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Short Communication

FIRST RECORD OF *MYOTIS FORMOSUS* HODGSON'S BAT (HODGSON, 1835) FROM BAJAUR AGENCY, PAKISTAN

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ABSTRACT

During a two year survey extending from 2014 through 2016, specimens (n = 3) of Hodgson's bat *Myotis formosus* were captured from Bajaur Agency, FATA in Pakistan using mist and hand nets. External body, cranial and bacular features of the captured specimens were recorded and compared with available literature. Mean head and body length of the captured specimens was 42.06±4.01 mm, forearm length was 47.16±0.93 mm, greatest length of skull (n = 2) was 17.38±0.17 mm while total baculum length (n = 1) was 8.1 mm. The species is the first record from the study area.

Keywords: Hodgson's bat, FATA, Forearm, Baculum, Skull.

INTRODUCTION

Chiropteran diversity of the globe is represented by 900 to 1200 species (Simmons, 2005) while 50 species, 23 genera and 8 families of bats have been reported from territorial limits of Pakistan. Few more species have been added in the existing list of bats of the country (Mahmood-ul-Hassan and Salim, 2015). In the developed world, conservation efforts have been launched to protect these environment friendly creatures from various anthropogenic hazards while in Pakistan even the number of various bat species and their distribution status are still debatable. A very few scientists have recently taken initiatives to explore poorly known bat fauna of the country. But most of them are poorly equipped and are mostly focusing Punjab province (Robert, 1997; Walker and Molur, 2003; Mahmood-ul-Hassan *et al*., 2009; Javid *et al.,* 2014). Bats play significant role in pollination of plants (Gulraiz *et al.,* 2015) and control of insect populations. Hence, bats are helpful in uplift of economy and reduction of several vectors of diseases (Cox *et al*., 1991; Fujita and Tuttle, 1991; Rainey *et al*., 1995; Banack, 1998; Adams, 2003; Rahman *et al*., 2015).

The distribution range of *M. formosus* extends from its native habitat in Nangarhar Province, Afghanistan, which is situated near Afghan-Pakistan border, Sylhet division in Bangladesh, Jammu and Kashmir, central and western parts of Nepal, central and eastern China, Korea, Taiwan and some islands of Indonesia and also to Philippines. The species prefers forests, tree foliage and roosts in houses and among bushes and hibernates in caves during winter (Bates and Harrison, 1997; Smith and Xie, 2008).

Bat populations are declining in their natural habitats due to threats from non-native species, loss of habitat and urbanization (Molur *et al*., 2002; Meyer *et al*., 2010; Salim *et al*., 2016). In this changing environment, many mammalian species have either extended their distribution ranges or became extinct and hence it is important to study the present distribution of species (Taber *et al*., 1967; Roberts, 1997; Javid *et al*., 2012 a,b, 2014; Mahmood-ul-Hassan and Salim, 2015). Present study was therefore planned to explore bat fauna of Bajaur agency in Federally Administrated Tribal Areas (FATA), Pakistan.

MATERIALS AND METHODS

Bat specimens were collected from Bajaur agency (34°41′ N, 71°31′ E) in Federally Administered Tribal Areas (FATA), Pakistan which is the part of arid subtropical region with severe winters and hot summers. Winter season starts from December and prevails through February during which the temperature drops below freezing point while May through August are the warmest months of the year with temperature rises to 50 ^{0}C. Average rainfall is 800 mm per annum. The terrain is mostly mountainous. Total uncultivated area is 200,000 hectares while irrigated land is about 82,000 hectares (http://www.thetribaltimes.com/fata/).

Bajaur agency is administratively divided in to two sub-divisions i.e subdivision Khar and subdivision Nawagi and seven tehsils. Sampling sites in all the tehsils were designated and their GPS coordinates were recorded (Fig. I).

All these sampling stations were visited on monthly basis. Mist nets (Ecotone 716/18, 716/6, 716/9)

were used for the collection of bats with "V" or "L" shape and erected on 3 to 5 meter bamboo poles in such a way that the shelf was one feet above the ground level. Bat specimens were also captured using hand nets. Specimens were collected during dusk hours and the time of capture was extended from two hours up to six hours after sunset according to the weather conditions. Mist nets were checked continuously at intervals of 10-15 minutes and captured bat specimens were kept in separate cloth bat bags. The external body, cranial and bacular features of these specimens were recorded and compared with the help of standard keys (Bates and Harrison, 1997; Bates *et al*., 2005; Jiang *et al*., 2010; Mahmood-ul-Hassan and Salim, 2015).

RESULTS AND DISCUSSION

During present surveys, specimens (n = 3) of *Myotis formosus* were captured through mist and hand nets from Jawar village (N 34°53.508, E 071°31.714) in Bajaur Agency at an elevation of 658 m where humidity was 65.7% and temperature was recorded 28.2 ^{0}C. Mahmood-ul-Hassan and Salim (2015) recorded this species first time from Pakistan in the areas of Dir, Malakand and Swat districts. Boundaries of Bajaur Agency are connected to Dir and Malakand districts and therefore it is not surprising that this bat species was present here. Moreover, this bat species was also reported from Afghanistan (Gaisler, 1970) that is adjacent to Bajaur Agency. The habitat from where the specimens were captured was mountainous, lowland and forest type while they were roosting in caves and trees. Coloration of the captured specimens was ginger brown dorsally while it was orange brown on the edges. The ventral side was deep orange posteriorly and lighter cinnamon brown on throat. Head was hairy while ears were naked and oval in shape with rounded interior border. Tragus was narrower and long with straight interior and concave posterior borders. The wings had orange and black patterns. These observations exactly match those documented by Bates and Harrison (1997) and Mahmood-ul-Hassan and Salim (2015).

Mean body mass of the captured bat specimens was 14.37±0.25g, head and body length, ear length, hind foot length and tibia length were 42.06±4.01mm, 39.87±2.69mm, 13.85±0.21mm, 10.92±0.28mm and 23.46±0.05mm, respectively. Mean length of forearm and thumb with claw length was 47.16±0.93mm, 5.54±0.49mm, respectively (Table 1). All these measurements are comparable to the findings of Bates and Harrison (1997) and Mahmood-ul-Hassanand Salim (2015).

Similarly, mean greatest length of skull of two specimens was 17.38±0.17mm while condylo-basal and condylo-canine lengths were 15.84±0.09mm and 16.74±0.36mm, respectively. The mean zygomatic breadth, breadth of braincase and post orbital constriction were 11.85±0.06mm, 8.71±0.01mm and 4.65±0.07mm, respectively (Table 2).These cranial measurements are in line with those documented by Bates and Harrison (1997), Mahmood-ul-Hassan and Salim (2015) and Sarmek *et al*. (2013).

The shape and size of the bacula are amongst the major species identification characters (Javid *et al*. 2012). Baculum of a single male *M. formosus* specimen captured during present study was concave dorsally while it was deeply grooved ventrally. Total length of the baculum was 0.81 mm while Jiang*et al*. (2010) reported total bacular length of 0.8 mm with similar features observed during present study.

Bats are facing serious threats and are declining at an unprecedented rate because of anthropogenic hazards. Awareness campaigns about the significance of bats in the ecosystems, proper monitoring and conservation efforts can help in protection of declining bat species (Meyer *et al*. 2010). In a two year survey, only three specimens of *M. formosus* were captured from the study area.

Table 1. Mean body mass (g) and external body measurements (mm) of *Myotis formosus* captured from Bajaur Agency, FATA, Pakistan (n=03, n is the number of specimens).

Parameters	Present Study	Bates and Harrison (1997)	Mahmood-ul-Hassan and Salim (2015)
Body mass	14.37±0.25(13.6.0-14.41)	-	-
Head and body length	42.06±4.01(39.5-43.0)	-	-
Tail length	39.87±2.69(37.8-42.91)	41.3±6.1(36.0-48.0)	45.85±2.99(40.83-47.92)
Ear length	13.85±0.21(13.61-14.0)	13.6±0.9 (12.8-14.5)	18.27±1.09(17.22-19.91)
Hind foot length	10.92±0.28(10.6-11.06)	10.6±0.6(10.2-11.6)	12.05±0.80(10.99-12.75)
Tibia length	23.46±0.05(21.34-25.91)	22.5±0.9(21.0-23.2)	24.18±1.22(22.96-26.19)
Forearm length	47.16±0.93(44.2-46.06)	47.4±1.9(44.5-49.1)	48.74±2.02(46.66-52.03)
Thumb with claw	6.54±0.49(6.1-5.9)	-	-
Claw length	1.51±0.81(1.02-1.06)	-	-
3rd metacarpal length	43.85±0.69(44.43-45.1)	44.3±1.1(43.2-45.7)	44.26±1.15(43.37-46.20)

1st phalanx on 3rd metacarpal	15.48±0.48(15.05-16.0)	-	-
2nd phalanx on 3rd metacarpal	16.04±0.24(15.82-16.3)	-	-
4th metacarpal length	43.53±1.23(42.18-44.6)	43.01±0.8(42.3-44.0)	43.94±1.81(42.38-46.83)
1st phalanx on 4th metacarpal	14.04±0.13(13.89-14.1)	-	-
5th metacarpal length	45.95±0.52(45.76-46.4)	43.5±1.3(42.3-47.2)	43.97±1.70(42.52-46.78)
1st phalanx on 5th metacarpal	13.21±0.63(12.54-14.78)	-	-
Tragus length	5.83±0.05(5.78-5.44)	-	-
Calcar length	5.10±0.46(4.57-5.33)	-	-
Wingspan	212.67±3.06(210.6-21.0)	-	-

Table 2. Cranial measurements (mm) of *Myotis formosus* captured from Bajaur Agency, FATA, Pakistan (n = 02, n is the number of specimens),

Parameters	Present Study	Bates and Harrison (1997)	Mahmood-ul-Hassan and Salim (2015)	Sarmek *et al*. (2013)
Greatest length of skull	17.38±0.17 (17.26-17.5)	18.4±0.4 (18.4-18.9)	17.81±0.12 (17.71-17.94)	15.636±0.254 (15.03-16.13)
Condylo-basal length	15.84±0.09 (15.77-15.9)	-	-	15.296±0.213 (14.86-15.45)
Condylo-canine length	16.74±0.36 (16.48-16.99)	16.4±0.2 (16.3-16.6)	15.95±0.17 (15.75-16.05)	-
Zygomatic breadth	11.85±0.06 (11.8-11.89)	-	-	8.919±0.184 (8.57-9.30)
Breadth of braincase	8.71±0.01 (8.7-8.72)	8.4±0.3 (8.1-8.7)	8.37±0.09 (8.27-8.45)	8.178±.159 (7.75-8.15)
Postorbital constriction	4.65±0.07 (4.6-4.7)	4.5±0.1 (4.4-4.5)	4.51±0.09 (4.41-4.57)	3.928±0.083 (3.76-4.15)
Maxillary toothrow length	7.04±0.19 (6.9-7.17)	7.1± 0.2 (6.8-7.2)	7.15±0.05 (7.10-7.20)	6.117±0.107 (5.89-6.34)
Mandibular toothrow length	7.57±0.13 (7.47-7.66)	7.80±0.05 (7.75-7.84)	7.4±0.2 (7.4-7.8)	6.507±0.113 (6.13-6.74)
Mandible length	14.00±0.14 (13.9-14.1)	13.9±0.2 (13.7-14.1)	13.85±0.07 (13.77 -13.89)	11.304±0.166 (11.00-11.60)
Anterior palatal width	5.01±1.55 (3.91-6.1)	-	-	-
Posterior palatal width	5.83±0.38 (5.56-6.1)	-	-	-

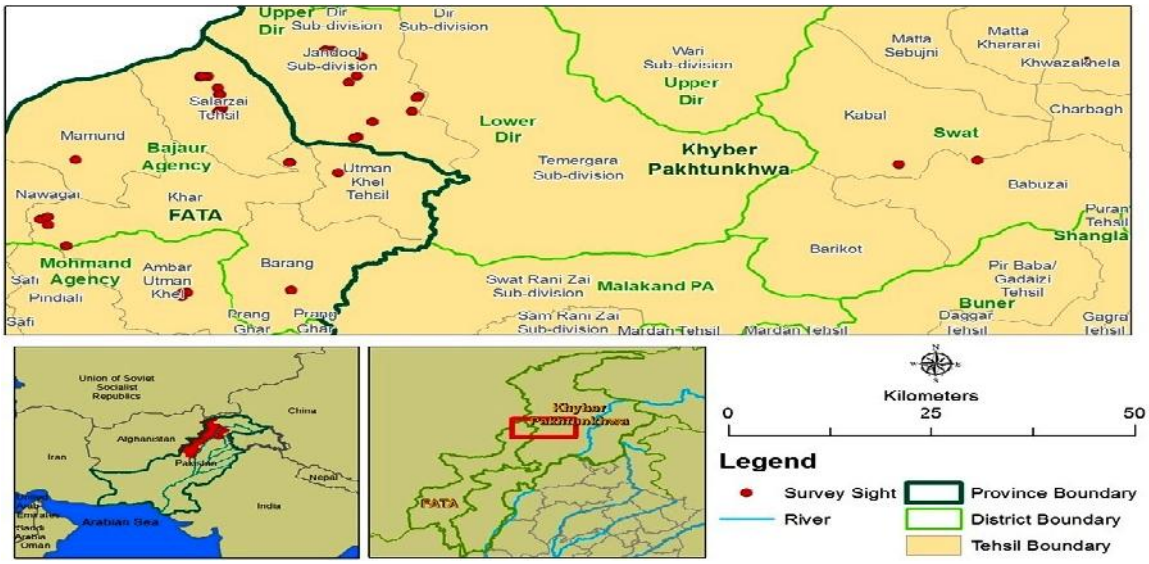

Figure 1. Map of the study area.

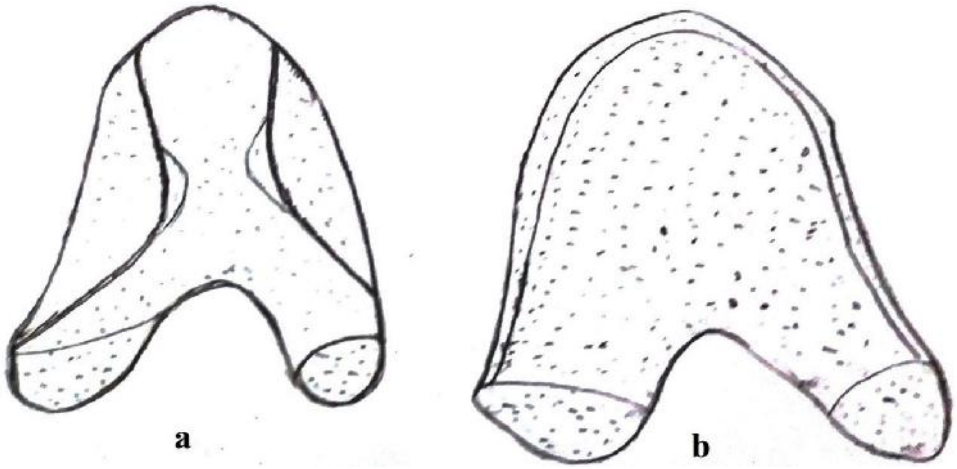

Figure 2. Dorsal (a) and ventral (b) view of the baculum of *Myotis formosus* captured from Bajaur agency, FATA.

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