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ULTRA-STRUCTURAL STUDIES OF HAIRS OF SEVENTEEN SPECIES OF CARNIVORES MAMMALS USING SCANNING ELECTRON MICROGRAPHS

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INTRODUCTION

The illegal trade in skin of a number of Wild animals exists in India despite the introduction of Wild Life (Protection) Act. It is becoming difficult for the scientists and large enforcement agencies such as wildlife department, customs, etc., to punish the offenders. It is often difficult to identify the material based on the morphological characteristics. This study attempts to provide the surface ultra-structure of dorsal guard hairs of 17 species of carnivores mammals using Electron Micrographs.

The study on hairs dates back to eighteenth century. In recent years, hair study has become one of the outstanding disciplines in science due to its manifold implications such as identification of prey species from the gut contents and scats of large predator-species.

Scanty information is available regarding ultra-structural details using SEM on mammalian hairs (Day, 1966 ; Short, 1978 ; Homan & Genoways, 1978 and De, 1993). Therefore, the present study is made on 17 species of carnivores under six families enlisted in CITES and Schedule I & Part II of Schedule II of Indian Wild Life (Protection) Act, 1972.

MATERIAL AND METHODS

Five to six dorsal guard hairs from 17 carnivore's species of mammals were collected with the help of a fine scissor and a fine forcep from the identified National Zoological Collections of the Zoological Survey of India, Calcutta. .Collected samples were washed and cleaned with different dilutions of acetone, and air dried. The samples were coated with carbon and gold in a vacuum evaporator JEE-4X, and scanned using Jeol JSM—840A.

RESULTS

The surface structure of hairs of each species shows cuticular scales, with variable inter-scalar portion and diameter (Table I).

Hairs of *Canis aureus* and *Canis lupus* possess flattened scales with slightly crenated margins along the entire length of the hair (Figs. 1 to 5). Mosaic pattern scales are observed on the hairs of *Felis bengalensis*, *Felis chaus* and *Felis marmorata* (Figs. 23 to 28). Highly crenated and short wide scales are found on the hairs of *Panthera tigris* (Figs. 33 & 34). Hairs of *Felis concolor* and *Felis rubiginosa* have thickly arranged cortical scales, with flattened edges (Figs. 29 to 32).

Herpestes edwardsi and *Herpestes smithi* possess hairs having narrow scale and smooth margins (Figs. 15 to 18), whereas hairs of *Herpestes auropunctatus* and *Herpestes urva* contain irregular petal-shaped scales (Figs. 13, 14 & 19, 20). Short wide scales with crenated edges are observed on the hairs of *Melogale personata* (Figs. 11 & 12). Flattened cuticular scales with flattened margin is found on the hair of *Arctonyx collaris* (Fig. 9), whereas hair of *Mellivora capensis* possess broad cuticular scales, with heavily crenated margins (Fig. 10). Regularly arranged cortical scales with crenated margins are found on the hair of *Ailurus fulgens* (Figs. 6 to 8).

DISCUSSION

From the scale pattern of different carnivores, it is observed that flattened scales with slightly crenated margins occur in the family Canidae and mosaic pattern occur in three species and thickly arranged scales with flattened edges in two species of the family Felidae.

One species of Viverridae has short wide scales, with highly crenated margin, other two species contain narrow scales with smooth margins and another two species contain irregular petal form of cortical scales.

Crenated margined cuticular scales are found in two species of Mustelidae and flattened cuticular scales with flattened margin in another one species. Hairs of one species of Procyonidae has regularly arranged cortical scales with crenated margin.

In the present study it is found that diameter of hair shaft is not specific and it varies from root up to the tip, as observed by Short (1978).

TABLE No : I

Name of the specimen	Family	Diameter	Mean of the inter-scalar portion
Canis aureus Linnaeus, 1758	Canidae	63·8 μ	20·2 μ
Canis lupus Linnaeus, 1758	"	55·2 μ	7·759 μ
Ailurus fulgens F. Cuvier, 1825	Procyonidae	74·5 μ	
Arctonyx collaries	Mustelidae	56·4 μ	12·08 μ
Melivora capensis (Schreber, 1776)	"	69·4 μ	14·526 μ
Melogale personata I. Geoffroy, 1831	"	133·3 μ	8·752 μ
Herpestes auropunctatus (Hodgson, 1836)	Viverridae	58·8 μ	5·55 μ
Herepestes edwardsi (E. Geoffroy, 1818)	"	103·3 μ	9·06 μ
Herepestes smithi Gray, 1837	"	126·0 μ	8·875 μ
Herpestes urva (Hodgson, 1836)	"	116·0 μ	10·06 μ
Hyaena hyaena (Linnaeus, 1758)	Hyaenidae	91·4 μ	13·93 μ
Felis bengalensis Kerr, 1792	Felidae	77·4 μ	6·012 μ
Felis chaus Guldenstaedt, 1776	"	81·3 μ	19·27 μ
Felis marmorata Martin, 1837	"	60·0 μ	14·14 μ
Felis rubiginosa I. Geoffroy, 1831	"	47·2 μ	16·804 μ
Felis concolor Linnaeus, 1771	"	69·3 μ	6·126 μ
Panthera tigris (Linnaeus, 1758)	"	65·9 μ	11·456 μ

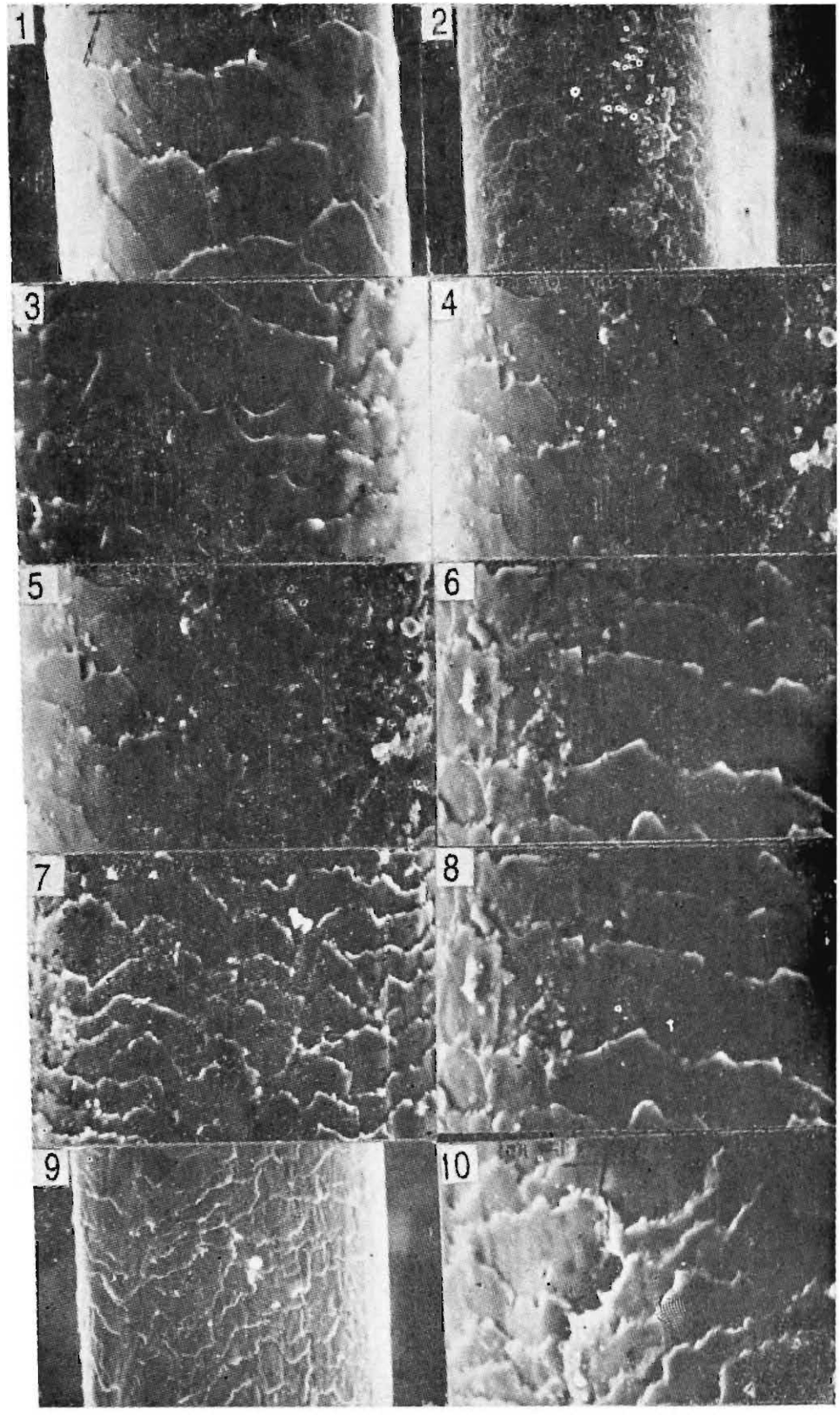

Fig. 1—10 *Scanning Electron micrographs of mammalian hairs*

Figs. 1 & 2 *Canis aureus* (X2, 500, X1, 700)

Figs. 3 — 5 *Canis lupus* (X2, 500, X2000, X2000)

Figs. 6 — 8 *Ailurus fulgens* (X2000, X1700, X2000)

Fig. 9 *Arctonyx collaris* (X750)

Fig. 10 *Mellivora capensis* (X3000)

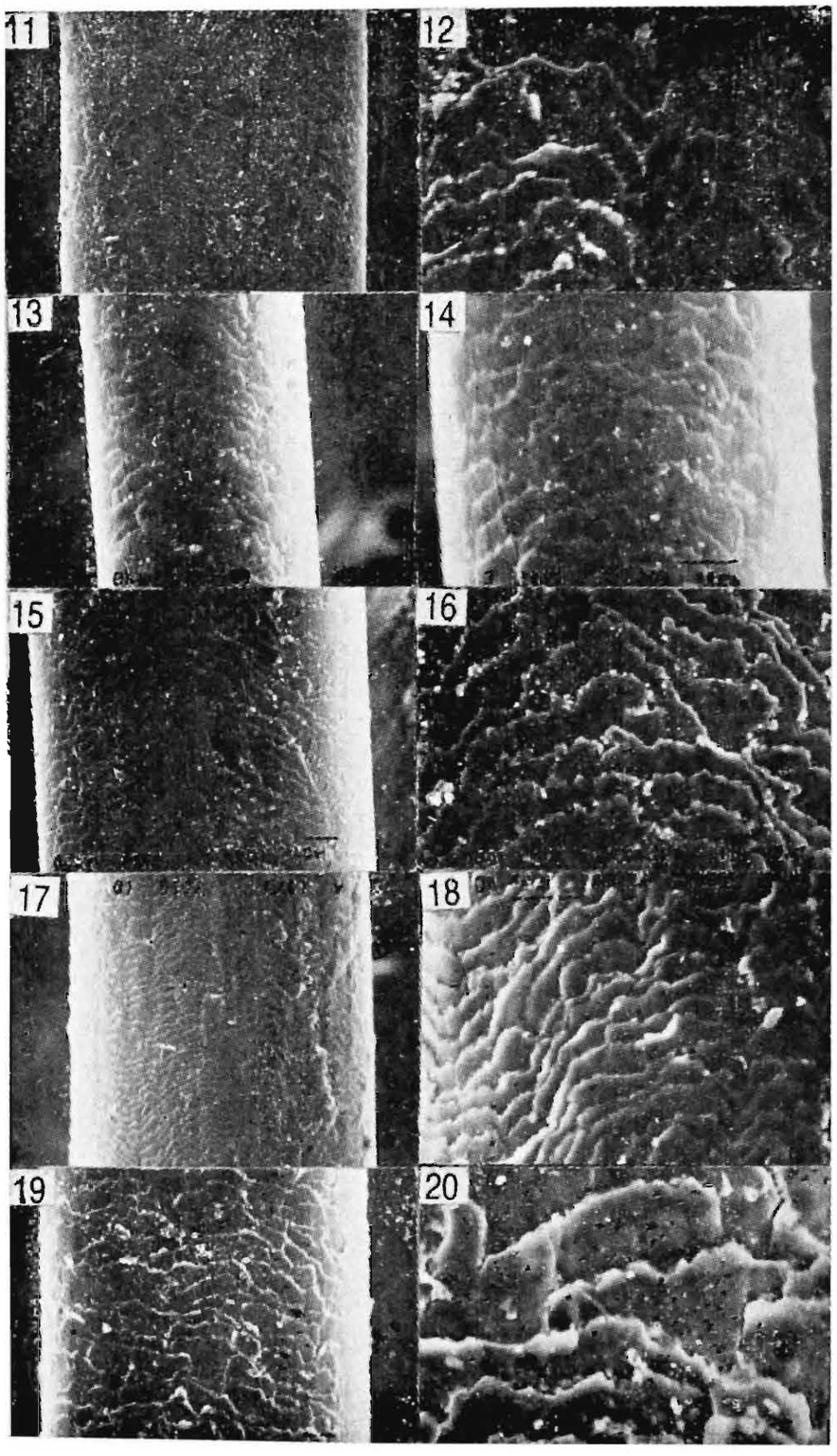

Fig. 11—20 *Scanning Electron micrographs of mammalian hairs*

Figs. 11 & 12 ***Melogale personata*** **(X600, X2000)**

Figs. 13 & 14 ***Herpestes aurepunctatus*** **(X1700, X1700)**

Figs. 15 & 16 ***Herpestes edwardsi*** **(X800, X2000)**

Figs. 17 & 18 ***Herpestes smithi*** **(X650, X2000)**

Figs. 19 & 20 ***Herpestes urva*** **(X800, X2000)**

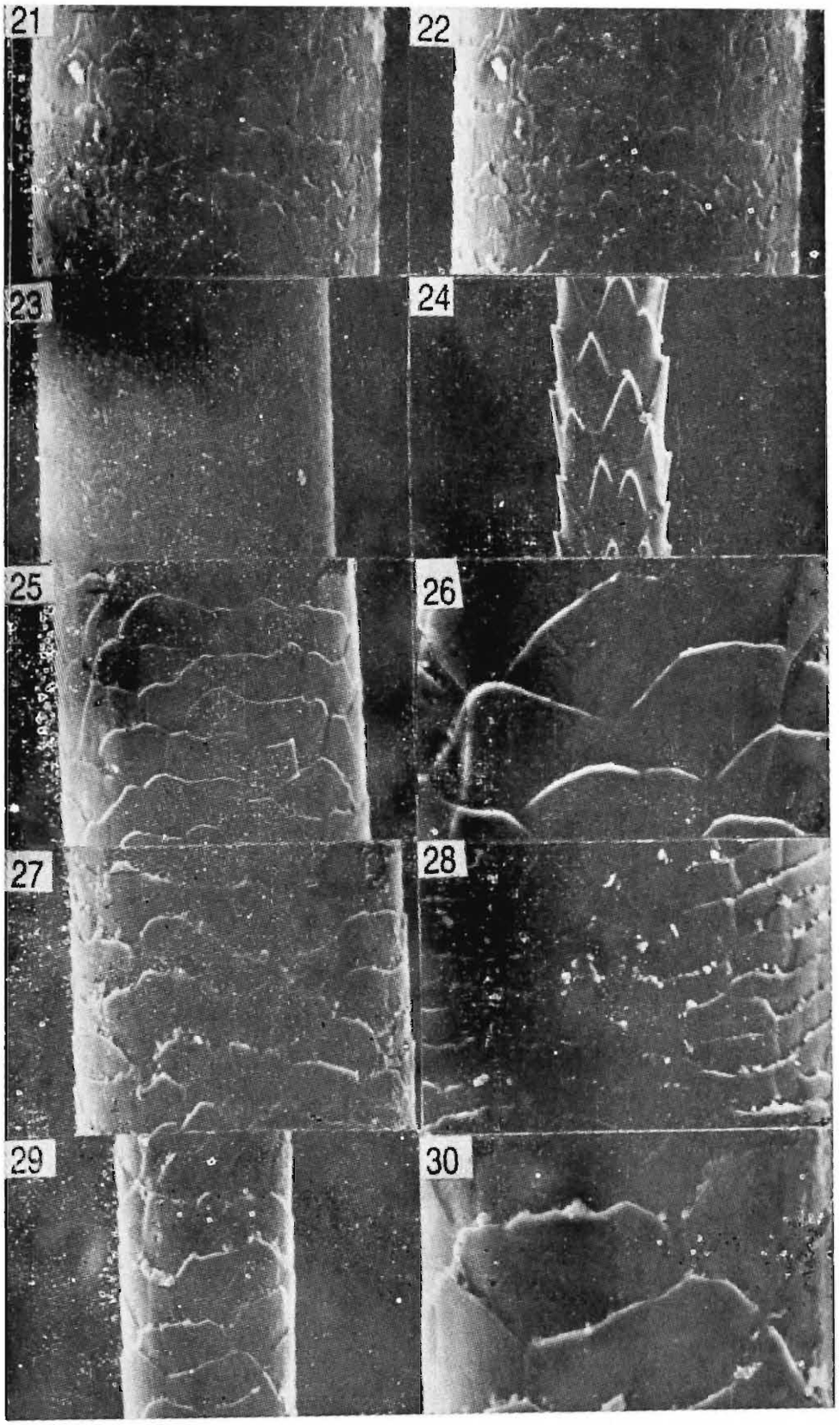

Fig. 21—30 *Scanning Electron micrographs of mammalian hairs*

Figs. 21 & 22 *Hyaena hyaena* (X1000, X2000)

Figs. 23 & 24 *Felis bengalensis* (X1000, X2000)

Figs. 25 & 26 *Felis chaus* (X1000, X2000)

Figs. 27 & 28 *Felis marmorata* (X1500, X2000)

Figs. 29 & 30 *Felis rubiginosa* (X1000, X2000)

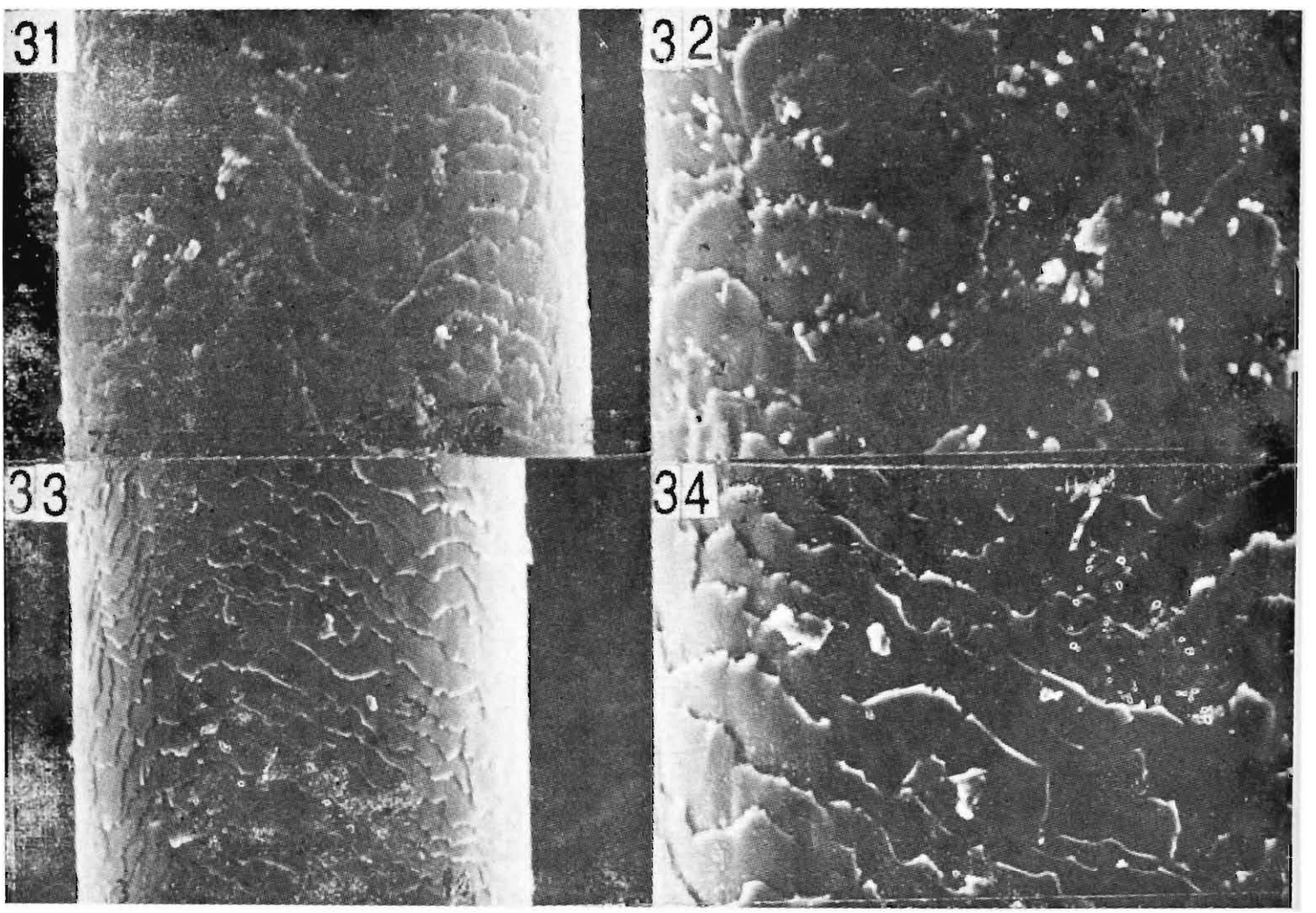

Fig. 31—34 *Scanning Electron micrographs of mammalian hairs*
Figs. 31 & 32 *Felis concolor* (X1300, X2000)
Figs. 33 & 34 *Panthera tigris* (X1000, X2000)

The width of inter-scalar portion may have some significance in identifying different mammalian species, if it is considered with other parameters *viz.*, length, width, cross-sectional appearance, and pigment patterns, etc. (Short, 1978, Homan & Genoways, 1978). More and more studies are required to establish a concrete differences between species.

Conclusion

So far, identification of hairs is done based on the cuticular and medullary patterns by making cross-section. Till to-day, no laboratory has established a method for their identification by any other means. In view of the above situation, the present study was conducted. A large number of endangered and vulnerable animal species are poached regularly for trade for products obtained from them. Identification of animal species based on morphological characteristics is possible only if the large body parts are available. Therefore, it is important to develop a technique which could enable the identification of species from the hair. The present study is aimed at serving the need to some extent.

Summary

Scanning Electron Microscopic (SEM) observations were made on the dorsal guard hairs of 17 species of mammals belonging to schedule I and part II of schedule II of the Wild life (Protection) Act. Results show that the micrographs of six families of carnivores differ in their morphology and inter-scalar portion. The present study is aimed at providing an atlas of the ultra-structure of hairs using SEM. It is apparent that the micrographs of hairs can provide a valuable tool to Wild Life researchers, customs department and other groups of investigators in identification of the animal species.

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