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Comparative hair morphology of the Indian Otter species *Aonyx cinerea*, *Lutra lutra* and *Lutrogale perspicillata* (Mustelidae: Carnivora: Mammalia)

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Abstract

The dorsal guard hair of three Indian otter species namely, *Aonyx cinerea*, *Lutra lutra*, and *Lutrogale perspicillata* were examined using the optical light microscope at the Zoological Survey of India, Kolkata during January – July 2016. The microscopic characteristics of hair of two species *Aonyx cinerea* and *Lutra lutra* showed almost similar characteristics, however, the cross-section of hair is varied between the two species. But the microscopic hair characteristics of *Lutrogale perspicillata* having different hair characteristics viz., ‘unicellular irregular’, ‘ladder’ medulla and ‘irregular’ cuticular scale patterns and these unique characteristics make the difference between the other two species (*Aonyx cinerea* and *Lutra lutra*) studied. The high-resolution photo-micrographs and key characteristics of hair were presented here can be used as an appropriate reference for species identification.

Keywords: Indian otters, hair characteristics, dorsal guard hair, unicellular irregular, ladder.

1. Introduction

Although the molecular analysis have become more common [6, 10], hair is usually identified to species using simple method with microscopic characteristics using the reference collections viz., Brunner and Coman [3], Moore *et al.* [9], Teerink [12]. The Otter species are poached or used mainly for their skins or domestic uses [1]. The tricho-taxonomy is one of the practical application used mainly in the animal forensic and ecological sciences in recent years for identification of species [2, 4].

In India, the hair characteristics study on the different orders of class Mammalia have been well documented viz., Primates [5], Carnivora [4], selected mammals [2], Rodentia [7], Artiodactyla and Lagomorpha [11], etc. However, hair characteristics studies on Indian otter species is little known except a study by Chakraborty and De [4]. In the present study, the three species namely, Oriental small-clawed otter *Aonyx cinerea* (Illiger, 1815), European otter *Lutra lutra* (Linnaeus, 1758), and smooth-coated otter *Lutrogale perspicillata* (I. Geoffroy Saint-Hilaire, 1826) were examined to know their microscopic hair structure for species identification.

2. Materials and Methods

A tuft of dorsal guard hairs *Aonyx cinerea*, *Lutra lutra*, and *Lutrogale perspicillata* were collected from the dry flat skins present in the National Zoological Collections, Mammal and Osteology Section, Zoological Survey of India, Kolkata, India during January – July 2016. The samples were washed thoroughly with acetone ($(\text{CH}_3)_2\text{CO} = 58.08$) and carbon tetrachloride ($\text{CCl}_4 = 153.82$) to remove the dirt of exogenous materials. The cuticular characters of hair such as scale position, scale patterns, structure of scale margins and distance between scale margins and medullary characters such as width composition, structure and form of margins of the medulla, and shape of cross-section of hair were examined under a digital camera fitted on optical microscope (Olympus BX41) and the observed microscopic characters of hair were photographed. The methodology and nomenclature of cuticular, medullary and cross-sectional characteristics of dorsal guard hairs were followed according to the descriptions provided by Brunner and Comman [3], Moore *et al.* [9] and Teerink [12].

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3. Results and Discussion

The microscopic hair characteristics were similar between the *Aonyx cinerea* and *Lutra lutra* species except for the shape of cross-section, but the hair characteristics of *Lutrogale perspicillata* is dissimilar among the three species studied (Table 1; Fig 1 - 3). The cuticular characteristics and medullary characteristics of hair *Aonyx cinerea* and *Lutra lutra* were similar and observed as the scale position was 'transversal', scale patterns is 'irregular wave', the structure of scale margins was 'rippled' and the distance between scale margins- 'close'; the composition of medulla- 'multicellular', the structure of medulla- 'wide aeriform lattice', and form of

the medulla margins- 'scalloped', but the cross-section of hair of two species was varied as 'biconvex' (*Aonyx cinerea*), and 'oblong' (*Lutra lutra*).

The microscopic hair characteristics of *Lutrogale perspicillata* were observed as the scale position was 'transversal', scale patterns is 'regular wave', the structure of scale margins was 'smooth' and the distance between scale margins- 'close'; the composition of medulla- 'unicellular irregular', the structure of medulla- 'ladder', and form of the medulla margins- 'scalloped' and the cross-section of hair was observed as 'oblong'.

Table 1: Microscopic hair characteristics of three species of *Aonyx cinerea*, *Lutra lutra*, and *Lutrogale perspicillata*.

Microscopic hair characteristics	<i>Aonyx cinerea</i> ,	<i>Lutra lutra</i> ,	<i>Lutrogale perspicillata</i>
Cuticular scale position	Transversal	Transversal	Transversal
Cuticular scale patterns	Irregular wave	Irregular wave	Regular wave
Cuticular Structure of scale margins	Rippled	Rippled	Smooth
Distance between cuticular scale margins	Close	Close	Close
Composition of medulla	Multicellular	Multicellular	Unicellular irregular
Structure of medulla	Wide aeriform lattice	Wide aeriform lattice	Ladder
Margins of medulla	Scalloped	Scalloped	Scalloped
Shape of cross-section	Biconvex	Oblong	Oblong

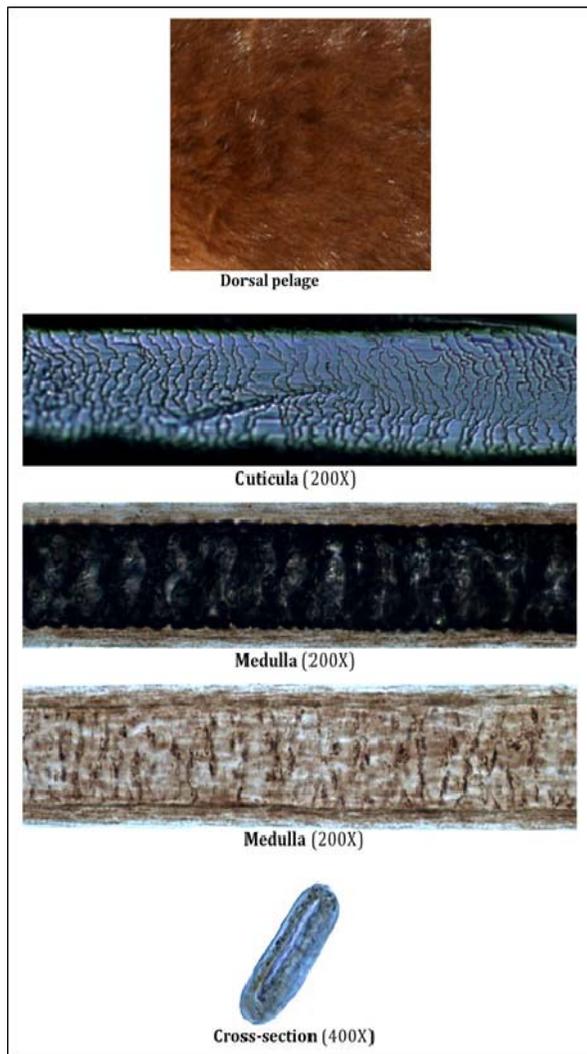


Fig 1: Photo-micrograph of dorsal guard hairs of *Aonyx cinerea*,

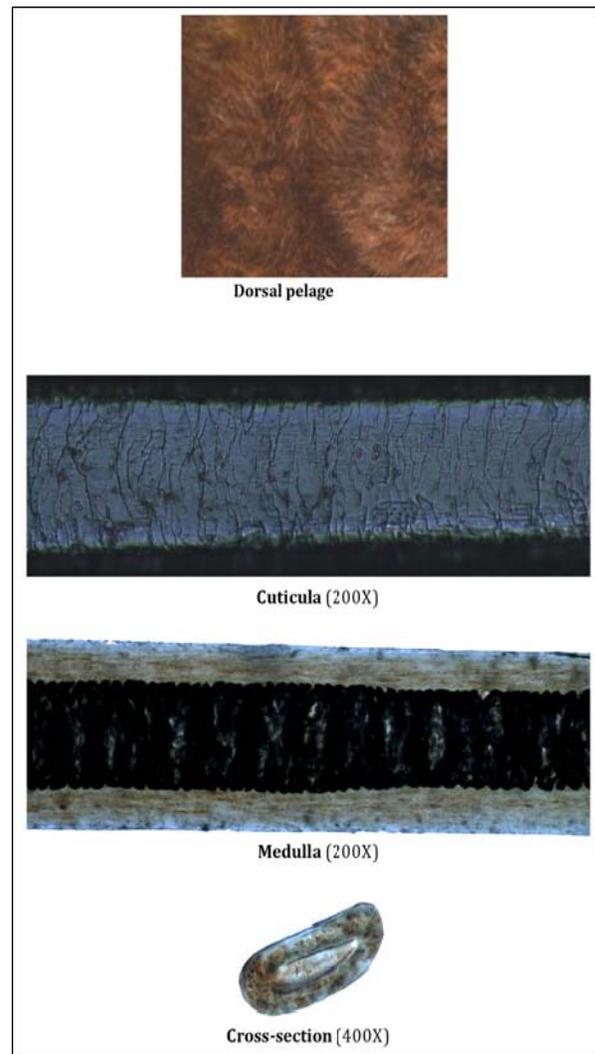


Fig 2: Photo-micrograph of dorsal guard hairs of *Lutra lutra*,

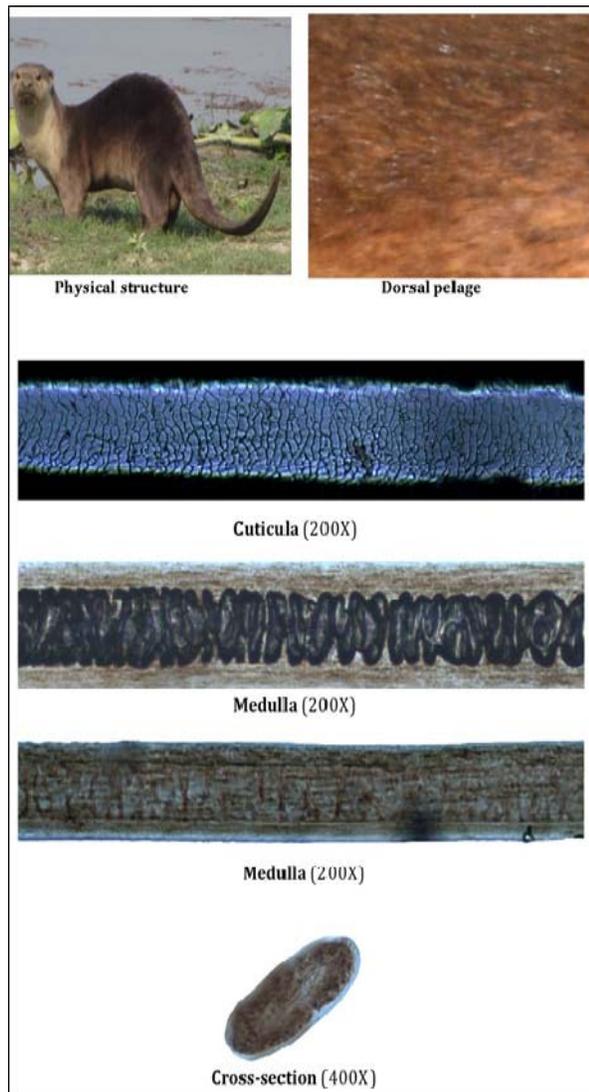


Fig 3: Photo-micrograph of dorsal guard hairs of *Lutrogale perspicillata*.

The dorsal pelage of *Aonyx cinerea*, was characterised by greyish brown and underside is light brown to yellow and whitish throat; *Lutra lutra* by rough and grizzled coarse coat of dark olive brown colour and the underparts are lighter and *Lutrogale perspicillata* by varies from blackish brown to lighter brown, or paler tawny or sandy brown, under side is lighter [1, 8]. The microscopic characteristics of hair of two species *Aonyx cinerea* and *Lutra lutra* showed almost similar characteristics, however, the cross-section of hair is varied between the two species. But the microscopic hair characteristics of *Lutrogale perspicillata* having different hair characteristics such as 'unicellular irregular', 'ladder' medulla and 'irregular' cuticular scale patterns, these unique characters make the difference between the other two species (*Aonyx cinerea* and *Lutra lutra*) studied. So far, there is no specific hair studies have been conducted on these species except a study of Chakraborty and De [4], in which the surface structure of hair characteristics of Indian otters were discussed. Based on comparative tricho-taxonomic studies by Chakraborty and De [4], Sarkar [11] and Kamalakannan [7], these three Indian otter species can easily be diagnosed from another group of mammals using these microscopic hair characteristics. This study provides a complete combination of characters of hair of three Indian otter species.

4. Conclusion

The three Indian otter species are protected under Schedule I (*Aonyx cinerea*) and Schedule II (*Lutra lutra*, and *Lutrogale perspicillata*) of the Indian Wildlife (Protection) Act, 1972. As mentioned earlier these otters are poached mainly skin and used for domestic uses. Therefore, the photo-micrographs presented here can be used in forensic science as an appropriate reference for the species identification.

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