

Project Update: November 2016

The second trapping session began from first week to 30th October, 2016. The intensive live trapping activities were carried out in the six different habitat types namely: agricultural land, fallow land, *Alnus* forest, open grassland, riparian and oak forest. Twelve transect lines (two replications per habitat type) of 155 m each with 500-800 m distance from other transects were drawn respectively. A total of 612 Sherman live traps (17 live traps per transects) at an interval of 15 m were deployed in the field and positions were marked by red flagging, so it was easy to locate during inspection. The Sherman live trapping sizes of 23 × 9 × 8 cm were used to capture both ground and arboreal non-flying small mammals in the BRS. All the deployed traps were baited with different locally available ingredients such as flour dough, crushed bread, biscuits mixed with canned fish and dry fish supplemented by local banana, apple, grapes and groundnut. Slices of carrot were also provided along with the baits to reduce mortality of live trapped individuals. Traps were placed under vegetation, close proximity to rocks, tree base and coarse wood debris and nearby visible droppings. Traps were covered with leave litter and grasses for camouflage.

To avoid high immigration, the intensive live trapping activities were conducted through closed population method for period of four weeks i.e. ≈30 days and for three consecutive nights per transect in each habitat. The deployed traps were checked twice daily, once in the morning (6.00 AM to 10.00 AM) and afternoon (3.30 PM to 5.30 PM) to record both diurnal and nocturnal species of small mammals. The traps were re-baited in the next day if it was found spoiled by biotic and abiotic factors. The trapped individuals were transferred to the weighing bag and weighed using different range of measuring instrument i.e. Pesola spring balance of 60, 100 and 300 g respectively based on weight of the individual animal. It is then identified to sex (male/female), different age class (juvenile, sub-adult and adult) and breeding status (male having descended testes or not, female prominent nipple or not). Standard measurements such as ear length (EL), head-body length (HBL), tail length (TL) and hind-foot length (HFL) of each captured individuals were recorded in cm using stranded measuring scale, then animals were identified to genus and species level using standard field guide book. Every captured individual was marked by marker pen at ventral pelage in order to curtail double counting if it is happen to trapped again.

Digital photographs were taken for further identification and proper documentation. Recording all the requisite parameters, captured animals were released safely in the same environment or habitat.

The vegetation and habitat assessment were carried at all the captured and un-captured trap locations. Vegetation layer like canopy cover (tree) and under-storey (shrubs) cover were assessed by laying quadrats of 10 m × 10 m and ground cover (herbaceous) of 1 m × 1 m. Key ecological variables like altitude, slope, aspect and microhabitats (rocks, gravels, piled stones, down logs, debris, litters, litter depths or thickness, exposed or barren soil, grasses, herbaceous, shrubs and tree buttress) were recorded. Local temperature and GPS coordinates were also recorded to support additional information. Both vegetation and environmental variables i.e. cover percentages were visually quantified to determine the correlation between cover percentage, abundance and distribution of small mammals.

Small mammals were threatened by both anthropogenic and natural disturbances. To assess the disturbances face by small mammals in BRS, the human activity likes grazing, fires, stone

collection or stone wall construction, timber or pole extraction, litter collection, road and feral dog recorded by sampling in a plot of 10 m × 10 m. Ungulates, carnivores and raptors sign or evidences were also recorded to contribute the detail information of the threats. The degree of disturbances was also assessed and classified into three categories such as low, medium and high depending upon on severity of the threats notice.

Results

Trapping over 612 trapping nights from 12 transects (two replications per habitat type) of six different habitat types resulted in captured of 109 individuals of small mammals belong to 11 species. Seven species were from rodent family Muridae and four shrew species, of family Soricidae. All the species captured were ground dwelling small mammals and not a single arboreal species were captured. Species diversity and richness varied among habitat types, being highest in agricultural land (n=59) followed by oak forest (n=30), riparian (n=8), fallow land (n=5), open grassland (=5) and lowest in *Alnus* Forest (n=2). The justification could be because of mainly the farm bushes, dry grasses, aplenty of fallen rice grain, crop residues, piled stone, temporary sheds and fences shows key microhabitat types in agricultural field that caters food resources and protective shelters.

Table 1. List of small mammals captured from BRS.

Family	Sl. No	Common Name	Scientific Name	Individuals captured
Muridae	1	Rat	<i>Rattus</i> sp.	36
	2	Soft-furred metad	<i>Millardia meltada</i> Gray, 1837	3
	3	Indian gerbil	<i>Tatera indica</i> Hardwicke, 1807	2
	4	House mouse	<i>Mus musculus</i> Linnaeus, 1758	7
	5	Wood mouse	<i>Apodemus sylvaticus</i> Linnaeus, 1758	9
	6	Himalayan white bellied rat	<i>Niviventer niviventer</i> , Hodgson, 1836	7
	7	Common house rat	<i>Rattus rattus</i> Linnaeus, 1758	3
Soricidae	1	Himalayan or Sikkim large-clawed shrew	<i>Soriculus nigrescens</i> Gray, 1842	10
	2	Hodgson's brown toothed shrew	<i>Soriculus caudatus</i> Horsfield, 1851	7
	3	Tiny shrew	<i>Sorex minutus</i> Linnaeus, 1766	3
	4	Himalayan mole-short tailed mole	<i>Talpa micrura/ Euroscaptor micrura</i> Hodgson, 1841	22
Total Family: 2		Total Species: 11		109

The warm broadleaved or evergreen forest such as *Alnus nepalensis*, *Quercus griffithii*, *Quercus* sp., *Betula* sp., *Michelia* sp., *Acer* etc. are dominant species in two different forest habitat types. The understory is made by *Rhododendron* sp., *Corylopsis himalayana*, *Elaeagnus parvifolia*, *Artemisia*, *Berberis* sp., *Daphne* sp., *Clerodendron* species and bamboo thickets. Thick leaf litters, mosses, *Pteridium* sp., *Sellaginella* sp., *Lycopodium* sp. and monocot plants dominated the ground cover.

The survival of small mammals in all the habitat types was threatened by free grazing. Stone and litter collection, fencing poles and firewood collection from forest, road and increasing number of stray dogs further threatened the lives of small mammals in and around BRS.

Table 2. 11 Small mammal species captured from six different habitat types.

Sl. No	Live Trapped Small Mammal Species	Habitat Types					
		AG	OG	OF	AF	RR	FL
1	<i>Rattus</i> sp.	21	1	6	2	5	1
2	<i>Millardia meltada</i> Gray, 1837	0	0	0	0	1	2
3	<i>Tatera indica</i> Hardwicke, 1807	2	0	0	0	0	0
4	<i>Mus musculus</i> Linnaeus, 1758	0	0	5	0	0	2
5	<i>Apodemus sylvaticus</i> Linnaeus, 1758	0	0	9	0	0	0
6	<i>Niviventer niviventer</i> , Hodgson, 1836	0	0	7	0	0	0
7	<i>Rattus rattus</i> Linnaeus, 1758	2	0	1	0	0	0
8	<i>Soriculus nigrescens</i> Gray, 1842	5	3	2	0	0	0
9	<i>Soriculus caudatus</i> Horsfield, 1851	5	1	0	0	1	0
10	<i>Sorex minutus</i> Linnaeus, 1766	2	0	0	0	1	0
11	<i>Euroscaptor micrura</i> Hodgson, 1841	22	0	0	0	0	0
Total		59	5	30	2	8	5
Total	Species	7	3	6	1	4	3

AG= agricultural land, OG= open grassland, OF= oak forest, AF= *Alnus* forest, RR= riparian and FL= fallow land.

Annexure I: Intensive Study Area

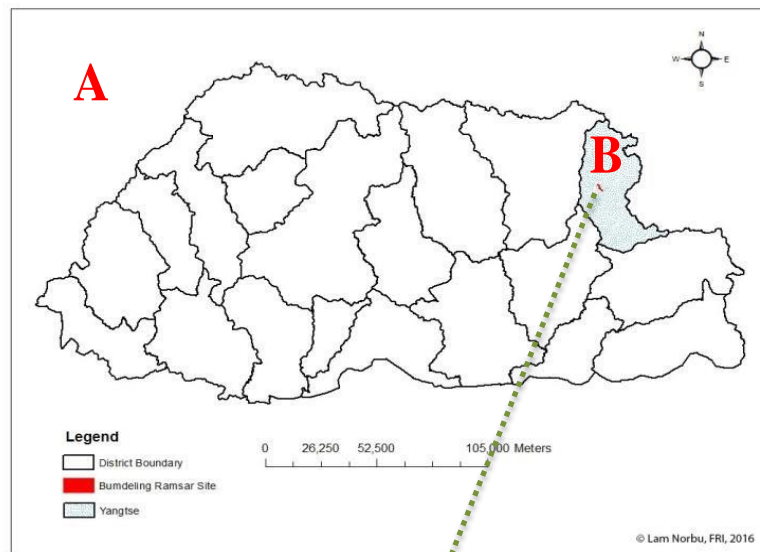


Figure 1: (A) Bhutan Map showing location of Trashi Yangtse District and Bumdeling Ramsar Site, (B) Trashi Yangtse district, (C) Bumdeling Ramsar Site and showing study locations.

Annexure II: Types of small mammal species- Rodents, family Muridae captured from BRS.

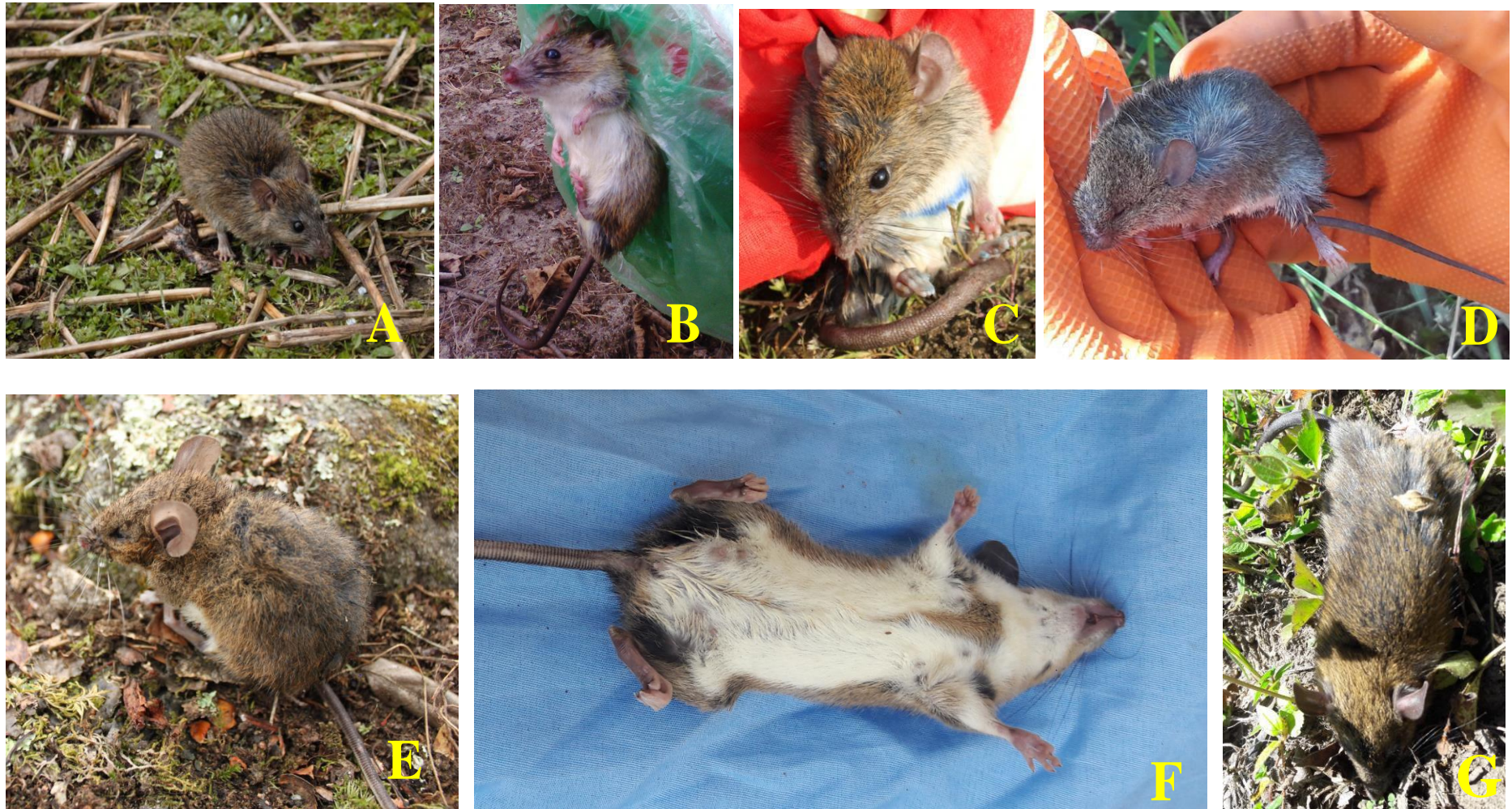


Figure 2. (A) *Rattus* sp., (B) *Millardia meltada* Gray, 1837 (C) *Tatera indica* Hardwicke, 1807 (D) *Mus musculus* Linnaeus, 1758 (E) *Apodemus sylvaticus* Linnaeus, 1758 (F) *Niviventer niviventer*, Hodgson, 1836 and (G) *Rattus rattus*.

Annexure III: Types of small mammal species- Insectivore, family Soricidae captured from BRS.



Figure 3. (A) *Soriculus nigrescens* Gray, 1842, (B) *Episoriculus caudatus* Horsfield, 1851 (C) *Sorex minutus* Linnaeus, 1766 and (D) *Talpa micrura/Euroscaptor micrura* Hodgson, 1841.

Annexure IV: Six Different Study Habitat Types in BRS

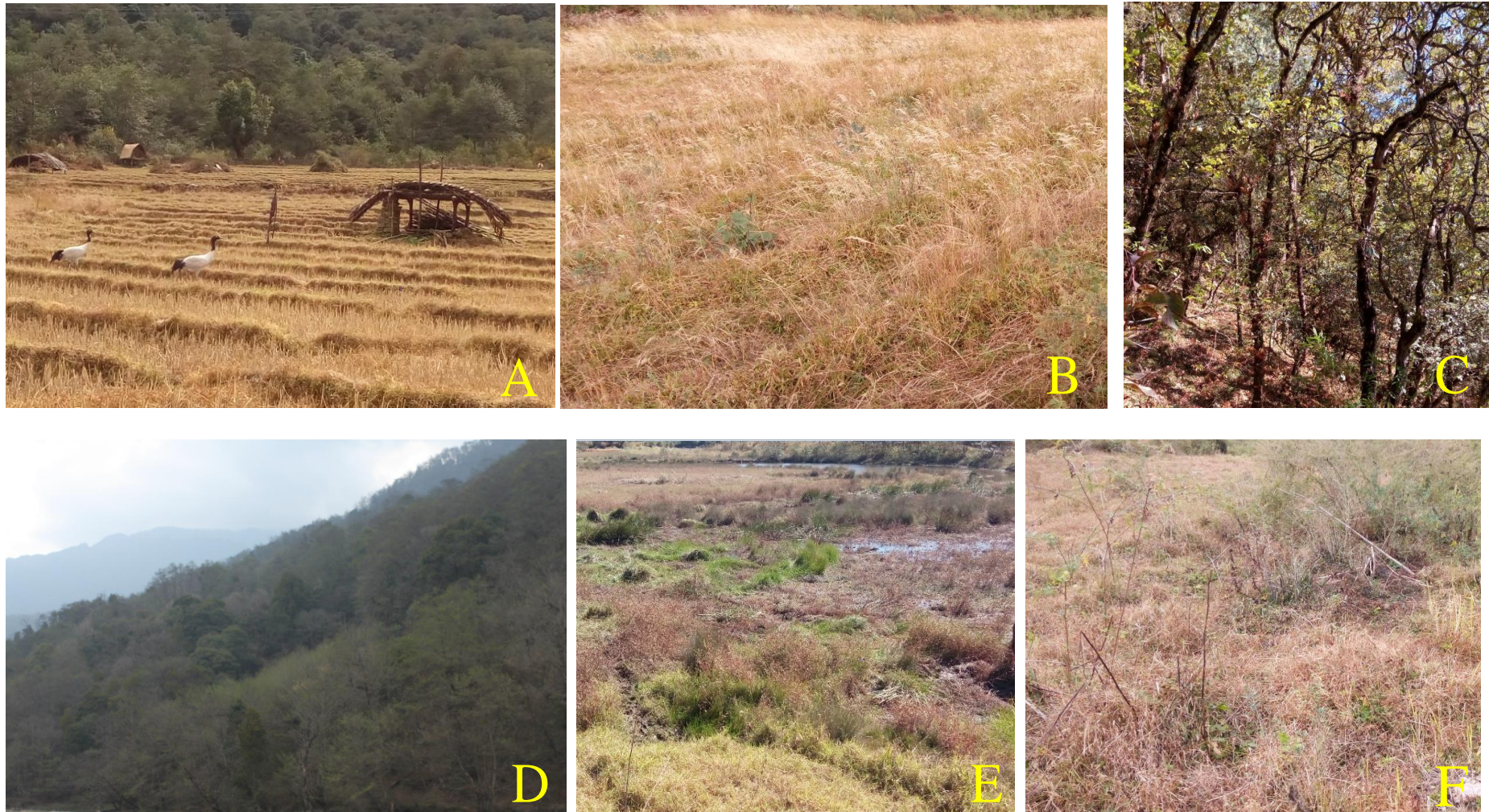


Figure 4. (A) Agricultural Land, (B) Open Grassland, (C) Oak Forest, (D) *Alnus* Forest, (E) Riparian and (F) Fallow Land.