Comparative Trichology of Common Wild Herbivores of India

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ABSTRACT

The current study was conducted to create markers for rapid identification of wild animals from hair samples. The study included four most common species of deer found in India i.e. mouse deer (Tragulus meminna), spotted deer (Axis axis), sambar (Cervus unicolor) and barking deer (Muntiacus muntjak); hair samples were collected from the neck, back and thigh region of the body. The differential microscopic anatomy was done on the basis of histological structures viz. cuticle, cortex, medulla and pigment granules. The specific variations were observed in present study as hair color (black, dark brown, light brown, white, yellow brown, white brown or yellow), cuticular margins (crenate, smooth, rippled), cortex color (brown, dark brown), medullary pattern (wide medulla lattice, narrow medulla lattice), pigment granules (black) and black and brown striations around the medulla. These characters were present in various combinations imparting a specific identity to each hair sample.

Key Words Comparative Trichology, Wild herbivores, Hair
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INTRODUCTION

Hair is chemically most stable than any other biological sample and its histological structures retain their uniqueness despite of processes like ageing, digestion and change in environment which is important for forensic investigations. The microanatomy of the hair from representative samples is detailed and characterized on its histological traits such as the cuticle, medulla, cortex, pigment granules, cortical fusi and others. The distribution and arrangement of these traits is important in the description of hair because of their variations along the length of the hair and also along different parts of the body [1, 2, 6, 7 and 9]. Every species has its own pattern which is characteristic [5]. Therefore, it is essential to combine all the characteristics, along with the external features, for identification of species [1]. The practical application of hair identification in biological and forensic sciences has been enumerated by several investigators [3, 10, 8 and 11]. Hair is one of the evidence to the forensic examiner which provides a foundation for its proper identification and comparison [4]. Hair identification is modern and excellent information which is simple and fast.

The present study was done to provide the investigators a rapid visual comparison for unknown hair samples with a series of photographs of actual microscopic field and detailed description of hair samples taken from known species.

3455

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MATERIALS AND METHODS

Hair samples included in this study belong to mouse deer (*Tragulus meminna*), spotted deer (*Axis axis*), sambar (*Cervus unicolor*), and barking deer (*Muntiacus muntjak*), collected from three different regions from the animal body that are neck, back and thigh. The samples were collected from the Wildlife Taxidermy Centre, Sanjay Gandhi National Park, Borivali, and Bombay Natural History Society, Mumbai. The samples were collected and stored in polythene bags. The whole mount of hair was carried out as described by Robertson and Atiken [7] for microscopic examination.

1. Place the hair in a small tube filled with equal volume of ether and absolute alcohol.
2. Shake to remove sebaceous matter and debris.
3. Clear in xylene, partially dry on filter paper and mount on DPX.

The slide was then observed under a magnification of 400X. The color of hair, cuticle pattern, cuticle color, cortex pattern, type of medulla and pigment distribution was observed and studied. Three different regions of the hair i.e. the proximal, medial and distal along with the cuticle pattern and medullary material were studied and classified along with their general shape and arrangement according to the classification by Brunner and Coman [6].

RESULTS AND DISCUSSION

In mouse deer (*Tragulus meminna*) and spotted deer (*Axis axis*) the hair color was white brown or yellow brown. In sambar (*Cervus unicolor*) the hair color was white brown, dark brown or black brown whereas in barking deer (*Muntiacus muntjak*) the hair color was white brown or brown. However it has been reported earlier [1] to be olive brown and white in mouse deer (*Tragulus meminna*), light brown and white in spotted deer (*Axis axis*), brown to very light brown in sambar (*Cervus unicolor*) and brown to light brown in barking deer (*Muntiacus muntjak*). Colour patterns are also vary with length of the hair, a previous study concludes [2] it to be white in the proximal region and changing to brown in the medial region in spotted deer (*Axis axis*) and in sambar (*Cervus unicolor*) it was almost pure white in the proximal region, gradually changing to yellowish gray in the medial region and the distal region is black.

The cuticular pattern was assessed by observing its margins, in mouse deer (*Tragulus meminna*) the cuticle had smooth margin except distally where it had crenate margins, these findings were similar to previous observation [1], the cuticle in spotted deer (*Axis axis*) had smooth margin, except distally in the hair of thigh region where the scales showed a crenate margin, whereas cuticle in sambar (*Cervus unicolor*) and barking deer (*Muntiacus muntjak*) showed rippled margin. However according to a previous study [1] in spotted deer (*Axis axis*) the scale margins were smooth, in sambar (*Cervus unicolor*) the scale margins were smooth in proximal region, rippled in medial region and crenate in the distal region and the scale margins in barking deer (*Muntiacus muntjak*) were smooth in the proximal and medial region, but crenate in the distal region. It has also been reported that in spotted deer (*Axis axis*) the scales are barely visible [2] whereas the scales in sambar (*Cervus unicolor*) were imbricate with plain edges in the proximal region and had plain borders in medial and distal region [2] (see photographs).

The cortex did not showed much variation among the studied species, in mouse deer (*Tragulus meminna*) it was brown in the proximal and medial aspect but dark brown with black striations in the distal region, in spotted deer (*Axis axis*), barking deer (*Muntiacus muntjak*) and sambar (*Cervus unicolor*) it was brown to dark brown with black and brown striations in the distal region, in spotted deer (*Axis axis*) and barking deer (*Muntiacus muntjak*) it was clear in the hair of the neck region with some black pigments in the proximal and medial region (see photographs).

The medulla in mouse deer (*Tragulus meminna*) and in the hair of thigh & back region of spotted deer (*Axis axis*) was wide lattice like in the proximal and medial region, however in the neck region spotted deer (*Axis axis*) it was narrow lattice like. Fragmentation, tapering in proximal and distal region and disruption in distal region in hair of thigh was more or less common in all studied species. The medulla in sambar (*Cervus unicolor*) and barking deer (*Muntiacus muntjak*) was wide lattice but it was thicker and barely visible in the distal region in sambar (*Cervus unicolor*), these observations are supported by previous reports [1], however Koppikar & Subnis [2] have reported the medullary pattern to be continuous in the proximal and medial regions and fragmented in the distal region in spotted deer (*Axis axis*) and reticular with polygonal appearance in the proximal and medial regions and not visible in the distal region in sambar (*Cervus unicolor*) (see photographs).

3456

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**PHOTOGRAPHS: Microscopic view of different hair samples of studied species.**

I. Spotted deer (*Axis axis*)
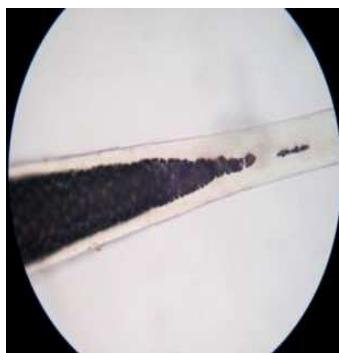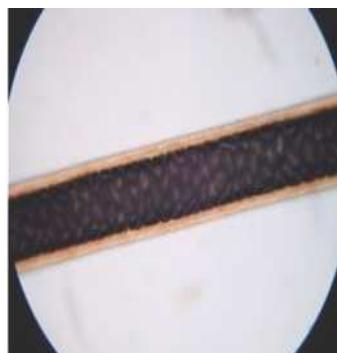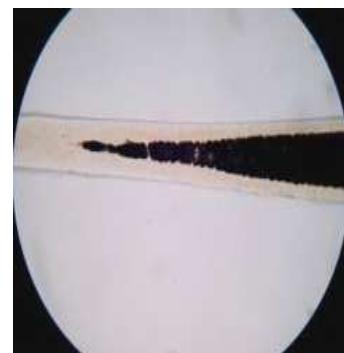
Proximal   **Medial**   **Distal**

II. Barking Deer (*Muntiacus muntjak*)
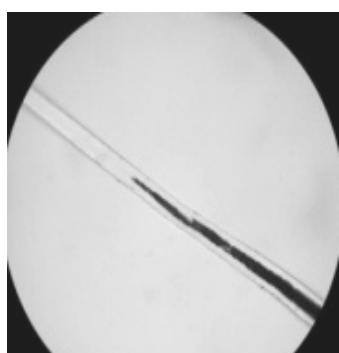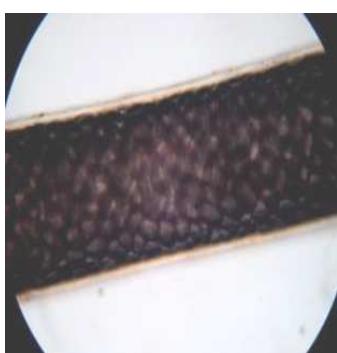
Proximal   **Medial**   **Distal**

III. Mouse Deer (*Tragulus meminna*)
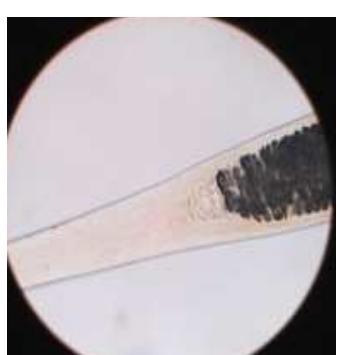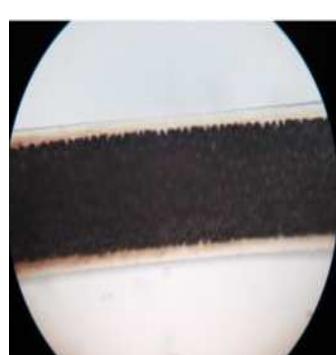
Proximal   **Medial**   **Distal**

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IV. Sambar Deer (*Cervus unicolor*)

| **Proximal** | **Medial** | **Distal** |
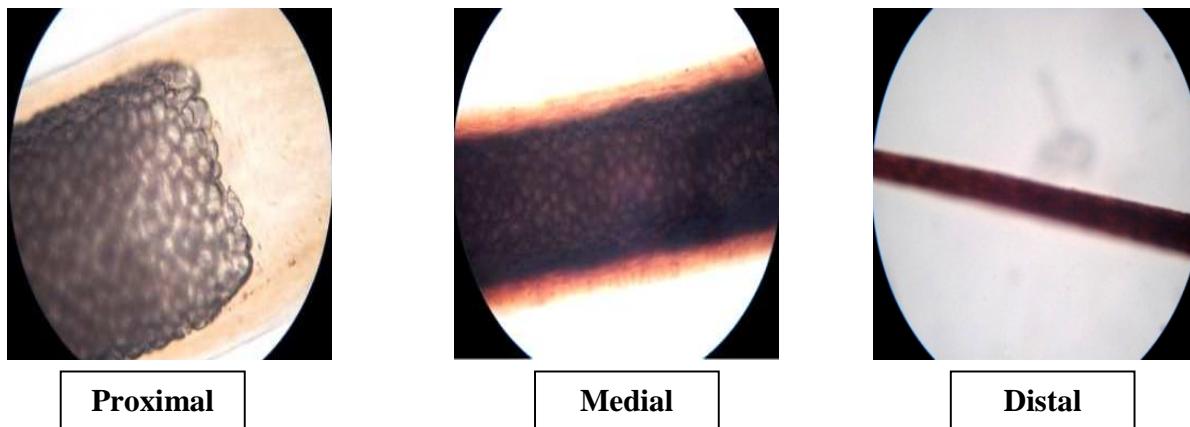
CONCLUSION

The current study was undertaken with the objective of developing rapid morphological markers for differentiation of species based on their hair pattern that can be used in forensic investigations. A considerable amount of variation was found in studied hair parameters between species as well as sometimes within species between different regions of body. Traits like colour & cuticular pattern showed a good variation within & between species but medullary pattern & cortex varied very less. These findings indicates that it is very hard to differentiate between related species based on any one trait of hair, instead all the characters must be considered, it also underscores a need to further investigate hair patterns in same & related species on a much larger scale, covering different geographical areas to document the variations within hair patterns, so that definitive markers could be established.

REFERENCES

[1] A. Bahuguna, V. Sahajpal, S.P. Goyal, S.K. Mukherjee, V. Thakur; Species Identification from Guard Hair of Selected Indian Mammals: A Reference Guide, Wildlife Institute of India, Dehradun, India, **2010**.
[2] B.R. Koppikar, J.H. Sabnis, *Journal of Bombay Natural History Society*, **1976**, 72(1), 5-20.
[3] C.R. Lesson, T. Lesson, A. Paparo; Textbook of Histology, 5th edition, W. B. Saunders Company, **1985**.
[4] D. Dedrick, S. Koch, *Forensic Science Communication*, **2004**, 6(1),
Accessed at-http://www.fbi.gov/hq/lab/fsc/backissu/jan2004/research/2004_01_research01b.htm.
[5] D.P. Kristen, *Forensic Sci. Communication*, **2005**, 7 (2), 1- 7.
[6] H. Brunner, B. Coman; The identification of mammalian hair. Shanghai Printing Press Ltd., Hong Kong, **1975**.
[7] J. Robertson, C.G. Atiken, *J. of Forensic Sci.*, **1986**, 31 (2), 563-573.
[8] J.K. De, S. Chakraborty, R. Chakraborti, *Mammalia*, **1998**, 62, 285-295.
[9] M.M. Houck, R.E. Bisbing, T.G. Watkins, R.P. Harmon, *Modern Microscopy Journal*, **2004**, Online-www.modernmicroscopy.com/main.asp?article=36.
[10] P.L. Kirk, J.I. Thornton; Crime Investigation, John Wiley & Sons Inc, New York, **1974.**
[11] R. Chakraborty, S. Chakraborty, J.K. De, *Mammalia*, **1999**, 65, 93-104.