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HABITAT PREFERENCES AND ROOST SITE SELECTION OF *Rhinopoma hardwickii* Gray, 1831 IN NORTHWESTERN, PAKISTAN

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ABSTRACT

Present study on habitat characteristics of *Rhinopoma hardwickii* was conducted in Charsadda district Khyber Pakhtunkhwa for a period of two years extending from May 2011 to July 2013. A bat roost of *R. hardwickii* was observed in forest Plantation at Menawrai Baba Shrine ($71^0 52' 32.84'' E\ 34^0\ 09' 12.39''N$), having more than 70 bats, where 5 pups and 3 lactating mothers were also present. Characteristically this roost was present in mulberry tree, *Morus alba* within a depth of half meter, at a height of 3 meter at breast height. This tree was about 7 meter long, with 1/2 meter diameter. This roost was located within the forest where various plant species including wild fig, *Ficus palmate*; white cedar, *Melia azedarack*; paper mulberry, *Brousonetia papyrifera*; black mulberry, *Morus nigra*; white mulberry, *Morus alba*; Indian jujube, *Zizipus mauritania*; blue gum, *Eucalyptus globules*; babul, *acacia Arabica* and commonly used as roosts by *Pteropus giganteus* at three sites. The black poplar, *Populus nigra* was the most abundant, while wild fig; *Ficus palmate* were the least abundant of all species. This paper will help in documenting new information regarding habitats and occurrence of *R. hardwickii*in Khyber Pakhtunkhwa and will add new distribution map to the bats of Pakistan. Further study about their status and biology is needed.

Key words: *Chiroptera*, Bat, Habitat, Roost site, *Rhinopoma hardwickii*.

INTRODUCTION

Rhinopoma hardwickii Gray, 1831, the lesser mouse-tailed bat is a species of family Rhinopomatidae, comprising of four extant species (Van cakenberghe and de Vree, 1994) including *Rhinopoma microphyllum* (Brunnich, 1792), *R. hardwickii* Gray, 1831, *Rhinopoma muscatellum* Thomas, 1903, *Rhinopoma macinnesi* Heyman, 1937. Former Three species of them are present in Pakistan. *Rhinopoma hardwickii* Gray, 1831 is distributed from Morocco to Burma, south to Mauritania, Senegal, Mali, Burkina Faso, Niger, Kenya and Socotora Isles (Yemen). In Pakistan it is rare and locally distributed in Pakistan (Roberts, 1997; Mahmood-ul-Hassan and Nameer, 2006). It has been recorded from Landhi and Karchat Hills (Hinton and Thomas, 1926) in Sindh (Roberts, 1997; Mahmood-ul-Hassan *et al*. 2009) from Rohtas, Salt Range in Punjab (Lindsay, 1927). It has small body size, soft fur with grayish to dark brown, mouse like tail and a small nose leaf snout irregular in shape (Whiting, 2012). This species is found in arid and semi-arid habitats, including abandoned buildings, caves, dry scrub, rocky areas, deserted mountain and wells. In the hot summer, these bats are nesting in nooks, cracks and large rocks (Benda *et al*. 2004). These bats are adaptable to live in dry climates and hot summer. They can maintain water balance in their bodies, and like to live in cover shelters to avoid heat and undergo torpor in winter, when insects availability is reduced (Grizmek, 2005), while hunt for insects at a height of 5 to 10 meters. They livein small and large size colonies ranging from 4 to 10 and hundreds to thousands, while the lactating mothers also living in groups (Whiting, 2012).

They are considered as the primitive bats in terms of echolocation as they are only producing signal with low harmonics and limited variations in the frequency (Whiting, 2012). Information regarding occurrence, area of occupancy, habitat status, distribution and morphology and population of this species is scarce (Sheikh and Molur, 2004). Information about their distribution and morphology has been documented based on literature review, as little or no work has been done on the actual distribution of this species from Pakistan (Bates and Harrison, 1997; Mahmood-ul-Hassan *et al*. 2009). Javed *et al*.(2012) recorded this species from Punjab recently. Keeping in mind the original reports (Hinton and Thomas, 1926; Lindsay, 1927; Javed*et al*. 2012), the present study was designed to investigate the existenceof bats in other parts of country as well and if present, their distribution pattern and habitat selection in the study area. It could be the very first study about the habitat of this species in Khyber Pakhtunkhwa, Pakistan.

MATERIALS AND METHODS

Study area: The present study was designed to investigate the habitat and roost site preferred and selected by *Rhinopoma hardwickii* (Mammalia: *Chiroptera*) for the first time in district Charsadda, Khyber Pakhtunkhwa, Pakistan (Figure 1&2) from May 2011 to July 2013, in Menawrai Shrine Forest Plantation ($71^0 52^{'} 32.84^{''}$ E 34^0 09' 12.39''N). This forest is located about 6 km away towards west from Utmanzai city. The climate of the area is dry and rough during summer, while mild cold during winter. Average annual rainfall is 500-1750 mm, while it is highest during February to April. However, winter temperature ranges from 4-8, starts in mid-November and ends in August. Summer starts in May and ends in August with temperature with the temperature ranges 25-40°C, relative humidity is 46% in June and 76% in August (Census, 1998).

This is a sub-tropical dried deciduous forest, located in semi-arid conditions, with no high rainfall and humidity. This was a diurnal roost situated near deserted house, an old historic Shrine and covered by rich vegetation layer in the vicinity including; ber, ficus, sheesham, eucalyptus, white cedar, and acacia. Habitat was surrounded by many agricultural crops included wheat, sugar beet, trifollium, and many vegetables etc. To the northeast of this habitat a permanent river called river Menawrai Baba is flowing. Due to this river all the vicinity is full of lush green vegetation and small water bodies available in patches.

During two years of study about the habitat and roost site selection of this species, a thorough study was conducted in the entire area to explore the existence of this species. In addition to information from the locals, various landscapes, water bodies, old buildings, tree cavities and forests were surveyed, where 35 mist netting nights were spent periodically during this period. These bats were collected through mist nets of a size of 6 m long and 2.5 wide (Black deep nylon made). The tree cavity was comprised of a colony of 79 bats of *R. hardwickii* containing only lactating females. Besides, the number of bats were counted through the direct roost count method (Herrera*et al*. 2008), while the tree height was measured by tape and diameter at breast height was also calculated (Granek, 2002).

Figure 1 Colony of *R. hardwickii* along with pups recorded from Meanwrai Baba Shrine Forest Plantation from May 2011 to July 2013.

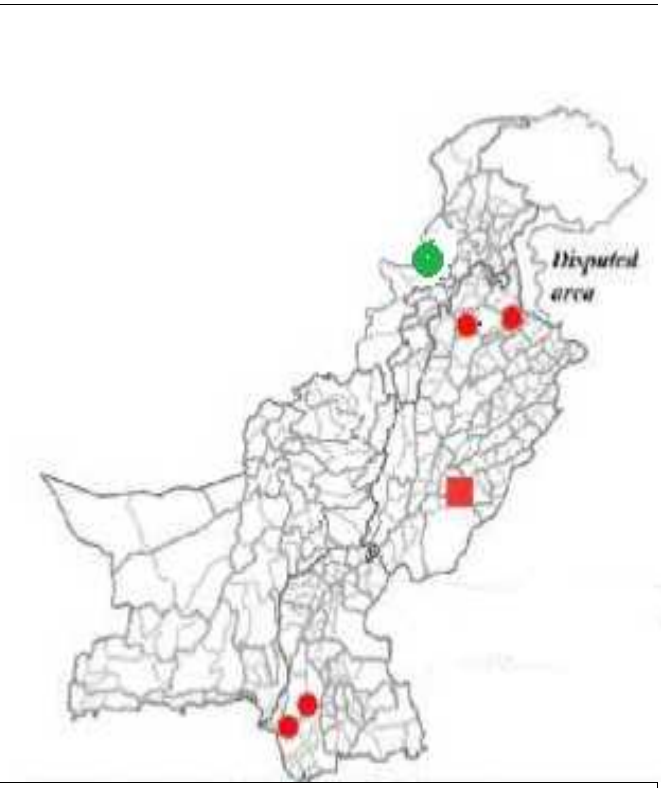

Figure 2 New distribution map (right) of *Rhinopoma hardwickii* (highlighted with green).

RESULTS AND DISCUSSION

Present study was conducted to record occurrence of *R. hardwickii* and habitat sites occupied by them in northwestern parts of Pakistan during July 2011 to May 2013.

Occurrence of *Rhinopoma hardwickii*:A bat roost of *R. hardwickii* was observed in a forest Plantation at Menawrai Baba Shrine ($71^0 52^{'} 32.84^{''}$ E 34^0 09' 12.39''N) in district Charsadda, Khyber Pakhtunkhwa, Pakistan. This species has previously been recorded by Roberts (1977) from Karchat Hills and Javid*et al*. (2012) from Noor Mahal in Bahawalpur, Punjab, which is a sub-tropical zone.

Roost site study: During the present studythis species was found only within a mulberry tree cavity *M. alba*, in Menawrai Baba Shrine Forest Plantation in district Charsadda, Khyber Pakhtunkhwa. The colony comprised of 79 individuals present close to the opening of the cavityand having 5 pups and 3 lactating mothers as well. Generally, their colony size ranges from 1 to 20, 6 to 40 and 2 to 25 (Brosset, 1962a;Sinha, 1981,1986).Brosset (1962a) reported that it is found in divergent climatic regions from dry to humid climates while in this study it was found in dry deciduous sub-tropical forest of district Charsadda, Khyber Pakhtunkhwa.Usman (1986) noted that they live in secret crevices and hang from roofs.Brosset (1962) recorded them from diurnal roosts included caves, wells, old buildings, while Sinha (1981a) found them in hollow banyan and peepal tree. However they were not reported in the old buildings and houses during the present study.

Habitat characteristics: Characteristically this roost was present in mulberry tree, *Morus alba* within a depth of half meter, at a height of 3 meter at breast height. This tree was about 7 meter long, with 1/2 meter diameter. This single species belonging to family Rhnopomatidae was identified to occupy a particular habitat site inside in the forest along with *P. giganteus* residing close to them. Siddiqi (1961) recorded that both *R. microphyllum* and *R. hardwickii* were found in the same diurnal roost in dry evergreen thorn forest in Pakistan. The tree was more than 25 years old, situated near a small stream and dense vegetation layer, where various arthropods were abundant. Mayer *et al*. (2010) noted that bats are bio-indicators and environmental detectors, therefore, sensitive to deforestation, habitat loss and global climate change. These bats were found within the dense forest that provides them relatively less cold temperature and humidity in the hot summer. Their diurnal roosts are comprised of caves, temples and deserted houses (Bates and Harrison, 1997). Bhat and Sreenivasan (1972) noted that *R. hardwickii* are inhabited in dry and semiarid regions, while they are absent from regions of high rainfall and humidity. In this study the roost was located in sub-tropical tree plantation which comprised of dry and semi-arid conditions. The forest was a thick plantation of various tree species and vegetation included wild fig, *Ficus palmate;* white cedar, *Melia azedarack*; paper mulberry, *Broussonetia papyrifera*; black mulberry, *Morus nigra*; white willow, *Salix alba*; black poplar, *Populus nigra*; Indian jujube, *Ziziphus mauritania*; blue gum, *Eucalyptus globules*; babul, *acacia Arabica* and common guava, *Psidium guava*. The black poplar, *Populus nigra* was the most abundant, while wild fig, *Ficus palmate* and Indian jujube, *Ziziphus mauritania* was least abundant plant species.

Threats to bat species: This species was under high risk of habitat loss as the forest was continuously under cutting and stress from the interference of children and local visitors to the Shrine. Schipper *et al*. (2008) indicated that the populations of bat species are continuously declining worldwide due to habitat loss and deterioration and their poaching for medicine and food. Jones *et al*. (2009) noted that for the conservation of bats population, a global network for bats is urgently needed. Noting the ecological importance and its distribution, this study was conducted to explore its habitats and occurrence in the unexplored areas. This paper provides new data regarding distribution of *R. hardwickii* to the pre-existing distribution map in Pakistan. However, detailed information regarding its status and biology will be needed.

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