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Original Article

First provincial record of desert yellow bat *Scotoecus pallidus* (Dobson, 1876) from Khyber Pakhtunkhwa, Pakistan

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Abstract
A two year survey extending from June 2010 through May 2012 was conducted in Malakand, Dir and Swat districts in Malakand division, Khyber Pakhtunkhwa (KPK). Twenty two desert yellow bat (*Scotoecus pallidus*) specimens were captured using mist and hand nets. The morphological features of the captured specimens were compared with available literature. This paper documents first record of *S. pallidus* from Khyber Pakhtunkhwa.
Key words: Morphometrics, *Scotoecus pallidus*, Lahore, Malakand

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INTRODUCTION

The genus *Scotoecus* is represented by two African species and has distribution ranges from Senegal to Ethiopia south to Angola and Mozambique (Hill, 1974). Only one species, the *Scotoecus pallidus*is reported from Pakistan and India (Koopman, 1993; Roberts, 1997; Bates and Harrison, 1997). In Pakistan, the species was reported by Dobson in 1876 for the first time from Mir Pur near Lahore. Specimens were further collected from Kashmor, Mirpur, Naundero (Wroughton, 1916), Khairpur Nathan Shah in Sindh (Siddiqi, 1961) and Mian Mir, Muzaffargarh, Sialkot (USNM; Bates and Harrison, 1997), Hafizabad, Mandi Bhauddin and Gujranwala districts (Shahbaz *et al*., 2015) in Punjab province. Roberts (1997) collected sixteen specimens of *S. pallidus* from Sindh and Punjab. Average head and body length of the captured specimens was 54 mm, tail length 37 mm, hind foot length 8 mm and ear length 13 mm.

Although, *S. pallidus*is an endemic species to the Indian subcontinent, the population status of the species is still unknown. The species is declining due to habitat loss, threats from introduced species and urbanization (Molur *et al*., 2002). Proper monitoring and research can help in conservation of bat species (Meyer *et al*., 2010). Prior to present survey, *S. pallidus* has never been reported from Khyber Pakhtunkhwa (KPK), Pakistan. The present survey was therefore planned to ascertain the presence or absence of the species from Malakand division in KPK.

MATERIALS AND METHODS

Study area

Present survey extending from June 2010 through May 2012 was conducted in Malakand, Swat and Dir districts in Malakand division, KPK. Division Malakand is famous for its valleys and elevated tops (ranging from 500m to 2500 m) in the Himalayan and Hindukush mountains. The diverse ecological zones comprising of extensive agricultural lands, dry and icy mild valleys provide habitats to a variety of animal species. Peach, apple, persimmon, walnut, citrus, pear, plum and apricot are the common fruit trees in the study areas. The cultivated vegetables include onion, tomato, potato, peas, okra, cucurbits, radish, pepper,

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turnips and verdant while maize, wheat and rice are amongst the common cereal crops. River Swat flows through Malakand and Charsadda districts and finally joins Kabul River (Ali *et al*., 2013).

Sampling strategy

The croplands, ranches, precipitous holes, old structures, abandoned wells, ruins, houses, under tree bark, crevices, old scaffolds, water channels and under bridges were searched to assess the occurrence of *Scotoecus pallidus* in the study area. Information regarding possible bat roosts was also collected from the local people of the study area. Once located, the GPS coordinates of the location were recorded through GPS. The specimens were captured from the study area through hand and mist nets following Javid *et al*. (2011).

Morphological measurements

The captured specimens were weighed through Pesola balance 10050, Swiss made up to 0.1 g accuracy and their external body parameters were recorded following Bates and Harrison (1997). Skull and bacula of captured *S. pallidus* were processed and measured according to Bates *et al*. (2005) and Javid *et al.* (2011) while external features of the bat specimens were noted with vernier calipers measuring up to 0.01mm accuracy and these measurements were compared with Roberts (1997), Bates and Harrison (1997) and Shahbaz *et al*. (2015).

RESULTS AND DISCUSSION

During present survey, twenty two *Scotoecus pallidus* specimens were captured through mist and hand nets from Manzaray Baba (N34º 29.480′ E71º 42.353′), Dir (N35º 12.327′ E71º 52.540′), Jrandy (N34º 24.808′ E71º 48.202′), KozKoper (N34º 24.399′ E71º 50.171′), Mola Misray (N34º 25.251′ E71º 49.085′), Astanadaro Kalay (N34º 24.913′ E71º 49.466′), Malakand Top (N34º 34.007′ E71º 55.736′), Badraga (N34º 23.314′ E71º 50.295′), Head Koper (N34º 24.454′ E71º 50.061′), Pull Saokai (N34º 38.553′ E72º 01.749′), Qadar Kalay (N34º 24.076′ E71º 50.723′), Kot (N34º 29.778′ E71º 43.501′), Fishing Hut (N34º 38.900′ E72º 01.941′) and Matkani (N34º 37.380′ E71º 51.055′). Fig. 1 shows new distribution map of the species from Pakistan. The external body, cranial and bacular measurements of the captured *S. pallidus* were recorded and compared with Roberts (1997), Bates and Harrison (1997) and Shahbaz *et al*. (2015).

The wing and tail membranes of the captured specimens were grey brown while the belly fur was pale in color. The ears were square in outline; the tragus was curving backward with anterior intended and near half of the ear pinna height. Similar findings have been documented by Roberts (1997).The external body measurements of the captured specimens (Table I) are aligned with Roberts (1997), Bates and Harrison (1997) and Shahbaz *et al*. (2015).

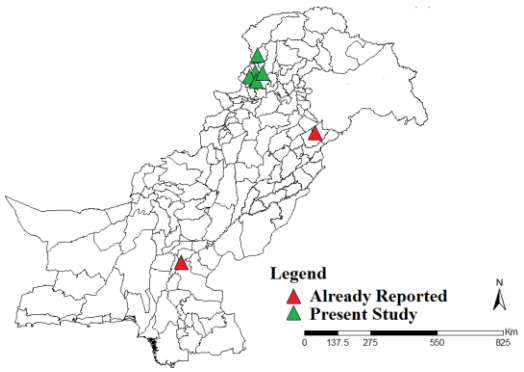

Figure 1: Distribution map of the lesser yellow house bat *Scotoecus pallidus* in Pakistan showing it as new record from Malakand.

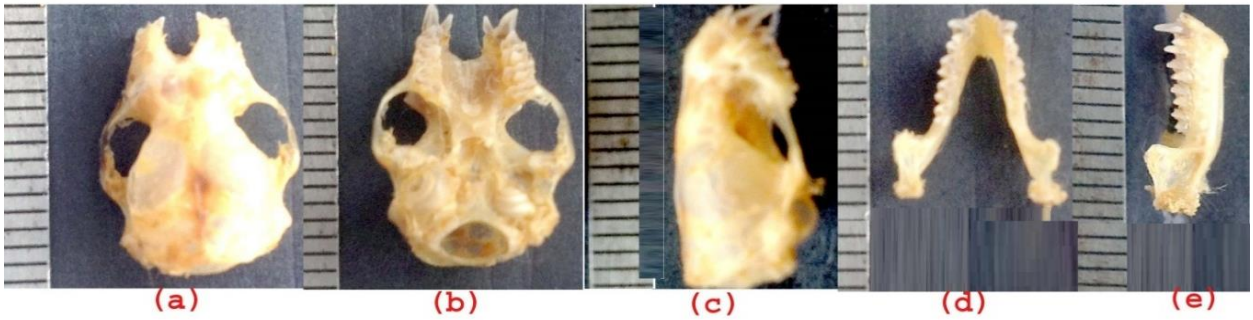

Figure 2: Dorsal (a), ventral (b) and lateral (c) view of the skull of *Scotoecuspallidus* captured from Malakand, KPK. The dorsal (d) and lateral (e) view of the lower jaw.

Table I: Comparison of mean±SD (range) body mass (g) and external body measurements (mm) of *Scotoecus pallidus* specimens captured from different localities in Malakand division, KPK with available.

Body Parameters	Bates and Harrison, 1997	Roberts, 1997	Shahbaz *et al*. (2015).	Present Study
Body mass	-	-	11.5 (9-14.3)	11.66±1.53 (9.10-14.40)
Head and body length	52.8±2.5 (50.0-58.0)	54 (50-59)	55.9 (47-59)	55.97±1.41 (53.33-58.00)
Ear length	12.0-15.0	13	11.2 (9-13.5)	12.98±0.76 (12.01-14.30)
Tragus height	-	-	4.2(3.4-4.8)	5.71±0.45 (5.01-6.01)
Forearm length	36.2±0.9 (34.1-37.3)	-	37(34-39.5)	36.83±0.42 (36.01-37.20)
Thumb with claw	-	-	-	6.26±0.41 (6.01-7.00)
Length of 2nd metacarpal	-	-	-	33.26±0.90 (32.00-35.00)
1st phalanx on 2nd metacarpal	-	-	-	2.78±0.41 (2.01-3.00)
2nd phalanx on 2nd metacarpal	-	-	-	9.12±0.75 (7.12-10.00)
Length of 3rd metacarpal	34.6±1.0 (33.5-36.0)	-	35.2(34-39)	34.97±0.50 (34.11-36.00)
1st phalanx on 3rdmetacarpal	-	-	12(7-13)	11.49±0.50 (11.01-12.10)
2nd phalanx on 3rdmetacarpal	-	-	10(6.1-11)	9.79±0.39 (9.03-10.00)
3rd phalanx on 3rd metacarpal	-	-	-	8.10±0.77 (6.08-10.00)
Length of 4th metacarpal	34.2±0.9 (32.8-35.4)	-	34.7(31-38.5)	34.72±0.44 (34.01-35.11)
1st phalanx on 4th metacarpal	-	-	11.3(10.2-12.5)	10.79±0.49 (9.51-11.22)
2nd phalanx on 4thmetacarpal	-	-	8.98(7-10.7)	10.07±0.48 (9.51-11.00)
Length of 5th metacarpal	33.7±0.8 (32.6-34.9)	-	34.3(33.2-35.4)	34.07±0.06 (34.01-34.20)
1st phalanx on 5th metacarpal	-	-	9.3(5.8-11.5)	8.71±0.44 (8.01-9.02)
2nd phalanx on 5th metacarpal	-	-	-	5.96±0.54 (5.02-7.00)
Wingspan	-	-	25(21.6-32.8)	247.32±13.01 (217.00-264.00)
Tibia length	-	-	13.3(8.5-15)	13.91±0.68 (12.00-15.00)
Calcar length	-	-	5.7(3.5-8)	11.09±1.31 (9.00-14.00)
Hind foot length	8.3±1.4 (6.0-10.0)	8	9.5(7.5-11)	8.27±0.63 (7.01-10.00)
Tail length	36.9±2.2 (34.0-41.0)	37 (31-41)	33.2(27.2-38)	34.14±0.21 (34.00-35.00)

The skulls of the captured specimens were robust with small postorbital processes. The upper jaw contained one pair of incisors, zygomatic arch was very delicate. Palate anterior emargination was wide and U-shaped; the post palatal extension was narrow with a small, delicate, palatal spine (Fig. 2). These features were similar as described by Bates and Harrison (1997) and Shahbaz *et al*. (2015).

The average condylo-canine length of the *S. pallidus* specimens captured during present study was 14.24±0.26 mm, maxillary toothrow length5.66±0.10 mm, mandibular toothrow length6.11±0.12 mm, greatest length of skull15.00±0.26 mm, mandible length11.35±0.23 mm, posterior palatal width6.85±0.17 mm, zygomatic breadth10.51±0.01 mm, breadth of braincase7.90±0.22 mm, postorbital constriction 4.46±0.09 mm and anterior palatal width was 5.28±0.13 mm. These measurements matched findings of Bates and Harrison (1997) and Shahbaz *et al*. (2015)(Table II).

The penis of the male specimens (n = 15) captured during present study were enlarged with a long narrow shaft, a small bifid tip and a bilobate base. Total baculum length of male *S. pallidus* specimens was 4.65±0.17 mm and the length of shaft was 4.14±0.35 mm. The proximal branch length was 0.13±0.12 mm, proximal branch width0.41±0.02 mm, baculum height1.31±0.08 mm, distal branch length 0.24±0.24 mm and distal branch width were recorded 0.77±0.19. Similar bacular

measurements have been documented by Shahbaz *et al*. (2015) (Table II).

This paper documents first record of *S. pallidus* from Khyber Pakhtunkhwa from where the species was not reported prior to the present study indicating range extension. The species is considered local having restricted distribution range and has not been reported from Iran and Afghanistan. However, it can be recorded from sub-tropical latitudes and semi-desert habitats.

Table II: Comparison of mean±SD (range) cranial and bacular measurements (mm) of *Scotoecus pallidus* specimens captured from different localities in Malakand division with available literature.

Cranial Parameters	Present study	Bates and Harrison, 1997	Shahbaz *et al*. (2015)
Condylo-basal length	14.24±0.26 (13.83-14.68)	14.1±0.3 (13.8-14.8)	14.3(13.7-15.2)
Maxillary toothrow length	5.66±0.10 (5.50-5.86)	5.6±0.2 (5.5-5.9)	4.9(4.2-5.5)
Mandibular toothrow length	6.11±0.12 (5.91-6.34)	6.1±0.2 (5.9-6.4)	5.4(4.8-5.7)
Greatest length of skull	15.00±0.26 (14.53-15.43)	15.1±0.5(14.5-16.1)	14.8(14.3-15.2)
Mandible length	11.35±0.23 (10.94-11.87)	11.4±0.3 (10.9-12.0)	10.8(10.3-11.2)
Posterior palatal width	6.85±0.17 (6.60-7.19)	6.9±0.2 (6.6-7.2)	6.0(5.3-6.4)
Zygomatic breadth	10.51±0.01 (10.50-10.54)	10.5± - (10.5-10.5)	10.1(9.8-10.4)
Breadth of braincase	7.90±0.22 (7.54-8.20)	7.7±0.2 (7.5-8.2)	7.2(6.4-8.0)
Postorbital constriction	4.46±0.09 (4.25-4.69)	4.3±0.1 (4.2-4.5)	4.3(3.9-4.8)
Anterior palatal width	5.28±0.13 (5.03-5.49)	-	4.5(4.2-4.7)
Bacular Parameters	**Mean± SD (n=15)**	**-**	
Total baculum length	4.65±0.17 (4.35-5.10)	-	4.9(4.7-5.2)
Shaft length	4.14±0.35 (3.55-4.70)	-	4.1(3.6-4.7)
Proximal branch length	0.13±0.12 (0.02-0.30)	-	0.5(0.46-0.7)
Distal branch length	0.24±0.24 (0.01-0.63)	-	0.4(0.34-0.4)
Proximal branch Width	0.41±0.02 (0.38-0.43)	-	1.2(0.8-1.7
Distal branch width	0.77±0.19 (0.40-1.00)	-	0.5(0.47-0.53)
Width of middle extreme	0.36±0.04 (0.30-0.43)	-	-
Width of distal extreme	0.97±0.03 (0.93-1.00)	-	-
Baculum height	1.31±0.08 (1.13-1.45)	-	0.5(0.4-0.6)

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