



Identification of hairs of some mammalian prey of large cats in Gir Protected Area, India

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The Gir Protected Area (GPA) is spread over 1412km² in western India; where two top carnivore species coexist viz. the Asiatic Lion *Panthera leo persica* and Leopard *Panthera pardus*. GPA ranks amongst the top regions in supporting very high large carnivore densities in India. It is important to know the diet of these two sympatric cat species since both are apex predators and also of conservation importance. One of the best methods to determine the prey species of carnivores is scat analysis, since scats contain undigested matter of prey like hair, hooves, quills and feathers that can be used for identification (Joslin 1973; Johnsingh 1983; Norton et al. 1986; Sinha 1987; Chellam 1993; Mukherjee et al. 1994 a,b; Singh et al. 1999).

In the present work the hair structure of those animals

identified as the chief prey base of both the carnivores was studied (Dharaiya 2001; Dharaiya & Soni 2010). The practical applications of hair identification in biological and forensic sciences have been enumerated by several investigators (Brunner & Coman 1974; Koppikar & Sabnis 1976; Rajaram & Menon 1985). Hair identification is also useful in identifying a mammal inhabiting a den or a tree as well as in surveys (Dharaiya 2001). Hair remains also serve as evidence in convicting a law violator and is also useful in wildlife forensic cases where the legality of confiscated material can be determined (Soni et al. 2003). Though molecular tools are a far more reliable option for species confirmation this method is very easy and handy and hence applicable for preliminary investigations.

The purpose of this project is to provide a set of illustrations of the structure of mammalian hair that can be used to make visual comparisons with unknown hair samples. All the characteristics are tabulated. Major macroscopic and microscopic distinguishing characters of the hair of each species are given along with their drawings prepared from microphotographs, which can be used in routine monitoring activities by the forest field staff. They can also serve as a quick tool to study the diet and prey preference of these two large cats in the Gir ecosystem.

Methods: The hair samples of the prey species were collected from the Sakkarbaug Zoological Garden, Junagadh and from the Municipal Corporation Zoo, Rajkot. The hair samples were collected from the rump portion of the animal. The specimens were carefully washed in running water and air-dried. Cross sections were taken using a sharp blade and imprints were taken by placing hair specimens on thin gelatin layer or on a layer of Kores Correcting Fluid as described by Soni et al. (2003). The permanent mountings of hair cross sections were observed under a light binocular microscope under the magnification of 10X as well as 45X and microphotographs were taken at 45X magnification. All the measurements of hair length and width were taken using micrometer.

Results and Discussion: The structural parts of the hair are the cuticle, cortex and medulla. In the system of hair identification to be outlined only cuticular and medullary structure are important (Rajaram & Menon

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1975). Table 1 and 2 show all the structural details (macroscopic and microscopic) of the hair specimen of those animals, which are the chiefly consumed as food by the big carnivore species of the said protected area (Singh et al. 1999; Dharaiya 2001). Species identification through the hair cuticular patterns while studying diet can lead to misidentification because the cuticle is often damaged while passing through the gut of the predator. The identification criteria and the microphotographs presented here can serve as suitable reference for further confirmation and rapid identification of prey of carnivores (Chellam 1993; Singh et al. 1999; Dharaiya 2001). Regular monitoring of both large felids in Gir and their prey is a priority in management by the forest department; hence identification of hairs from scats may serve as a rapid, inexpensive and practical technique which would help the field staff as well as the researchers. Further, the photographs presented in this paper illustrate the microscopic appearance of the hair cross sections under 40X magnification, which can be used as a reference for further studies in monitoring carnivore feeding pattern and prey base identification.

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Table 1. Macroscopic characteristics of mammalian hair for rapid identification

	Animal Species	Macroscopic appearance of the hair			
		Colour		Length (cm)	Diameter (m)
		Proximal	Distal		
1	<i>Antelope cervicapra</i> (Black Buck)	White	Grayish	1.7±0.3	48
2	<i>Axis axis</i> (Chital)	White	Brown to Yellow	3±1.5	78
3	<i>Boselaphus tragocamelus</i> (Blue Bull)	Brownish	Yellowish	20±3	137
4	<i>Canis aureus</i> (Golden Jackal)	Brown	Black-Gray	5±1	90
5	<i>Rusa unicolor</i> (Sambar)	White	Yellowish	4±1.5	180
6	Domestic Buffalo	Black	Black	2.5±1	80
7	Domestic Cow	Darker	Lighter	1.2±0.3	35
8	Domestic Goat	Darker	Lighter	4 to 6	51
9	Domestic Sheep	White	Brownish	4 to 6	20
10	<i>Gazella gazella</i> (Chinkara)	Black	Grayish to White	16.5±1	52
11	<i>Lepus ruficaudatus</i> (Hare)	Dark brown	Light brown	2.9±0.3	10
12	<i>Mellivora capensis</i> (Ratel)	Brown/ White	Brown/White	4±0.5	55
13	<i>Panthera leo persica</i> (Asiatic Lion)	White	Yellow	3.1±0.1	40
14	<i>Panthera pardus</i> (Leopard)	Yellowish	White	4±1	45
15	<i>Semnopithecus</i> sp. (Langur)	Gray	Gray	6±0.2	58
16	<i>Viverricula indica</i> (Small Indian Civet)	Light gray	Dark gray	3±1.5	62
17	<i>Sus scrofa</i> (Wild Boar)	Dark brown	Brown	3.8±0.5	160

Table 2. Microscopic characteristics of mammalian hair for rapid identification

	Animal species	Microscopic appearance of the hair			
		Medullary structure	Cuticular scale structure		
			Margin	Pattern	Distance
1	<i>Antelope cervicapra</i> (Black Buck)	Curved	Crenate	Ir. Waved	Near
2	<i>Axis axis</i> (Chital) (Image 1)	Large oval	Smooth	R. Waved	Closed
3	<i>Boselaphus tragocamelus</i> (Blue Bull) (Image 2)	Large rounded	Crenate	Ir. Waved	Near
4	<i>Canis aureus</i> (Jackal)	Cigar	Scalloped	R. Waved	Distant
5	<i>Rusa unicolor</i> (Sambar) (Image 3)	Large oval	Smooth	R. Waved	Near
6	Domestic Buffalo (Image 4)	Large rounded	Crenate	R. Waved	Closed
7	Domestic Cow (Image 5)	Oval	Rippled	R. Waved	Closed
8	Domestic Goat (Image 6)	Cigar	Dentate	Diamond	Distant
9	Domestic Sheep (Image 7)	Irregular oval	Smooth	Ir. Waved	Closed
10	<i>Gazella gazella</i> (Chinkara) (Image 8)	Elliptical	Crenate	Ir. Waved	Near
11	<i>Lepus ruficaudatus</i> (Hare)	Small rounded	Smooth	R. Waved	Closed
12	<i>Mellivora capensis</i> (Ratel) (Image 9)	Large oval	Rippled	Ir. Waved	Near
13	<i>Panthera leo persica</i> (Asiatic Lion) (Image 10)	Small rounded	Rippled	R. Waved	Near
14	<i>Panthera pardus</i> (Leopard) (Image 11)	Large oval	Crenate	R. Waved	Near
15	<i>Semnopithecus</i> sp. (Langur)	Small rounded	Crenate	R. Waved	Closed
16	<i>Viverricula indica</i> (Small Indian Civet) (Image 12)	Large oval	Crenate	R. Waved	Closed
17	<i>Sus scrofa</i> (Wild Boar)	Large oval	Rippled	Ir. Waved	Distant



Image 1. Cross section of hair of Chital

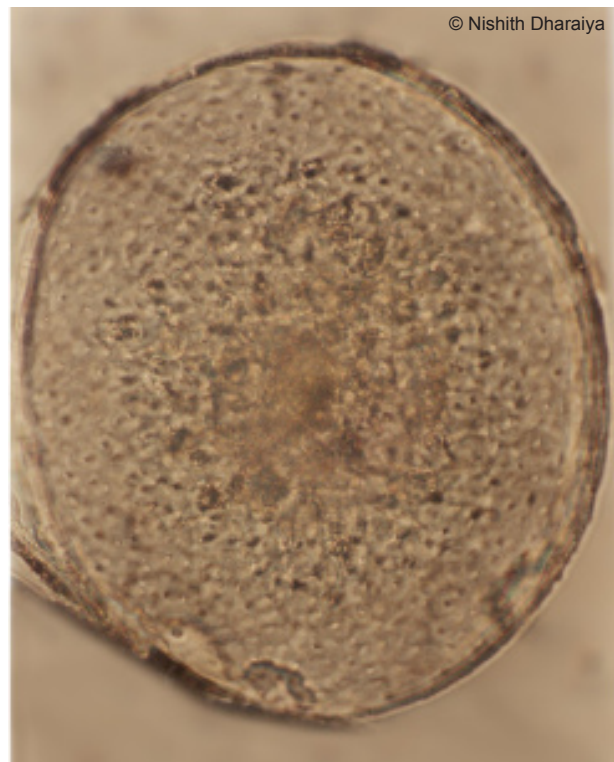


Image 2. Cross section of hair of Bluebull

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Image 3. Cross section of hair of Sambar

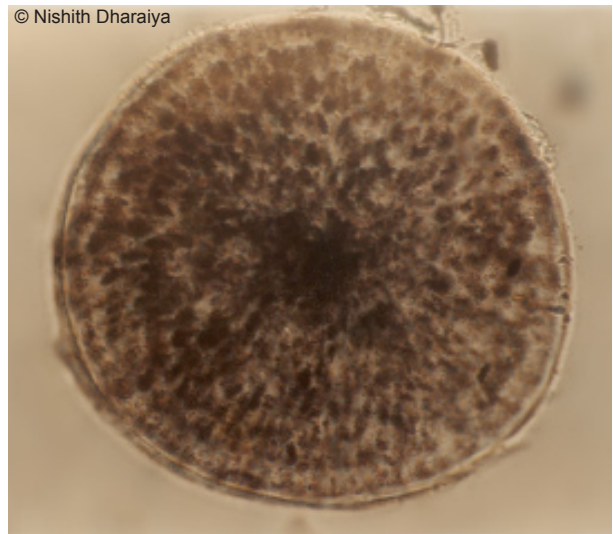


Image 4. Cross section of hair of Domestic Buffalo



Image 5. Cross section of hair of Domestic Cow



Image 6. Cross section of hair of Domestic Goat

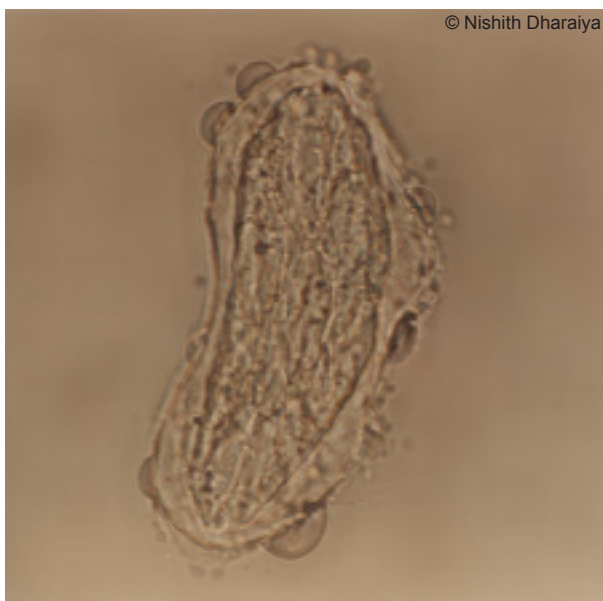


Image 7. Cross section of hair of Domestic Sheep

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Image 8. Cross section of hair of Chinkara



Image 9. Cross section of hair of Ratel



Image 10. Cross section of hair of Small Indian Civet



Image 12. Cross section of hair of Leopard

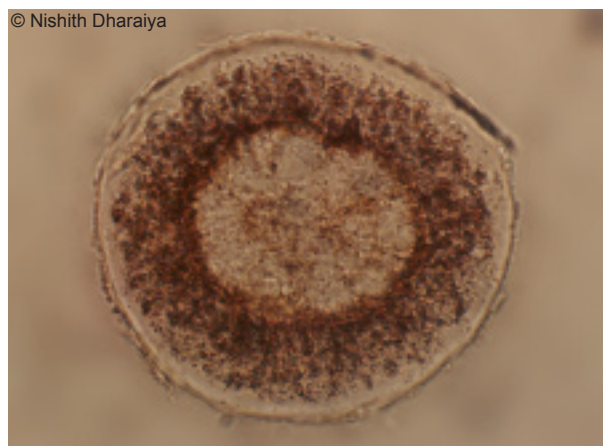


Image 11. Cross section of hair of Asiatic Lion

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