Project Update: July 2020

Summary of the Project.

Some cryptic species of bats are difficult to identify by external morphological features. Moreover, flying nocturnal bats are hard to identify by visual observation during their flight activities. However, most micro-chiropterans emit echolocation calls which provides vocalisation analyses that offers a great potential for bat biologists for species identification. Although, calls of some complicated species overlap with one another and have difficulties in species identification, yet ID of free flying bats based on their calls is still made possible with advanced technological recording systems and call analysis techniques (Jones *et al*. 2000).

It is very popular as of now with affordable, commercially available and more effective bat detectors in studying on bat ecology acoustically in the field of distribution, activity level, habitat use, and monitoring population trends (Russ and Montgomery 2002, Vaughan *et al*. 1997a, Walsh *et al*. 2004). However, due to regional variations or different geographical features, the call frequencies of same taxa differ (O'Farrell et al. 2000). Therefore, this study attempts to establish reference call collection from the region, southern Bhutan.

Study Site.

The land use of the region is projected with ArcGIS version 10.3.1 © 2015 Esri based on Land Use and Land Cover of Bhutan, 2016, Ministry of Agricultural and Forest. The study is conducting in two contiguous districts namely, Fig. 1:

1. Samdrup Jongkhar (SJ) located in (26° 55′ 0″ N, 91° 37′ 0″ E) with an area of 1877.94 sq. km with an elevation of 200 - 3600 m above sea level. The temperature ranges from a minimum of 14 degree centigrade to a maximum of 36 degree centigrade during the peak summer of the year. Its average annual rainfall is 5309.4 mm.

2. Pema Gatshel (PG) Fig. 1 district (27° 0′ 0″ N, 91° 15′ 0″ E) with an area of 1023 sq. km ranging from 1000 -3,500 m above sea level and experiences an average annual rainfall of 1500 mm to 3000 mm. Generally, there are four distinct seasons: winter (December to February) mostly driest months, spring (March to May), summer with heavy rainfall (June to August) and autumn (September to November).

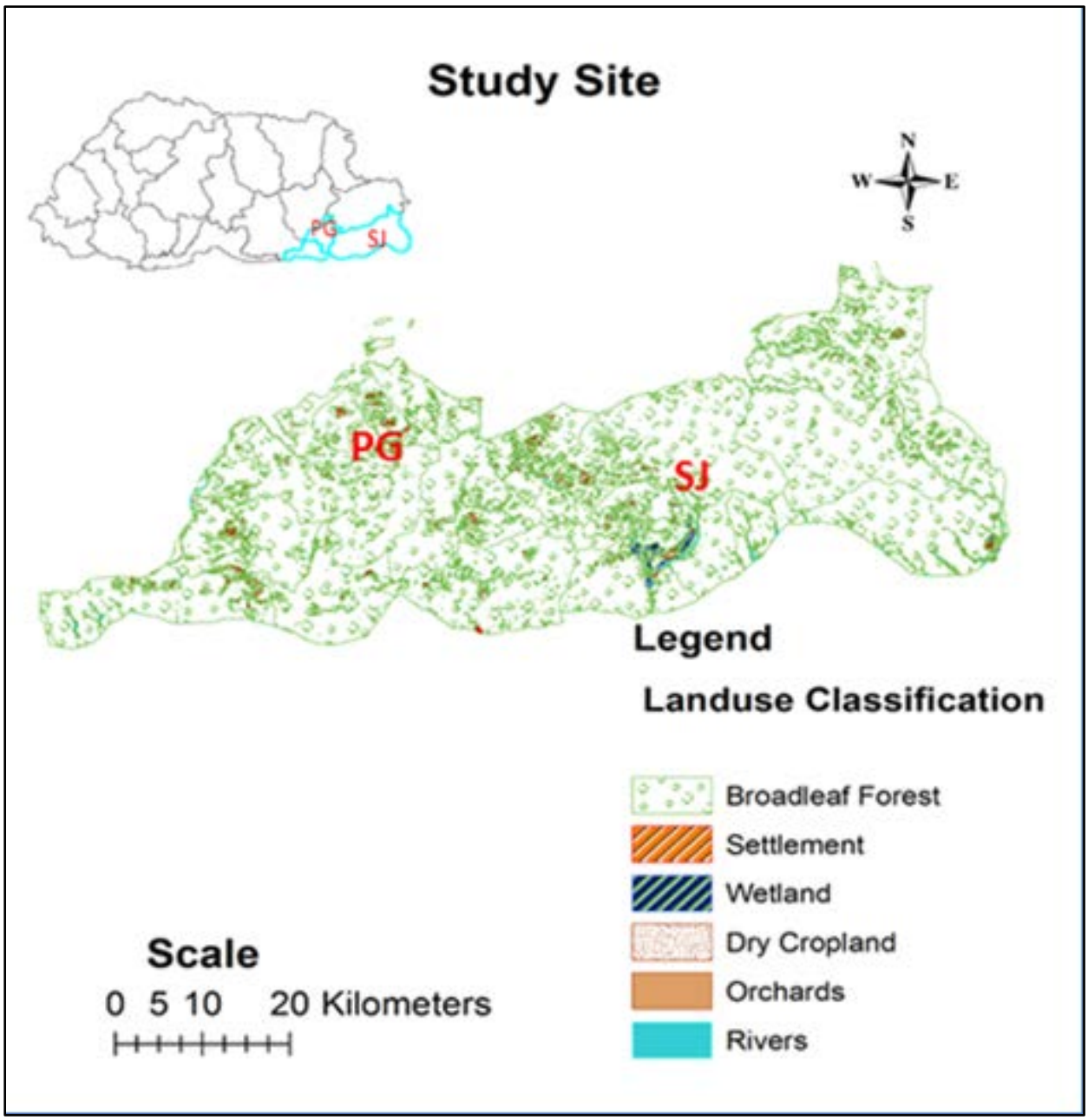

Figure 1. Study sites in two contiguous districts namely: Samdrup Jongkhar (SJ) and Pema Gatshel (PG). Land use of the study region is classified into Broadleaf forest, Settlement, Wetland, Dry Cropland, Orchards and major River systems based on Bhutan Land Use, 2016.

Fieldwork Progression

1. Cave surveys.

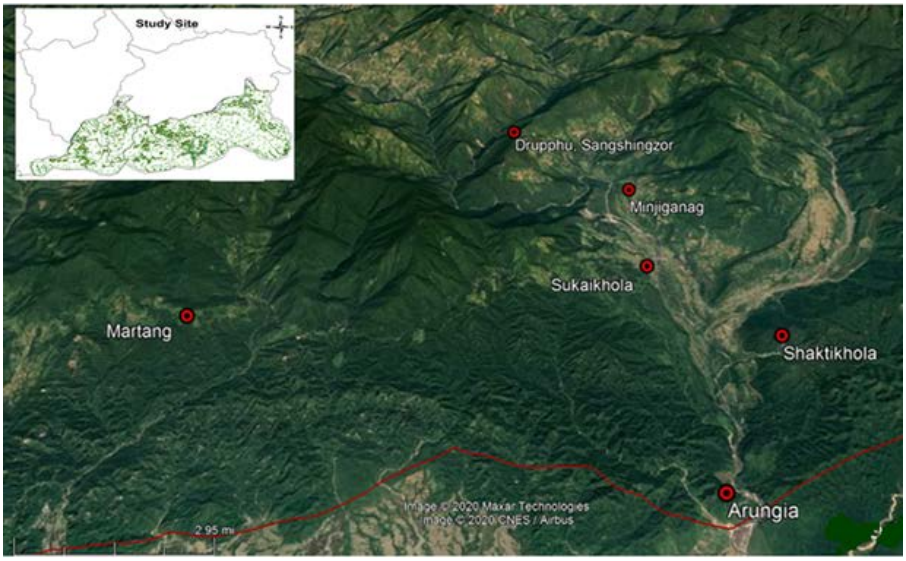

Figure 2. Roosts assessment (Caves) under the sub-district of Samdrup Choling, Samdrup Jongkhar, Bhutan. Of these roosts, Arungia and Sukaikhola were recorded as Abandoned, and Shaktikhola as temporary roost for flying fox at the time of migratory seasons from elsewhere, probably from India. Martang, Drupphu and Minjigang were found as active roosts till date.

Photo 1. Roosts survey where we have recorded species of *Hipposideros* spp. and *Rhinolophus* sp. Roost **A** is at Druphu, Sangshingzor, **B**-Minjigang and **C**-Martang (see **Figure 2** to view location). Unlike other caves, roost **C** is a big boulder cave with very

stable roost sharing by few hundreds of individuals. However, this place is visited by people frequently as it is considered as religious sites by local people which might be the threat to the species dwelling in it.

Photo 2. Roosts survey but found inactive roosts where the species have left recently. Roost **A** is at Sukaikhola (name of the place) and **B** at Arungia which were found as abandoned sites. Roost **C**-Shaktikhola as temporary roost for flying fox at the time of their migratory seasons (source: verbal talk from the local person who led the way to the place, Mr. Asha Gurung from Mindrupling), (see **Figure 2** to view location).

Photo 3. Every captured individual was recorded their calls by Pettersson M500 detector combined with BatSound Touch for the call analysis. **A-** In hand recording of QCF bat calls (Hipposideros spp.) after the morphological assessment. **B**- Recordings in confined net for FM bat calls (Pipistrellus sp.).

Photo 4. Unknown FM sp. Pup fallen from her mother. For this credited to Mr. Dendup Wangchuck (teacher of PMSS) who was so kind enough to inform me about the fallen pup in front of his resident near Phuntshothang Middle Secondary School under Samdrup Choling sub-district, Samdrup Jongkhar district, Bhutan. It was a great time to be as a feeder for a weeklong and finally released safely from where we spotted.

Photo 5. *Hipposideros* spp. sharing a permanent roost recorded from Martang (see **Figure 2** to view the location). Released safely in the same roost after their morphological assessment and call recordings.

Photo 6. *Pipistrellus* sp. captured by mist-nets nearby human settlement from Zomlingzor village under Samdrup Choling sub-district, Samdrup Jongkhar district, Bhutan.

Photo 7. Unknown FM sp. captured by mist-nets nearby human settlement from Phuntshothang village under Samdrup Choling sub-district, Samdrup Jongkhar district, Bhutan.

Photo 8. Door to door Awareness on the Theme "Covid-19 is Zoonotic, But NOT because of Bats". On the Day 1, we the team could covered around 25 households in the villages called Sukuni and Agarung under the Samdrup Choling sub-district, Bhutan. On day 2, only around 15 households were covered in the village called Mindrupling where we have to stop after the lunch due to unfavorable weather condition. During this campaign, we also did data collection based on their previous knowledges and ideas on bats (results will be revealed in the next report after few more data collections from different villages). We had to do face to face campaign due to Covid-19 pandemic since the social gatherings have been withheld for the time by the government.

Citation

O'Farrell, M.J., Corben, C. and Gannon, W.L., 2000. Geographic variation in the echolocation calls of the hoary bat (Lasiurus cinereus). *Acta Chiropterologica*, *2*(2), pp.185-196.

Russ, J.M. and Montgomery, W.I.2002. Habitat associations of bats in Northern Ireland: implications for Conservation. Biological Conservation 108: 49-58.

Vaughan, N., Jones, G., Harris, S., 1997a. Habitat use by bats (Chiroptera) assessed by means of a broad-band acoustic method. Journal of Applied Ecology 34, 716–730.

Walsh A. L., Barclay, R. M. R. and McCracken, G. F. 2004. Designing bat activity surveys for inventory and monitoring studies at local and regional scales. Pp. 157-165 in Bat Echolocation Research: tools, techniques and analysis (Brigham, R. M. et al., eds.). Bat Conservation International. Austin, Texas.