

Detailed monitoring survey of bats and their conservation through radio awareness programme and outreach programme to school children in Kathmandu



Progress Report II

December 2010



Cover Photo:

A Mandelli's Mouse-eared myotis (*Myotis sicarius*) netted over the stream at the edge of dense Bajrabarahi Religious Forest near Chapagaun.

Note: This species is Vulnerable in Nepal as well as World-wide.



Suchita at Radio awareness Programme

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Sagar delivering lecture at a school

All Photos by:

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Executive Summary

The first phase of this detailed monitoring added five species to the species number after Thapa et al. 2009, however, it is the minimum re-records in comparison to previous records in Bates and Harrison 1997. This project's first phase also helped to aware schoolchildren, teachers and their parents as well as radio programme listeners about importance of bats for life and nature. Mist nettings, scoop nettings and roost survey were the research methodologies carried out within 20 sites of Kathmandu Valley; Radio-awareness programme and lectures to schoolchildren were conservation actions. Six species was supplemented from this second phase of the project to monitoring data, now totaling the species number to 13 which is still lacking 12 species after Bates and Harrison 1997. Many specific sites and bat habitats were discovered and documented within Kathmandu Valley. Availability of the species, population estimates, and habits were noted. Lectures were delivered to schoolchildren of twelve schools at nine sites within the study area. Radio-awareness programme was successfully broadcasted. Extensive surveys and conservation activities should be extended to other virgin areas of Nepal.

1. Introduction

1.1. Background

Kathmandu Valley is the most studied area since Hodgson 1835 in Chiropterology of Nepal. Twenty-five bat species was documented in Bates and Harrison 1997. Csorba *et al.* 1999 collected specimens of six species from two localities in Kathmandu district. Myers *et al.* 2000 provided locality record of *Miniopterus schreibersii* inside the Kathmandu city. After the first phase of this current project, the number of bat species increased to seven (after preliminary survey report by Thapa *et al.* 2009), however, the species account is still deficient against 25 species prerecorded (Bates and Harrison 1997). A contract was made to Radio Kantipur for 13 episodes of radio-awareness programme and lectures to schoolchildren were conducted in eight schools.

In between the gap of first and second phases there are numerous changes experienced. South Asian region has recently achieved an important documentation; A key to bats of South Asia (Srinivasulu *et al.* 2010). Meanwhile the scenario of Nepalese Chiropterology has also outcome some important documentation. First one the checklist of valid bat species has been updated to 53 species (Thapa 2010), next National Red List of Nepal Mammals prepared with species under different threat category; two Critically Endangered, one Endangered, two Vulnerable, four Near Threatened, 24 Least Concern, 20 Data Deficient (Red List of Nepal Mammals, 2010).

The detailed monitoring is another important outcome in history of bat studies of Nepal.

1.2. Objectives

The aim of the second phase was to

- Re-record the bat species diversity, population and their habitats in Kathmandu valley
- Adopt a radio awareness programme and lectures to schoolchildren for the conservation of bats and nature for the substantial and long-lasting time.

1.3. Rationale

The rapid transformation of the land use pattern of the valley due to haphazard urbanization, infrastructure development, industrialization and economic increment has encroached the major roosting habitats of bats, may have influence to the species loss. Regular monitoring of the species and their roosting habitats did not approach since 1997. Re-recording of only three species *Rhinolophus pusillus*, *Hipposideros armiger* and *H. cineraceus* during the preliminary survey (Thapa *et al.*, 2009) fantasize the prediction. Unconfirmed diversity, status and distribution of bats are still the unanswered questions in the Chiropterology of Nepal. This study is expected to update the facts of the species and population prevailing and their roosting and hibernating habitats in the Kathmandu valley.

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 healthy forest maintenance and pest control in agriculture and therefore has nullified attempts for their conservation. It has become necessary to aware the local people and initiate them into monitoring for the conservation of bats as well as nature for their good health and well being.

1.4. Limitations of the study

Although this project covers most of the previous recorded sites and some new sites, some previously recorded sites such as Thankot, Hattiban and Baansbahari remains uncovered. At the end of the project it was felt some more new sites inside the busy city should also be extended. Hence this project becomes an estimate of the bat species existing in Kathmandu Valley.

The school lecture programme could only be conducted at twenty schools which is only the half of the targeted number, because of strikes, vacations, holidays and unavailability of extra time during the field visits.

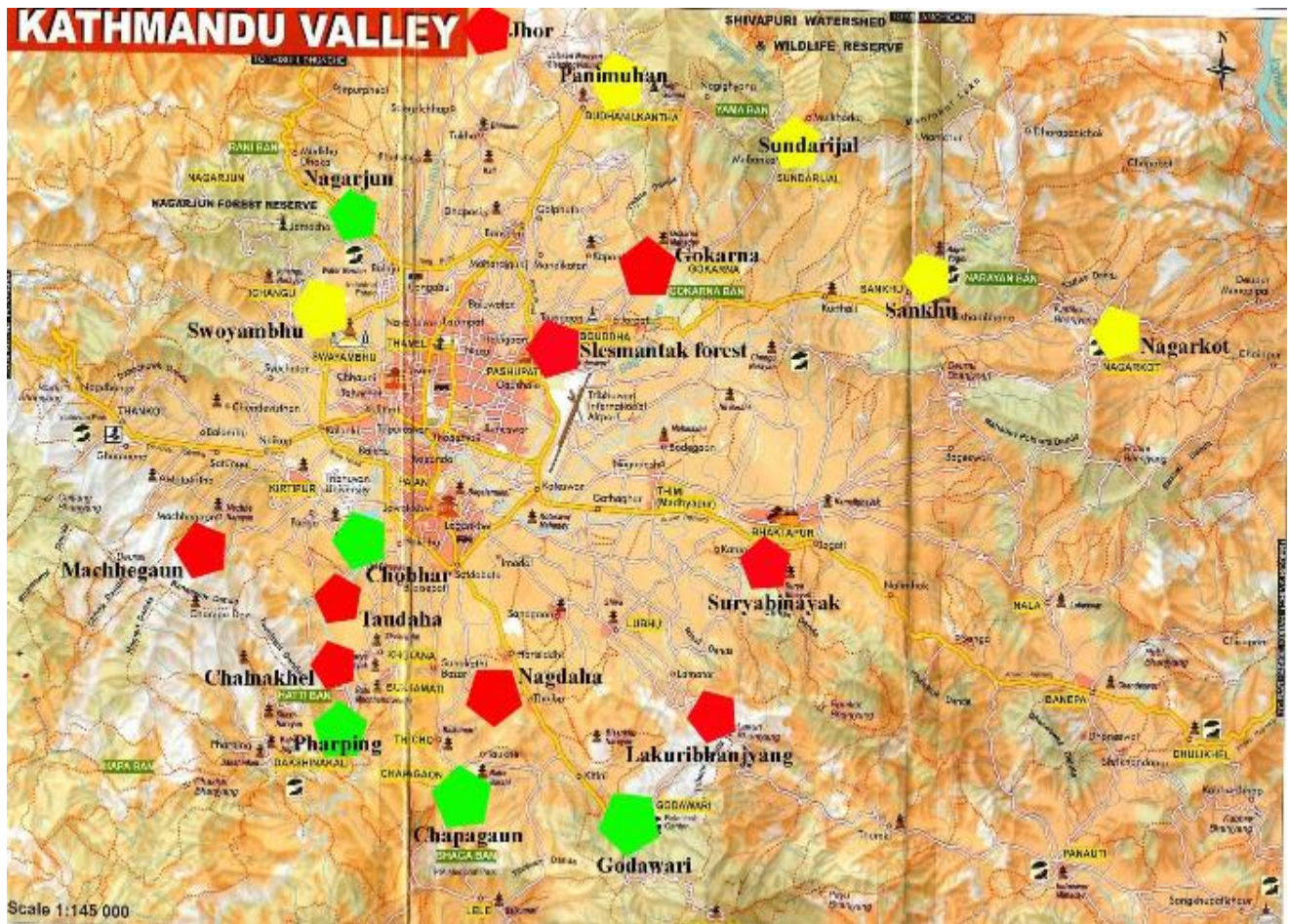
2. Materials and Methods

2.1. Study Area




Kathmandu Valley (27°35'00" N 85°15'00"E, 27°50'00"N 85°37'30"E) comprised of Kathmandu district, with the capital of Nepal; Lalitpur and Bhaktapur district is chosen as study area for the study. It is an oval shaped, flat bottomed basin valley with hills: Phulchowki; Chandragiri; Shivapuri and Nagarjuna, at Southern; Western; northern and western corner. The study area occupies 395 square kilometers and is situated at an elevation of 1372 m to 2732 m.

Climate in Kathmandu Valley is characteristic temperate, influenced by the tropical monsoon. The average air temperature is 19° C but the mean annual temperature at summer season is 28° C while that in winter is 13° C. The annual rainfall in Kathmandu is about 140 mm (DHM, 2006).

Bagmati and Bishnumati are major rivers of this area with centripetal drainage system. The surrounding hilly area is covered with forest of *Alnus nipalensis*, *Pinus roxburghii*, *Prunus spp.*, *Quercus* sps. And bamboo as major vegetation while the fauna like Leopard (*Panthera pardus*), Wild boar (*Sus scrofa*), Common langur (*Semnopithecus entellus*), Rhesus monkey (*Macaca mulata*) etc, numerous volant fauna (bats and birds) are present. It's a religious and tourist attraction centre of Nepal. Twenty project sites: such as Godawari; Phulchowki; Lakuribhanjyang; Bajrabarahi; Chapagaun; Nagdaha were aside the busy city in Lalitpur district; Pharping; Chalnakhel; Taudaha; Chobhar, Machhegaun; Nagarjuna Cave; Jhor; Muhanpokhari (Paanimuhan, Headquarter of Shivapuri Nagarjun National Park); Sundarijal; Gokarna; Shankhu-Bajrayogini were aside the busy city while Swoyambhu and Slesmantak forest at Pashupati-Gujeshwori area were in vicinity of the busy city at Kathmandu district; Nagarkot and was aside the busy city while Suryabinayak in the vicinity of busy city within the Bhaktapur district.



Map 1. Study area with pointed project sites and species recorded sites

-  Project site without species record
-  Project site with species record in second field
-  Project site with species record in first and second fields

Sites:

Godawari-Phulchowki Area

The site lies within one-kilometer periphery of 27°35'42.08"N 85°22'40.81"E, at an elevation of 1524m a.s.l. The area is moist, drained with water streams, north facing slope, dense vegetation of Chestnut *Castanopsis indica* (Katus), Box Myrtle *Myrica esculenta* (Kafal), Plum *Prunus cersoides* (Paiyun), Alder *Alnus nipalensis* (Utis), *Schima walichii* (Chilaune), Oak *Quercus sp.*, Rhododendron *Rhododendron spp.* (Gurans), Walnut *Juglans regia* (Okhar), *Michelia champaca* (Chaap) etc. Common Leopard *Panthera pardus* (Chituwa), Indian Crested Porcupine *Hystrix indica* (Dumsi), Squirrels, Bats are mammals sited frequently in the jungle. This area is famous for resident birds and butterflies.



View from Godawari Cave

Slesmantak forest

This area is sacred holy land for Hindu bordered in west and east by famous god Pashupatinath temple and goddess Gujeshwori temple respectively. This site lies in periphery of one kilometer at 27°42'32.79"N 85°20'59.61"E at an elevation of 1332m a.s.l. This site is also another home place for large flocks of monkeys. Chestnut *Castanopsis tribuloides* (Masure Katus), *Schima wallichii*, Syzgium spp., Monkey Puzzle *Araucaria bidwillii*, Wild pear *Pyrus pashia* (Mayel), Oak *Quercus glauca* Saano falant, Woolly Oak *Q. lanata* (Saano baanjh), *Ziziphus incurve* (Haade Bayer) are dominating tree species, *Viburnum cotinifolium* and *V. erubescens* are dominating shrub species.



View from Nagarkot

Nagarkot

This area is joint of Bhaktapur and Kavrepalanchowk districts. The sites are east and west facing slopes and lies at the periphery of one kilometer at $27^{\circ}43'15.37''\text{N}$ $85^{\circ}31'15.95''\text{E}$, at an elevation of 1829m a.s.l. Blue Pine *Pinus wallichiana* (Gobre Salla) and *Alnus nipalensis*, Eucalyptus *Eucalyptus sp.*(Masala), *Cryptomeria japonica* dominates the vegetation. Few caves were found, some of them were facing disturbances. There are some caves in this area.

Jhor

The area lies at $27^{\circ}47'19.76''\text{N}$ $85^{\circ}17'26.31''\text{E}$, at an elevation 5003ft. a.s.l. It borders Shivapuri and Nagarjuna National Park in the south. Vegetation consists of mixed forest of Pine, *Albizia sp.* vegetable farming is the new agricultural practice here. A temple of God Shiva is inside a cave.

Swoyambhu

This upland in the Kathmandu valley lies at $27^{\circ}43'1.19''\text{N}$ $85^{\circ}17'15.90''\text{E}$, at an elevation 1326m a.s.l. Mixed forest with *Schima wallichii*, *Prunus spp.* and Pine dominates the vegetation. This site is sacred holy land for Buddhist and home place for a large folks of monkeys.



Pharping Hydro power plant

Lakuribhanjyang

This area lies one kilometer within $27^{\circ}36'55.39''\text{N}$ $85^{\circ}24'41.11''\text{E}$ and at an elevation of 2035m a.s.l. It is east-west sloping face, where vegetation is dominated by Pine, *Alnus nipalensis*, *Schima wallichii*.

Pharping

The site lies at $27^{\circ}36'46.97''\text{N}$ $85^{\circ}17'22.53''\text{E}$, at an elevation 1267m a.s.l. Agricultural lands surround the Pharping Hydro power plant which celebrated 100 years of its establishment.

Muhan Pokhari (Panimuhan)

The site lies at $27^{\circ}47'2.09''\text{N}$, $85^{\circ}22'52.68''\text{E}$, at an elevation 1992m a.s.l. This area is moist with few small ponds, south facing slope with dense forest of *Alnus nipalensis*, *Schima wallichii*, *Siris Albizia sp.* (Siris), *Cryptomeria japonicum* (Dhupi Salla) etc. *Sus Scrofa*, *Panthera pardus* *Hystrix indica*, Squirrels and bats are mammals seen in this site. Headquarter of Shivapuri Nagarjun National Park is situated here.



View at Panimuhan

Nagarjun Forest (Shivapuri Nagarjun National Park)

This is a culturally important site along the Kathmandu-Trishuli Highway. The area is a northward facing slope dominated by *Schima wallichii*, *Alnus nepalensis*, *Prunus spp.* and Chir Pine *Pinus roxburghii* (Raani Salla). There is a small cave called the Nagarjuna cave located at 27° 44' 43.7" N, 85° 17' 39.4" E and elevation 1373m a.s.l. Just after a congested entrance a large space is the microhabitat where about 200 *Rhinolophus pusillus* in few (5) colonies were observed on September 4, 2008 (Thapa *et al.* 2009).

Bajrabarahi Forest, Chapagaun

The site lies within one-kilometer periphery of 27°35'23.30"N 85°20'6.61"E, at an elevation 1485m a.s.l. This area is special to bat habitats. Primary forest with older plantations guarded religiously is the specialty of the site. The forest centers the god Bishnu temple. 29 plants make up the vegetation in which *Castanopsis indica*, *Choerospondias axillaris* (Lapsi), *Ficus sp.*, *Myrica esculenta*, *Prunus cersoides*, *P. paschia* (Mayal), Oak *Quercus glauca* (Sano falant), *Schima wallichii* etc. dominates. Rose-ringed Parakeet, Oriole, Owl, Spotted Owlet, Woodpecker, Red-billed magpie, dove, drongo etc. makes up the avi fauna. Jackal and Jungle cats are the wild animals seen. A small stream covered by the dense vegetation borders at the west from the agricultural fields, also the southern east side of the forest ends to the agricultural fields.

Chobhar Gorge

This is another culturally important site dominated by *Pinus roxburghii* forest and famous caves of Nepal are located. The topography shows that hills of the gorge are mainly composed of limestone and dolomite. There are four caves Manjushree cave, Bagh cave, Naya cave, and Barahi cave in this area. This area lies within 500 meters of 27° 39' 35.3" N, 85° 17' 39.2" E, and elevation 1404m a.s.l.. *Hipposideros cineraceus* from the Eastern entrance of the cave was captured on September 16, 2008. Numerous individuals were seen wandering during and noticed their flight at 6 PM (Thapa *et al.* 2009).



Chobhar Gorge and Cave

Chalnakhel

This area lies within one kilometer periphery of 27°38'17.91"N 85°16'28.36"E at an elevation 1423m a.s.l. *Schima-Castanopsis* forest dominate the vegetation mixed with *Myrica esculenta*, *Rhododendron arboretum*, *Myrsine capitellata*. Animals in the jungle are: *Macaca mulatta*, *Hystrix indica*, *Muntiacus muntjack*, Civet, jackal, *Panthera pardus*, and Flying squirrel etc.

Sankhu-Bajrayogini

This area lies 27°43'49.32"N 85°27'48.11"E at an elevation 1474m a.s.l. Sankhu is an old Newari town in Kathmandu district. The Bajrayogini temple is the tourist centre here. A dense jungle of *Schima-Castanopsis* and *Pinus wallichiana* patches are the dominating vegetation.

Gokarna

It's the tourist place with golf resort and holy place for Hindu with temple of god Gokarneshwor Mahadev. The site lies within one-kilometer periphery of 27°44'19.24"N 85°23'17.25"E at an elevation 1354m a.s.l. *Pinus roxburghii*, *Alnus nipalensis* is dominating vegetation of the area.

Machhegaun

This area lies within one kilometer periphery of 27°39'38.75"N 85°15'13.63"E at an elevation 1493m a.s.l. This site is north facing and at the foot of Chandragiri. *Myrica esculenta*, *Castanopsis indica*, Pine dominates the vegetation.



View from above of Armed Police Force School at Machhegaun in the morning

Nagdaha

This very small lake is the resting place for migrating birds in winter which lies at 27°37'28.01"N 85°20'0.25"E at an elevation 1378m a.s.l. common coot *Fulica atra*, Cormorants *Phalacrocorax spp.*, Darter *Anhinga melanogaster*, Mallard *Anas platyrhynchos*, Red-crested Pochard *Netta rufina*, Bar-Headed Goose *Anser indicus*, Northern Shoveler, Northern Pintail are the winter visitors. Common moorhen is the summer visitor. Woodpeckers, Kingfishers, Barbets, Eagle, Black Kite, Parakeets, Cuckoo, herons, egrets etc. are the residential birds.

Taudaha

This area is a small lake surrounded by agricultural fields with thin plantations. It lies 27°38'55.35"N 85°16'56.03"E at an elevation 1295m a.s.l. This lake has eight corners a Cutch tree *Acacia catechu* (Khair) in the north edge and a nearest station for bird watching from Kathmandu where one can see migrating birds; common coot *Fulica atra*, Cormorants *Phalacrocorax spp.*, Darter *Anhinga melanogaster*, Mallard *Anas platyrhynchos*, Eurasia Wigeon *Anas Penelope*, Gadwall *Anas strepera*, Common Pochard *Aythya ferina*, Red-crested Pochard *Netta rufina*, Bar-Headed Goose *Anser indicus*, Northern Shoveler, Northern Pintail are the winter visitors. Common moorhen is the summer visitor. Woodpeckers, Kingfishers, Barbets, Eagle, Black Kite, Cuckoo, herons, egrets etc. are the residential birds.

Sundarijal

This is hydro-reservoir and tourist area at the eastern border of Shivapuri National park. This hilly area with south and east facing slopes are dominated by *Pinus wallichiana*, *Prunus spp.*, *Alnus nipalensis*, *Schima wallichii* and Bamboo as major vegetation. *Hipposideros armiger* inhabits in small colonies inside the tunnels. A tunnel harboring about 30 individuals located at 27° 46' 18.5" N, 85° 25' 35.4" E and elevation 1579m a.s.l., was observed. A few individuals were seen flying at 6 PM on September 13, 2008 at Ward no. 5, Mulkharka VDC. However, locals report this area consist large population and diversity of bats (Thapa *et al.* 2009).

Suryabinayak

This is a religious spot for Hindu where lies god Ganesh temple in the vicinity of Suryabinayak Community forest. The vegetation is dominated by Schima-Castanopsis forest intermingled with pine. The area lies within one kilometer of 27°39'25.60"N 85°25'25.27"E and at an elevation of 1384m a.s.l.

2.2. Mist netting

Mist netting was done randomly in each study site. Three mist nets were deployed near crevices/caves/ bushes/lakes, evening to 21:00 (01:00 at Godawari).

2.3. Roosts survey

Tree barks, hollows, old houses, temples, caves etc. were searched at the day time. The population in the colony was estimated and photographed. Bats were captured by scoop net/s and mist net/s.

2.4. Flight observation and acquiring echolocation frequency:

Flight emergence and behavior was noted. Echolocation frequency was acquired from the heterodyne bat detector Magenta MkIIb.

2.5. Morphometrics and identification

The following external measurements was taken with the help of millimeter graded steel scale to the nearest 0.5-1 mm. T- Tail length (from the anus to last vertebra); FA – Forearm Length, E – Ear length from the lower border of the external auditory meatus (Posterior to tragus to the tip of pinna), TIB - Tibia length, HF- hind foot length (including claws). HB-Head body, 5mt-Fifth metacarpal, 4mt-Fourth metacarpal, 3mt-Third metacarpal, 1ph5mt-First Phalange Fifth metacarpal, 1ph4mt- First Phalange Fourth metacarpal, 1ph3mt- First Phalange Third

metacarpal, 2ph5mt- Second Phalange. Fifth metacarpal, 2ph4mt- Second Phalange Fourth metacarpal, 2ph3mt- Second Phalange Third metacarpal, WSP-Wingspan, Thumb. All the measurements were noted in the form. The body weight was measured with the help of 100g Pesola spring balance graded with gram. Additionally, the reproductive stage of them was noted by observing their genitalia and digital photographs were taken. On the basis of these measurements, we made spot identification with the help of the taxonomic key (Srinivasulu et al. 2010).



Mistnetting at Bajrabarahi



Mistnetting at Chobhar



Mistnetting at Godawari



A pond at Godawari



Mist netting at Panimuhan



Measuring bat at Swoyambhu



Mist netting at Machhegaun



Hiking at Sundarijal



Returning after mist netting at Bajrabarahi



Interview with Secretary, Ministry of Forest and Soil Conservation

2.6. Community awareness radio programme

Importance of bats in public benefits and sustainable environment and ecosystem management, their conservation threats and local's contribution towards their conservation through monitoring or else is being broadcasted in Nepali on Radio Kantipur (www.radiokantipur.com).

2.7. Programme of lectures to schoolchildren

Lecture classes to aware schoolchildren about bats and their importance was delivered in one or two schools from each study sites.



At Sundarijal

3. Results

The second phase detailed monitoring was carried from May to August 2010.

Altogether thirteen species including an unidentified *Myotis sp.* These species were recorded from the ten sites among nineteen sites. *Rhinolophus affinis* was mostly recorded. The species were recorded from 4 sites: namely Godawari-Phulchowki; Sankhu-Bajrayogini; Nagarjun; Nagarkot. *Hipposideros armiger* follows next most widely distributed, which was reported from two sites Nagarkot and Sundarijal. All the remaining 11 species including *Myotis sp.* were recorded from each single site. Maximum individuals of *R. affinis* (11 individuals) and *H. cineraceus* (nine individuals) were captured. Followed by four individuals of *Myotis sp.*, three individuals of *Miniopterus schreibersii* and two individuals each of *Pipistrellus javanicus* and *M. sicarius* and one individual each of *R. macrotis*, *R. ferrumequinum*, *M. muricola*, *M. nipalensis*.

Bat flights were observed frequent at Machhegaun, Jhor, Hattiban and Gokarna. While few bat flights were observed at Suryabinayak-Sipadol and Lakuribhanjyang. There was silence in bat emergence at Taudaha, Nagdaha and Pashupati (Slesmantak forest).

Six species namely: *Myotis muricola*, *M. sicarius*, *Rhinolophus affinis*, *R. ferrumequinum*, *Miniopterus schreibersii*, *Pipistrellus javanicus* were captured above and near water source (stream, pond) at three sites (Godawari, Panimuhan and Bajrabarahi). *Nyctalus noctula* was captured by hands from tree hollows at Swoyambhu. *R. affinis* was scoop netted from an old abandoned house at Sankhu. *M. nipalensis* was scoop netted from inside of tunnel at Pharping. Three species namely: *Myotis sp.*, *R. macrotis*, *R. affinis* were scoop netted from caves at Godavari and Nagarkot. *R. affinis*, *Hipposideros cineraceus* and *R. pusillus* were mistnetted at the entrance of caves at Nagarjun and Chobhar. *H. armiger* was observed only inside the cave and tunnel at Nagarkot and Sundarijal respectively.

Godawari was found harboring maximum species (4 species). Bajrabarahi, Chobhar, Nagarkot and Panimuhan were with second highest species number (2 species each). Nagarjun, Pharping, Sankhu, Sundarijal and Swoyambhu recorded third highest (a single species).

In site 1. Bats were seen flying from 18:40 onwards. Magenta Mkllb bat detector detected echolocation calls at 40-65 kHz. In site 9. Bat flight emergence was observed at 18:50. The bat detector detected variable echolocation frequency at 40-45 (at 18:55 on 16th June)-50-60 kHz with maximum repetition of 50 kHz. Maximum flight was found 19:30 onwards. In site 11. Bat flight emergence was noted 19:15. At this time few small bats with fast flapping and turns were observed. The bat detector detected 50 kHz. Then followed by dark, large but narrow winged species with slow flight but speedy turnings. After 19:36 larger species was observed flying. Bat detector detected variable echolocation frequency at 50-55-60-650 kHz with maximum repetition of 55 kHz. In site 16. Bats flight at the entrance of the Barahi cave was noted 19:12, a minute later at Bagh cave and 10 minutes later at Naya cave. Maximum flight was observed at the entrance of the cave behind the mist net at 19: 30-20:00. However, the bat detector could not detect the echolocation call. In site 17. Bat flight at the entrance of the cave was observed at 19:14. Continuous flight was observed from 19:22-8:00.



Rhinolophus affinis resting under ceiling at Godawari



Colony of *Myotis* sp. at Godawari Cave



Handling *R. affinis* at Nagarkot



An old abandoned house at Sankhu roosted by *R. affinis* colony

THREATS



Forest fire at Machhegaun



Habitat destruction at Bajrabarahi



Turbines at Nagarkot



Habitat destruction at Mechhegaun



Cutting down trees inhabited by bats

SPECIES PROFILE



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)

	Mean	Range	n
HB	34.44	32-38	9
T	24.33	21-27	9
TIB	16.37	14-17	8
HF	5.8	4.5-9	6
FA	35.77	33-39	9
Thumb	6.35	4.5-8	7
5mt	25.75	23-28	8
1ph5mt	12	11.5-13	7
2ph5mt	9.5	8.5-11	7
4mt	26.62	20-30	9
1ph4mt	10	9.5-11	7
2ph4mt	8	7.5-9	7
3mt	25.75	24-27	8
1ph3mt	16.71	16-18	7
2ph3mt	13.5	12.5-16	7
E	16.7	14-18	7
Tragua length			
WSP	240	240	1
Wt.	5	5	1
NL (H)	4.78	4.5-5	7

Population: a colony of twelve individuals was observed roosting in the tunnel at Sundarijal and four individuals were found roosting solitarily in the chamere gupha at Nagarkot.



H. cineraceus Blyth,
1853

Common Name:
Least leaf-nosed Bat
Nepali Name:
Fusro Golopatre
Chamero (Baral and
Shah 2008)

Conservation status:
World-wide: LC (IUCN
2010)
South Asia:
NT (Molur et. al 2002)
Nepal:
DD (National Red list
of Nepal Mammals
2010)

	Mean	Range	n
HB	52.33	46-58	11
T	20.88	15-30	11
TIB	24.33	20-27	11
HF	10.44	8.5-13	11
FA	53.11	50-56	11
Thumb	10.22	9.5-12	11
5mt	42.22	40-44	11
1ph5mt	12.75	10.5-15	11
2ph5mt	14.25	13.5-15	11
4mt	40.55	38-45	11
1ph4mt	10.25	9.5-11	11
2ph4mt	17.37	16-19	11
3mt	39.22	38-41	11
1ph3mt	15.62	14-17	11
2ph3mt	29.37	26-33	11
E	17.77	15-19	11
Tragua length			
WSP	327.5	280-370	11
Wt.	17.11	16-18	11
NL (H)	13.83	12.5-17	11
NL (B)	9.5	9.5-10	11
Ectoparasite		p	11
Frequency		60-90	

Status: five adult males, one young male and three adult females were mist netted at the entrance of the Bagh cave and Barahi cave at Chobhar.

Population: More than a hundred individuals were estimated during their flight observation at entrances of four caves; Bagh cave, Naya cave, Manjushree cave and Barahi cave.

External characters: Average Forearm length measured is 35.77mm (9) ranging 33mm-39mm. Dorsal pelage is dull brown with whitish hair bases and ventral pelage is ginger brown at the lateral sides and shoulders while a large white patch is covering the chest and belly and adjacent sides and in some pale ginger brown.

Habitat and Habit: Cave roosting (but their roosting site/s inside the cave was not found). The flight emergence was noted 19:12. Nine individuals were mist netted during 19:30-20:00 one after another at the entrance of Bagh cave, Barahi cave and Naya cave. The bat detector Magenta Mkllb could not detect the echolocation frequency. Maximum flight was observed at the entrance of Bagh cave during 19:30-20:00.

Family:
Rhinolophidae

Rhinolophus affinis
Horsfield, 1823

Common Name:
Intermediate Horseshoe
Bat

Nepali Name:
Majhaua Ghodnaale
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)

	Mean	Range	n
HB	60		1
T	26		1
TIB	25.5		1
HF	10		1
FA	61		1
Thumb	6		1
5mt	43		1
1ph5mt	15		1
2ph5mt	20		1
4mt	42		1
1ph4mt	11		1
2ph4mt	17		1
3mt	38		1
1ph3mt	20		1
2ph3mt	31		1
E	20		1
Tragua length			
WSP	360		1
Wt.	21		1
NL (H)			1
NL (B)			1

Status: Altogether 10 adult and one young male were captured. One adult and one young male individual were mist netted at 20:25 aside a pond at Godawari. Two adult males each were scoop netted inside the chamere gupha at Nagarkot and inside the old abandoned house of Lok Bajra Bajracharya, Shankharapur, Sankhu. Five adult males were netted at the entrance of the Nagarjun cave.

Population: Solitary and 22 groups of few individuals (3-8) were found resting during late night (23:00-1:00) under the rough surface of Honeybee production and development center inside the Botanical Garden at Godawari. A colony of about 100 individuals was observed roosting inside the cave (second storey). A colony of less than 30 individuals was observed roosting inside the large space just after the entrance of the cave. A colony of about 200 individuals was found inside the old abandoned house of Lok Bajra Bajracharya, Shankharapur, Sankhu.

External characters: Average Forearm length measured is 52.33 (n=11) ranging from 46mm-58mm. 3mt is 7.10% shorter than 5mt and 3.27% shorter than 4mt in average respectively. 2ph3mt is 74.88% to the 3mt in average. Dorsal pelage is buffy brown with whitish hair bases while tips rufous brown to light grey while the ventral pelage has short hairs pale brown to grayish brown.

Habitat and Habit: Cave roosting. Also found roosting inside the old abandoned house of Lok Bajra Bajracharya, Shankharapur, Sankhu. The flight emergence was noted 19:15 (first mistnetted at 19:20) in the at the Nagarjuna cave. The bat detector Magenta Mkllb detected the frequency of 60 (Sankhu)-90 (Nagarjun) KHz. Inundated with numerous parasites. Producing frequent chirping sound and becomes restless during handling.



**R. ferrumequinum
(Schreber, 1774)**

Common Name:
Greater Horseshoe Bat
Nepali Name:
Thulo Ghodnaale
Chamero (Baral and
Shah 2008)

Conservation status:
World-wide:
LC (IUCN 2010)
South Asia:
VU (Molur et al. 2002)
Nepal:
LC (National Red list of
Nepal Mammals 2010)



R. macrotis Blyth, 1844

Common Name:
Big-eared Horseshoe Bat
Nepali Name:
Laamkaane Ghodnaale
Chamero (Baral and Shah 2008)

Conservation status:
World-wide:
LC (IUCN 2010)
South Asia:
NT (Molur et. al 2002)
Nepal:
LC (National Red list of Nepal Mammals 2010)

	Mean	Range	n
HB	34		1
T	20		1
TIB	21		1
HF	6		1
FA	40.5		1
Thumb			1
5mt	31.5		1
1ph5mt	10		1
2ph5mt	12		1
4mt	32		1
1ph4mt	9		1
2ph4mt	11		1
3mt	31		1
1ph3mt	12		1
2ph3mt	19		1
E	20		1
Tragua length			1
WSP	250		1
Wt.	6		1
NL (H)	14		1
NL (B)	8		1

Status: a young female was scoop netted inside the cave about 500m above the Jayvadre community forest gate at Godawari.

Population: single individual was scoop netted.

External characters: Forearm was measured 40.5mm. The nose leaf is distinctly different with broad inferior surface of sella. The ear is characteristically large (E=20mm) in comparison to the small body (HB=34mm). The combined length of 1ph3mt and 2ph3mt is equal to the length of 3mt. Pelage is soft and dense, somewhat wooly. Dorsal pelage was found buffy brown while the ventral pelage has short hairs of pale brown color.

Habitat: Cave roosting.



Rhinolophus pusillus
Temminck, 1834

Common name:
Least Horseshoe Bat
Nepali Name:
Saano Ghodnaale
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)

	Mean	Range	n
HB	38		1
T	22		1
TIB	16		1
HF	7		1
FA	37		1
Thumb	5		1
5mt	30		1
1ph5mt	9		1
2ph5mt	12		1
4mt	29		1
1ph4mt	8		1
2ph4mt	11		1
3mt	29		1
1ph3mt	11		1
2ph3mt	18		1
E	17		1
Tragua length			1
WSP	240		1
Wt.	5		1
NL (H)	10		1
NL (B)	7		1

Status: an adult male was mist netted.

Population: single individual was mist netted.

External characters: Forearm was measured 37mm. The nose leaf is distinctly different with bifurcated sella (lateral view). The combined length of 1ph3mt and 2ph3mt is equal to the length of 3mt. Pelage is soft and dense, somewhat woolly. Dorsal pelage was found buffy brown while the ventral pelage has short hairs of pale brown color.

Habitat and Habit: Cave roosting (but their roosting site/s inside the cave was not found). It was mist netted at 20:30 at the entrance of the Naya cave at Chobhar



Family:
Vespertilionidae

Myotis nipalensis
(Dobson, 1871)

Common name:
Nepal Myotis
Nepali Name:
Nepali musakaane
chamero (Baral and
Shah 2008)

Conservation Status:

World-wide:
LC (IUCN 2010)
Nepal:
LC (National Red list of
Nepal Mammals 2010)

	Mean	Range	n
HB	36		1
T	40		1
TIB	13		1
HF	8.5		1
FA			1
Thumb	39		1
5mt	34		1
1ph5mt	9		1
2ph5mt	10		1
4mt	35		1
1ph4mt	9.5		1
2ph4mt	10		1
3mt	35		1
1ph3mt	10		1
2ph3mt	19		1
E	12		1
Tragua length	4		1
WSP	260		1
Wt.	6		1

Status: an adult female was scoop netted.

Population: A colony about 150 individuals under the ceiling of the tunnel of the Pharping Hydroelectricity Plant was estimated.

External characters: Forearm measured 36mm. Pelage is soft, short and dense. Dorsal pelage was found ashy brown (dark brown or black) on the head, while the ventral pelage with hair tips cream colored. Upper lips in the muzzle has hairy fringe.

Habitat and habit: inside the tunnel at Pharping Hydropower Plant, 100m from the entrance. They were inundated with few ecto-parasites.



Myotis sp.

	Mean	Range	n
HB	33	31-35	4
T	28	27-30	3
TIB	13.5	13-15	3
HF	6.83	6.5-8	4
FA	30.25	30-31	4
Thumb	6.75	6-7.5	4
5mt	25	25	4
1ph5mt	6	6	4
2ph5mt	9.37	9-9.5	4
4mt	22	22	4
1ph4mt	8.25	7.5-9	4
2ph4mt	9	8.5-9.5	4
3mt	22	22	4
1ph3mt	7.5	6.5-8.5	4
2ph3mt	13.5	13-14	4
E	14.25	12.5-17	4
Tragua length	7.37	7-8.5	4
WSP	197	194-200	4
Wt.	4.37	3-4.5	4

Status: two each male and female juvenile was scoop netted inside the cave about 500m above the Jayvadre community forest gate at Godawari.

Population: breeding colony of more than hundred.

External characters: Forearm measured 30.25 mm (30-31mm, n=4). Pelage is soft, short and dense. Dorsal pelage is dark slaty, hair bases are dark while the ventral pelage is paler. Weighed 4.37gm (3-4.5gm, n=4).

Habitat and habit: Cave roosting and are inundated with few to maximum ecto-parasites.



Myotis muricola
(Gray, 1864)

Common name:
Nepalese Whiskered
Myotis
Nepali Name:
Parkhale chamero
(Baral and Shah 2008);
Nepali Junge chamero

Conservation Status:
World-wide:
LC (IUCN 2010)
South Asia:
LC (Molur et al. 2002)
Nepal:
LC (National Red list of
Nepal Mammals 2010)

	Mean	Range	n
HB	48		1
T	27		1
TIB	15		1
HF	5		1
FA	35		1
Thumb	5		1
5mt	30		1
1ph5mt	9		1
2ph5mt	8.5		1
4mt	31		1
1ph4mt	9		1
2ph4mt	9.5		1
3mt	30		1
1ph3mt	11		1
2ph3mt	18		1
E	12		1
Tragua length	4		1
WSP	240		1
Wt.	5		1

Status: an adult male was mist netted.

Population: A single individual was mist netted.

External characters: Forearm measured 35mm. Pelage is soft, short and dense. Dorsal pelage was found ashy brown (dark black) on the back, while the ventral pelage with hair tips pale colored. Upper lips in the muzzle has hairy fringe.

Habitat: mist netted at 20:10, a foot over stream water inside the Botanical Garden at Godawari. Inundated with few ectoparasites.



Myotis sicarius
Thomas, 1915

Common name:
Mandelli's Mouse-eared
Myotis
Nepali Name:
Mandelli ko musakaane
chamero (Baral and
Shah 2008)

Conservation Status:
World-wide:
VU (IUCN 2010)
South Asia:
VU (Molur et al. 2002)
Nepal:
VU (National Red list
of Nepal Mammals
2010)

	Mean	Range	n
HB	56	55-57	2
T	50	47-53	2
TIB	20	20	2
HF	10.75	10.5-11	2
FA	49.5	49-50	2
Thumb	9.75	9.5-10	2
5mt	41.5	41-42	2
1ph5mt	10.75	10.5-11	2
2ph5mt	10.25	9.5-11	2
4mt	43.5	43-44	2
1ph4mt	12.75	12.5-13	2
2ph4mt	12.75	12-13.5	2
3mt	45	44-46	2
1ph3mt	17	17	2
2ph3mt	22.5	22-23	2
E	17	16-18	2
Tragua length	7	7	2

Status: two adult females was mist netted.

Population: two individuals were mist netted.

External characters: Forearm was measured 49.5 mm (49-50mm, n=2). Dorsal pelage is uniform deep chocolate brown to dark ferruginous brown. Ventral pelage is paler with the hair tip ginger colored and darker hair root, yellow shade at the belly. In the wing, the third metacarpal scarcely exceed the fourth and fifth. Wing membranes and interfemoral membranes are black in color, naked. Tail tip extruding 2mm from the tail.

Habitat and Habit: their roosting site was not found. Mistnetted above one foot and one meter over stream water at the edge of Bajrabarahi religious forest at 19:55. They was inundated with few ecto-parasites.



Pipistrellus javanicus
(Gray, 1838)

Common Name:
Javan Pipistrelle
Nepali Name:
Java ko chamero

Conservation Status:
World-wide:
LC (IUCN 2010)
South Asia:
LC (Molur et al. 2002)
Nepal:
LC (National Red List
of Nepal Mammals
2010)

	Mean	Range	n
HB	44	43-45	2
T	34	30-38	2
TIB	12.75	12.5-13	2
HF	5.75	5.5-6	2
FA	35	35	2
Thumb	6	6	2
5mt	31.5	31-32	2
1ph5mt	7	7	2
2ph5mt	6	6	2
4mt	32	32	2
1ph4mt	13	13	2
2ph4mt	10	10	2
3mt	34.5	34-35	2
1ph3mt	12	12	2
2ph3mt	17	17	2
E	10.25	8.5-12	2
Tragua length	4	3.5-4.5	2
WSP	280	220-240	2
Wt.	13.25	12.5-14	2

Status: two adult females were mist netted.

Population: two individuals were mist netted.

External characters: Forearm measured 35mm (n=2). Dorsal pelage with chestnut brown to darker clove brown with a light frosting of paler brown hair tips. Ventral pelage has buffy brown hair tips and black hair roots. Pinnae and membranes are uniform dark brown and essentially naked.

Habitat: mist netted at 20:05, a meter over stream water inside Headquarter premises of Shivapuri-Nagarjun National Park.



Nyctalus noctula
(Schreber, 1774)

Common name:
Noctule
Nepali Name:
Gandhe chamero (Baral
and Shah 2008); Thulo
gandhe chamero

Conservation Status:
World-wide:
LC (IUCN 2010)
South Asia:
LC (Molur et al. 2002)
Nepal:
DD (National Red list
of Nepal Mammals
2010)

	Mean	Range	n
HB	82.5	80-85	2
T	50.5	46-55	2
TIB	20		1
HF	11		1
FA	61		2
Thumb	12.5	10-15	2
5mt	50		2
1ph5mt	10.5	10-11	2
2ph5mt	6		2
4mt	60		2
1ph4mt	23	22-24	2
2ph4mt	9.5	9-10	2
3mt	59.5	59-60	2
1ph3mt	23.5	22-25	2
2ph3mt	29		2
E	17		12
Tragua length			
WSP			
Wt.	49	47-51	2

Status: one each adult male and female were captured.

Population: A colony of six individuals was found roosting.

External characters: This species is a large and robust vespertilionid bat. Tail is relatively short with the tip of the final vertebrae (third caudal vertebra) protruding 3 mm from the membrane. Calcar is well developed. Muzzle is broad with well-marked glandular swellings. Presence of a whitish/yellowish oval buccal pad at the posterior aspect or angle of mouth. Pinna is short and tragus is club-shaped expanding distally. Antitragus is low. Feet are large, more than half the length of tibiae. Wings are long, narrow, leathery, opaque and black in color. The fifth metacarpal is greatly shortened than third or fourth. Pelage is short, dense, fine and silky. The dorsal pelage was cinnamon brown. Ventral pelage is somewhat similar to the dorsal pelage. Hairs are characteristically uni-colored. Wing membranes are densely furred ventrally, which seems as a thick line joining the elbows to the knees. Interfemoral membranes are haired throughout. Penis is distinctly enlarged.

Habitat and habit: captured from the tree holes of Chestnut Castanopsis tribuloides (Musure Katus) at Swoyambhu. They produce irritating chattering sound when disturbed. It exerts great force when handled.



Miniopterus schreibersii (Kuhl, 1817)

Common name: Schreiber's Long-fingered Bat
 Nepali Name: Baange chamero (Baral and Shah 2008), Schreiber ko laampakhete chamero

Conservation Status:
 World-wide: NT (IUCN 2010)
 South Asia: LC (Molur et al. 2002)
 Nepal: LC (National Red list of Nepal Mammals 2010)

	Mean	Range	n
HB	54.33	50-58	3
T	51	47-55	3
TIB	19.66	18-23	3
HF	8.66	8.5-9	3
FA	49.66	42-50	3
Thumb	7.5	7-8.5	3
5mt	39.5	39-40	3
1ph5mt	9	9	3
2ph5mt	9	9	3
4mt	42.5	41-44	3
1ph4mt	10.25	8.5-12	3
2ph4mt	19.75	19-20	3
3mt	43	43	3
1ph3mt	12	10.5-14	3
2ph3mt	29.5	20-39	3
E	9.75	8-11.5	3
Tragua length	5	5	3
WSP	313.33	300-330	3
Wt.	13.75	13-15	3

Status: one each adult male and female were mist netted.

Population: two individuals were mist netted. From the flight observance the population can be supposed to be good.

External characters: Tail, interfemoral membrane and hind limbs are long. Characteristically, each wing have highly developed second phalanx of the third digit (about two and half times the first phalanx of the same digit). Pinna is small and broad with rounded tip and its height does not exceed the pelage of the crown significantly. The tragus is also stunt about half the height of the pinna, slightly curved forward, antitragus is low and less distinct. The pelage is soft, silky and dense. The dorsal pelage ranges from blackish brown throughout. Ventral pelage is slight paler. Short hairs of the forehead extend to the nostril pads characteristically. Cheeks are naked below the eyes. Membranes are uniformly dark throughout.

Habitat and Habit: mist netted at 21:10, a meter over stream water inside Headquarter premises of Shivapuri-Nagarjun National Park. They were inundated with numerous ecto-parasites.

Conservation awareness radio programme

Thirteen episodes of radio awareness programme “Mammalian World” each Friday 7:30-8:00 was broadcasted through Radio Kantipur (www.radiokantipur.com) from 22nd January to 16th April 2010.

School Lecture Programme

Lectures of 45 minutes were delivered to schoolchildren of classes 6, 7 and 8 at twelve schools in nine project sites (except classes 4 and 5 at one school at Sipadol, Suryabinayak). Among the twelve schools; five were government school from sites 3, 4, 5, 8 and 9 while six were private school from sites 1, 2, 3, 5, 6 and 7. In sites 3 and 5 programme were launched in each (government and private) schools. While in site 4 all were government schools.

Brochures on “awareness for bat conservation” published by SMCRF was distributed among the schoolchildren. Two 5’ * 2’ flex of the brochure was also displayed in the lecture class. At last, a photograph of participating schoolchildren was taken with the banner.

Table 1. Details of School lecture Programme.

Site No:	Site	Date of lecture (2010)	School Name	No. of School children participating
1	Nagarjun	Jun 22	Goldhunga Orchid Academy	32
2	Sundarijal	Jul 20	Genius English Boarding School	45
3	Suryabinayak-Sipadol	Jul 27	Bright future English Boarding School	60
		Jul 28	Shanta Krishna Primary School	24
4	Machhegaun	Jul 9	Shree Aatma Bikas Secondary School	76
		Jul 10	Baghbhairab Secondary School	79
5	Chobhar	Jun 28	Shree Adinath Secondary School	68
		Jun 29	Laboratory English Boarding School	86
6	Byasi, Bhaktapur	Sep 3	Basu Higher Secondary School	87
7	New Baneshwor	May 28	Don Bosco English Boarding School	42
8	Jhochhe, New Road	Jun 5	Bal Sewa Secondary School	54
9	Sunakothi, Chapagaun	Jun 19	Shree Balkumari Higher Secondary School	89

1. Discussions

Five species (excluding *Myotis sp.*) and a new family Miniopteridae was supplemented to the first phase monitoring species record. Nine sites could not provide any species record. Five sites provided species records in both phases and five sites additionally in second phase (see map 1.). Only *Pipistrellus sp.* could not be re-recorded in this field among those recorded in first phase. Most of the species localities were recorded as Kathmandu Valley and Kathmandu. Further details or specific sites were not mentioned, such as for *R. ferrumequinum*; *R. pusillus*; *R. subbadius*, *R. luctus*, *H. fulvus*, *M. formosus* (Scully, 1887); *M. muricola* (Hinton and Fry, 1923); *Hipposideros armiger*; *Hipposideros cineraceus* from Kathmandu valley (Bates and Harrison, 1997). This study has detailed the localities of bat distribution.

According to Scully, 1887 (In Hinton and Fry, 1923), *M. siligorensis* is one of the commonest bats in Kathmandu Valley but during this monitoring the species remained unreported. Bates and Harrison, 1997 reported *M. nipalensis* (as *M. mystacinus*) from Kathmandu. However, it was considered not common in the Kathmandu valley (Scully, 1887), but this species is frequently re-recorded during this study.

The next case can be seen in Shivapuri as the locality. The location specifically does not signify the place rather than the whole Shivapuri National Park (Now Shivapuri-Nagarjun National Park) such as: *R. affinis* (Fry, 1925); *Pipistrellus javanicus* (Bates and Harrison, 1997) from Shivapuri. Few species were reported from other localities in Kathmandu Valley before which this study couldn't cover. Specimens of *R. affinis* from Thankot are at The Natural History Museum, London (BMNH) (Bates and Harrison, 1997) and also the species along with *M. sicarius* was previously recorded from Baansbahari; *R. luctus* and *H. armiger* from Hattiban etc. Also, this study could not cover the scattered bats within the busy city where they could not be captured rather were observed flying.

The absence of species from the specific sites during one season and presence in another (see Table 2.) predicts seasonal short distance migration. Whereas, absence of species for a long time predicts long distance migration in one hand while species loss in other hand. Disappearance of species from the Kathmandu Valley can be interpreted as the consequences of habitat encroachment and loss in turn caused by rapid transformation of land use pattern due to haphazard urbanization, infrastructure development, industrialization etc. This factor is clearly visible to us. Another supplementary factor responsible for the issue rose, which still invisible to us is known to be climate change, can also be suspected. We can hypothesize “the effect of climate change exhibit inflation in population and distribution of one species (and also those restricted to certain small area before) while decrease population and distribution of other”. The adaptation developed against climate change in the former species will rule over other species. Recordings of *R. affinis* during this study may support the hypothesis



Lecture to schoolchildren at Chobhar



Lecture to schoolchildren at Suryabinayak



Lecture to school children at Machhegaun

2. Conclusions and Recommendations

Summer immigration of the bats and their colonies were observed. Bats were captured slightly more in outer area (eight species) than in the cave. They were found active during summer as more species were recorded from the outer space. Dense population of *Myotis nipalensis* was estimated. *Rhinolophus affinis* was frequently re-recorded from different sites. Five additional bats assemblage potential sites were recorded. Re-recording of remaining pre-recorded species as well as population estimation of other species still remained. Lectures to schoolchildren in 20 schools were carried out. Thirteen episodes of radio-awareness program were also broadcasted. We can conclude seasonal variation in distribution of bats exist throughout Kathmandu Valley. Some specific sites within the area still prove to be good and some are good enough in term of diversity and distribution of bats. However, some distribution of bats in some area is negligible. Some species like *R. affinis* exhibit greater distribution range than other.

- Priority should be given to bat surveys in other untouched sites (throughout Nepal) as well as monitoring the previously recorded sites in Kathmandu Valley.
- Acoustic (echolocation) survey of bats within busy city should also be covered.
- Migration studies through banding and their migration pattern monitoring should be attempted.
- Further researches regarding the climate change effect to bats population and their distribution should be initiated and exercised.
- Habitat development such as bat house installation should be initiated.
- Further awareness and conservation activities and regular monitoring should be continued.

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ANNEXES

Table 2. Species recorded from different study sites at study area before and within two phases of the current project.

Location	Bat species distributed		
	Before	Present study	
		First shift (Nov., 2009-Jan., 2010)	Second shift (May., 2010-Jul. 2010)
Bajrabarahi (Chapagaun) 1485m a.s.l.	-	<i>Pipistrellus sp.</i>	<i>Myotis sicarius*</i> <i>Rhinolophus ferrumequinum</i>
Chalnakhel 1423m a.s.l.	<i>R. luctus</i> (Hinton and Fry, 1923);	-	-
Chobhar 1404m	<i>Megaderma lyra</i> ; <i>R. ferrumequinum</i> ; <i>R. pusillus</i> (Csorba <i>et al.</i> 1999) <i>Hipposideros cineraceus</i> (Thapa <i>et al.</i> 2009)	<i>H. cineraceus</i>	<i>H. cineraceus</i> <i>R. pusillus</i>
Gokarna 1354m a.s.l.	-	-	-
Godawari 1562m a.s.l.	<i>Nyctalus noctula</i> (Bates and Harrison, 1997) at 1200m <i>R. sinicus</i> (Abe 1971; Bates and Harrison 1997) <i>M. silingorensis</i> (Abe, 1971) <i>R. pearsonii</i> (Abe, 1971) <i>Myotis sicarius</i> at 1350 m ; <i>Pipistrellus javanicus</i> (Bates and Harrison, 1997)	<i>M. nipalensis</i> <i>R. affinis</i> <i>H. armiger</i>	<i>M. muricola</i> <i>R. affinis</i> <i>R. macrotis</i> <i>Myotis sp.</i>
Jhor 1525m a.s.l.	-	-	-
Lakuribhanjyang 2035m a.s.l.	-	-	-
Machhegaun 1560m a.s.l.	-	-	-
Muhanpokhari	-	-	<i>Miniopterus</i>

(Panimuhan) 1992m a.s.l.			<i>schreibersii</i> <i>Pipistrellus javanicus</i>
Nagarjun 1373m a.s.l.	<i>Megaderma lyra</i> (1410m) in 1994; <i>R. affinis</i> ; <i>H. armiger</i> (Csorba <i>et al.</i> 1999) <i>R. pusillus</i> (Bates and Harrison, 1997; Malla, 2000) <i>M. lyra</i> ; <i>Miniopterus schreibersii</i> (Malla, 2000) <i>R. pusillus</i> (Thapa <i>et al.</i> 2009)	<i>R. macrotis</i> <i>R. ferrumequinum</i> <i>R. affinis</i>	<i>R. affinis</i>
Nagarkot 1829m a.s.l.	<i>P. javanicus</i> ; <i>Falsistrellus affinis</i> (Bates and Harrison, 1997)	-	<i>H. armiger</i> <i>R. affinis</i>
Nagdaha 1378m a.s.l.	-	-	-
Pharping 1267m	-	<i>R. affinis</i>	<i>M. nipalensis</i>
Phulchowki	<i>R. sinicus</i> (Bates and Harrison, 1997)	-	-
Sankhu-Bajrayogini 1474m a.s.l.	-	-	<i>R. affinis</i>
Slesmantak forest (Pashupati-Gujeshwori area) 1332m a.s.l.	-	-	-
Sundarijal 1579m	<i>R. pusillus</i> (Sinha, 1973) <i>R. pearsonii</i> (Bates and Harrison, 1997) <i>H. armiger</i> (Thapa <i>et al.</i> 2009)	-	<i>H. armiger</i>
Suryabinayak 1384m a.s.l.	-	-	-
Swoyambhu 1326m a.s.l.	-	-	<i>Nyctalus noctula</i>
Taudaha 1295m a.s.l.	-	-	-

Table 3. Bats captured in different sites and their characters

Site No:	Site Name	Date (2010)	Species netted	No. of individuals	Age and sex
1	Godawari-Phulchowki	Jun 11-13	<i>Myotis sp.</i>	3	Ju
			<i>M. muricola</i>	1	AdM
			<i>Rhinolophus affinis</i>	2	1AdM, 1YM
			<i>R. macrotis</i>	1	YF
2	Naagdaha	May 27-29	-	-	-
3	Sankhu-Bajrayogini	Jul 4-6	<i>R. affinis</i>	2	AdM
4	Machhegaun	Jul 8-10	-	-	-
5	Taudaha	May 20-22	-	-	-
6	Swoyambhu	Jun 2-4	<i>Nyctalus noctula</i>	2	1 AdM, 1AdF
7	Pashupati (Slesmantak Forest)	Jun 6-8	-	-	-
8	Jhor	Aug 7-9	-	-	-
9	Muhanpokhari (Paanimuhaan)	Jun 15-17	<i>Miniopterus schreibersii</i>	2	1 AdM, 1AdF (all)
			<i>Pipistrellus javanicus</i>	2	
10	Laakuribhanjyang	May 14-17	-	-	-
11	Bajrabarahi (Chapagaun)	Jun 18-20	<i>Rhinolophus ferrumequinum</i>	1	M
			<i>Myotis sicarius</i>	2	AdF
12	Nagarkot	Jun 24-26	<i>Hipposideros armiger</i>	-	-
			<i>Rhinolophus affinis</i>	2	AdM
13	Suryabinayak - Sipadol	Jul 26-28	-	-	-
14	Chalnakhel	May 23-25	-	-	-
15	Pharping	Jul 1-3	<i>Myotis nipalensis</i>	1	AdF
16	Chobhar	Jun 28 -30	<i>Hipposideros cineraceus</i>	9	5AdM, 1YM, 3 AdF
			<i>Rhinolophus pusillus</i>	1	AdM

17	Nagarjun	Jun 21-23	<i>Rhinolophus affinis</i>	5	AdM
18	Sundarijal	Jul 18-20	<i>Hipposideros armiger</i>	-	-
19	Gokarna	Jul 21-23	-	-	-

Note: AdM=Adult male; AdF=Adult female; YM=Young male; YF=Young female; Ju=Juvenile.



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