

## Short Communications

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### **The Common Bronzeback Tree Snake, *Dendrelaphis tristis* (Daudin, 1803): An Addition to the Herpetofauna of Pakistan**

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**Abstract.-** The common bronzeback tree snake *Dendrelaphis tristis* is reported from the hilly terrain of Margalla Hills National Park, Islamabad. This represents the first well documented record of this species from Pakistan. The status of one specimen housed in the Natural History Museum, London purportedly collected in Pakistan in 1860 is discussed.

**Keywords:** *Dendrelaphis tristis*, new record, Colubridae, Himalayan foothills, Margalla Hills.

The genus *Dendrelaphis* Boulenger, 1890 (Colubridae) is widely distributed, from Pakistan westward to the northern and eastern coasts of Australia and northward into southern China (Ziegler and Vogel, 1999). Members of the genus *Dendrelaphis* are slender, diurnal species that are predominantly arboreal, feeding mainly on lizards and amphibians. The common bronzeback tree snake, *Dendrelaphis tristis* (Daudin, 1803), ranges from Sri Lanka northward through most of India to Myanmar and Nepal (Van Rooijen and Vogel, 2008).

A single specimen housed in the Natural History Museum, London (BMNH 60.3.19.1441) is purportedly from Sindh Province, Pakistan. It is part of a large Indian collection made by the Schlagintweit brothers and presented to the British Museum in 1860 (Boulenger, 1894). It is an adult female with 185 ventrals, 127 subcaudals, and other scale counts typical of *Dendrelaphis tristis*. The

handwritten label is almost illegible, but appears to read "Sabzil Kot", Sindh, close to the mouth of the river.' Minton (1966) was unable to find this locality on any map. Jeremie A. Anderson and his collectors made special efforts to find this snake in oases in the Thar Desert, but were unsuccessful (Minton, 1966). The species is, however, reported from Shoolpaneshwar, Vansda and Purna Wildlife Sanctuaries, Gujarat, India bordering east of Sindh Province (Vyas, 2000, 2004, 2007, 2011).

Extensive surveys by staff of Pakistan Museum of Natural History in different parts of Cholistan and the Thar deserts also failed to find this species (Baig *et al.*, 2008: Masroor, unpublished).

#### *Materials and methods*

During recent extensive herpetological surveys of the Margalla Hills National Park, Islamabad (Masroor, unpublished), two unidentified dead specimens were collected and then deep-frozen, both on trail # 5 (Fig. 1), in 2008 (33° 45' 30.33" N, 73° 04' 51.99" E) and 2010 (33° 44' 47.27" N, 73° 05' 10.67" E) by Z. B. Mirza and Shadmeena Khanum, respectively. The author received two images of live snakes by Ghulam Rasool in 2010 taken from the Rawal lake. The images were identified as that of *Dendrelaphis tristis* and hence it necessitated a search for this little known species. The trail originates at the Margalla Road and runs for about 5km, terminating at the village near Murad Gali on Pir Sohawa Road. This junction is at least a 2-3 km walk from the Capital Viewpoint Restaurant. The trail is narrow and gradually ascends the hill.

These specimens were taken to Pakistan Museum of Natural History (PMNH) for preservation and examination and catalogued as PMNH Nos. 2245 and 2248. Absolute formalin was injected into their bodies (including the tail) and the specimens are permanently stored in 40% formalin solution. The heads of both specimens were badly mutilated. Various measurements were taken with a digital caliper to the nearest 0.1 mm and shown in Table I. Features of scalation and their counts were examined using a stereo dissecting microscope (Table I).

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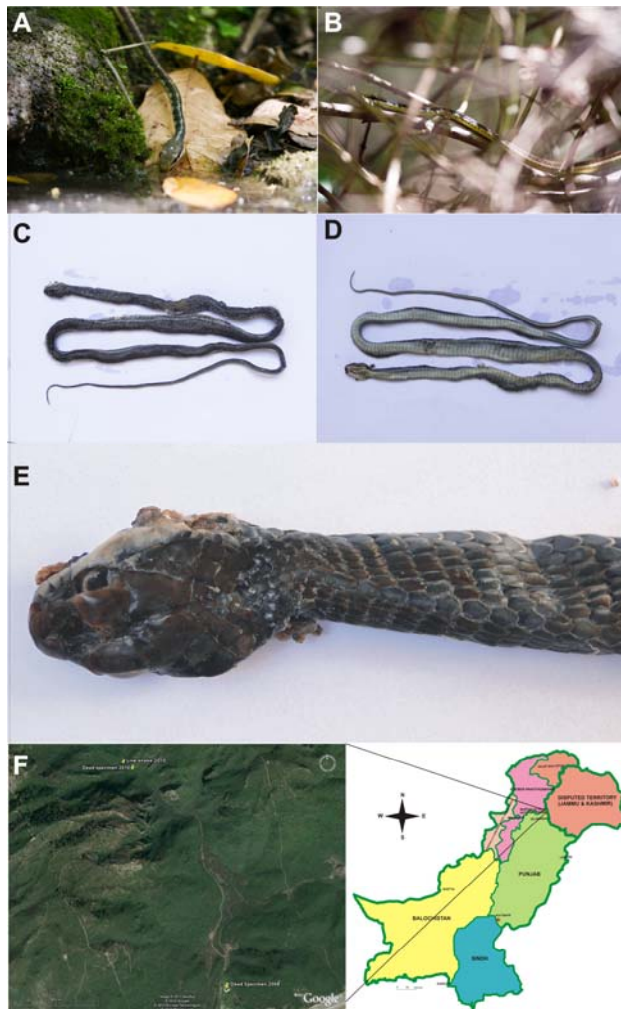


Fig. 1. A, A live specimen of *Dendrelaphis tristis* from Rawal Lake at water's edge, photo credit to Ghulam Rasool; B, Live *Dendrelaphis tristis* moving in thick vegetation in Rawal Lake, photo credit to Ghulam Rasool; C, dorsal view of specimen PMNH No. 2245; D, ventral view of specimen PMNH No. 2245; E, dorsal view of head of PMNH No. 2245 showing the interparietal spot; F, Distribution map showing the collection localities for *Dendrelaphis tristis* in Pakistan.

### Results and discussion

In my search for the possible collection locality for the 1860 specimen (BMNH), I found two localities that are interchangeably used, namely Sabzal Kot and Kot Sabzal, both in Punjab Province. Sabzal Kot is a small village, at an elevation of about 159 m above sea level, 50 km

towards the northwest of Rajanpur District, far from the western flank of the Indus River (29° 08' 58.49" N, 69° 59' 00.99" E). This area is harsh, arid land with sparse vegetation, drained by several seasonal streams and nalas, mainly Chhezgi Nala. This

Table I.- Data of *Dendrelaphis tristis* (All measurements are in mm.)

Characters	PMNH 2445	PMNH 2448
Head measurements		
OD	4.9	4.8
HL	24	26
TL	390	416
SVL	827	840
VS	196	198
Features of scalation		
SC	139	136
DS1	15	15
DS2	15	15
DS3	11	11
ISL	4-4	4-4
SL1	9-9	9-9
SL2	2-2	2-2
LR	2-2	2-2
IL	10-9	10-9
TP	6-5	5-5
PO	2-2	2-2
Coloration		
VRS	0	0
IPS	2	2
POS	0	0
VLS	1	1

SVL, snout-vent length from tip of snout to vent; TL, tail length from vent to tip of tail; HL, head length distance between retroarticular process of jaw and snout tip, OD, orbital diameter, horizontal.

The following counts were taken: number of ventrals (VS), number of subcaudals (SC), number of dorsals 1-head length behind the head (DS1), number of dorsals at the position of middle ventral (DS2), number of dorsals 1-head length before the tail (DS3), number of infralabials touched by the first sublabial (ISL), number of supralabials (Left + Right) (SL1), number of supralabials touching the eyes (Left + Right) (SL2), number of loreals (Left + Right) (LR), number of infralabials (Left + Right) (IL), number of temporals (Left + Right) (TP), number of postoculars (Left + Right) (PO), number of supralabials (Left + Right) (SL).

Vertebral scales smaller than (0) or larger than (1) scales of the first dorsal (VRS); interparietal spot absent (0), rudimentary (1), present (2) (IPS); postocular stripe absent (0), rudimentary (1), present (2) (POS); ventrolateral stripe absent (0), present (1) (VLS)

virtually barren land is not suitable habitat for *Dendrolaphis tristis*. Therefore, I suggest that this BMNH specimen was not collected at this locality. The second locality Kot Sabzal (sometimes referred to as Sabzal Kot), is a small town in Bahawalpur District lying on the border of Punjab and Sindh provinces along the eastern bank of Indus River at an elevation of 74 m above sea level (28° 12' 52.55" N, 69° 53' 44.85" E). Ecologically, the area is an agricultural plain with a minor representation of xeric habitats towards its eastern border. Recent floods in 2010 washed over about 65% of the Kot Sabzal Game Reserve, which stretches over a length of about 110 km. The game reserve provides habitat to the houbara bustard (*Chlamydotis undulata macqueenii*) and the other wildlife species (Khan *et al.*, 2010). The area is devoid of forestation and thick bushes. Most of the original habitats have been severely altered in recent years for extensive agricultural practices. This may be the locality from which the BMNH specimen of *Dendrelaphis tristis* was collected.

The specimens in the Margalla Hills were assigned to *Dendrelaphis tristis* by the combination of characters (Table-I) : (1) vertebral scales enlarged, but smaller than dorsals of the first row; (2) 196-198 ventrals; (3) 136-139 divided subcaudals; (4) 15 dorsal scale rows at midbody; (5) anal shield divided; (6) 2 supralabials touching the eye; (7) a short first sublabial that touches 2 infralabials; (8) 5 to 6 temporal scales on each side; (9) 2 postoculars; (10) maximum total length 1256.0 mm; (11) TL/Total length 0.32-0.33; (12) a bright interparietal spot; (13) the presence of a light ventrolateral stripe; (14) ventrals with lateral keel and notch on each side corresponding to a keel (Table I). The ventrals and subcaudals of this species ranges between 178-198 and 121-136, respectively (Rooijen and Vogel, 2008). It is also noted that these specimens have the highest ventrals and subcaudal counts for the species.

The specimens are bronzy-brown or purplish brown above, light grey, greenish, or yellow ventrally; a more or less distinct buff to yellow stripe along scale rows 1-2, edged or spotted with black; an indistinct black temporal stripe extending onto the neck, where it may break up into vertical bars; vertebral scales on neck and anterior part of

the body sometimes yellow; upper lip yellow, the eye often edged with the same color; yellow along the ventral margin, sometimes with black speckles.

The species is found usually in twiggy bushes or trees with small braches and twigs; at the forest edges, often in hilly country to 1700 m (Kramer, 1977). It is timid, shy, and does not bite readily (Wall, 1910). It may often remain stationary in branches where it is extremely difficult to see.

However, it is very quick when attempting to escape it is a very swift snake on both the ground and in trees. It is often found in tree holes and among branches as high as 8 m above the ground (Wall, 1910).

*Dendrelaphis tristis* feeds on lizards (agamids, geckos and scincids), bird eggs, toads and frogs, sometimes even small snakes; the young apparently feed on grasshoppers (Wall, 1910).

Some of the amphibian and reptile species that are found sympatrically with *Dendrelaphis tristis* in the Margalla Hills National Park include *Duttaphrynus stomaticus*, *Duttaphrynus melanostictus*, *Hoplobatrachus tigerinus*, *Euphlyctis cyanophlyctis*, *Calotes versicolor farooqi*, *Laudakia agorensis*, *Hemidactylus flaviviridis*, *Hemidactylus brookii*, *Cyrtopodion scabrum*, *Eutropis dissimilis*, *Typhlops porrectus*, *Boiga trigonata*, *Psammophis schokari*, *Ptyas mucosus*, *Spalerosophis atriceps*, *Xenochrophis piscator*, *Bungarus caeruleus*, *Naja naja*, *Naja oxiana*, *Echis carinatus sochureki*, and *Daboia russelii*.

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## Is Mammalian Hair Fiber Analysis by Optical Fiber Diameter Analyzer Helpful to Identify Prey from Scats of Carnivores?

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**Abstract.** Mammalian hair characteristics have been extensively studied for prey identification in carnivore scats. In this study we compared the results observed by manual microscopy and the results obtained by optical fiber diameter analyzer (OFDA). In manual microscopic methods we determined the medullary pattern, hair width and medulla width to identify the prey species in scats, while average fiber diameter, diameter distribution and percent medullation was measured by OFDA. Comparisons of 1000 hair fibers of each of nine mammalian prey species with the hair fibers isolated from 73 scats of three carnivores were made by OFDA. In manual identification

error rate was zero while it was 1.4% in case of OFDA.

**Keywords:** Hair fibre diameter, medullation, scat of carnivore.

Efforts to develop more accurate, efficient and rapid methods of hair fiber diameter measurement are extensively worked out (Qi *et al.*, 1994). In past the optical fiber diameter analyzer (OFDA) has been used for measurement of hair fiber characteristics of sheep, goat, rabbit and wild muskoxen (Qi *et al.*, 1994; Rowell *et al.*, 2001; Rafat *et al.*, 2007).

OFDA is based on automatic image analysis technology and was introduced to provide a rapid, accurate measurement of average fiber diameter (AFD) and diameter distribution (SD) of fibers. The OFDA is a novel comparison method that is time-saving, inexpensive, and more precise than the existing manual microscopic hair fiber analyses (Lupton and Pfeiffer, 1998).

Hair fiber parameters from unknown source can be detected with the help of reference measurement values and could be used for the identification of prey hairs in the scats of mammals. In this study OFDA technique was used to obtain useful information about hair fibers of different mammalian species considered as reference and the prey hair fibers isolated from scats. Usefulness of this technique in wildlife comparison studies was also assessed.

### Materials and methods

Analyses of hair fibers of 9 mammal species viz. domestic sheep (*Ovis aries*), domestic goat (*Capra hircus*), Siberian ibex (*Capra sibirica*), markhor (*Capra falconeri*), marmot (*Marmota caudata*), pika (*Ochotona roylei*), ox/cow (*Bos taurus*), zo/zomo and yak (*Bos grunniens*) were carried out (Fig. 1). One thousand hair fibers were analyzed for each reference collection and the results were compared with hair fibers obtained from 42 scats of snow leopard, 21 scats of fox and 10 scats of gray wolf. Hair reference key of all potential snow leopard preys including domestic animals were made from representative hairs collected from various sources, including museum specimens, skins owned by villagers, and through

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Fig. 1. Hair fibers of ibex (*Capra sibirica*) during analysis by optical fiber diameter analyzer.

field collection of small mammals. Initially scat contents were manually identified on the basis of guard hair characteristics such as medullary pattern, hair width and medulla width by comparing it with reference key. After manual microscopic analyses, the hair fiber diameter as well as medullation (MD) in fibers was measured using latest computer aided OFDA. MD describes the hollow or partially hollow core in the animal fibers and in this paper it has been represented as a percent of fiber diameter. Standard procedure provided in manual of OFDA-38 was adopted for sample preparation and its analysis. Sample consisted of short lengths of fiber called snippets. Cutting of bulk sample into the snippets (2 mm pieces of fiber) was done by punching of cleaned staples with two sharp parallel blades. The snippets were then washed with ether by using a mesh with a size of 50  $\mu\text{m}$ . After washing snippets were oven dried at approximately 60°C and dropped into the spreader. To prepare slides for the analysis a slide was placed under the spreader and a small pinch of hair fibers were dropped into the spreader. As the fibers were spread on the glass slide, it was ready for the analysis by OFDA-38. Same procedure was used for each sample (Browne and Hindson, 1982). This analysis was carried out in Small Ruminant Research Laboratory of National Agriculture Research Center, Islamabad.

### Results

Prey items found in the scats were investigated after a careful comparison of hair characteristics viz., cuticular scale patterns, cross sections and medulla patterns, with the help of the reference photographic key by manual microscopy. Prey species identified by manual microscopic observations were then compared with the results obtained by OFDA. For this purpose a key was developed, based on the measurement values of AFD and MD of fibers from 9 species, by using OFDA (Table I). Same OFDA process was repeated for 73 scat samples which contained hair fibers of unknown prey species (Figs. 2, 3). It was observed that the accuracy of manual microscopy method was 100%, while in the case of OFDA 1.4% error was recorded.

Table I.— OFDA measurements for known mammalian species (Reference key).

Species	Diameter ( $\mu$ ) (n=1000)	Medullation (%)
<b>Large mammals</b>		
Domestic sheep ( <i>Ovis aries</i> )	29.29 $\pm$ 19.32 <sup>a</sup>	09%
Domestic goat ( <i>Capra hircus</i> )	81.18 $\pm$ 30.68	79%
Siberian ibex ( <i>Capra sibirica</i> )	53.03 $\pm$ 45.94	52%
Markhor ( <i>Capra falconeri</i> )	86.88 $\pm$ 51.44	75%
<b>Small mammals</b>		
Marmot ( <i>Marmota caudata</i> )	47.69 $\pm$ 17.89	73%
Pika ( <i>Ochotona roylei</i> )	20.61 $\pm$ 11.35	36%
<b>Probable scavenging</b>		
Ox/cow ( <i>Bos taurus</i> )	56.24 $\pm$ 16.80	78%
Zo/zomo*	53.77 $\pm$ 18.56	95%
Yak ( <i>Bos grunniens</i> )	68.80 $\pm$ 24.90	80%

<sup>a</sup>Mean $\pm$ SD

\*Yak and Cow F<sub>1</sub> cross breeds from Basha valley Shigar, Pakistan

### Discussion and Conclusions

Hair present in fecal matter of carnivore predators are useful investigating tools to know about the mammalian preys that figure in their diets. There are number of problems linked with this

method (Brunner and Coman, 1974). These include variation in hair types on the same individual, different scale patterns along the length of an individual hair, some hair characteristics overlap between species and cross breeds. The hair characteristics of the yak, cow and their cross breed tend to overlap between them.

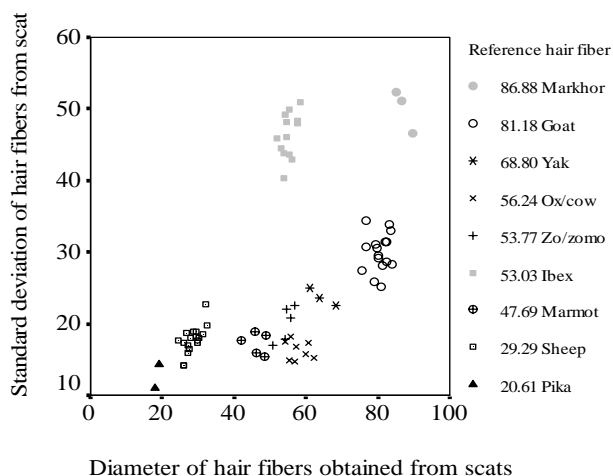


Fig. 2. Diameter distribution (SD) and the diameter of hair fibers isolated from 73 scats compared with the fiber diameters of known species.

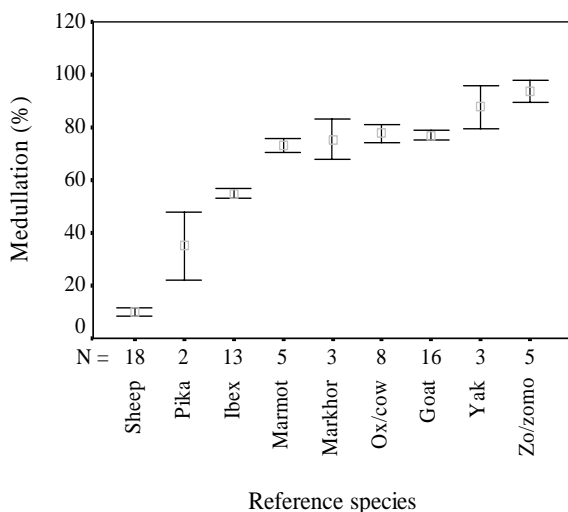


Fig. 3. Percent medullation for 95% CI of unknown fibers. 'N' represents number of scat samples in which fibers of given species were found.

OFDA instrument has been widely used for studying not only wool quality parameters but also provide useful information about hair fibers of different animal species. No literature exists about such type of hair fiber comparisons in which hair fibers obtained from unknown source are identified on the basis of fiber characteristics by matching them with the hair fibers of known origin.

Although instrument provides useful information regarding different hair fiber characteristics however, it has been found that it is not fully supportive for the comparison studies. Because sometimes enough quantity of fibers cannot be obtained from scats to analyze by OFDA and two different types of hair fibers found in a single scat can not be isolated merely on the basis of fiber characteristics. Therefore OFDA technique can be used successfully for the identification of unknown hairs from scats on limited scale; however the combination of both methods (manual and OFDA) could provide more authentic results.

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