel of Small Hydropower project,
Barnalu-1,



Bamboo hut where *Pipistrellus* sp. was
Okhaldhunga found at Bhulke, Katari-8,
Udaypur

Species Profile

Family: Pteropodidae

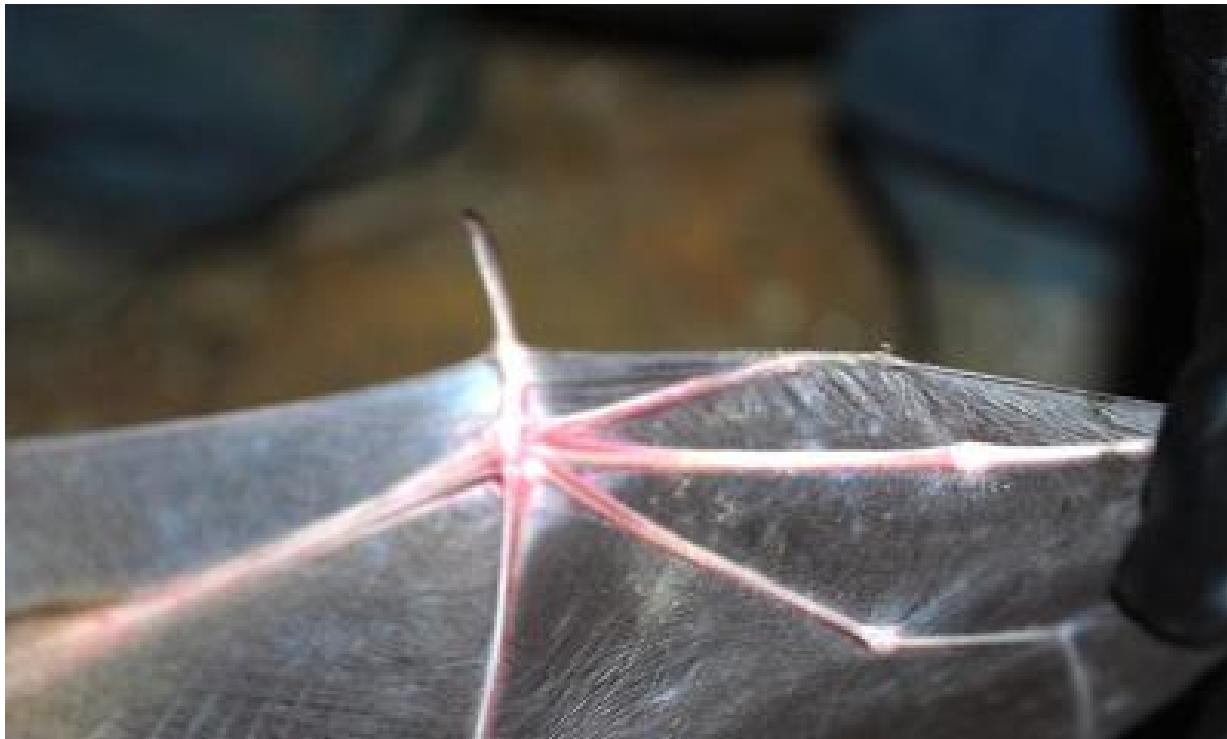
Rousettus leschenaultii (Desmarest, 1820)



Head focused of an adult individual



Young male (note penis)



Left wing with claws in both first and second fingers

Common Name: Leschenault's Rousette (IUCN 2010)

Nepali Name: Sano Badura (Baral and Shah 2008); Jibro Padkaune Falahari chamero (Acharya et al. 2010)

Conservation status:

World-wide: LC (IUCN 2010)

South Asia: LC (Molur et. al 2002)

Nepal: LC (National Red list of Nepal Mammals 2010)

Description: One adult female and one young male was mist netted at the entrance of Bhairav Cave, Halesi, Khotang at 18:25hr and 18:37hr, respectively on January 25, 2012. Population of the species could not be estimated as it was found sharing roost with *Eonycteris spelaea*. A colony of hundreds of *Rousettus leschenaulti* and *Eonycteris spelaea* was found roosting at Bhairav cave. Chattering sound from the roost was conspicuously heard. Ectoparasite was present in both individuals.

External characters: Average Forearm length measured is 85.3mm (n=2) ranging 78mm-85mm. Tail is short and measured 10mm (n=2). Claws are present in both first and second fingers. Dorsal pelage is brownish with pale ventrally. Penis of 9 mm was seen in a young individual. All individuals infested by ectoparasites.



Cynopterus sphinx roosting under banana leaf tent at Rumjatar, Okhaldhunga

Ejecta (Elaeocarpus sphaericus fruit)

Cynopterus sphinx (Vahl, 1797)

Common Name: Greater Short-nosed Fruit Bat

Nepali Name: Nepte chamero (Baral and Shah 2008)

Conservation status:

World-wide: LC (IUCN 2010)

South Asia: LC (Molur et. al 2002)

Nepal: LC (National Red list of Nepal Mammals 2010)

Description: Two individuals were observed roosting under banana leaf tent at Rumjatar V.D.C.-6, Okhaldhunga on January 29, 2012. Below the roost, ejecta (Rudrakshya *Elaeocarpus sphaericus* fruit) were also observed.

Eonycteris spelaea (Dobson, 1891)



Whole of an adult *Eonycteris spelaea*



Adult female (note nipples)



Left wing with claws in first finger only

Common Name: Dawn Bat

Nepali Name: Mirmire chamero (Acharya et al. 2010)

Conservation status:

World-wide: LC (IUCN 2010)

South Asia: LC (Molur et. al 2002)

Nepal: DD (National Red list of Nepal Mammals 2010)

Description: Altogether five adult males and two adult females were mist netted at the entrance of Bhairav cave on Jan 24, 2012 and main cave on January 25, 2012 at Haleshi, Khotang. This species is the earliest flier. The first flight of the species was noted 17:00hr at Bhairav cave and 17:29hr at main cave, the first individual was caught in the mist net at 17:40hr in Bhairav cave and 18:04hr at main cave. The flight was continued until 20:00hr. The last individual was captured at 19:10hr. It was found sharing roost with *Rousettus*

leschenaultii. This species was cooperative while handling. Chattering sound from the roost was conspicuously heard. A colony of hundreds of *Rousettus leschenaulti* and *Eonycteris spelaea* was found roosting at Bhairav cave and about 2000 *Eonycteris spelaea* were found divided in four colonies in the main cave. All individuals were infested by ecto-parasite, except one adult male captured at last in main cave was free of ecto-parasite.

External characters: Average Forearm length measured is 73.42mm (n=7) ranging 70mm-75mm. Tail is larger than *Rousettus leschenaulti* and measured 15mm (n=1). Pelage is grey brown with darker dorsum and ventral pelage is paler. Flacid nipples were seen in an individual. All individuals except one was infested with ectoparasites. Second finger lacks claw.

Family: Hipposideridae

***Hipposideros armiger* (Hodgson, 1835)**

Common Name: Great Himalayan Leaf-Nosed Bat

Nepali Name: Thulo Golopatre Chamero (Baral and Shah 2008)

Conservation status:

World-wide: LC (IUCN 2010)

South Asia: LC (Molur et. al 2002)

Nepal: LC (National Red list of Nepal Mammals 2010)

Description: a colony of hundreds of individuals was observed

roosting in the tunnel at Thotne Khola, Small Hydropower Project, Dandagaun, Kholaghara, Barnalu-1, Okaldhunga on January 30, 2012. One individual was caught by hands inside the tunnel.

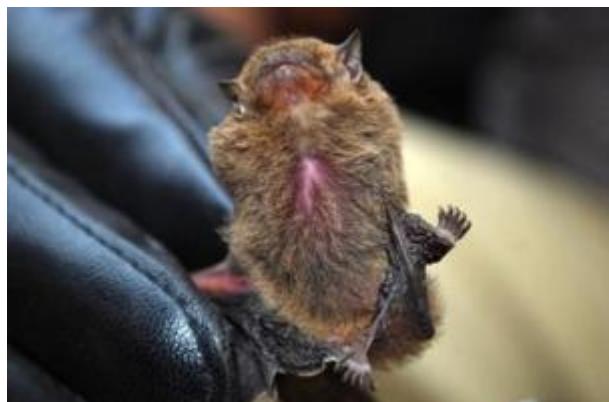


Family: Vespertilionidae

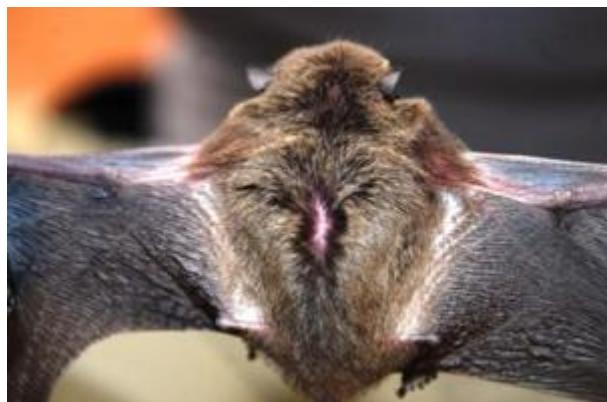
Pipistrellus sp.



Lateral and frontal views of *Pipistrellus sp.* at Bhulke, Katari-8



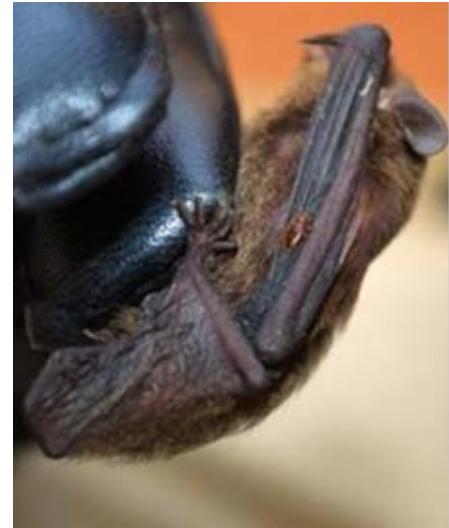
Ventral pelage



Dorsal pelage



Tail



Ectoparasites in wing membrane

Description: A colony of four individuals was found roosting in the hollow of bamboo of the ceilings of a school at Bhulke, Katari-8, Udayapur on February 6, 2012. Two individuals (one adult female and male each) were captured by hands. Ectoparasite (probably bug) was present in the female while absent in the male.

External characters: Average Forearm length measured is 30.5mm (n=2) ranging 30mm-31mm. Average of: 3mt=29mm; 4mt=29mm; 5mt=28.5mm; TIB=11.5mm; HB=41.5mm; T=30.5mm; E=8mm Dorsal pelage is dull brown with dark brown hair bases and ventral pelage is dull brown with pale hair bases. A female individual was infested with ectoparasites (bat bug).

Hypsugo sp.



Lateral view



Wing membrane attached to the base of toe of
Hypsugo sp. at Kholaghara, Barnalu-1

Description: A colony of six individuals was observed roosting inside the hollow bamboo of thatched house at Kholaghara, Barnalu V.D.C.-1, Okhaldhunga on January 30, 2012. Two adult females were captured by hand.

External characters: Forearm length measured is 34mm (n=1). 3mt=30mm; 4mt=29mm; 5mt=29mm; TIB=14mm; HB=46mm; T=35mm; E=10mm. Dorsal pelage is buffy brown with black hair bases while tips rufous brown while the ventral pelage has hairs tips pale brown and the hair bases black.

Open Art Competition and Awareness Program:

Table 2. Schools and number of participants of Open Art Competition and Awareness Program.

Name of school	Address	No. of Students	
		Open-Art Competition	Awareness lecture
Mahendodaya Higher Secondary School	Halesi, Mahadevsthan-4, Khotang	12	30
Saraswati Ma. Vi.	Arkhaule, Khotang	12	38
Laliguransh English School	Okhaldhunga	12	35
Sagarmatha Janata Higher	Okhaldhunga	-	45

Secondary School				
White-Hills English Secondary Boarding School	Higher	Salleri-5, Solukhumbu	12	40
Mount Everest Secondary School	English	Salleri-5, Solukhumbu	12	60
Shree Tribeni Secondary School	Higher	Katari-3, Udayapur	20	90
Prabhat School	English Boarding	Katari-4, Udaypur	21	80

Note: In Sagarmatha Janata Higher Secondary School, there was internal exam of classes VI-X, so, open-art competition could not be organized. Therefore, lecture program was conducted amongst class XI student. Numbers of students in schools at most of the schools were because the school was just re-opened after a long winter vacation.

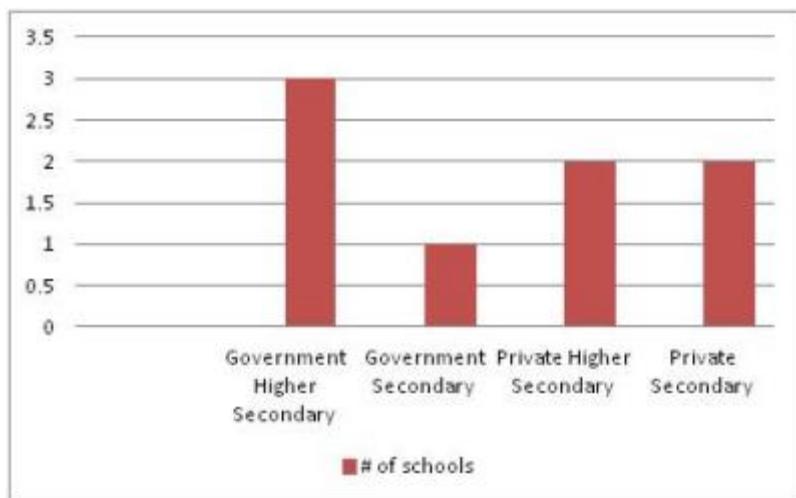


Figure 10. Pie-chart showing number and types of schools.







Arts showing Perception and Knowledge on bats of participants of Pre-Awareness Open Art Competition







Some schoolchildren are confused bats with insects, owl and birds etc. Few participants draw bats face like that of horse. Some schoolchildren take as amazing creature. Few know very well about their habitat such as bats live in caves and in trees. Some are well known of bats habits such as they feed upon insects, rats etc. Few have misconception that bats suck blood of cattle.

5. Discussion and Conclusions

People have little collective information regarding bats. People of the study area are confused with distinguishing bats. Rainy season is the appropriate time for bats sighting in the area according to 35% of the informant. Most of the people know habitats of bats; however, 20% informant has lack of knowledge on the bat habitat. They can distinguish the colour of bats perfectly. Regarding feeding habits of bats about 50% of the informant do not have idea. Knowledge regarding advantages and harms of bats are almost negligible. Bats killing are informed by less percentage (29%) of people. People kill bats mainly for the bush meat and medicine.

In Sagarmatha zone, bats occurrence with elevation gradient is exhibited. Bats were recorded from 206m a.s.l. to 1373m a.s.l. This is the first record of *Eonycteris spelaea* in Mid-hills. *E. spelaea* was reported from Chitwan National Park (Myers et al., 2000; Dahal et al., 2011). Also, this is the first record of the co-existence of *E. spelaea* with *Rousettus leschenaultii*. Species variation with altitude has been interestingly exhibited. *Hypsugo sp.* occurs in the higher elevation, whereas, *Pipistrellus sp.* is distributed in lowlands. However, both species inhabit bamboo hollows. *Hypsugo sp.* was previously recorded from similar habitat and nearly same elevation at Khadbari-4, Dada Pangma ($27^{\circ} 24' 31.1''$ N $87^{\circ} 11' 7.1''$ E at an elevation 1238m). *Hipposideros armiger* was found inhabiting in the tunnel. It was recorded previously from Sundarijal tunnel (Thapa et al., 2009; 2010). Cave and Bamboo hollow hoard maximum number of species.

Altogether seven schools were approached for the open-art competition and eight schools for awareness program. Maximum programs (3) were conducted in Government Higher Secondary School, minimum (1) in Government Secondary School, whereas, equal number of programs (2) was conducted in Private Higher Secondary School and Private Secondary School. Maximum participation of students was in Udaypur district whereas least participation in Khotang district.

Few schoolchildren participated in the pre-awareness open art competition know bats very well while most of them are either confused or they have very less idea on bats.

6. Next Steps

Second Phase of Project will be carried out during May 2012. Art Exhibition and Calendar printing will be conducted within July-September 2012.

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ANNEX I

Informants according to Occupation

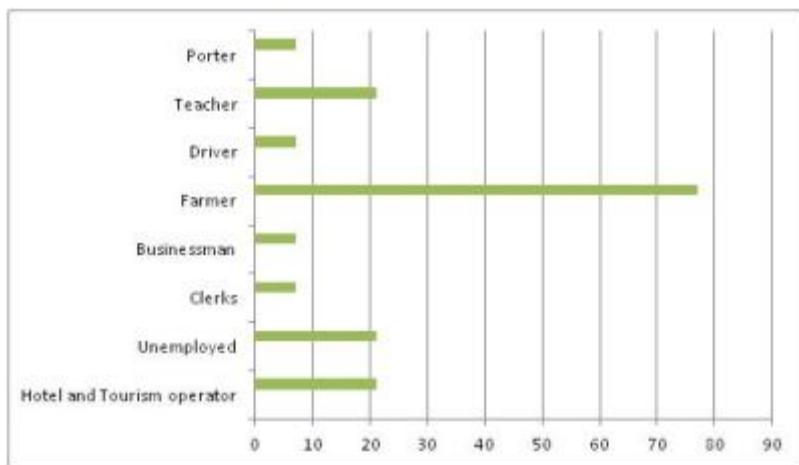


Figure 11. Bar diagram showing informants on the basis of occupation.

Informants according to Age group

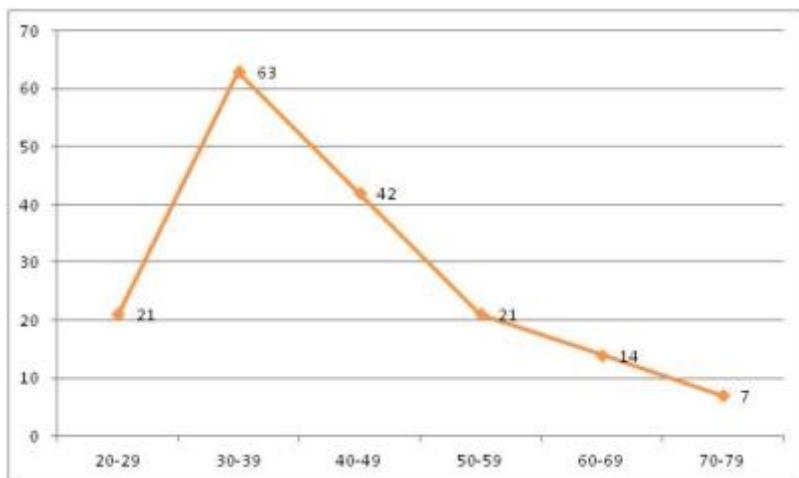


Figure 12. Line-chart showing informants on the basis of age.

Informants according to sex

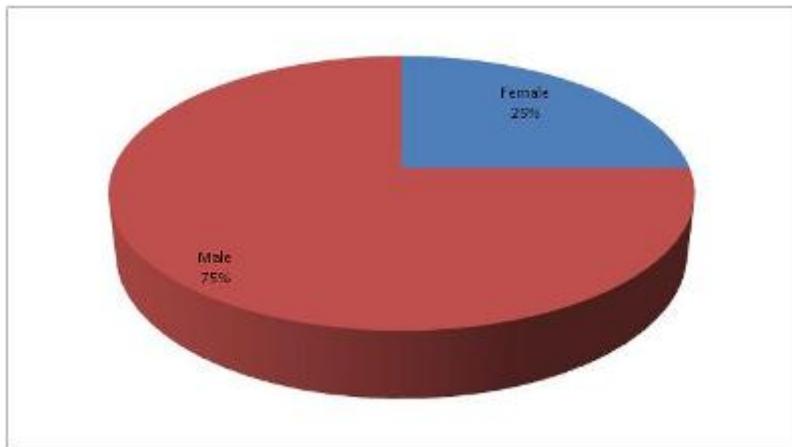


Figure 13. Pie-chart showing informants on the basis of sex.

Informants according to Education

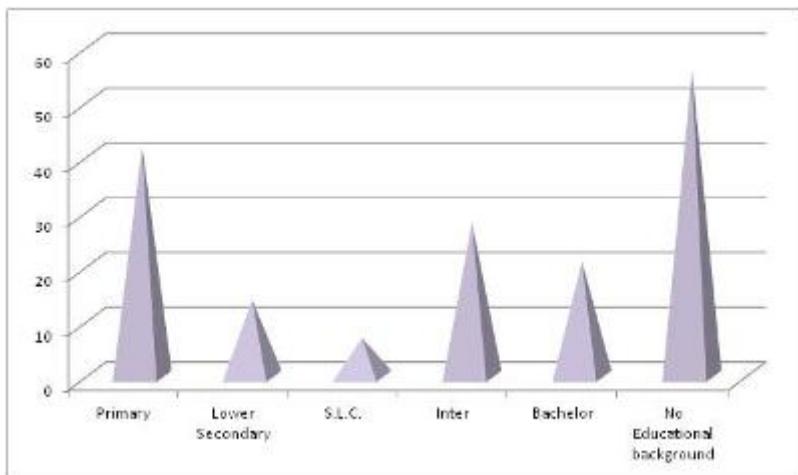


Figure 14. Column-diagram showing informants on the basis of Education.

Informants according to community

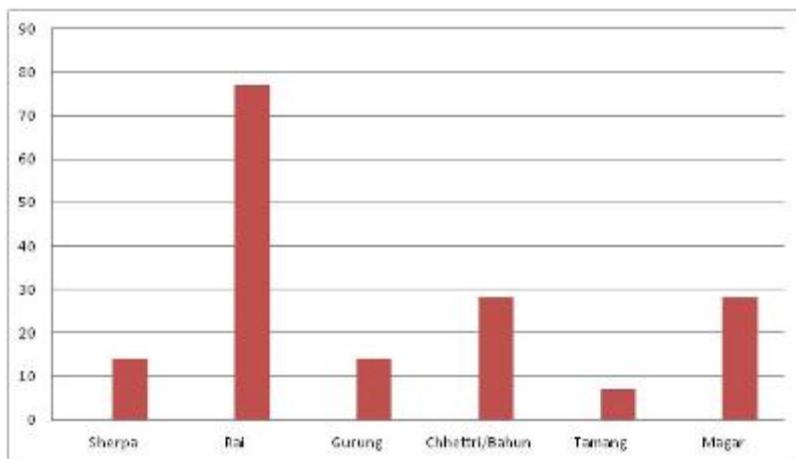


Figure 15. Column-diagram showing informants on the basis of community type.

ANNEX II

Table 3. Bats in dialect.

Casts	What they say for Bats
Thulung Rai	Pwakhti
Magars	Ghichin/Ghichinni/Ghichinpa
Bahing Rai	Pakati
Ambule Rai	Pakchapa
Tilung Rai	Pape
Chamling Rai	Pape
Danuwar	Vedini
Sherpa	Fam-taktak
Tamang	Fawang



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