

Original Research Article

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**Comparative Study of Dorsal Guard Hair of Large Indian Civet (*Viverra zibetha*) and Small Indian Civet (*Viverricula indica*)
(Carnivora: Viverridae: Mammalia)**

Manokaran Kamalakannan*

Zoological Survey of India, M-Block, New Alipore, Kolkata-700053, India

**Corresponding author*

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The microscopic hair analysis of Large Indian Civet (*Viverra zibetha*) and Small Indian Civet (*Viverricula indica*) was done using the optical light microscope for its species identification, the hair of two species showed different cuticular and cross-section characteristics. The unique cuticular pattern 'broad diamond petal' and the shape of the cross-section 'oval or oblong' of dorsal guard hair of two species determine the species identity between the two species. The high-resolution photo-micrographs and key characteristics of hair presented here can be used as an appropriate reference for species identification.

Introduction

The hair characteristics study is one of the methods for identification of mammals when the morpho-taxonomy is failed to provide a proper result in the case of small part of the skin of a mammal available (Chakraborty and De, 2010). The tricho-taxonomy i.e. study of mammal hair can be used for identification of species on the basis of a combination of microscopic characters (Teerink, 1991). There are many workers *viz.*, Mayer (1952); Brunner and Coman (1974); Moore *et al.*, (1974); Koppikar and Sabins (1975); Teerink (1991); Wallis (1993); Chakraborty and De (2010) have well documented the different hair characters of mammals.

In India, the significant tricho-taxonomic studies have been carried out by many workers on different species of mammals *viz.*, Koppikar and Sabins (Artiodactyls; 1975); Bahuguna *et al.*, (selected mammals; 2010); Chakraborty and De (Carnivores; 2010); Sarkar (Rodents and Primates; 2012) and Kamalakannan (Artiodactyls and Lagomorphs, 2015). Apart from these studies, Chakraborty and De (2010), Bahuguna (2011) have well documented the hair characters of family Viverridae. However, comparative study of hair characters between *Viverra zibetha* and *Viverricula indica* is little known. Therefore, in the present study, the

microscopic analysis of hairs of *Viverra zibetha* and *Viverricula indica* was studied comparatively.

Materials and Methods

The dorsal guard hairs of were collected from the dry skins of *Viverra zibetha* and *Viverricula indica* housed in the National Zoological Collections, Mammal and Osteology Section, Zoological Survey of India, Kolkata, India. The samples were washed thoroughly with acetone and carbon tetrachloride 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 100 X - 400 X magnification with help of the 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 (1974), Moore *et al.*, (1974) and Teerink (1991).

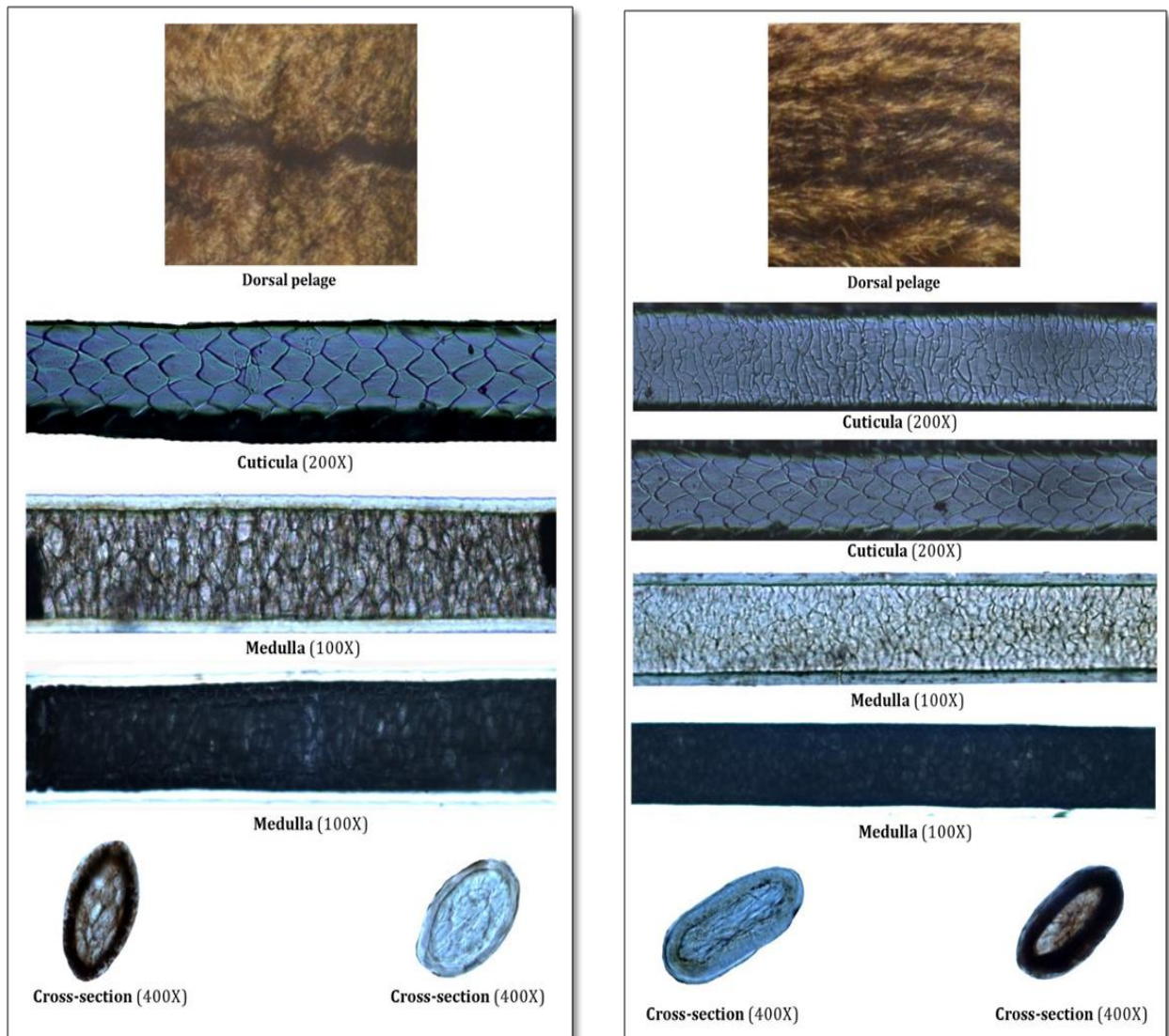
Results and Discussion

The general pelage colour of *Viverra zibetha* is dark hoary grey mixed with yellowish or brown tinge fur; *Viverricula indica* is tawny grey or greyish brown infused with spots on the body (Menon, 2014) (Table 1 and Fig. 1&2). The cuticular characteristics of dorsal guard hair differed between the two species studied *i.e.* the scale position was ‘longitudinal’, scale patterns was ‘broad diamond petal’, the structure of scale margins was ‘smooth’ and the distance between scale margins- ‘distant’ was observed in *Viverra zibetha*, but the scale position was either ‘transversal’ or ‘longitudinal’, scale patterns was either ‘regular wave’ or ‘broad diamond petal’, the structure of scale margins was ‘smooth’ and the distance between scale margins- ‘distant’ was observed in *Viverricula indica*.

Table.1 Microscopic hair characteristics of *Viverra zibetha* and *Viverricula indica*

Microscopic hair characteristics	<i>Viverra zibetha</i>	<i>Viverricula indica</i>
Cuticular scale position	longitudinal	longitudinal / Transversal
Cuticular scale patterns	broad diamond petal	Regular wave/ broad diamond petal’
Cuticular Structure of scale margins	Smooth	Smooth
Distance between cuticular scale margins	Distant	Distant
Composition of medulla	multicellular in rows	multicellular in rows
Structure of medulla	wide medulla lattice	wide medulla lattice
Margins of medulla	straight	straight
Shape of cross-section	Oval	Oval / Oblong

Fig.1&2 Photo-micrograph of hairs of *Viverra zibetha* and Photo-micrograph of hairs of *Viverricula indica*



However, the medullary characteristics of dorsal guard hair of the two species studied were similar as: the composition of medulla- 'multicellular in rows', the structure of medulla- 'wide medulla lattice', and form of the medulla margins- 'straight'. The cross-section of hair was varied between the two species and observed as: 'oval', and 'oval or oblong' shape in dorsal guard hair of *Viverra zibetha* and *Viverricula indica*, respectively. As mentioned earlier, the two species *Viverra zibetha* and *Viverricula indica* can be

diagnosed with their pelage coat colour (Menon, 2014). Apart from this, the distinct microscopic characters such as 'longitudinal' and 'broad diamond petal (*Viverra zibetha*)' and 'transversal regular wave or longitudinal' and 'regular wave or broad diamond petal' (*Viverricula indica*) cuticular scales of hair also determines the species identity between the two species. Although the medullary characteristics of dorsal guard hair are similar between the two species studied, the shape of the cross-section of dorsal guard hair makes

the distinct between the two species *i.e.* 'oval' in *Viverra zibetha* and 'oval or oblong' in *Viverricula indica*. Similar observation was made by Chakraborty and De (2010), and Bahuguna (2011) on dorsal guard hair's study of family Viverridae, however, the hair characters are varied comparatively. This study provides a complete combination of characters of dorsal guard hair of *Viverra zibetha* and *Viverricula indica* for species identification.

In conclusion, the two species of civets listed under Schedule II of the Indian Wildlife (Protection) Act, 1972 as they are threatened by many factors including poaching. This animal is poached for local consumption, body parts and glands for medicinal uses. Therefore, the photo-micrographs are presented here can be used in forensic science as well as prey-predator food analysis as an appropriate reference for the species identification.

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